



Master Components Selector Guide

Including Pb-Free Leadframe Options

ON Semiconductor Master Components Selector Guide

Analog, Clock and Data Management, Standard Logic, Discrete,
Power MOSFET and Integrated Function Products

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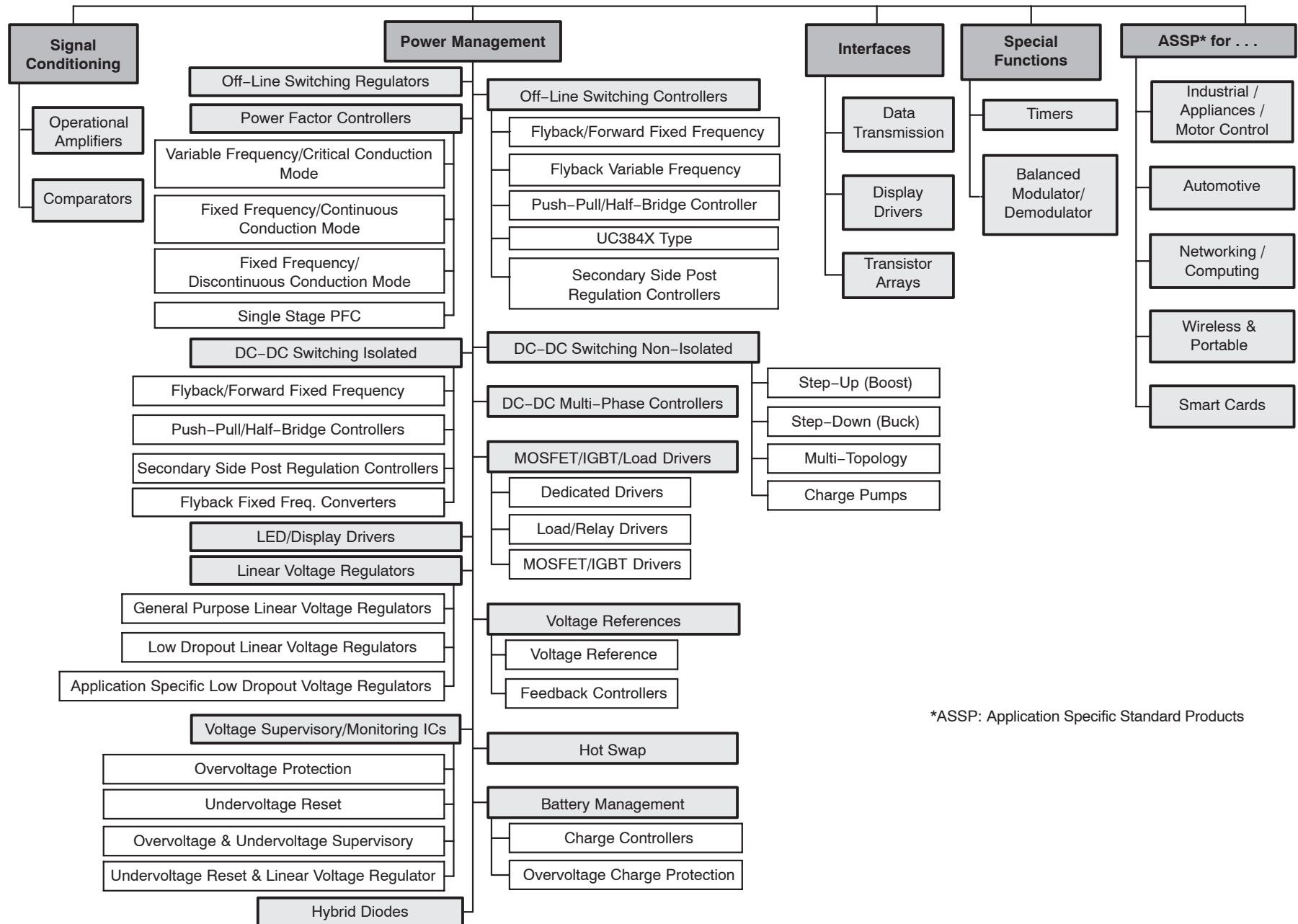
NOTE: The **Tape & Reel Specification** information has been moved to its own publication. Please see ON Semiconductor brochure, BRD8011/D, for information on Tape & Reel.

Analog ICs

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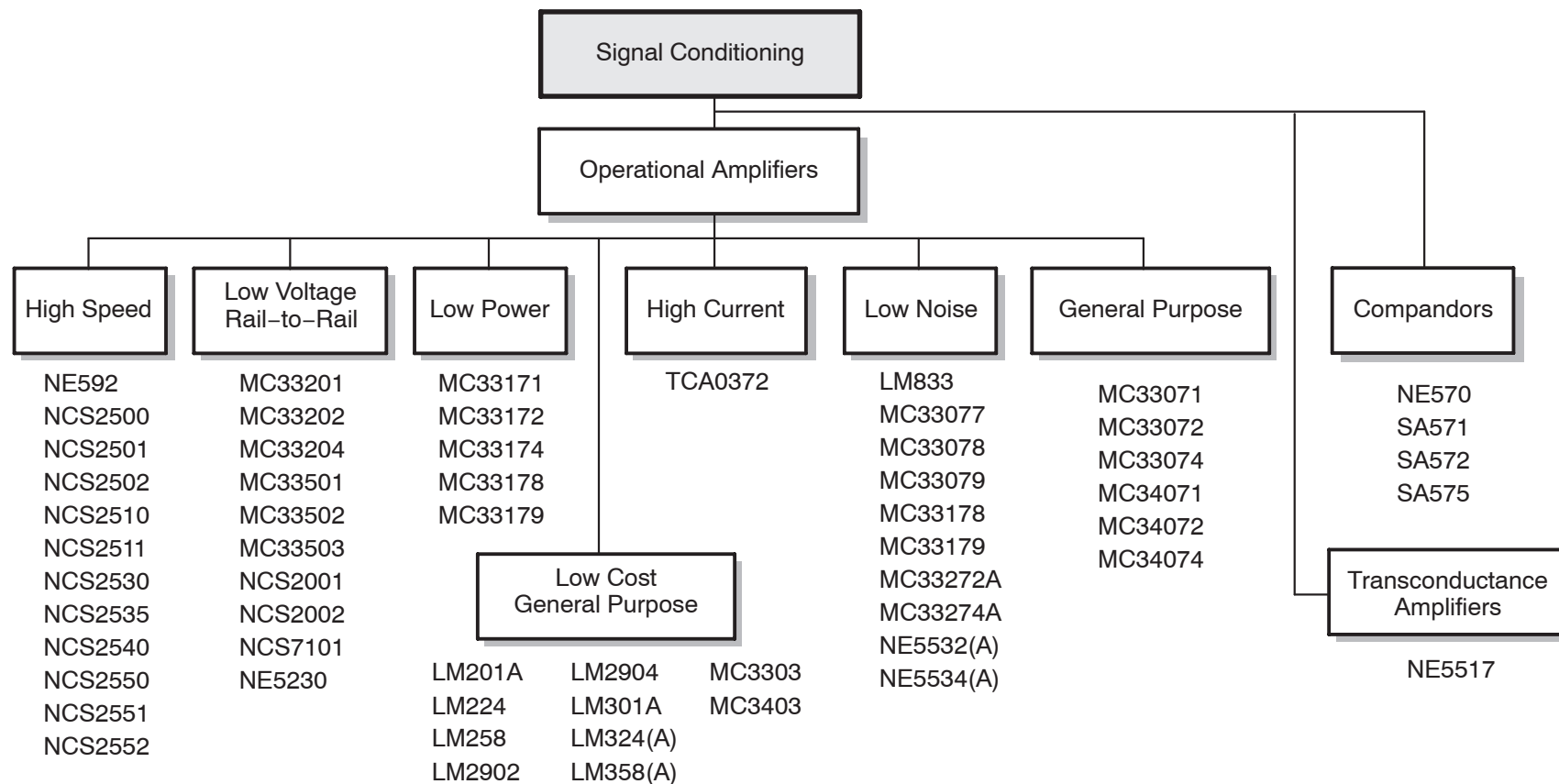
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ON Semiconductor's Analog Integrated Circuits



*ASSP: Application Specific Standard Products

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Single Operational Amplifiers

Device Name	V _{CC} (min) (V)	V _{CC} (max) (V)	GBW (typ) (MHz)	Slew Rate (typ) (V/us)	V _{IO} (max @ 25°C, V _S = 5.0 V) (mV)	I _{IB} (typ) (nA)	I _D (typ) (mA)	Temp Range (°C)	CMR (typ) (dB)	e _n (typical) (nV/√Hz) @ f = 1.0 kHz	Number of Channels	Supply Type	Package	Description
LM201A	±3.0	±22	1.0	0.5	2.0	30	1.8	–25 to +85	96	–	1	Split	DIP–8, SO–8	General Purpose, Precision Non Compensated
LM201AV	±3.0	±22	1.0	0.5	2.0	30	1.8	–40 to +105	96	–	1	Split	DIP–8, SO–8	General Purpose, Precision Non Compensated
LM301A	±3.0	±18	1.0	0.5	7.5	70	1.8	0 to 70	90	–	1	Split	DIP–8, SO–8	General Purpose, Non Compensated
MC33071	3.0 or ±1.5	44	4.5	13*	5.0	100	1.6	–40 to +85	97	32	1	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
MC33071A	3.0 or ±1.5	44	4.5	13*	3.0	100	1.6	–40 to +85	97	32	1	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
MC33171	3.0 or ±1.5	44 or ±22	1.8	2.1	5.0	20	0.18	–40 to +85	90	32	1	Single, Split	DIP–8, SO–8	Low Power, Single Supply, Two Voltage Ranges
MC33201	1.8 or ±0.9	12	2.2	1.0	6.0	80	0.9	–40 to +105	90	20	1	Single, Split	DIP–8, SO–8	Low Voltage, Rail–to–Rail
MC33201V	1.8 or ±0.9	12	2.2	1.0	6.0	80	0.9	–55 to +125	90	20	1	Single, Split	DIP–8, SO–8	Low Voltage, Rail–to–Rail, Extended Temp. Range
MC33501	1.0 or ±0.5	7.0 or ±3.5	4 @ V _S = 5	3.0	5.0	0.04 pA	1.2 @ V _S = 1 V	–40 to +105	75	30	1	Single, Split	TSOP–5*	One Volt SMARTMOS™, Rail–to–Rail
MC33503	1.0 or ±0.5	7.0 or ±3.5	4 @ V _S = 5	3.0	5.0	0.04 pA	1.2 @ V _S = 1 V	–40 to +105	75	30	1	Single, Split	TSOP–5*	One Volt SMARTMOS, Rail–to–Rail

*TSOP–5 – Also known as Thin SOT23–5.

ON Semiconductor Selector Guide – Analog Integrated Circuits

Single Operational Amplifiers (continued)

Device Name	V _{CC} (min) (V)	V _{CC} (max) (V)	GBW (typ) (MHz)	Slew Rate (typ) (V/us)	V _{IO} (max @ 25°C, V _S = 5.0 V) (mV)	I _{IB} (typ) (nA)	I _D (typ) (mA)	Temp Range (°C)	CMR (typ) (dB)	e _n (typical) (nV/√Hz) @ f = 1.0 kHz	Number of Channels	Supply Type	Package	Description
MC34071	3.0 or ±1.5	44	4.5	13*	5.0	100	1.6	0 to 70	97	32	1	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
MC34071A	3.0 or ±1.5	44	4.5	13*	3.0	100	1.6	0 to 70	97	32	1	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
NCS2001	0.9 or ±0.45	7.0 or ±3.5	1.4	1.6	6.0	10 pA	.80	–40 to +105	70	100	1	Single, Split	TSOP–5*, SC70–5	One Volt, CMOS Rail–to–Rail
NCS2002	0.9 or ±0.45	7.0 or ±3.5	0.8	1.2	6.0	10 pA	.80	–40 to +105	82	100	1	Single, Split	TSOP–6*	One Volt, CMOS Rail–to–Rail with Enable
NCS7101	1.8 or ±0.9	10 or ±5.0	1.0	1.2	7.0	1.0 pA	1.1	–40 to +85	65 (min)	140	1	Single, Split	TSOP–5*	Low Voltage, Rail–to–Rail
NCV2002	0.9 or ±0.45	7.0 or ±3.5	0.8	1.2	6.0	10 pA	.80	–40 to +125	82	100	1	Single, Split	TSOP–6*	One Volt, CMOS Rail–to–Rail with Enable
NE5230	±0.9 or 1.8	±7.5 or 15	0.6	0.25	3.0	40	0.6	0 to 70	95	30	1	Single, Split	SO–8, PDIP–8	Single Low Voltage Op Amp
NE5534	±3.0	±20	10	13	4.0*	500	4.0	0 to 70	100	4.0	1	Single, Split	SO–8, PDIP–8	Single Low Noise Op Amp
NE5534A	±3.0	±20	10	13	4.0*	500	4.0	0 to 70	100	3.5	1	Single, Split	SO–8, PDIP–8	Single Low Noise Op Amp
SA5230	±0.9 or 1.8	±7.5 or 15	0.6	0.25	3.0	40	0.6	–40 to 85	95	30	1	Single, Split	SO–8, PDIP–8	Single Low Voltage Op Amp
SA5534	±3.0	±20	10	13	4.0*	500	4.0	–40 to 85	100	4.0	1	Single, Split	PDIP–8	Single Low Noise Op Amp
SA5534A	±3.0	±20	10	13	4.0*	500	4.0	–40 to 85	100	3.5	1	Single, Split	SO–8, PDIP–8	Single Low Noise Op Amp
SE5534	±3.0	±20	10	13	2.0*	400	4.0	–55 to 125	100	4.0	1	Single, Split	PDIP–8	Single Low Noise Op Amp
SE5534A	±3.0	±20	10	13	2.0*	400	4.0	–55 to 125	100	3.5	1	Single, Split	PDIP–8	Single Low Noise Op Amp

*TSOP–5 – Also known as Thin SOT23–5.

Dual Operational Amplifiers

Device Name	V _{CC} (min) (V)	V _{CC} (max) (V)	GBW (typ) (MHz)	Slew Rate (typ) (V/us)	V _{IO} (max @ 25°C, V _S = 5.0 V) (mV)	I _B (typ) (nA)	I _D * (typ) (mA)	Temp Range (°C)	CMR (typ) (dB)	e _n (typical) (nV/√Hz) @ f = 1.0 kHz	Number of Channels	Supply Type	Package	Description
LM258	3.0 or ±1.5	32 or ±18	1.0	0.6	5.0	45	0.7	–25 to +85	85	–	2	Single, Split	DIP–8, SO–8, Micro8	Low Noise
LM358	3.0 or ±1.5	32 or ±18	1.0	0.6	7.0	45	0.7	0 to 70	70	–	2	Single, Split	DIP–8, SO–8, Micro8	Low Noise
LM833	±2.5	36	15	7.0	5.0	300	4.0	–40 to +85	100	4.5	2	Single, Split	DIP–8, SO–8	Low Noise
LM2904	3.0 or ±1.5	26 or ±13	1.0	0.6	7.0	45	0.7	–40 to +105	70	–	2	Single, Split	DIP–8, SO–8, Micro8	Low Power
LM2904V	3.0 or ±1.5	26 or ±13	1.0	0.6	7.0	45	0.7	–40 to +125	70	–	2	Single, Split	DIP–8, SO–8, Micro8	Low Power
MC33072	3.0 or ±1.5	44 or ±22	4.5	13*	5.0	100	3.2	–40 to +85	97	32	2	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
MC33072A	3.0 or ±1.5	44 or ±22	4.5	13*	3.0	100	3.2	–40 to +85	97	32	2	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
MC33077	±2.5	±18	37	11	1 @ V _S = ±15 V	280	3.5	–40 to +85	107	4.4	2	Split	DIP–8, SO–8	Low Noise
MC33078	±5.0	±18	16	7.0	2.0	300	4.1	–40 to +85	100	4.5	2	Split	DIP–8, SO–8	Low Noise
MC33172	3.0 or ±1.5	44 or ±22	1.8	2.1	5.0	20	0.36	–40 to +85	90	32	2	Single, Split	DIP–8, SO–8	Low Power, Single Supply, Two Voltage Ranges
MC33172V	3.0 or ±1.5	44 or ±22	1.8	2.1	5.0	20	0.36	–40 to +105	90	32	2	Single, Split	SO–8	Low Power, Single Supply, Two Voltage Ranges, Extended Temp. Range
MC33178	±2.0	±18	5.0	2.0	3.0	100	.85	–40 to +85	110	7.5	2	Split	DIP–8, SO–8	High Output Current, Low Power, Low Noise

*I_D typical for total device (all channels)

ON Semiconductor Selector Guide – Analog Integrated Circuits

Dual Operational Amplifiers (continued)

Device Name	V _{CC} (min) (V)	V _{CC} (max) (V)	GBW (typ) (MHz)	Slew Rate (typ) (V/us)	V _{IO} (max @ 25°C, V _S = 5.0 V) (mV)	I _B (typ) (nA)	I _D * (typ) (mA)	Temp Range (°C)	CMR (typ) (dB)	e _n (typical) (nV/√Hz) @ f = 1.0 kHz	Number of Channels	Supply Type	Package	Description
MC33202	1.8 or ±0.9	12 or ±6	2.2	1.0	8.0	80	1.8	–40 to +105	90	20	2	Single, Split	DIP–8, SO–8, Micro8™	Low Voltage, Rail–to–Rail
MC33202V	1.8 or ±0.9	12 or ±6	2.2	1.0	8.0	80	1.8	–55 to +125	90	20	2	Single, Split	DIP–8, SO–8	Low Voltage, Rail–to–Rail, Extended Temp. Range
MC33272A	3.0 or ±1.5	36 or ±18	24	10	1 @ V _S = ±15 V 2 @ V _S = 5.0 V	300	4.30	–40 to +85	100	18	2	Single, Split	DIP–8, SO–8	Single Supply, High SR, Low Input Offset Voltage
MC33502	1.0	7.0	5.0	3.0	5.0	0.04 pA	3.3	–40 to +105	75	30	2	Single, Split	DIP–8, SO–8	One Volt SMARTMOS, Rail–to–Rail
MC34072	3.0 or ±1.5	44 or ±22	4.5	13*	5.0	100	3.2	0 to 70	97	32	2	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
MC34072A	3.0 or ±1.5	44 or ±22	4.5	13*	3.0	100	3.2	0 to 70	97	32	2	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, *Av = –1.0
MC34072V	3.0 or ±1.5	44 or ±22	4.5	13*	5.0	100	3.2	–40 to +125	97	32	2	Single, Split	DIP–8, SO–8	High SR, Wide BW, Single Supply, Extended Temp. Range, *Av = –1.0
NE592	–8.0	+8.0	90	–	–	9.0 μA	18	0–70	86	–	2	–	SO–8, 14 PDIP–8, 14	Video Amplifier
NE5532/A	±3.0	±20	10	9.0	4.0 @ ±15 V	200	8.0	0 to 70	100	8.0	2	Split	DIP–8, SO–8, SO–16W	Low Noise
SA5532	±3.0	±20	10	9.0	4.0 @ ±15 V	200	8.0	–40 to 85	100	8.0	2	Split	DIP–8	Low Noise
SE5532/A	±3.0	±20	10	9.0	2.0 @ ±15 V	200	8.0	–55 to 125	100	8.0	2	Split	DIP–8, SO–8	Low Noise
TCA0372	5.0 or ±2.5	40 or ±20	1.4	1.4	15 @ ±15 V	100	5.0	–40 to +125	90	22	2	Single, Split	SOP (12+2+2) DIP–8, DIP–16	Power, High Current
TCA0372B	5.0 or ±2.5	40 or ±20	1.4	1.4	15 @ ±15 V	100	5.0	–40 to +125	90	22	2	Single, Split	DIP–8, SO–16W	Power, High Current

*I_D typical for total device (all channels)

Quad Operational Amplifiers

Device Name	V _{CC} (min) (V)	V _{CC} (max) (V)	GBW (typ) (MHz)	Slew Rate (typ) (V/us)	V _{IO} (max @ 25°C, V _S = 5.0 V) (mV)	I _B (typ) (nA)	I _D * (typ) (mA)	Temp Range (°C)	CMR (typ) (dB)	e _n (typical) (nV/√Hz) @ f = 1.0 kHz	Number of Channels	Supply Type	Package	Description
LM224	3.0 ±1.5	32 ±16	1.0	0.6	5.0	90	–	–25 to +85	85	–	4	Single, Split	DIP–14, SO–14	Low Power
LM324	3.0 ±1.5	32 ±16	1.0	0.6	7.0	90	–	0 to 70	70	–	4	Single, Split	DIP–14, SO–14	Low Power
LM324A	3.0 ±1.5	32 ±16	1.0	0.6	3.0	45	0.7	0 to 70	70	–	4	Single, Split	DIP–14, SO–14	Low Power
LM2902	3.0 ±1.5	26 ±13	1.0	0.6	7.0	90	–	–40 to +105	70	–	4	Single, Split	DIP–14, SO–14	Low Power
LM2902V	3.0 ±1.5	26 ±13	1.0	0.6	7.0	90	–	–40 to +125	70	–	4	Single, Split	DIP–14, SO–14	Low Power, Extended Temp. Range
MC3303	3.0 ±1.5	36 ±18	1.0	0.6	8.0	200	2.8	–40 to +85	90	–	4	Single, Split	DIP–14, SO–14	Low Power
MC33074	3.0 or ±1.5	44 or ±22	4.5	13*	5.0	100	6.4	–40 to +85	97	32	4	Single, Split	DIP–14, SO–14, TSSOP–14	High SR, Wide BW, Single Supply, *AV = –1.0
MC33074A	3.0 or ±1.5	44 or ±22	4.5	13*	3.0	100	6.4	–40 to +85	97	32	4	Single, Split	DIP–14, SO–14, TSSOP–14	High SR, Wide BW, Single Supply, *AV = –1.0
MC33079	±5.0	±18	16	7.0	2.5	300	8.4	–40 to +85	100	4.5	4	Split	DIP–14, SO–14	Low Noise
MC33174	3.0 or ±1.5	44 or ±22	1.8	2.1	5.0	20	0.72	–40 to +85	90	32	4	Single, Split	DIP–14, SO–14, TSSOP–14	Low Power, Single Supply, Two Voltage Ranges
MC33174V	3.0 or ±1.5	44 or ±22	1.8	2.1	5.0	20	0.72	–40 to +105	90	32	4	Single, Split	DIP–14, SO–14	Low Power, Single Supply, Two Voltage Ranges, Extended Temp. Range
MC33179	±2.0	±18	5.0	2.0	3.0	100	1.7	–40 to +85	110	7.5	4	Split	DIP–14, SO–14	High Output Current, Low Power, Low Noise

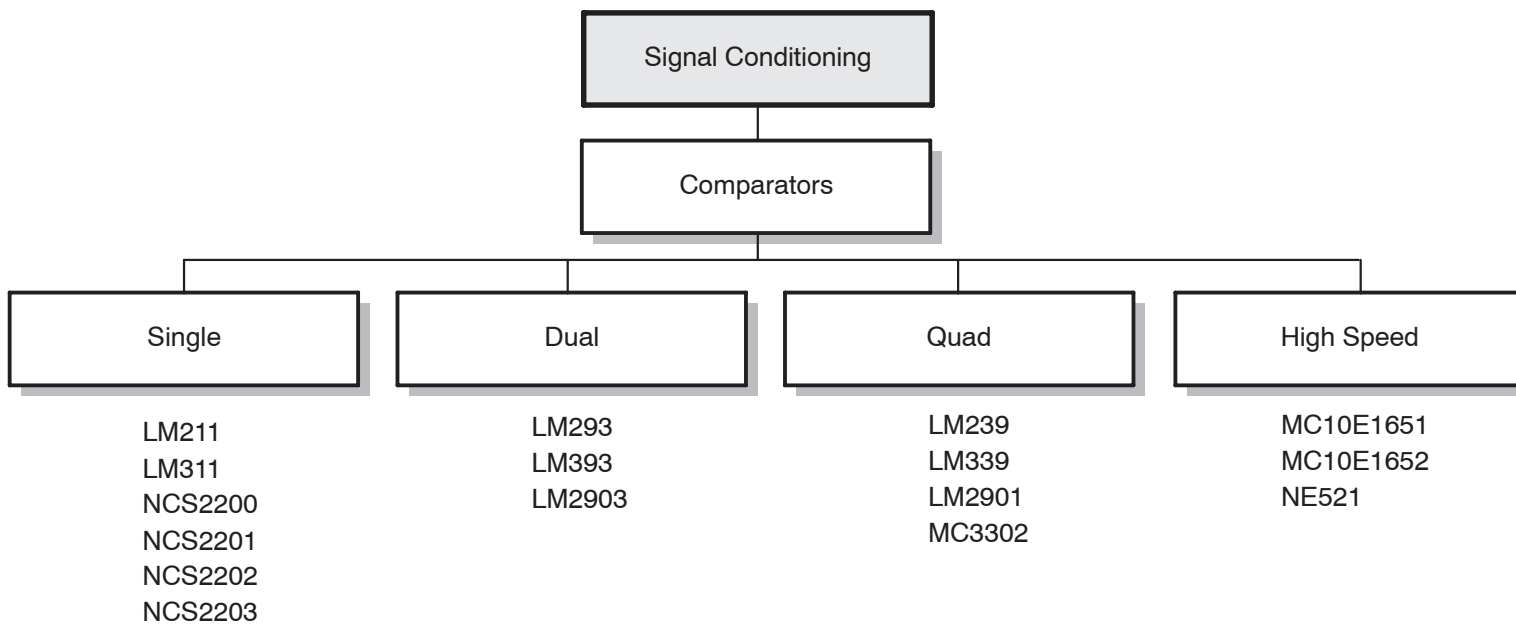
*I_D typical for total device (all channels)

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Quad Operational Amplifiers (continued)

Device Name	V _{CC} (min) (V)	V _{CC} (max) (V)	GBW (typ) (MHz)	Slew Rate (typ) (V/us)	V _{IO} (max @ 25°C, V _S = 5.0 V) (mV)	I _B (typ) (nA)	I _D * (typ) (mA)	Temp Range (°C)	CMR (typ) (dB)	e _n (typical) (nV/√Hz) @ f = 1.0 kHz	Number of Channels	Supply Type	Package	Description
MC33204	1.8 or ±0.9	12 or ±6.0	2.2	1.0	10	80	3.6	–40 to +105	90	20	4	Single, Split	DIP–14, SO–14, TSSOP–14	Low Voltage, Rail-to–Rail
MC33204V	1.8 or ±0.9	12 or ±6.0	2.2	1.0	10	80	3.6	–55 to +125	90	20	4	Single, Split	DIP–14, SO–14	Low Voltage, Rail-to–Rail, Extended Temp. Range
MC33274A	3.0 or ±1.5	36 or ±18	24	10	1.0 @ V _S = ±15 V 2.0 @ V _S = 5.0 V	300	8.6	–40 to +85	100	18	4	Single, Split	DIP–14, SO–14	Single Supply, High SR, Low Input Offset Voltage
MC3403	3.0 ±1.5	36 ±18	1.0	0.6	10	200	2.8	0 to 70	90	–	4	Single, Split	DIP–14, SO–14	Low Power
MC34074	3.0 or ±1.5	44 or ±22	4.5	13*	5.0	100	6.4	0 to 70	97	32	4	Single, Split	DIP–14, SO–14	High SR, Wide BW, Single Supply, *AV = –1.0
MC34074A	3.0 or ±1.5	44 or ±22	4.5	13*	3.0	100	6.4	0 to 70	97	32	4	Single, Split	DIP–14, SO–14	High SR, Wide BW, Single Supply, *AV = –1.0
MC34074V	3.0 or ±1.5	44 or ±22	4.5	13*	5.0	100	6.4	–40 to +125	97	32	4	Single, Split	DIP–14, SO–14	High SR, Wide BW, Single Supply, *AV = –1.0
NCV33274A	3.0 or ±1.5	36 or ±18	24	10	3.5 @ V _S = ±15 V 2.0 @ V _S = ±5.0 V	300	8.6	–40 to +125	100	18	4	Single, Split	DIP–14, SO–14	Single Supply, High SR, Low Input Offset Voltage

*I_D typical for total device (all channels)



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Single Comparators

Device Name	V _{CC} (min)	V _{CC} (max)	V _{IO} (max) (mV)	I _{IO} (max) (nA)	I _{IB} (typ) (nA)	I _Q (typ) (mA)	Temp Range (°C)	Response Time (ns)	Supply Type	Number of Channels	Package	Description
LM211	5.0 or ±2.5	36 or ±15	3.0	10	45	2.4	–25 to +85	200	Single Split	1	SO–8	Highly Flexible Voltage
LM311	5.0 or ±2.5	36 or ±15	7.5	50	45	2.4	0 to 70	200	Single Split	1	SO–8 DIP–8	Highly Flexible Voltage
NCS2200	0.85 or ±0.425	6.0 or ±3.0	+8.0	–	1.0 pA	10	–40 to 105	700	Single Split	1	SOT23–5 QFN 2x2.2	Low Voltage CMOS
NCS2201	0.85 or ±0.425	6.0 or ±3.0	+8.0	–	1.0 pA	10	–40 to 105	700	Single Split	1	SOT23–6	Low Voltage CMOS with Enable
NCS2202	0.85 or ±0.425	6.0 or ±3.0	+8.0	–	1.0 pA	10	–40 to 105	700	Single Split	1	SOT23–5	Low Voltage CMOS
NCS2203	0.85 or ±0.425	6.0 or ±3.0	+8.0	–	1.0 pA	10	–40 to 105	700	Single Split	1	SOT23–6	Low Voltage CMOS with Enable

Dual Comparators

Device Name	V _{CC} (min)	V _{CC} (max)	V _{IO} (max) (mV)	I _{IO} (max) (nA)	I _{IB} (typ) (nA)	I _Q * (typ) (mA)	Temp Range (°C)	Response Time (ns)	Supply Type	Number of Channels	Package	Description
LM293	2.0 or ±1.0	36 or ±18	5.0	50	25	0.4	–25 to +85	1300	Single Split	2	SO–8	Low Offset Voltage
LM393	2.0 or ±1.0	36 or ±18	5.0	50	25	0.4	0 to 70	1300	Single Split	2	SO–8 DIP–8	Low Offset Voltage
LM2903	2.0 or ±1.0	36 or ±18	7.0	50	25	0.4	–40 to +105	1500	Single Split	2	SO–8 DIP–8	Low Offset Voltage
LM2903V	2.0 or ±1.0	36 or ±18	7.0	50	25	0.4	–40 to +125	1500	Single Split	2	SO–8 DIP–8	Low Offset Voltage

*I_Q typical for total device (all channels)

Quad Comparators

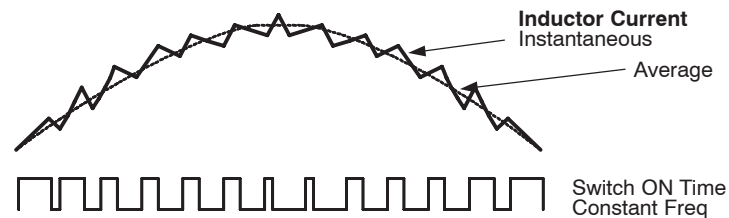
Device Name	V _{CC} (min)	V _{CC} (max)	V _{IO} (max) (mV)	I _{IO} (max) (nA)	I _B (typ) (nA)	I _Q * (typ) (mA)	Temp Range (°C)	Response Time (ns)	Supply Type	Number of Channels	Package	Description
LM239	3.0 or ±1.5	36 or ±18	5.0	50	25	0.8	–25 to +85	1300	Single Split	4	SO–14 DIP–14	TTL and CMOS Compatible
LM339	3.0 or ±1.5	36 or ±18	5.0	50	25	0.8	0 to 70	1300	Single Split	4	SO–14 DIP–14	TTL and CMOS Compatible
LM2901	3.0 or ±1.5	36 or ±18	7.0	50	25	0.8	–40 to +105	1300	Single Split	4	SO–14 DIP–14	TTL and CMOS Compatible
LM2901V	3.0 or ±1.5	36 or ±18	7.0	50	25	0.8	–40 to +125	1300	Single Split	4	SO–14 DIP–14	TTL and CMOS Compatible
MC3302	3.0 or ±1.5	30 or ±15	20	100	25	0.8	–40 to +85	1300	Single Split	4	SO–14 DIP–14	TTL and CMOS Compatible

*I_Q typical for total device (all channels)

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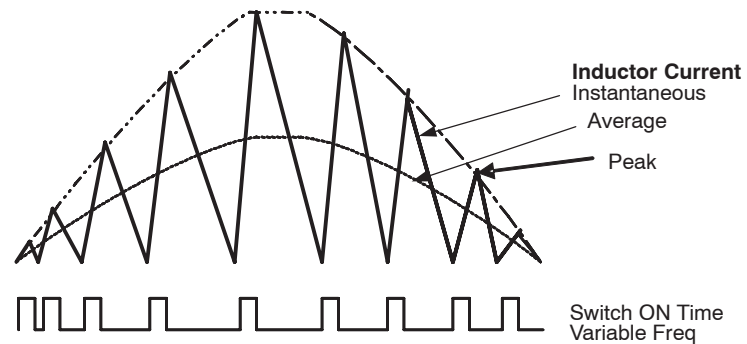
**Continuous
Conduction Mode (CCM)**
→ e.g. NCP1653

CCM Operation
Power Range 300 W – 1 kW+
+ Constant Frequency
+ Lowest Peak Current
– Turn-off Losses Because of Hard Switching
– Inductor Value is Largest



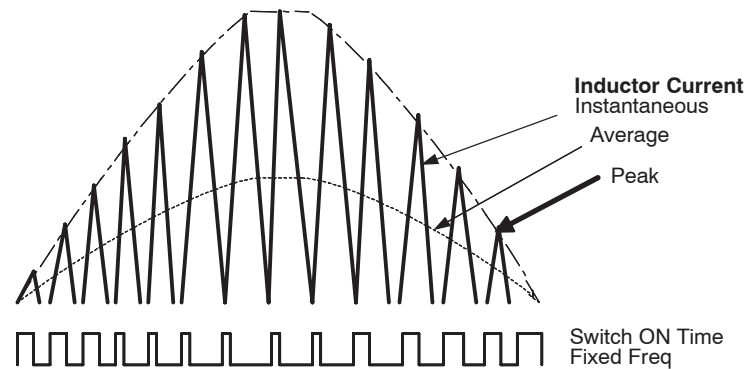
**Critical
Conduction Mode (CRM)**
→ e.g. NCP1601

CRM operation
Power Range: 75 W – 400 W
+ No Recovery Effect
+ Fewer External Components
– High Peak Current
– Variable Frequency



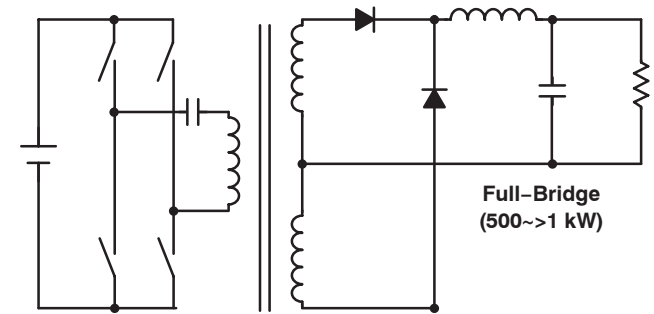
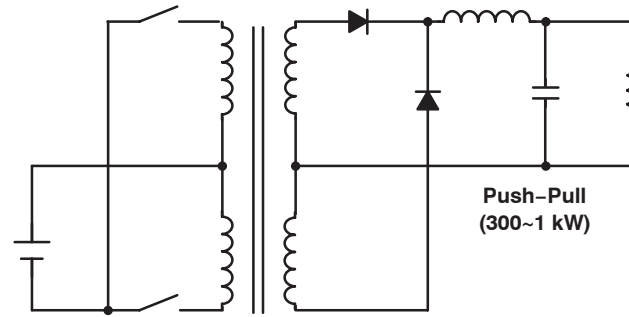
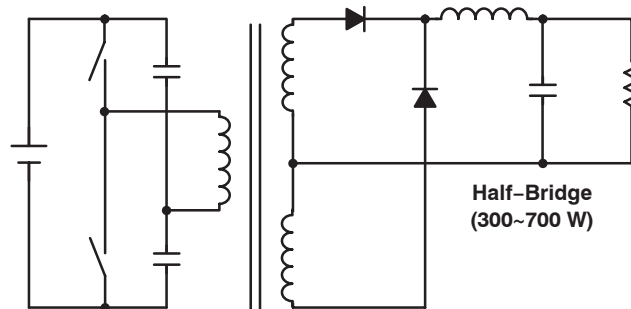
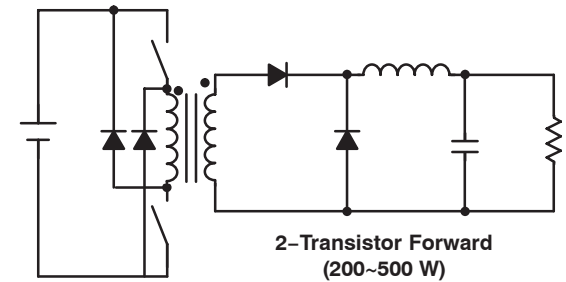
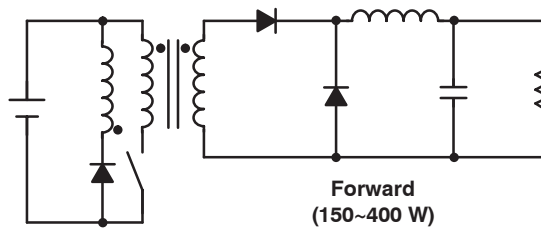
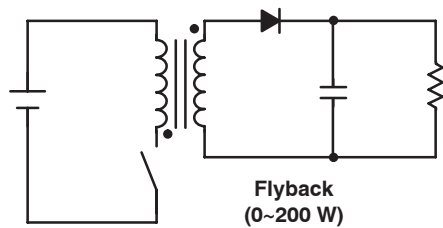
**Discontinuous
Conduction Mode (DCM)**
→ e.g. NCP1601

DCM operation
Power Range: 75 W – 400 W
+ Constant Frequency
+ No Recovery Effect
+ Best Stability
– Highest Peak Current



CHOOSING AN ISOLATED TOPOLOGY BY POWER

Increasing Higher Power



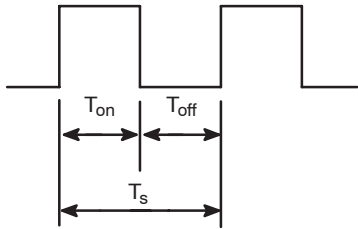
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Summary of Choosing a Topology

Power	Topology	Conversion	Isolated	Multi-Output	Output Ripple	MOSFET Stress
Low	Buck Boost Buck-Boost Cuk Sepic	Step-down Step-up Inverting Inverting Up or Down	No No No No No	No No No No No	Small Large Large Small Large	V_{IN} V_{OUT} $V_{IN} - V_{OUT}$ $> V_{IN}, > V_{OUT}$ $> V_{IN}, > V_{OUT}$
	Flyback Forward 2-Transistor Forward	Up or Down Up or Down Up or Down	Yes Yes Yes	Yes Yes Yes	Large Small Small	$< 2 V_{IN}$ $< 2 V_{IN}$ V_{IN}
Medium	Half-Bridge	Up or Down	Yes	Yes	Small	V_{IN}
High	Push-Pull Full-Bridge	Up or Down Up or Down	Yes Yes	Yes Yes	Small Small	$2 V_{IN}$ V_{IN}

*I_q typical for total device (all channels)

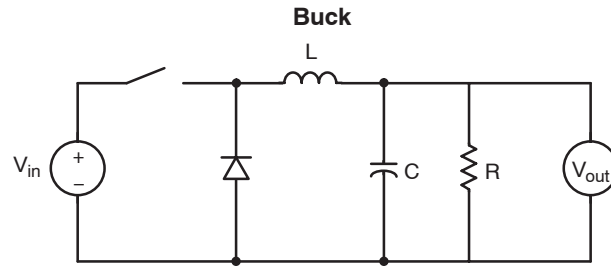
PWM Topology Overview



$$\text{Duty Cycle} = D = \frac{T_{on}}{T_{on} + T_{off}} = \frac{T_{on}}{T_s}$$

$$D' = 1 - D = \frac{T_{off}}{T_{on} + T_{off}} = \frac{T_{off}}{T_s}$$

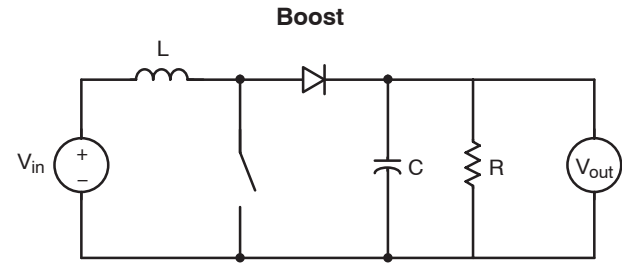
NOTE: In all circuits, equations for V_{out} apply to the continuous conduction case.



$$V_{out} = D V_{in}$$

Attributes:

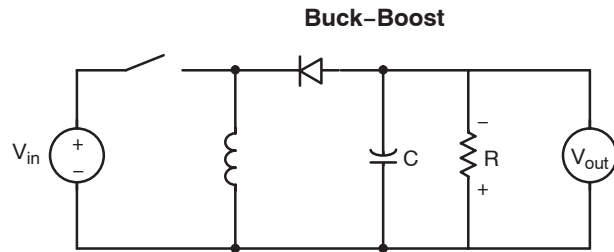
Step down only
MOSFET stress = V_{in}



$$V_{out} = \frac{1}{D'} V_{in}$$

Attributes:

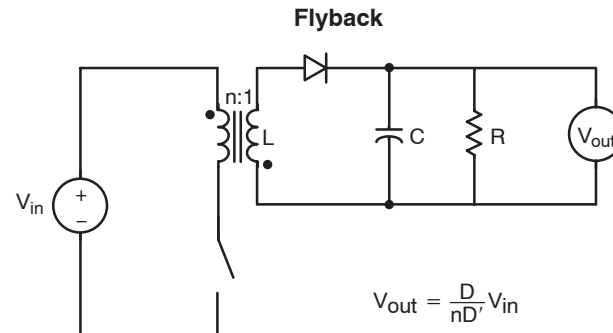
Step up only
Used for power factor correction
MOSFET stress = V_{out}



$$V_{out} = -\frac{D}{D'} V_{in}$$

Attributes:

Inverted output
Step up or step down
MOSFET stress = $V_{in} - V_{out}$

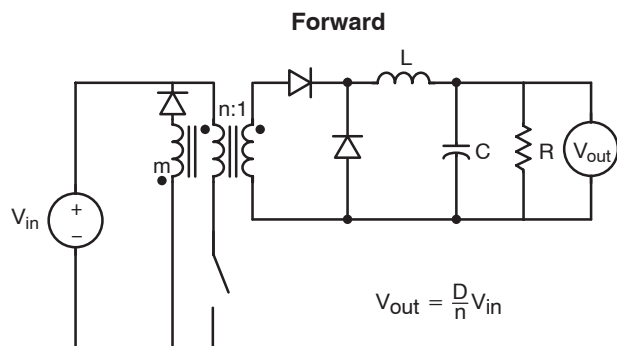


$$V_{out} = \frac{D}{n D'} V_{in}$$

Attributes:

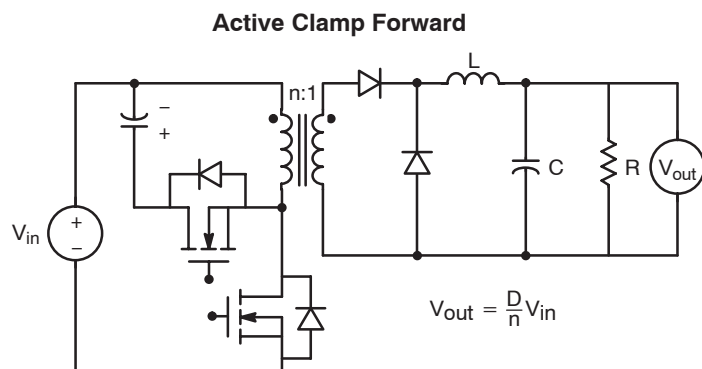
Step up, step down, or inverting
Up to 100 W power level
MOSFET stress > V_{in}

PWM Topology Overview (continued)



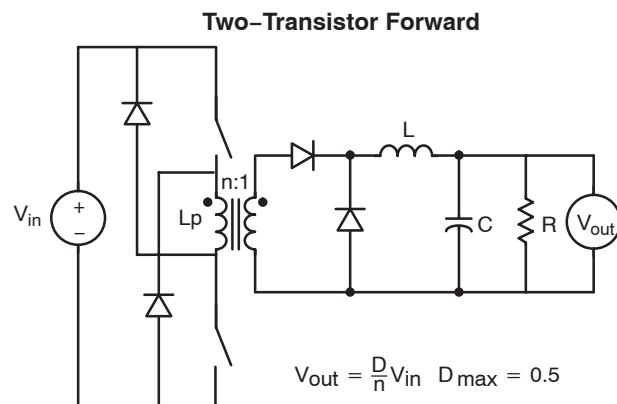
Attributes:

Step up, step down, or inverting
 More complex transformer
 Reset winding is needed ($m < n$)
 Potentially more than 50% duty cycle
 Up to 200 W power level
 MOSFET stress $> V_{in}$



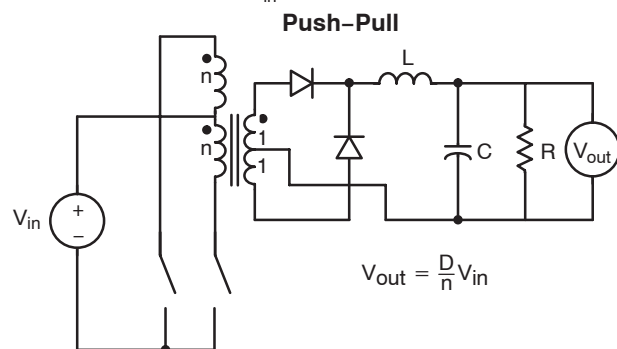
Attributes:

Step up, step down, or inverting
 Simple transformer construction
 Potentially more than 50% duty cycle
 Up to 500 W power level
 MOSFET stress $> V_{in}$



Attributes:

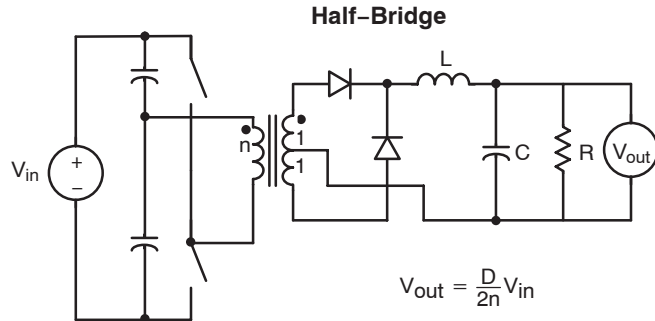
Step up, step down, or inverting
 Up to 500 W power level
 Simple transformer construction
 Primary winding is also the reset winding, so duty cycle $< 50\%$
 MOSFET stress $= V_{in}$



Attributes:

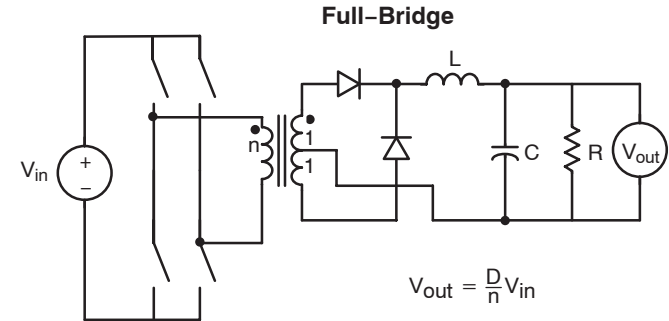
Step up, step down, or inverting
 Useful for low input voltage applications
 Up to 1.0 kW power level
 More complex transformer
 Duty cycle $< 50\%$
 MOSFET stress $= 2.0 V_{in}$

PWM Topology Overview (continued)



Attributes:

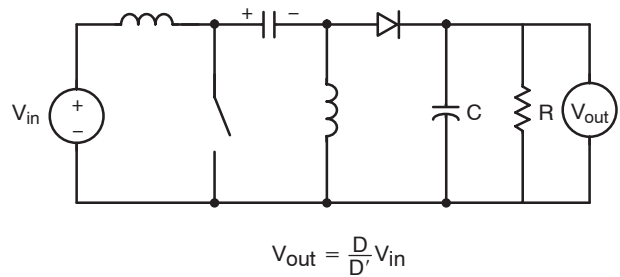
Step up, step down, or inverting
Alternative to 2-transistor forward
Up to 500 W power level
Duty cycle < 50%
MOSFET stress = V_{in}



Attributes:

High power applications
Step up, step down, or inverting
Up to 2.0 kW power level
Duty cycle < 50%
Phase-shifted version possible for high density
Current doubler version useful for very high output currents
MOSFET stress = V_{in}

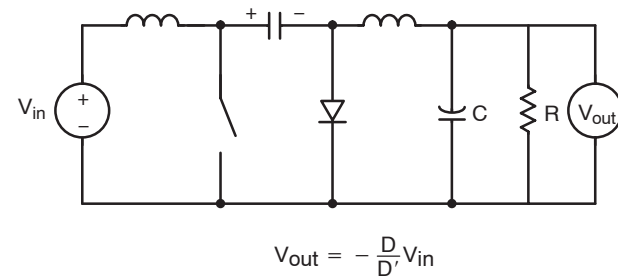
SEPIC (Single-Ended Primary Inductor Converter)



Attributes:

Step up or step down
MOSFET stress = $V_{in} + V_{out}$

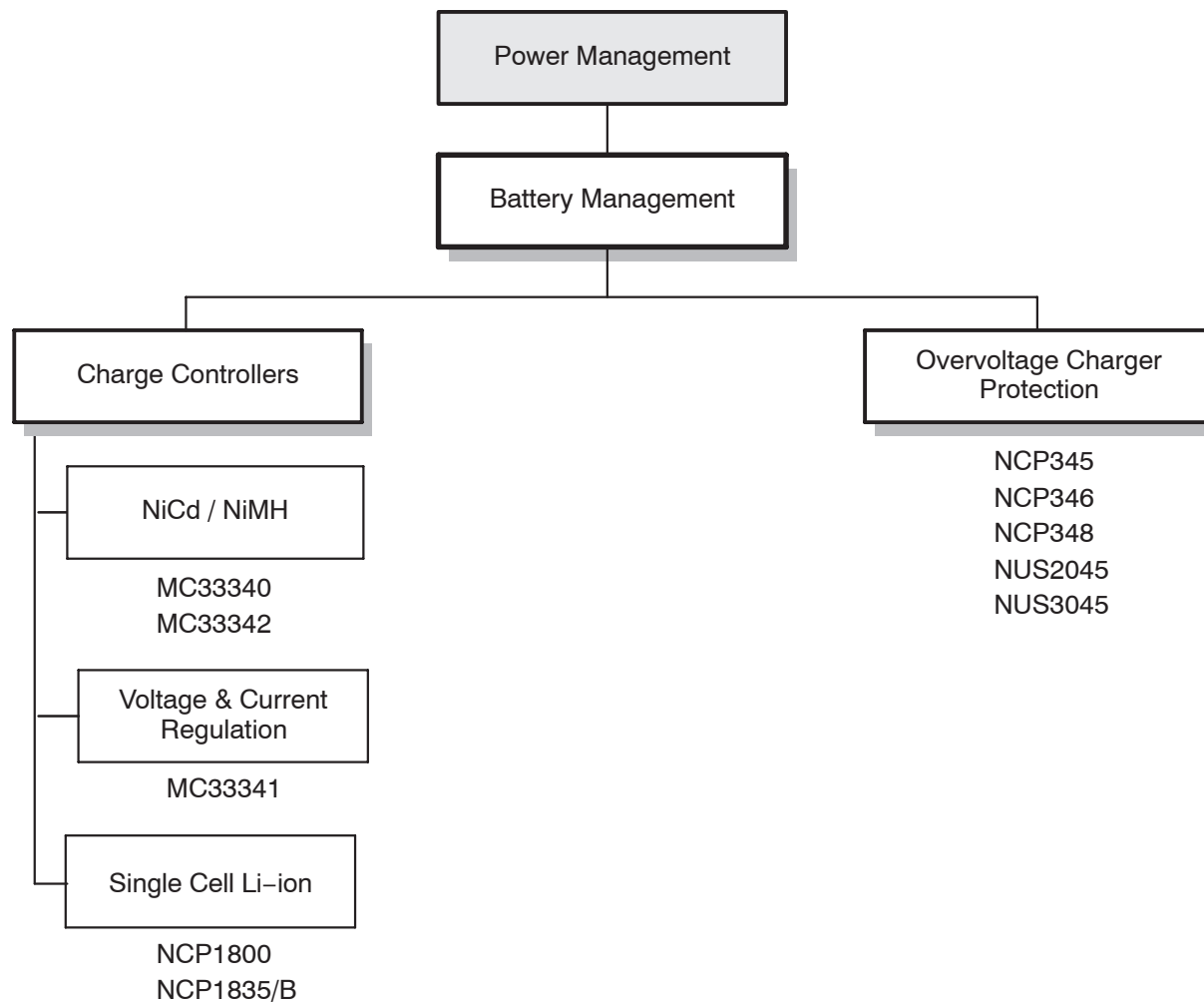
C'uk (By Slobodan C'uk)



Attributes:

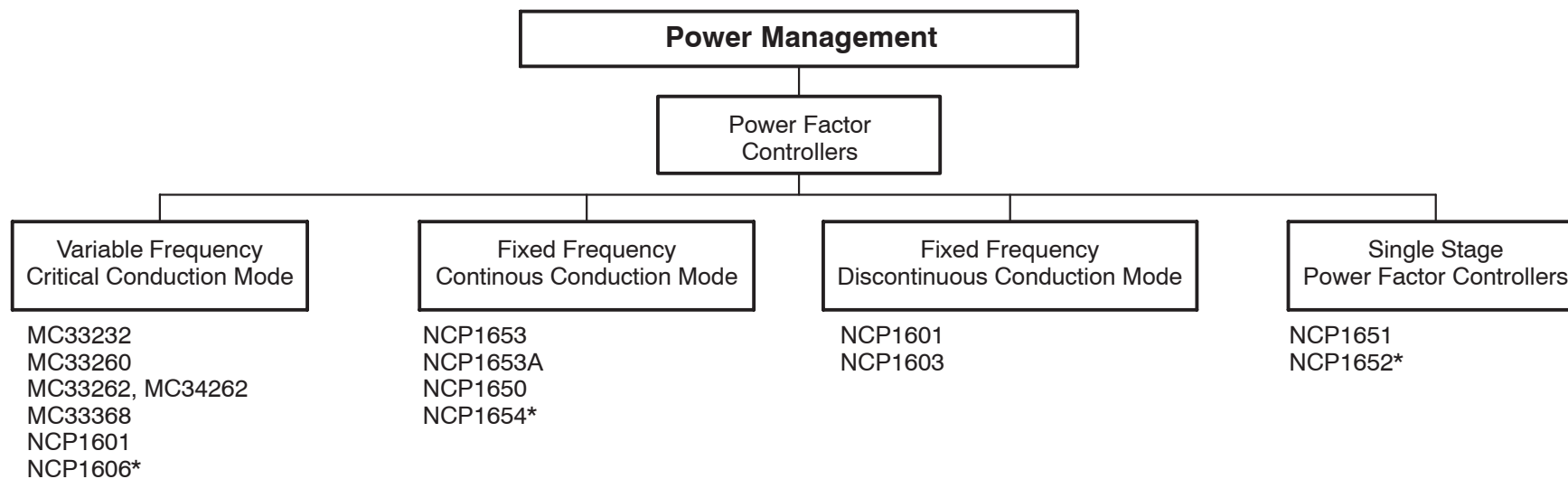
Inverted output
Step up or step down
MOSFET stress > V_{in} and V_{out}

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Battery Management

Device	Description	Package	Key Features
NCP1800	Single-Cell Lithium Ion CCCV Battery Charger	Micro8™	- Industry Leading Standby Current 0.5 μA - Adjustable Charge Current Limit
MC33340/2	Nickel Chemistry Battery Cradle Charger	SO-8	Peak Voltage Detection
NCP345	Overvoltage Protection IC	SOT23-5	30 V Capability, 6.85 V Detect Threshold 1 μS Overvoltage Disconnect Time
NCP346	Adjustable Overvoltage Protection IC	SOT23-5	30 V Capability, 4.4 V and 5.5 V Detect Threshold 1 μS Overvoltage Disconnect Time
NCP348	Positive overvoltage protection controller with internal low R_{ON} N-MOSFET and status flat.	DFN-10	No External MOSFET
NCP1835	Up to 1 A Single-Cell Lithium-ion/Polymer Integrated CCCV Battery Charger	DFN-10	No External MOSFET
NCP1835B	Up to 300 mA Single-Cell Lithium-ion/Polymer Integrated CCCV Battery Charger	DFN-10	No External MOSFET
NUS2045	Overvoltage Protection IC with Integrated 20 V P-Channel Power MOSFET	DFN-8	Integrated NCP345 + 20 V P-Channel MOSFET
NUS3045	Overvoltage Protection IC with Integrated 30 V P-Channel Power MOSFET	DFN-8	Integrated NCP345 + 30 V P-Channel MOSFET
MC33341	Power Supply Battery Charger Regulation Control Unit	SO-8 DIP-8	Operating Voltage Range of 2.3 V to 16 V



*Coming Soon.

Variable Frequency / Critical Conduction Mode

Web Part	Control Mode	Topology	Freq Clamp Freq Max (kHz)	Min HV Startup Limit (V)	Under Voltage Lock-Out (V)	Max Startup Consumption (μA)	Current Limit Detection	Latch	Under Voltage Protection	In-Rush Detection	Enable Capability	Synchronization Capability	Max V _{CC} (V)	Drive Capability Source/Sink (mA)	Temp (°C)	Pack-ages
MC33232	Voltage	Boost	NO	N/A	10 to 16 Typ.	50	Current Sensing	NO	Fixed	NO	NO	NO	16	300 / 300	-20 to +85	SO-8, PDIP-8
MC33260	Voltage	Boost and Follower Boost	NO	N/A	8.5 to 11 Typ.	250	Current Sensing	Fixed	Fixed	YES	YES	NO	16	500 / 500	-40 to +105	SO-8, PDIP-8
MC33262	Current	Boost	NO	N/A	8 to 13 Typ.	400	Current Sensing	Fixed	NO	NO	YES	NO	30	500 / 500	-40 to +105	SO-8, PDIP-8
MC34262	Current	Boost	NO	N/A	8 to 13 Typ.	400	Current Sensing	Fixed	NO	NO	YES	NO	30	500 / 500	0 to +85	SO-8, PDIP-8
MC33368	Current	Boost	YES	N/A	8.5 to 13 Typ.	N/A	Current Sensing	Fixed	NO	NO	YES	NO	16	1000 / 1000	-25 to +125	SO-16, PDIP-16
NCP1601	Voltage	Boost	405	N/A	9 to 13.75 Typ. 9 to 10.5 Typ.	40	Negative Current Sensing	Fixed	Fixed	YES	N/A	YES	18	500 / 800	-40 to +125	SO-8, PDIP-8
NCP1606*	Voltage Mode	Boost	600	N/A	9.5 to 12 Typ.	50	Current Sensing	Programmable	Fixed	NO	YES	NO	20	500 / 800	-40 to +125	SO-8, PDIP-8

Fixed Frequency / Continuous Conduction Mode

Web Part	Control Mode	Topology	Switching Freq (kHz)	Under Voltage Lock-Out (V)	Max Startup Consumption (μA)	Over Power Limitation	Current Limit Detection	Brown Out Protection	Latch	Under (Output) Voltage Protection	In-Rush Detection	Enable Capability	Max V _{CC} (V)	Drive Capability Source/Sink (mA)	Temp (°C)	Pack-ages
NCP1653	Average Current Mode or Peak Current Mode	Boost and Follower Boost	67	8.7 to 13.25 Typ.	50	YES	Programmable Negative Current Sensing	NO	Fixed	Fixed	YES	YES	18	1000 / 1000	-40 to +125	SO-8, PDIP-8
NCP1653A	Average Current Mode or Peak Current Mode	Boost and Follower Boost	100	8.7 to 13.25 Typ.	50	YES	Programmable Negative Current Sensing	NO	Fixed	Fixed	YES	YES	18	1000 / 1000	-40 to +125	SO-8, PDIP-8
NCP1650	Average Current Mode	Boost	Adjustable 25 to 250	10 to 10.5 Typ.	80	NO	Negative Current Sensing	YES	Fixed	NO	NO	YES	20	1500 / 1500	-40 to +125	SO-16
NCP1654*	Average Current Mode	Boost	Adjustable 65 to 266	9 to 13.75 9 to 10.5	150	YES	Current Sensing	NO	YES	YES	YES	YES	25	1500 / 1500	-40 to +125	SO-8 PDIP-8

*Coming Soon.

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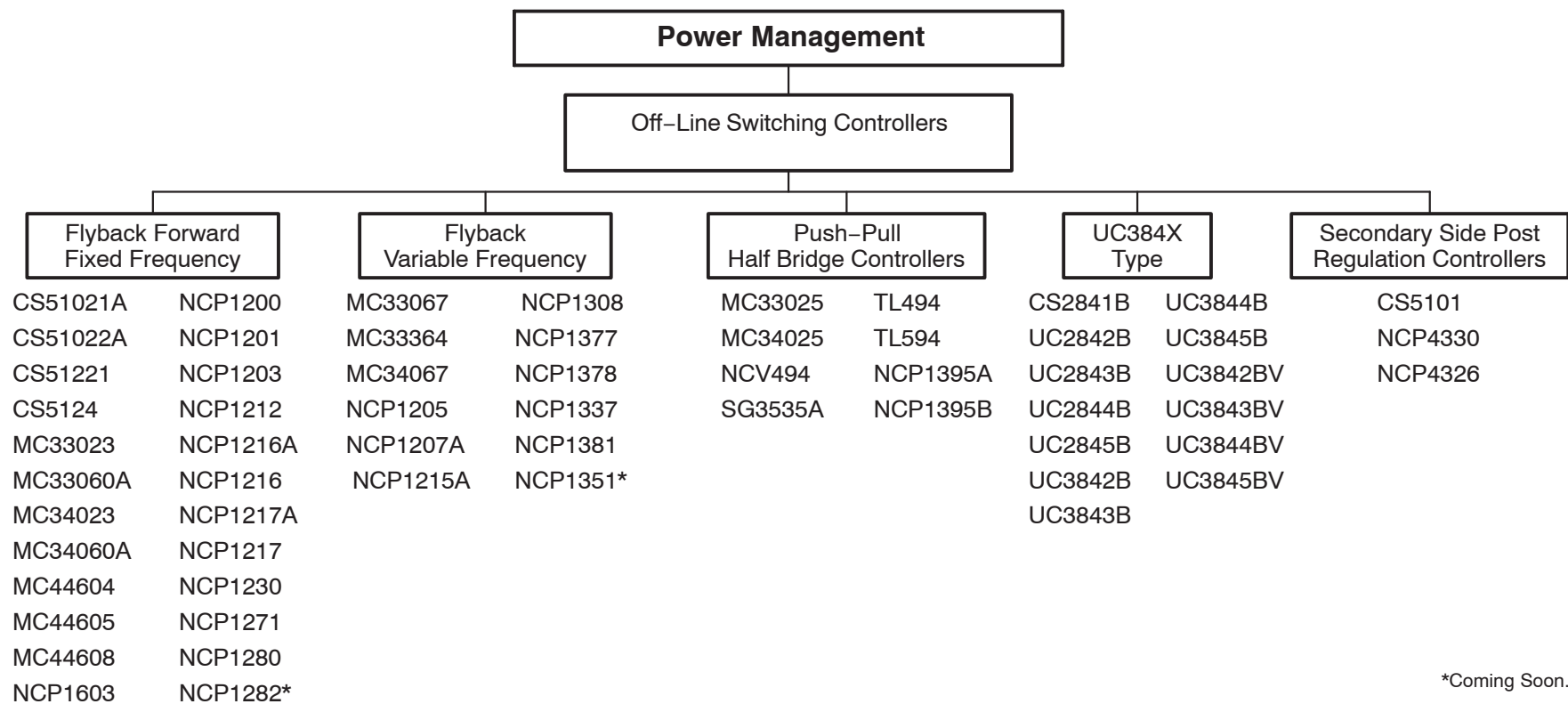
Fixed Frequency / Discontinuous Conduction Mode

Web Part	Control Mode	Topology	Switching Freq (kHz)	Min HV Startup Limit (V)	Under Voltage Lock-Out (V)	Startup Consumption (μA)	Current Limit Detection	Latch	Under (Output) Voltage Protection	In-Rush Detection	SMPS Go To ON Signal	Enable Capability	Max V _{CC} (V)	Drive Capability Source/ Sink (mA)	Temp (°C)	Pack-ages
NCP1601	Voltage Mode	Boost	58	N/A	9 to 13.75 Typ. 9 to 10.5 Typ.	40	Negative Current Sensing	Fixed	Fixed	YES	N/A	YES	18	500 / 800	-40 to +125	SO-8, PDIP-8
NCP1603	Voltage Mode	Boost	100	30	9 to 13.75 Typ.	80	Negative Current Sensing	Fixed	Fixed	YES	N/A	YES	18	500 / 800	-40 to +125	SO-16

Single Stage PFC

Web Part	Control Mode	Topology	Switching Freq (kHz)	Standby Mode Technique	Min HV Startup Limit (V)	Under Voltage Lock-Out (V)	Max Startup Consumption (mA)	Current Limit Detection	Under (Output) Voltage Protection	Enable Capability	Max V _{CC} (V)	Drive Capability Source/ Sink (mA)	In-Rush Detection	Temp (°C)	Pack-ages
NCP1651	Average Current Mode	Boost	Adjustable 25 to 250	N/A	N/A	9.8 to 10.8 Typ.	5.5	Current Sensing	YES	YES	18	1500 / 1500	N/A	-40 to +125	SO-16
NCP1652*	Average Current Mode	Boost	100	Adj Skip Mode	40	11 to 14 Typ.	100	Current Sensing	YES	YES	20	300 / 700	N/A	-40 to +125	SO-16

*Coming Soon.



*Coming Soon.

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Flyback / Forward Fixed Frequency

Web Part	Control Mode	Switching Freq (kHz)	Freq Jittering (%)	Standby Mode Technique	Min HV Startup Limit (V)	Dynamic Self Supply (mA)	Under-voltage Lock-Out (V)	Short Circuit Protection	Over Power Compensation	Brown-Out Protection	Latch	Soft-Start (ms)	Max V _{CC} (V)	Drive Capability Source/Sink (mA)	Temp (°C)	Packages	Additional Features
CS51021A	Current Mode	Adjustable	N/A	NO	NO	NO	YES	YES	NO	NO	Via the Latch / Demag	Adj	20	1,000	–40 to +85	SO–16	Bidirectional Synchronization
CS51022A	Current Mode	Adjustable	N/A	NO	NO	NO	YES	YES	NO	NO	Via the Latch / Demag	Adj	20	1,000	–40 to +85	TSSOP–16, SO–16	100 μ A Max Sleep Current
CS51221	Voltage Mode	Adjustable	N/A	NO	NO	NO	YES	NO	NO	NO	Via the Latch / Demag	Adj	15	1,000	–40 to +85	SO–16	
CS5124	Current Mode	400	N/A	NO	NO	NO	YES	NO	NO	NO	NO	Adj	20	200	–40 to +105	SO–8	
MC33023	Voltage or Current	Adjustable	N/A	NO	NO	NO	YES	YES	NO	NO	NO	Adj	30	200	–40 to +105	SO–16 WB	
MC34023	Voltage or Current	Adjustable	N/A	NO	NO	NO	YES	YES	NO	NO	NO	Adj	30	200	0 to +70	PDIP–16	
MC33060A	Voltage Mode	200	N/A	NO	NO	NO	YES	YES	NO	NO	NO	Adj	42	200	–40 to +85	SO–14, PDIP–14	
MC34060A	Voltage Mode	200	N/A	NO	NO	NO	YES	YES	NO	NO	NO	Adj	42	200	0 to +70	SO–14, PDIP–14	
MC44604	Current Mode	250	N/A	YES	14.5	NO	YES	NO	NO	NO	Via the Latch / Demag	Adj	18	750	–25 to +85	PDIP–16	
MC44605	Current Mode	250	N/A	NO	14.5	NO	YES	NO	NO	NO	Via the Latch / Demag	Adj	18	750	–25 to +85	PDIP–16	
MC44608	Voltage Mode	100, 40, 75	N/A	Secondary Reconfig.	50	NO	10 to 13.1 Typ.	NO	YES	NO	Via the Latch / Demag	NO	16	800 / 800	–25 to +85	PDIP–8	
NCP1200	Current Mode	100, 40, 60	± 0.7	Adj Skip Mode	30	4	N/A	When DSS is used	NO	NO	NO	NO	16	250 / 250	–25 to +125	SO–8, PDIP–8	
NCP1201	Current Mode	100, 60	0.82	Adj Skip Mode	30	5.3	10.5 to 12.5 Typ.	When DSS is used	NO	YES	NO	NO	16	250 / 250	–25 to +125	SO–8, PDIP–8	
NCP1203	Current Mode	100, 40, 60	N/A	Adj Skip Mode	30	NO	7.8 to 12.8 Typ.	NO	NO	NO	NO	NO	16	250	–40 to +125	SO–8, PDIP–8	
NCP1212	Current Mode	Adj	N/A	Adj Skip Mode	NO	NO	10 to 25 Typ.	YES	NO	YES	Via the Latch / Demag	NO	28	100 / 300	–25 to +125	SO–8, PDIP–8	
NCP1216A	Current Mode	133, 100, 65	± 4	Adj Skip Mode	30	8	NO	When DSS is used	NO	NO	NO	1.00	16	500	0 to +125	SO–8, PDIP–7	Limited Duty Cycle to 50%
NCP1216	Current Mode	133, 100, 65	± 4	Adj Skip Mode	30	8	NO	When DSS is used	NO	NO	NO	NO	16	500	0 to +125	SO–8, PDIP–7	

Flyback / Forward Fixed Frequency (continued)

Web Part	Control Mode	Switching Freq (kHz)	Freq Jittering (%)	Standby Mode Technique	Min HV Startup Limit (V)	Dynamic Self Supply (mA)	Under-voltage Lock-Out (V)	Short Circuit Protection	Over Power Compensation	Brown-Out Protection	Latch	Soft-Start (ms)	Max V _{CC} (V)	Drive Capability Source/Sink (mA)	Temp (°C)	Packages	Additional Features
NCP1217A	Current Mode	133, 100, 65	N/A	Adj Skip Mode	30	NO	7.6 to 12.8 Typ.	NO	NO	NO	Via the Latch / Demag	1.00	16	500	0 to +125	SO-8, PDIP-7	Limited Duty-Cycle to 50%
NCP1217	Current Mode	133, 100, 65	N/A	Adj Skip Mode	30	NO	7.6 to 12.8 Typ.	NO	NO	NO	Via the Latch / Demag	NO	16	500	0 to +125	SO-8, PDIP-7	
NCP1230	Current Mode	100	± 6.4	Adj Skip Mode	20	NO	7.7 to 12.6 Typ.	YES	NO	NO	Via the Latch / Demag	2.50	18	500 / 800	-40 to +125	SO-8, PDIP-7	
NCP1280	Voltage Mode	Adjustable	NO	NO	25	13.8	YES	NO	NO	NO	Via the Latch / Demag	Adj	16	95 / 200	-40 to +125	SO-16	
NCP1271	Current Mode	65, 100	± 7.5	Adj Skip Mode with Transient Load Detection	20	NO	12.6 to 20 Typ.	YES	NO	NO	Via the Latch / Demag	4	20	500 / 800	-40 to +125	SO-7	
NCP1282*	Voltage Mode	230	N/A	NO	NO	NO	8.5 to 11 Typ.	NO	NO	NO	Line UV/OV detectors	Adj	20	1000 / 2000	-40 to +125	SO-16	HV Startup up to 700V
NCP1603	Voltage Mode	100	± 6.4	Adj Skip Mode	30	NO	9 to 10.5 Typ.	YES	NO	NO	Via the Latch / Demag	2.5	18	100 / 100	-40 to +125	SO-16	

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Flyback Variable Frequency

Web Part	Control Mode	Freq Clamp Max On Time (μs)	Freq Clamp Min Off Time (μs)	Standby Mode Technique	Min HV Start-Up Limit (V)	Dynamic Self Supply (mA)	Under-voltage Lock-Out (V)	Short Circuit Protection	Over Power Compensation	Brown-Out Protection	Latch	Soft-Start (ms)	Max V _{CC} (V)	Drive Capability Source/Sink (mA)	Temp (°C)	Packages
MC33067	Voltage Mode	Adj	Adj	NO	NO	NO	9 to 16 Typ.	YES	NO	NO	NO	Adj	20	200 / 200	-40 to +85	SO-16, PDIP-16
MC34067	Voltage Mode	Adj	Adj	NO	NO	NO	9 to 16 Typ.	YES	NO	NO	NO	Adj	20	200 / 200	0 to +70	SO-16, PDIP-16
MC33364	Current Mode	NO	6.9	Freq Clamp	40	NO	7.6 to 15 Typ.	NO	NO	NO	NO	NO	16	220 / 600	-25 to +125	SO-8, SO-16
NCP1205	Current Mode	NO	NO	Frequency Foldback	40	NO	7.2 to 15 Typ.	YES	NO	NO	Adj	NO	30	300 / 300	-25 to +125	SO-16, PDIP-14, PDIP-8
NCP1207A	Current Mode	NO	8	Adj Skip Mode	40	7	9.8 to 10.4 Typ.	YES	NO	NO	Via the Latch / Demag	1	16	500 / 500	-40 to +125	SO-8, PDIP-8
NCP1215A	Quasi Fixed Ton	Fixed Ton	Variable Toff	Frequency Foldback	NO	NO	9 to 15 Typ.	NO	NO	NO	NO	NO	18	30 / 30	0 to +105	SO-8, TSOP-6
NCP1308	Current Mode	NO	10	Adj Skip Mode	40	7	9.8 to 12 Typ.	YES	NO	NO	Fixed on the V _{CC}	1	16	500 / 500	0 to +125	SO-8
NCP1377	Current Mode	NO	3, 8	Adj Skip Mode	40	NO	7.6 to 12.8 Typ.	NO	NO	NO	Via the Latch / Demag	1	16	500 / 500	0 to +125	SO-7, PDIP-7
NCP1378	Current Mode	NO	8	Adj Skip Mode	40	NO	7.6 to 8.5 Typ.	NO	NO	NO	Via the Latch / Demag	1	16	500 / 500	0 to +125	SO-8, PDIP-7
NCP1337	Current Mode	67	35	Soft-Ripple Mode	55	9.5	10 to 12 Typ.	YES	YES	YES	Via the Latch / Demag	4	20	500 / 500	0 to +125	SO-8, PDIP-7
NCP1381	Current Mode	45	8	Adj Skip Mode	NO	NO	10 to 15 Typ.	YES	YES	YES	Via the Latch / Demag	5	20	500 / 800	0 to +125	SO-14
NCP1351*	Current Mode	Fixed Ton	Variable Toff	Adj Skip Mode	NO	NO	8.5 to 15 Typ.	YES	NO	NO	NO	NO	20	300 / 150	0 to +125	SO-8, PDIP-8

*Coming Soon.

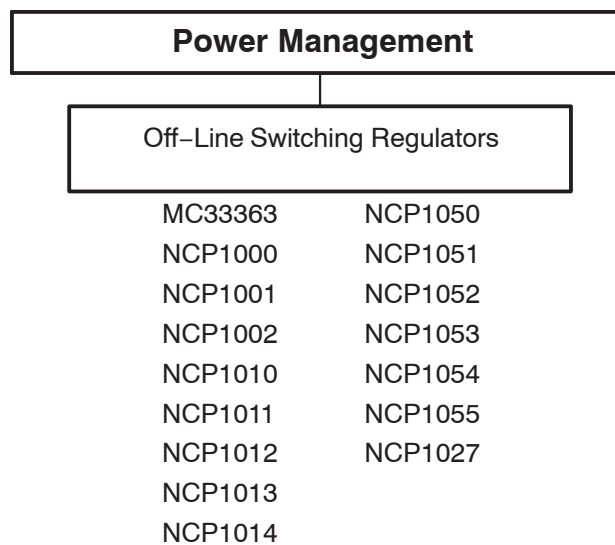
Push-Pull / Half-Bridge Controllers

Web Part	Control Mode	Switching Freq (kHz)	Standby Mode Technique	Max Duty Cycle (%)	Under-voltage Lock-Out (V)	Short Circuit Protection	Latch	Internal Ref Voltage (V)	Enable Capability	Soft-Start (ms)	Max V _{CC} (V)	Drive Capability Source/Sink (mA)	Temp (°C)	Packages	Additional Features
MC33025	Voltage & Current mode	1000	NO	45	9.2 & 4.2	YES	NO	5.1	NO	Adj	30	200 / 200	–40 to +105	SO–16, PDIP–16	
MC34025	Voltage & Current mode	1000	NO	45	9.2 & 4.2	YES	NO	5.1	NO	Adj	30	200 / 200	0 to +70	SO–16, PDIP–16	
NCV494	Voltage	200	NO	48	6.43	NO	NO	5	NO	Ad	40	500 / 500	–40 to +125	SO–16, PDIP–16	Auto qualified
TL494	Voltage	200	NO	48	6.43	NO	NO	5	NO	Adj	40	500 / 500	–40 to +125 0 to +70 –40 to +85	SO–16, PDIP–16	
SG3525A	Voltage	400	NO	49	7	NO	NO	5.1	YES	Adj	40	400 / 400	0 to +70	SO–16, PDIP–16	
TL594	Voltage	300	NO	50	5.2	NO	NO	5	NO	Adj	42	500 / 500	–40 to +85	SO–16, PDIP–16, TSSOP–16	
NCP1395A	Voltage	1000	Adj Skip Mode	52	9.3	NO	YES	2	YES	Adj	20	180/180	0 to +125	SO–16, PDIP–16	Consumer Applications
NCP1395B	Voltage	1000	Adj Skip Mode	52	9.3	NO	YES	2	YES	Adj	20	180/180	0 to +125	SO–16, PDIP–16	Industrial Applications

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UC384X Type

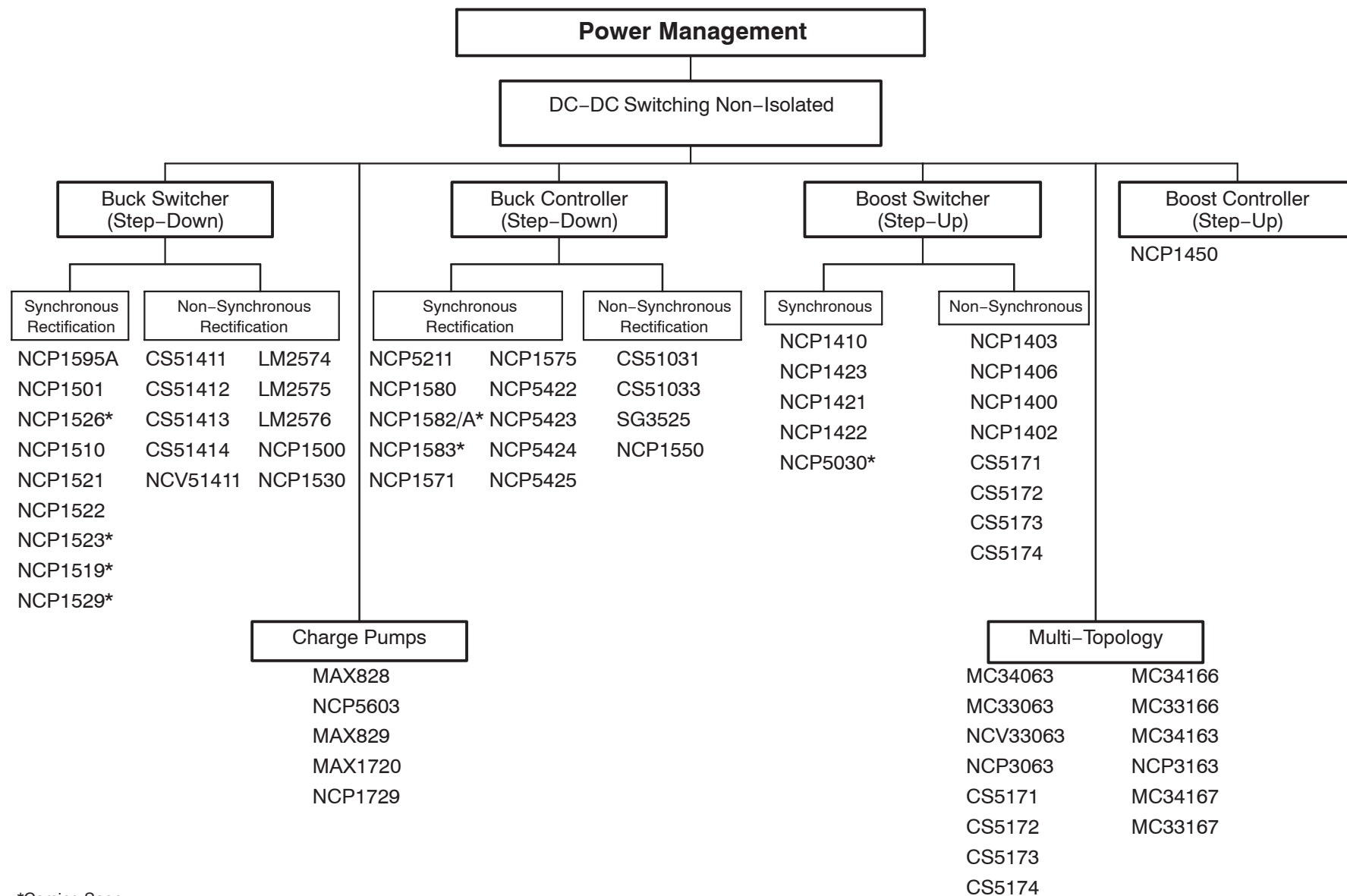
Web Part	Control Mode	Switching Freq (kHz)	Standby Mode Technique	Max Duty Cycle (%)	Undervoltage Lock-out (V)	Short Circuit Protection	Latch	Internal Ref Voltage (V)	Soft-Start (ms)	Max V _{CC} (V)	Drive Capability Source/Sink (mA)	Temp (°C)	Packages
CS2841B	Current Mode	52	NO	50	7.4 to 8 Typ.	YES	N/A	5	NO	40	200 / 200	–40 to +85	SO–14, PDIP–8
UC2842B	Current Mode	52	NO	96	10 to 16 Typ.	YES	N/A	5	NO	30	200 / 200	–25 to +85	SO–14, SO–8, PDIP–8
UC2843B	Current Mode	52	NO	96	7.6 to 8.5 Typ.	YES	N/A	5	NO	30	200 / 200	–25 to +85	SO–14, SO–8, PDIP–8
UC2844B	Current Mode	52	NO	48	10 to 16 Typ.	YES	N/A	5	NO	30	200 / 200	–25 to +85	SO–14, SO–8, PDIP–8
UC2845B	Current Mode	52	NO	48	7.6 to 8.5 Typ.	YES	N/A	5	NO	30	200 / 200	–25 to +85	SO–14, SO–8, PDIP–8
UC3842B	Current Mode	52	NO	96	10 to 16 Typ.	YES	N/A	5	NO	30	200 / 200	0 to +70	SO–14, SO–8, PDIP–8
UC3843B	Current Mode	52	NO	96	7.6 to 8.5 Typ.	YES	N/A	5	NO	30	200 / 200	0 to +70	SO–14, SO–8, PDIP–8
UC3844B	Current Mode	52	NO	50	10 to 16 Typ.	YES	N/A	5	NO	25	200 / 200	0 to +70	SO–14, SO–8, PDIP–8
UC3845B	Current Mode	52	NO	50	7.6 to 8.5 Typ.	YES	N/A	5	NO	25	200 / 200	0 to +70	SO–14, SO–8, PDIP–8
UC3842BV	Current Mode	52	NO	96	10 to 16 Typ.	YES	N/A	5	YES	30	200 / 200	–40 to +105	SO–14, SO–8
UC3843BV	Current Mode	52	NO	96	7.6 to 8.5 Typ.	YES	N/A	5	YES	30	200 / 200	–40 to +105	SO–14, SO–8
UC3844BV	Current Mode	52	NO	50	10 to 16 Typ.	YES	N/A	5	YES	25	200 / 200	–40 to +105	SO–14, SO–8
UC3845BV	Current Mode	52	NO	50	7.6 to 8.5 Typ.	YES	N/A	5	YES	25	200 / 200	–40 to +105	SO–14, SO–8



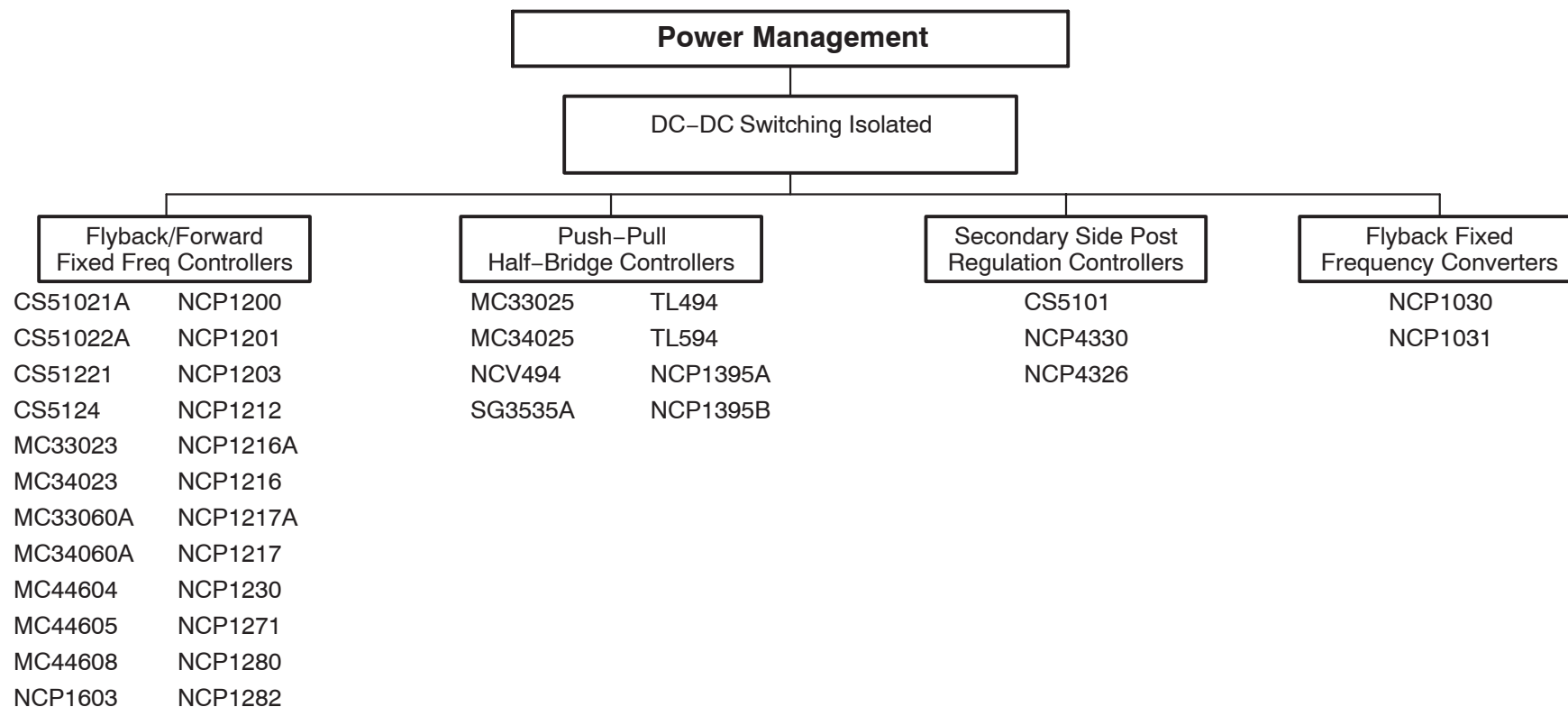
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Off-Line Switching Regulators

Web Part	Control Mode	Switching Freq (kHz)	Freq Jittering (%)	Standby Mode Technique	R _{DS(on)} Typ (U)	Max Break-down Voltage (V)	Max Internal Current Set Point (mA)	Min HV Startup Limit (V)	Dynamic Self Supply (mA)	Under-voltage Lock-out (V)	Short Circuit Protection	Over Power Compensation	Brown-Out Protection	Latch	Temp (°C)	Packages
MC33363	Voltage Mode	285	N/A	NO	14	700	400	9	NO	9.5 to 15.2 Typ.	NO	NO	NO	NO	–25 to +150	SO–16, PDIP–16
NCP1000	Voltage Mode	100	N/A	Skip Mode	18	700	500	20	NO	7.5 to 8.5 Typ.	NO	NO	NO	NO	–40 to +125	PDIP–8
NCP1001	Voltage Mode	100	N/A	Skip Mode	9	700	1000	20	NO	7.5 to 8.5 Typ.	NO	NO	NO	NO	–40 to +125	PDIP–8
NCP1002	Voltage Mode	100	N/A	Skip Mode	6	700	1500	20	NO	7.5 to 8.5 Typ.	NO	NO	NO	NO	–40 to +125	PDIP–8
NCP1010	Current Mode	65, 100, 130	± 3.3	Skip Mode	25	700	100	30	8.5	7.5 to 8.5 Typ.	When DSS is used	NO	NO	YES	0 to +125	PDIP–7, SOT–223
NCP1011	Current Mode	65, 100, 130	± 3.3	Skip Mode	25, 11	700	250, 450	30	8.5	7.5 to 8.5 Typ.	When DSS is used	NO	NO	YES	0 to +125	PDIP–7, PDIP–7 SMT, SOT–223
NCP1012	Current Mode	65, 100, 130	± 3.3	Skip Mode	11	700	250	30	8	7.5 to 8.5 Typ.	When DSS is used	NO	NO	YES	0 to +125	PDIP–7, PDIP–7 SMT, SOT–223
NCP1013	Current Mode	65, 100, 130	± 3.3	Skip Mode	11	700	350	30	8	7.5 to 8.5 Typ.	When DSS is used	NO	NO	YES	0 to +125	PDIP–7, SOT–223
NCP1014	Current Mode	65, 100, 130	± 3.3	Skip Mode	11	700	450	30	8	7.5 to 8.5 Typ.	When DSS is used	NO	NO	YES	0 to +125	PDIP–7, PDIP–7 SMT, SOT–223
NCP1050	Gated Oscillator	45.5, 103, 140	± 5.0	Skip Mode	30	700	100	20	6.3	7.5 to 8.5 Typ.	YES	NO	NO	YES	–40 to +150	PDIP–7, SOT–223
NCP1051	Gated Oscillator	45.5, 103, 140	± 5.0	Skip Mode	30	700	200	20	6.3	7.5 to 8.5 Typ.	YES	NO	NO	YES	–40 to +150	PDIP–7, SOT–223
NCP1052	Gated Oscillator	45.5, 103, 140	± 5.0	Skip Mode	30	700	300	20	6.3	7.5 to 8.5 Typ.	YES	NO	NO	YES	–40 to +150	PDIP–7, SOT–223
NCP1053	Gated Oscillator	45.5, 103, 140	± 5.0	Skip Mode	15	700	300	20	6.3	7.5 to 8.5 Typ.	YES	NO	NO	YES	–40 to +150	PDIP–7, SOT–223
NCP1054	Gated Oscillator	45.5, 103, 140	± 5.0	Skip Mode	15	700	530	20	6.3	7.5 to 8.5 Typ.	YES	NO	NO	YES	–40 to +150	PDIP–7, SOT–223
NCP1055	Gated Oscillator	45.5, 103, 140	± 5.0	Skip Mode	15	700	680	20	6.3	7.5 to 8.5 Typ.	YES	NO	NO	YES	–40 to +150	PDIP–7, SOT–223
NCP1027	Current Mode	65,100	± 6.0	Skip Mode	5.6	700	800	30	N/A	7.2 to 8.5 Typ.	YES	YES	YES	YES	0 to +125	PDIP–7



*Coming Soon.



Step-Down Buck Switching Regulator – Internal Switch

Device	V _{IN} (V)		V _{OUT} Options (Adj Range)	I _{OUT} (A)	F _{SW} (kHz)	Mode	Enable	Soft-Start	Comments	Temp Range (°C)	Package
	Min	Max									
CS51411	4.5	40	Down to 1.276 V	1.5 A	260	Voltage	✓	✓	Sync capability; Pin-Compatible with LT1375 and LT1376	–40 to +85	SO–8 / DFN–8
CS51412	4.5	40	Down to 1.276 V	1.5 A	260	Voltage	✓	✓	External Bias; Pin-Compatible with LT1375 and LT1376	–40 to +85	SO–8 / DFN–8
CS51413	4.5	40	Down to 1.276 V	1.5 A	520	Voltage	✓	✓	Sync capability; Pin-Compatible with LT1375 and LT1376	–40 to +85	SO–8 / DFN–8
CS51414	4.5	40	Down to 1.276 V	1.5 A	520	Voltage	✓	✓	External Bias; Pin-Compatible with LT1375 and LT1376	–40 to +85	SO–8 / DFN–8
NCV51411	4.5	40	Down to 1.276 V	1.5 A	260	Voltage	✓	✓	Automotive version	–40 to +125	SO–8 / DFN–8
LM2574	4.75	40	3.3, 5, 12, 15, Adj(1.23 to 37 V)	0.5 A	52	Voltage	✓		No external compensation required	–40 to +125	D2PAK / TO–220
LM2575	4.75	40	3.3, 5, 12, 15, Adj(1.23 to 37 V)	1.0 A	52	Voltage	✓		No external compensation required	–40 to +125	D2PAK / TO–220
LM2576	4.75	40	3.3, 5, 12, 15, Adj(1.23 to 37 V)	3.0 A	52	Voltage	✓		No external compensation required	–40 to +125	D2PAK / TO–220
NCP1595A	4.0	5.5	Down to 0.8 V	1.5 A	1200	Current	✓	✓	Internal compensation; Synchronous Rectification	0 to +85	DFN–6
MC34166	7.5	40	Down to 5.0 V	3.0 A	72	Voltage			Cycle-by-Cycle current limit	0 to +70	D2PAK / TO–220
MC33166	7.5	40	Down to 5.0 V	3.0 A	72	Voltage			Internal thermal shutdown	–40 to +85	D2PAK / TO–220
MC33167	7.0	40	Down to 5.0 V	5.0 A	72	Voltage			Large 5.0 A output capability	–40 to +85	D2PAK / TO–220
MC34167	7.0	40	Down to 5.0 V	5.0 A	72	Voltage			Standby Mode < 36 μ A	0 to +70	D2PAK / TO–220
NCP1500	2.7	5.4	1.0, 1.3, 1.5, 1.8 V	300 mA	270 – 630	Voltage			PWM or Linear mode. Can be programmed to work in Linear LDO Regulator mode. External Sync.	–40 to +85	Micro8™
NCP1501	2.7	5.2	1.05, 1.35, 1.57, 1.8 V	300 mA	450–1000	Voltage			Synchronous Rectification. Can be programmed to work in Linear LDO Regulator mode. External Sync.	–40 to +85	Micro8™
NCP1526*	2.7	5.5	PWM – 1.2V ; LDO – 2.8 V Other Options Available	PWM: 400 mA LDO: 150 mA	3000	Voltage	✓	✓	Dual output: PWM + LDO. Synchronous Rectification	–40 to +85	Thin DFN–10
NCP1510	2.5	5.2	1.05, 1.35, 1.57, 1.8 V	500 mA	450–1000	Voltage	✓	✓	Synchronous Rectification. Can be programmed to work in Low I _q (14 μ A) Pulsed mode at light loads. External Sync.	–40 to +85	Micro–Bump–9
NCP1530	2.7	5	2.5, 2.7, 3.0, 3.3 V	600 mA	600 – 1200	Voltage	✓	✓	Automatic PWM/PFM mode. External Synchronization up to 1.2 MHz	–40 to +85	Micro8™
NCP1521	2.7	5.5	0.9 – 3.3 V	600 mA	1500	Voltage	✓	✓	Auto PWM/ PFM mode. Synchronous Rectification	–40 to +85	Thin SOT–23–5, Thin DFN–6
NCP1522	2.7	5.5	0.9 – 3.3 V	600 mA	3000	Voltage	✓	✓	Auto PWM/ PFM mode. Synchronous Rectification	–40 to +85	Thin SOT–23–5
NCP1523*	2.7	5.5	0.9 – 3.3 V	600 mA	3000	Voltage	✓	✓	Auto PWM/ PFM mode. Synchronous Rectification	–40 to +85	Micro–Bump–8
NCP1519*	2.7	5.5	1.2, 1.5, 1.8, Adj(0.9–3.3 V)	600 mA	1700	Voltage	✓	✓	Auto PWM/ PFM mode. Synchronous Rectification	–40 to +85	Thin SOT–23–5
NCP1529*	2.7	5.5	1.2, 1.5, 1.8, Adj(0.9–3.3 V)	1 A	1700	Voltage	✓	✓	Auto PWM/ PFM mode. Synchronous Rectification	–40 to +85	Thin SOT–23–5

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Step-Up Boost Switching Regulator – Internal Switch

Device	V _{IN} (V)		V _{OUT} Options (Adj Range)	I _{OUT} (A)	F _{SW} (kHz)	Mode	Enable	Soft-Start	Comments	Temp Range (°C)	Package
	Min	Max									
NCP1403	1.2	5.5	up to 15 V	50 mA	300	Voltage	✓	✓	PFM mode	–40 to +85	Thin SOT–23–5
NCP1406	1.4	5.5	up to 25 V	50 mA	1000	Voltage	✓	✓	PFM mode	–40 to +85	Thin SOT–23–5
NCP1400	0.8	5.5	1.8–5.0 V	100 mA	180	Voltage	✓	✓	PWM mode	–40 to +85	Thin SOT–23–5
NCP1402	0.8	5.5	1.8–5.0 V	200 mA	180	Voltage	✓	✓	PFM mode	–40 to +85	Thin SOT–23–5
NCP1410	1.0	5.5	1.5–5.5 V	250 mA	600	Voltage	✓		PFM mode. Synchronous Rectification, Low–battery detect	–40 to +85	Micro8™
NCP1423	0.8	5.5	1.8–5.5 V	400 mA	600	Voltage	✓	✓	PFM mode. Synchronous Rectification, True–cutoff, Low–battery detect	–40 to +85	Micro–10
NCP1421	1.0	5.0	1.5–5.0 V	600 mA	1200	Voltage	✓	✓	PFM Sync–rect, True–cutoff, Low–battery detect	–40 to +85	Micro8™
NCP1422	1.0	5.0	1.5–5.0 V	800 mA	1200	Voltage	✓	✓	PFM mode. Synchronous Rectification, True–cutoff, Low–battery detect	–40 to +85	DFN–10
NCP5030*	2.7	5.5	2.2–5.5 V	1.2 A	1000	Current	✓	✓	Buck/ Boost Converter – can supply either regulated current or regulated output voltage	–40 to +85	DFN–12
CS5171	2.7	30	1.276 to 40 V	1.5 A	280	Current		✓	LT1372/1373 Compatible	–40 to +85	SO–8
CS5172	2.7	30	–2.5 to 40 V	1.5 A	280	Current		✓	Flyback & SEPIC	–40 to +85	SO–8
CS5173	2.7	30	1.276 to 40 V	1.5 A	560	Current		✓	Easy External Synchronization	–40 to +85	SO–8
CS5174	2.7	30	–2.5 to 40 V	1.5 A	560	Current		✓	Negative feedback polarity	–40 to +85	SO–8

*Coming Soon.

Multi-Topology (Step-Up, Step-Down, Inverting) Switching Regulator – Internal Switch

Device	V _{IN} (V)		V _{OUT} Options (Adj Range)	I _{OUT} (A)	F _{SW} (kHz)	Enable	Mode	Step- Up	Step- Down	Step-Up/ Step- Down	Inv	Comments	Temp Range (°C)	Package
	Min	Max												
MC34063	3.0	40	Down to 2.5 V	1.5	up to 100	✓	Hysteresis	✓	✓	✓	✓	Simple and flexible regulator	0 to +70	SO-8 / PDIP-8
MC33063	3.0	40	Down to 2.5 V	1.5	up to 100	✓	Hysteresis	✓	✓	✓	✓	Minimal number of external components	-40 to +85	SO-8 / PDIP-8
NCV33063	3.0	40	Down to 2.5 V	1.5	up to 100	✓	Hysteresis	✓	✓	✓	✓	Automotive version	-40 to +125	SO-8
NCP3063	3.0	40	Down to 2.5 V	1.5	up to 250	✓	Hysteresis	✓	✓	✓	✓	Higher F _{SW} for optimized size and efficiency	0 to +70	PDIP/SO-8/DFN
NCP3063B	3.0	40	Down to 2.5 V	1.5	up to 250	✓	Hysteresis	✓	✓	✓	✓		-40 to +85	PDIP/SO-8/DFN
CS5171	2.7	30	1.276 to 40 V	1.5	280		Current	✓			✓	LT1372/1373 Compatible	-40 to +85	SO-8
CS5172	2.7	30	-2.5 to 40 V	1.5	280		Current	✓			✓	Flyback and SEPIC	-40 to +85	SO-8
CS5173	2.7	30	1.276 to 40 V	1.5	560		Current	✓			✓	Easy External Synchronization	-40 to +85	SO-8
CS5174	2.7	30	-2.5 to 40 V	1.5	560		Current	✓			✓	Negative feedback polarity	-40 to +85	SO-8
MC34166	7.5	40	Down to 5.0 V	3.0	72		Voltage		✓	✓	✓	Cycle-by-Cycle current limit	0 to +70	D2PAK / TO-220
MC33166	7.5	40	Down to 5.0 V	3.0	72		Voltage		✓	✓	✓	Internal thermal shutdown	-40 to +85	D2PAK / TO-220
MC34163	2.5	40	Down to 1.25 V	3.4	up to 100	✓	Hysteresis	✓	✓	✓	✓	Simple & Flexible regulator	0 to +70	SO-16W / PDIP
MC33163	2.5	40	Down to 1.25 V	3.4	up to 100	✓	Hysteresis	✓	✓	✓	✓	Minimal number of external components	-40 to +85	SO-16W / PDIP
NCP3163	2.5	40	Down to 1.25 V	3.4	up to 300	✓	Hysteresis	✓	✓	✓	✓	Higher F _{SW} for optimized size and efficiency	0 to +70	SO-16WEP
NCP3163B	2.5	40	Down to 1.25 V	3.4	up to 300	✓	Hysteresis	✓	✓	✓	✓		-40 to +85	SO-16WEP
MC34167	7.0	40	Down to 5.0 V	5.0	72		Voltage		✓	✓	✓	Large 5.0A output capability	0 to +70	D2PAK/TO-220
MC33167	7.0	40	Down to 5.0 V	5.0	72		Voltage		✓	✓	✓	Standby Mode < 36 µA	-40 to +85	D2PAK/TO-220

ON Semiconductor Selector Guide – Analog Integrated Circuits

Switching Controllers for Step-Down Non-Isolated Topologies

Device	V _{IN} (V)		V _{OUT} Options (Adj Range)	V _{OUT} Accuracy	F _{SW} (kHz)	Mode	Enable	Soft-Start	Synchronous	Comments	Temp Range (°C)	Package
	Min	Max										
NCP5211	4.5	14	Down to 1.0 V	1.5%	150 – 750	Voltage	✓	✓	✓	1.5 A drive capability	0 to +70	SO-14
NCP5211B	4.5	14	Down to 1.0 V	1.5%	150 – 750	Voltage	✓	✓	✓	1.5 A drive capability	–40 to +85	SO-14
CS51031	4.5	16	Down to 1.25 V	2%	200 – 700	Hysteresis		✓		No compensation required ; PFET	–40 to +85	SO-8
CS51033	3.3	5.0	Down to 1.25 V	2%	200 – 700	Hysteresis		✓		No compensation required ; PFET	–40 to +85	SO-8
SG3525	8.0	35	Down to 5.1 V	1%	100 – 400	Voltage	✓	✓		Flexible configurations; ST Compatible	0 to +70	SO-16W
NCP1580	4.5	15	Down to 0.8 V	1.5%	350	Voltage		✓	✓	1.5 A gate drive; 90% duty cycle	–40 to +85	SO-8
NCP1582/A	4.5	15	Down to 0.8 V	1.5%	350	Voltage	✓	✓	✓	0.7 A gate drive; Short Circuit Protection	–40 to +85	SO-8
NCP1583	4.5	15	Down to 0.8 V	1.5%	300	Voltage	✓	✓	✓	0.7 A gate drive; Short Circuit Protection	–40 to +85	SO-8
NCP1571	2.0	12	Down to 0.980 V	1.0%	200	Voltage	✓	✓	✓	12 V bias supply	0 to +125	SO-8
NCP1575	2.0	12	Down to 0.980 V	1.0%	200 – 500	Voltage		✓	✓	12 V bias supply	0 to +125	SO-8
NCP1550	2.5	5.5	1.8–3.3 V (factory prefixed)	2.0%	600	Voltage	✓	✓		Auto PWM/ PFM mode.	–40 to +85	Thin SOT-23-5

Dual Switching Controllers for Step-Down Non-Isolated Topologies

Device	V _{IN} (V)		V _{OUT} Options (Adj Range)	V _{OUT} Accuracy	F _{SW} (kHz)	Mode	Enable	Soft-Start	Synchronous	Comments	Temp Range (°C)	Package
	Min	Max										
NCP5422	10.8	13.2	Down to 1.0 V	2.0%	150 – 600	Voltage	✓	✓	✓	Hiccup mode overcurrent protection	0 to +70	SO-16
NCP5423	10.8	13.2	Down to 1.0 V	1.0%	150 – 600	Voltage	✓	✓	✓	1% Voltage reference	0 to +70	SO-16
NCP5424	10.8	13.2	Down to 1.0 V	2.0%	150 – 600	Voltage	✓	✓	✓	Hiccup & cycle-by-cycle overcurrent	0 to +70	SO-16
NCP5425	4.6	13.2	Down to 0.8 V	1.0%	150 – 750	Voltage	✓	✓	✓	1.5A peak drive capability	0 to +125	TSSOP-20

Switching Controllers for Step-Up Non-Isolated Topologies

Device	V _{IN} (V)		V _{OUT} Options (Adj Range)	V _{OUT} Accuracy	F _{SW} (kHz)	Mode	Enable	Soft-Start	Synchronous	Comments	Temp Range (°C)	Package
	Min	Max										
NCP1450	0.9	5.5	1.8–5.0 V (Factory Prefixed)	2.5%	180	Voltage	✓	✓		PFM mode	–40 to +85	Thin SOT-23-5

Switching Controllers for Step-Down Isolated Topologies

Device	V _{IN} (V)		V _{OUT} Options (Adj Range)	V _{OUT} Accuracy	F _{sw} (kHz)	Mode	Enable	Soft-Start	Synchronous	Comments	Temp Range (°C)	Package
	Min	Max										
CS5124	7.7	75	External	–	400	Current	√	√		Small PCB footprint; Bias for startup	–40 to +105	SO–8
CS51221	3.3	72	Down to 1.26V	2%	up to 1000	Voltage		√		Programmable features; Bias for startup	–40 to +85	SO–16/TSSOP–16
CS51021	3.3	72	Down to 5.0V	1%	200 – 1000	Current		√		Synch; Bias for startup	–40 to +85	SO–16/TSSOP–16
CS51022	3.3	72	Down to 5.0V	1%	200 – 1000	Current		√		Sleep mode; Bias for startup	–40 to +86	SO–16/TSSOP–16
NCP1030	10	200	2.5 up to V _{IN}	2%	up to 1000	Voltage	√	√		PoE applications; Integrated Switch	–40 to +125	Micro8™
NCP1031	10	200	2.5 up to V _{IN}	2%	up to 1000	Voltage	√	√		PoE applications; Integrated Switch	–40 to +125	SO–8

ON Semiconductor Selector Guide – Analog Integrated Circuits

Secondary Side Post Regulation Controllers

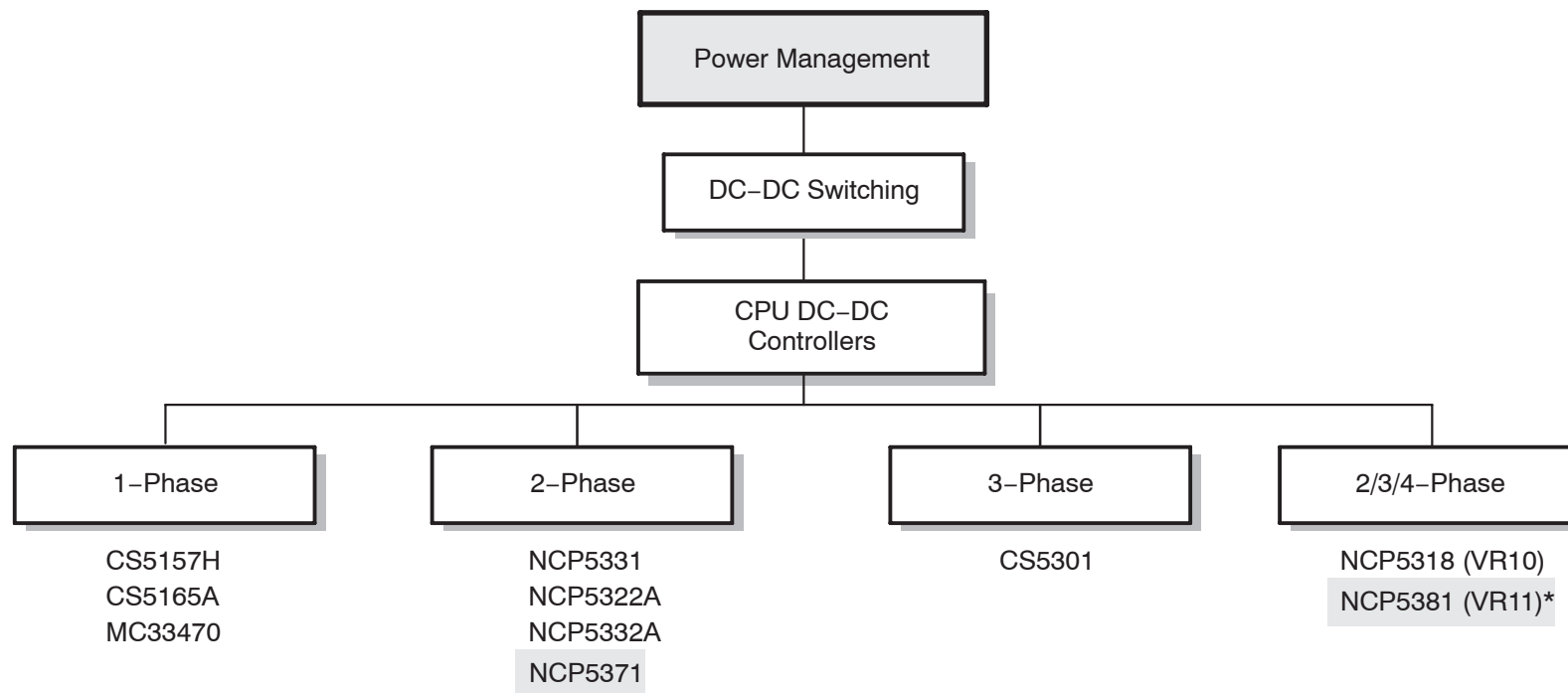
IC Operating Voltage	Converter Input Voltage	Output Voltage	Output Driver	Freq.	Temp. (T _A)	Package	Part No.	Features
ULVO: 7.0/8.0 V Max: 45 V	(V _{gate} max: 75 V)	(V _{REF} = 2.0 V)	1.5 A	SYNC	–40 to +85°C	SO–16L	CS5101EDW16	- Voltage mode - Configured as either buck or boost with external NFET - Externally programmable overcurrent protection 5.0 V 2% reference pin
						DIP–14	CS5101EN14	

Synchronous Buck Post Regulator Controller – Forward Topologies

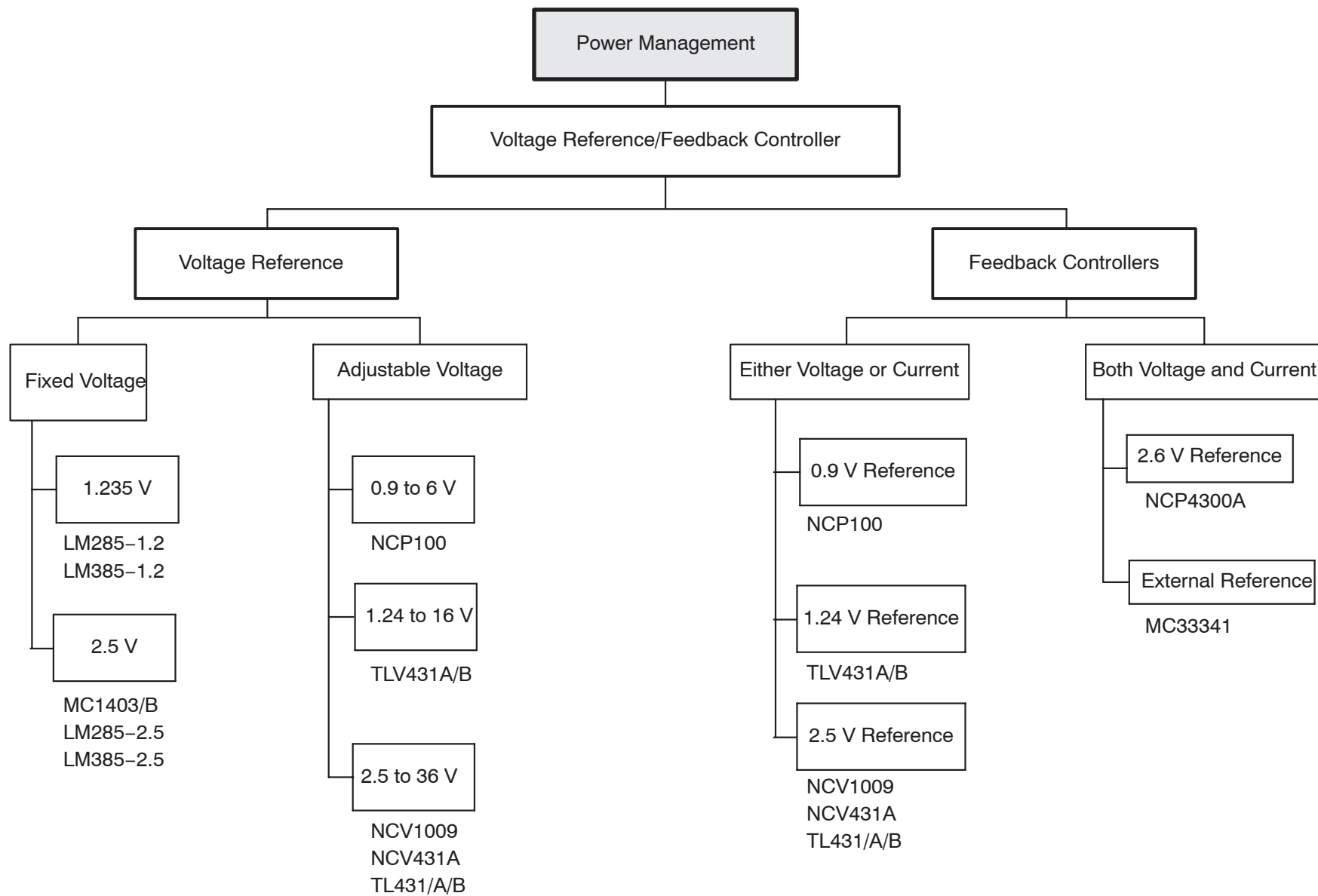
Temp. (T _J)	Package	Part No.
–40 to +125°C	SO–8	NCP4330DR2

Secondary Controller for Multi–Output Quasi–Resonant Switch–Mode Power Supplies

Temp. (T _J)	Package	Part No.
0 to +125°C	SO–16	NCP4326DR2



*Coming Soon.



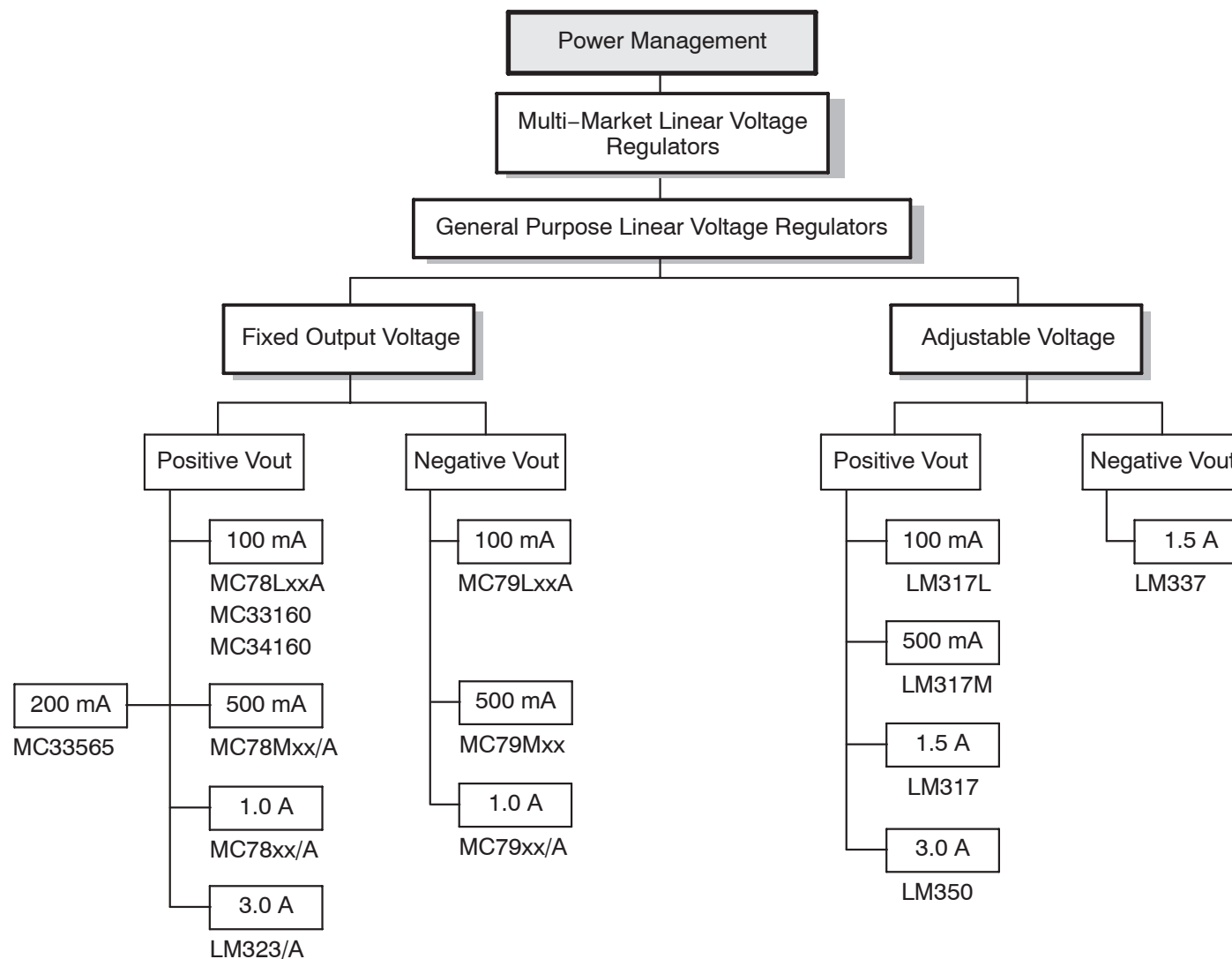
Series Voltage References

Part Number	Reference Voltage (V)	Tolerance $\pm$ (%)	Typical Temperature Coefficient (ppm/°C)	Typical Quiescent Current (mA)	Package		Operating Temperature Range (°C)
					SO-8	PDIP	
MC1403	2.500	1.0	10	1.200	✓	✓	0 to +70
MC1403B	2.500	1.0	10	1.200	✓	✓	-40 to +85

Shunt Voltage References

Part Number	Reference Voltage (V)	Tolerance $\pm$ (%)	Typical Temperature Coefficient (ppm/°C)	Minimum Operating Current (mA)	Package						Operating Temperature Range (°C)
					SO-8	TO-92	Micro8	TSOP-5†	PDIP	SOT23-3	
LM285-1.2	1.235	1.0	80	0.010	✓	✓					-40 to +85
LM385-1.2	1.235	2.0	80	0.015	✓	✓					0 to +70
LM285-2.5	2.500	1.5	80	0.020	✓	✓					0 to +70
LM385-2.5	2.500	3.0	80	0.020	✓	✓					0 to +70
LM385B-1.2	1.235	1.0	80	0.020	✓	✓					0 to +70
LM385B-2.5	2.500	1.5	80	0.020	✓	✓					0 to +70
NCV1009	2.500	0.2	–	–	✓	✓					-40 to +125
NCP100	Adjustable 0.9 to 6 V	1.0	25	0.100				✓			-40 to +85
TLV431A	Adjustable 1.24 to 16 V	1.0	–	0.050		✓		✓			-40 to +85
TLV431B	Adjustable 1.24 to 16 V	0.5	–	0.050		✓		✓		✓	-40 to +85
TL431C	Adjustable 2.495 to 36 V	2.2	50	0.500	✓	✓	✓		✓	✓	0 to +70
TL431I	Adjustable 2.495 to 36 V	2.2	50	0.500	✓	✓	✓		✓	✓	-40 to +85
TL431AC	Adjustable 2.495 to 36 V	1.0	50	0.500	✓	✓	✓		✓	✓	0 to +70
TL431AI	Adjustable 2.495 to 36 V	1.0	50	0.500	✓	✓	✓		✓	✓	-40 to +85
TL431BC	Adjustable 2.495 to 36 V	0.4	50	0.500	✓	✓	✓		✓	✓	0 to +70
TL431BI	Adjustable 2.495 to 36 V	0.4	50	0.500	✓	✓	✓		✓	✓	-40 to +85

†TSOP-5 – Also known as Thin SOT23-5.



Multi-Market General Purpose Linear Voltage Regulators

		Nominal Output Voltage																Package					
Output Current	Part Number	Positive	Negative	Adjustable	5.0 V	5.2 V	6.0 V	8.0 V	9.0 V	12.0 V	15.0 V	18.0 V	20.0 V	24.0 V	Tolerance (%)	Drop Out Voltage (Typical)	Maximum Input Voltage (Vdc)	SOP-8	DPAK	D ² PAK	SOT-223	TO-92	TO-220
100 mA	MC78LxxA Series	✓			✓			✓	✓	✓	✓	✓		✓	5.0	1.7 V @ 40 mA	5.0 to 18 V Version = 30V 12 to 18 V Version = 35 V 24 V Version = 40 V	✓				✓	
100 mA	MC79LxxA Series		✓		✓					✓	✓	✓		✓	5.0	1.7 V @ 40 mA	–5.0 V Version = –30 V –12 to –18 V Version = –35 V –24 V Version = –40 V	✓				✓	
100 mA	LM317Lxx Series	✓		✓											4.0	1.9 V @ 100 mA	V _I – V _O = 40 V	✓				✓	
100 mA	MC33160	✓			✓										5.0	2.0 V @ 100 mA	40 V						SO–16, DIP–16
100 mA	MC34160	✓			✓										5.0	2.0 V @ 100 mA	40 V						SO–16, DIP–16
200 mA	MC33565	✓			3.3, 5.0 V									2.0	2.3 V @ 100 mA	V _I – V _O = 7.0 V	✓						
500 mA	MC78Mxx Series	✓			✓		✓	✓	✓	✓	✓	✓	✓	✓	4.0	1.9 V @ 500 mA	5.0 to 18 V Version = 35 V 20 to 24 V Version = 40 V		✓				✓
500 mA	MC78MxxA Series	✓			✓		✓	✓	✓	✓					2.0	1.9 V @ 500 mA	5.0 to 18 V Version = 35 V 20 to 24 V Version = 40 V		✓				✓
500 mA	MC79Mxx Series		✓		✓		✓	✓	✓	✓					4.0	1.1 V @ 500 mA	–35 V		✓				✓
500 mA	LM317Mxx Series	✓		✓											4.0	2.1 V @ 500 mA	V _I – V _O = 40 V		✓		✓		✓
500 mA	LM317MxxA Series	✓		✓											2.0	2.1 V @ 500 mA	V _I – V _O = 40 V		✓		✓		✓
1.0 A	MC78xx Series	✓			✓		✓	✓	✓	✓	✓	✓		✓	4.0	2.0 V @ 500 mA	5.0 to 18 V Version = 35 V 24 V Version = 40 V			✓			✓
1.0 A	MC78xxA Series	✓			✓		✓	✓	✓	✓	✓	✓		✓	2.0	2.0 V @ 500 mA	5.0 to 18 V Version = 35 V 24 V Version = 40 V			✓ 4			✓
1.0 A	MC79xx Series		✓		✓	✓	✓	✓		✓	✓	✓		✓	4.0	2.0 V @ 1.0 A	–5.0 to –18 V Version = –35 V –24 V Version = –40 V			✓			✓
1.0 A	MC79xxA Series		✓		✓		✓	✓	✓	✓					2.0	2.0 V @ 1.0 A	–5.0 to –18 V Version = –35 V –24 V Version = –40 V			✓ 4			✓

'xx' indicates nominal voltage

1. Available in select packages only; contact your local ON Semiconductor sales office for information.
2. Available for select voltage options only; contact your local ON Semiconductor sales office for information.

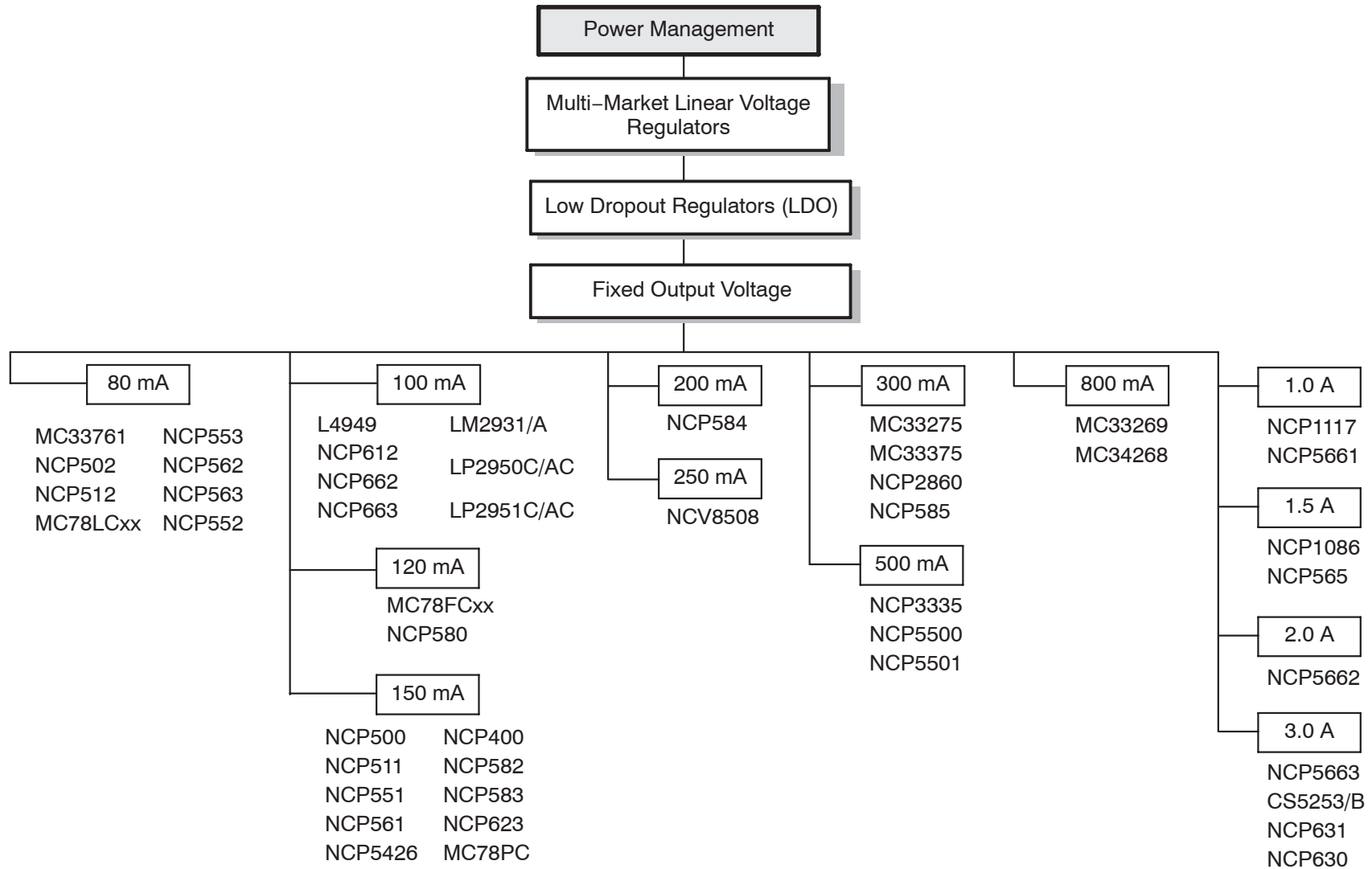
ON Semiconductor Selector Guide – Analog Integrated Circuits
Multi-Market General Purpose Linear Voltage Regulators (continued)

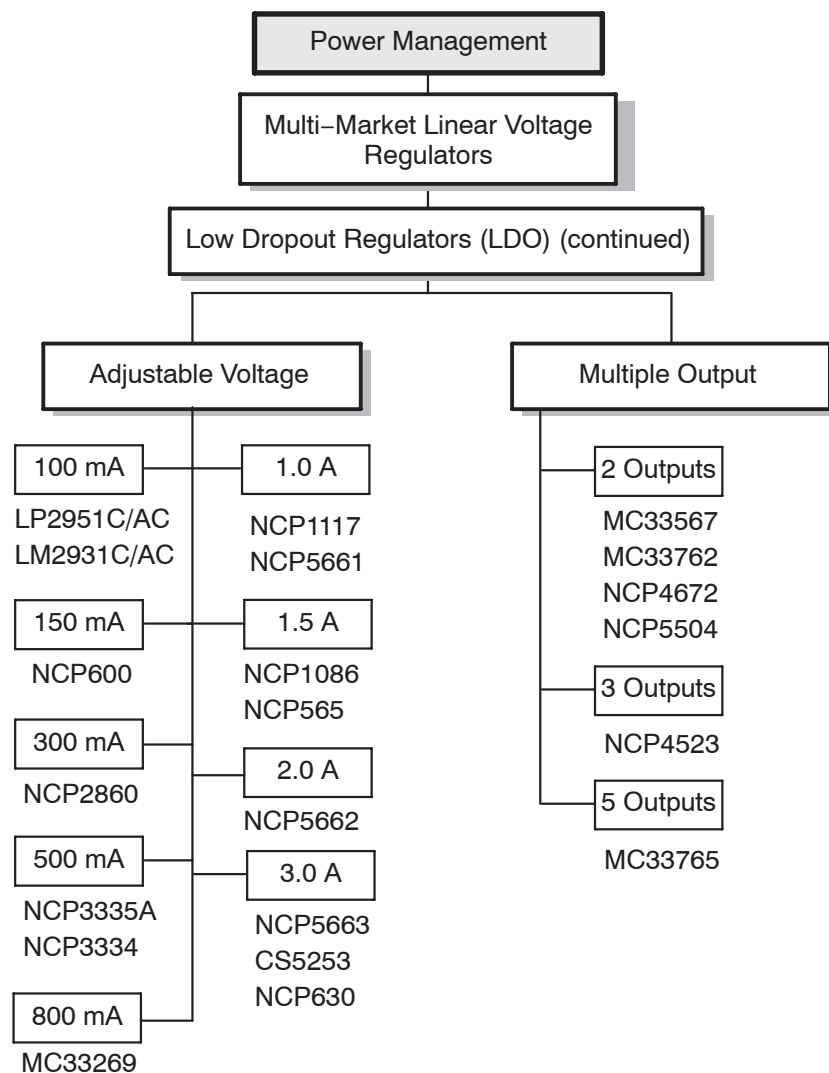
		Nominal Output Voltage														Package							
Output Current	Part Number	Positive	Negative	Adjustable	5.0 V	5.2V	6.0 V	8.0 V	9.0 V	12.0 V	15.0 V	18.0 V	20.0 V	24.0 V	Tolerance (%)	Drop Out Voltage (Typical)	Maximum Input Voltage (Vdc)	SOP-8	DPAK	D ² PAK	SOT-223	TO-92	TO-220
1.5 A	LM317	✓		✓											4.0	2.25 V @ 1.5 A	V _I – V _O = 40 V			✓			✓
1.5 A	LM337		✓	✓											4.0	2.2 V @ 1.5 A	V _I – V _O = 40 V			✓			✓
3.0 A	LM323	✓			✓										4.0	2.0 V @ 3.0 A	20 V						✓
3.0 A	LM323A	✓			✓										2.0	2.0 V @ 3.0 A	20 V						✓
3.0 A	LM350	✓		✓											4.0	2.7 V @ 3.0 A	V _I – V _O = 35 V						✓

'xx' indicates nominal voltage

3. Available in select packages only; contact your local ON Semiconductor sales office for information.

4. Available for select voltage options only; contact your local ON Semiconductor sales office for information.





Multi-Market Low Dropout Voltage Regulators

		Output Voltage																Input Voltage		Package																								
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	See Note	Tolerance (%)	Drop Out Voltage	Min.	Max.	SC-70	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	QFN	TSSOP16	PDIP	Additional Features					
80 mA	MC33761	2.5, 2.8, 2.9, 3.0, 5.0 V														1.5	0.16 V @ 80 mA	–	12		✓																							w/ ENABLE, Ultra Low Noise
80 mA, 80 mA	MC33762			✓	✓	✓		✓	✓											–	0.16 V @ 80 mA, 0.16 V @ 80 mA	–	12						✓											Dual, w/ ENABLE, Ultra Low Noise				
80 mA	NCP502	1.5, 1.8, 2.5, 2.7, 2.8, 3.0, 3.3, 3.5, 5.0 V														2.0	0.8 V @ 80 mA	–	12	✓																						Low Iq, High PSRR, ENABLE		
80 mA	NCP512		✓	✓	✓	✓	✓		✓		✓				✓					2.0	0.25 V @ 80 mA	–	6.0	✓																w/ ENABLE				
80 mA	NCP562		✓	✓	✓	✓	✓		✓		✓				✓					2.0	0.25 V @ 80 mA	–	6.0	SC-82AB																				Ultra Low Iq, ENABLE
80 mA	NCP553		✓	✓	✓	✓	✓		✓		✓				✓					2.0	0.7 V @ 80 mA	–	12	SC-82AB																				Ultra Low Iq
80 mA	NCP563		✓	✓	✓	✓	✓		✓		✓				✓					2.0	0.25 V @ 80 mA	–	6.0	SC-82AB																				Ultra Low Iq
80 mA	MC78LCxx Series		✓	✓	✓	✓	✓		✓		✓		✓		✓					3.0	1.0 V @ 80 mA	2.5	12		✓																Ultra Low Iq			
80 mA	NCP552		✓	✓	✓	✓	✓		✓	✓					✓					3.0	650 mV	–	12	✓																	ENABLE, Low Iq			
100 mA	L4949														✓					1.0	0.2 V @ 50 mA	5.0	28				✓		✓												Power-On Reset, Input Voltage Sense			
100 mA	LM2931/A														✓					5.0, 3.8	0.16 V @ 100 mA	–	40				✓			✓	✓			✓							–			
100 mA	LM2931C/AC	✓																		5.0, 2.0	0.16 V @ 100 mA	–	40				✓									✓					–			
100 mA	LP2950C/AC								✓		✓				✓					1.0/0.5	0.38 V @ 100 mA	–	30							✓				✓							–			
100 mA	LP2951C/AC	✓							✓		✓				✓					1.0/0.5	0.38 V @ 100 mA	–	30				✓		✓	✓											–			

5. Output voltages from 2.0 V to 6.0 V, in 0.1 V increments, are available on request.

ON Semiconductor Selector Guide – Analog Integrated Circuits
Multi-Market Low Dropout Voltage Regulators (continued)

		Output Voltage																Input Voltage		Package																									
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	See Note	Tolerance (%)	Drop Out Voltage	Min.	Max.	SC-70	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	QFN	TSSOP16	PDIP	Additional Features						
100 mA	NCP612	1.8, 2.5, 2.7, 2.8, 3.0, 3.1, 5.0 V														2.0	200 mV @ 100 mA	–	6.0	✓																									ENABLE
100 mA	NCP662	✓	✓	✓	✓	✓		✓							✓					2.0	230 mV @ 100 mA	–	6.0	SC-82AB												ENABLE, Ultra Low Iq									
100 mA	NCP663	✓	✓	✓	✓	✓		✓							✓					2.0	230 mV @ 100 mA	–	6.0	SC-82AB												Ultra Low Iq									
120 mA	MC78FCxx							✓							✓				6	2.5	0.5 V @ 40 mA	2.0	10			✓														–					
120 mA	NCP580	✓	✓	✓		✓		✓		✓		✓								3.0	180 mV @ 120 mA	2.2	6.5	SC-82AB												ENABLE									
150 mA	MC78PCxx		✓	✓		✓		✓		✓					✓					2.0	0.2 V @ 100 mA	–	8.0		✓															w/ ENABLE					
150 mA	NCP623										✓		✓		✓					2.0	0.18 V @ 150 mA	–	12						✓						✓				w/ ENABLE, Ultra Low Noise						
150 mA	NCP500	1.8, 1.85, 2.5, 2.6, 2.7, 2.8, 3.0, 3.3, 5.0 V														2.5	0.165 V @ 150 mA	–	6.0		✓																✓			w/ Shutdown					
150 mA	NCP511		✓	✓	✓	✓	✓		✓		✓				✓					3.0	0.170 V @ 150 mA	–	6.0		✓															w/ Shutdown					
150 mA	NCP551		✓	✓	✓	✓	✓		✓	✓	✓				✓					3.0	0.720 V @ 150 mA	–	12		✓															w/ Shutdown, Ultra Low Iq					
150 mA	NCP561		✓	✓	✓	✓	✓		✓		✓				✓					3.0	0.15 V @ 150 mA	–	6.0		✓															Ultra Low Iq					
150 mA	NCP5426	1.3 V														3.0	0.15 V @ 150 mA	–	12		✓																				w/ ENABLE				
150 mA	NCP400			✓																2.0	160 mV @ 100 mA	1.8	5.0	Flip-Chip												ENABLE, Reset									

6. Output voltages from 2.0 V to 6.0 V, in 0.1 V increments, are available on request.

Multi-Market Low Dropout Voltage Regulators (continued)

		Output Voltage																Input Voltage		Package																					
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	See Note	Tolerance (%)	Drop Out Voltage	Min.	Max.	SC-70	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	QFN	TSSOP16	PDIP	Additional Features		
150 mA	NCP582	1.5, 1.8, 2.5, 2.8, 2.9, 3.0, 3.3 V														3.0	220 mV @ 150 mA	2.0	6.5	SC-82AB, SOT-563														ENABLE							
150 mA	NCP583	1.5, 1.8, 2.5, 2.8, 2.9, 3.0, 3.3 V														3.0	250 mV @ 150 mA	1.7	6.5	SC-82AB, SOT-563														ENABLE, Ultra Low Quiescent Current							
150 mA	NCP600	√																		2.0	100 mV	-0.3	6.0	√														ENABLE, Fast Turn-ON			
200 mA	NCP584	0.9, 1.2, 1.8 V														3.0	200 mV @ 200 mA	1.4	6.5	√																					ENABLE, Tri-Mode
300 mA	MC33275				√				√		√				√					2.0	0.26 V @ 300 mA	-	12				√			√		√							-		
300 mA	MC33375			√	√				√		√				√					2.0	0.26 V @ 300 mA	-	12				√				√								w/ ENABLE		
300 mA	NCP2860	√				√														2.0	0.150 V @ 300 mA	-	6.0						√										Low Noise 60 μV, FAULT Indicator		
300 mA	NCP585	0.9, 1.2, 1.8 V														3.0	310 mV @ 300 mA	1.4	6.5	SOT-23-5, HSON														ENABLE, Tri-Mode							
500 mA	NCP5501		√												√					2.9	300 mV	-7.0	18							√									Low Noise		
500 mA	NCP3335A	√			√			√		√					√					0.9	340 mV (max)	-0.3	16							√					√				ENABLE, High Accuracy		
500 mA	NCP3334	√																		0.9	340 mV (max)	-0.3	16				√												ENABLE, High Accuracy		

7. Output voltages from 2.0 V to 6.0 V, in 0.1 V increments, are available on request.

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Multi-Market Low Dropout Voltage Regulators (continued)

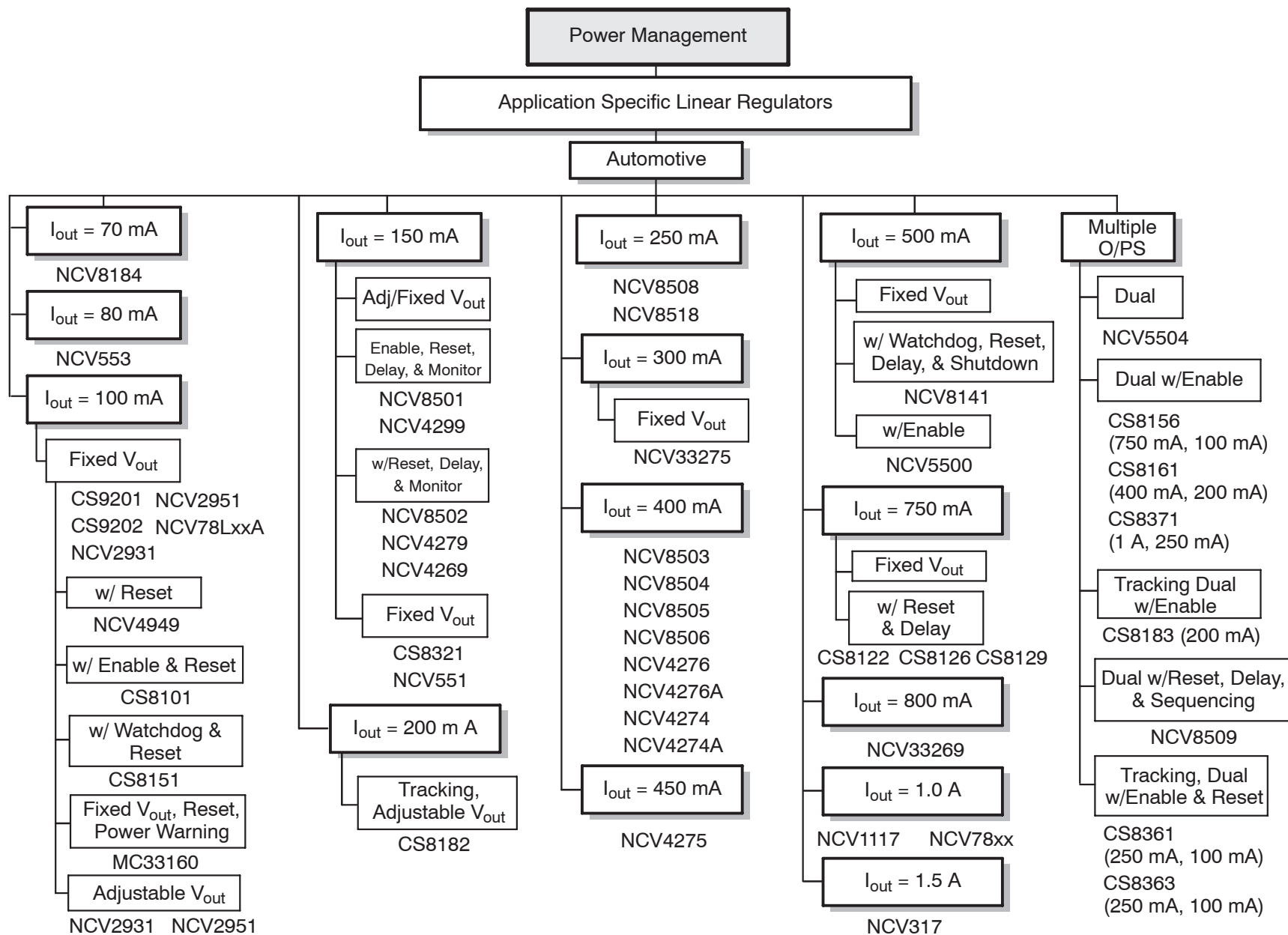
		Output Voltage															Input Voltage		Package																					
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.0 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	See Note	Tolerance (%)	Drop Out Voltage	Min.	Max.	SC-70	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	QFN	TSSOP16	PDIP	Additional Features
800 mA	MC33269	✓										✓				✓			✓		1.0	1.1 V @ 800 mA	–	20				✓		✓	✓	✓								–
800 mA	MC34268								✓												1.4	1.1 V @ 800 mA	–	15			✓			✓	✓									For SCSI–2 Active Termination
1.0 A	NCP1117	✓	✓	✓	✓	✓			✓			✓				✓			✓		1.0	1.07 V @ 800 mA	2.7	20						✓	✓									Safe Area Compensation
1.0 A	NCP5661	Adjustable, 1.2, 3.3 V													1.0	–	2.0	18							✓														ENABLE, Ultra Fast Transient	
3.0 A	NCP630	Adjustable, 3.47													1.5	1.0 V	–	12								✓														ENABLE, Fast Turn–ON, High PSRR
500 mA	NCP5500	✓	✓	✓		✓						✓					✓				5.0	20 mV @ 1.0 mA	2.6	16						✓										Enable, Reverse Battery Protection
1.5 A	NCP565	Adjustable, 1.2 V													2.0	900 mV @ 1.5 A	2.4	9.0							✓														ENABLE, Ultra Fast Transient Response	
1.5 A	NCP1086	✓										✓									1.5	1.05 V @ 1.5	2.75	7.0						✓	✓		✓						Fast Response	
3.0 A	CS5253–1	✓																			1.0	0.4 V @ 3.0 A	–	6.0						✓										w/ Control and Sense
3.0 A	CS5253B–8					✓															1.5	0.4 V @ 3.0 A	–	6.0						✓										w/ Control and Sense
3.0 A	NCP5663	✓	✓																		1.0	1.0 V @ 3.0 A	2.0	9.0						✓										ENABLE, Ultra Fast Transient Response
30 mA 40 mA 50 mA 150 mA 60 mA	MC33765							✓													3.0 3.0 3.0 3.0 3.0	110 mV 110 mV 110 mV 170 mV 110 mV	3.0	5.3												✓				5 Outputs w/ENABLE

8. Output voltages from 2.0 V to 6.0 V, in 0.1 V increments, are available on request.

Multi-Market Low Dropout Voltage Regulators (continued)

		Output Voltage																		Input Voltage		Package																											
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.0 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	See Note	Tolerance (%)	Drop Out Voltage	Min.	Max.	SC-70	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	QFN	TSSOP16	PDIP	Additional Features									
150 mA 80 mA 80 mA	NCP4523	2.8 V																4.0 4.0 4.0	350 mV 300 mV 220 mV	3.35	7.0	SSOP-8												3 Outputs w/ENABLE															
Aux. Drive	MC33567	1.2, 1.515, 1.818, 2.3 V																5.0 5.0	110 mV	–	7.0				√																								Dual, ENABLE
30 mA 80 mA	NCP4672	1.8, 3.5 V																4.0 4.0	150 mV @ 30 mA	–	12				√																						Dual, Reset, Delay		
2.0 A	NCP5662	√	√																		1.0	1.0 V @ 2.0 A	2.0	18								√									ENABLE, Ultra Fast Transient Response								
3.0 A	NCP631	3.47 V																1.0	0.4 V @ 300 mA	–	9.0																√										Soft-Start		
250 mA 250 mA	NCP5504	3.3 V, Adjustable																2.0 2.0	250 mV (max) @ 250 mA	2.25	12														√													Dual, Fast Dynamic Response, Low Iq	

9. Output voltages from 2.0 V to 6.0 V, in 0.1 V increments, are available on request.



Automotive

		Output Voltage																Input Voltage		Package																				
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	14 V	Tolerance (%)	Drop Out Voltage	Min.	Max.	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	TSSOP16	PDIP	Additional Features			
70 mA	NCV8184	Tracking														± 10 mV	300 mV @ 70 mA	4.0	42		√				√															ENABLE, 60 V Load Dump Protection
80 mA	NCV553														√					3.0	470 mV @ 80 mA	2.5	12	SC-82AB										ENABLE, No Cap						
100 mA	MC33160														√					5.0	2.0 V @ 100 mA	7.0	40													Regulator and Supervisory Circuit in SOP-16L and DIP-16 Packages				
100 mA	CS9201														√					2.0	0.4 V @ 100 mA	6.0	26		√											No Cap				
100 mA	CS9202										√									2.0	1.2 V @ 100 mA	4.5	26		√											No Cap				
100 mA	CS8151														√					2.0	0.4 V @ 100 mA	6.0	26			√			√			√	√	w/ WATCHDOG, RESET, WAKE UP and DELAY, 74 V Load Dump Protection						
100 mA	CS8101														√					2.0	0.4 V @ 100 mA	6.0	26		√	√						√			μPower w/ RESET and ENABLE, 60 V Load Dump Protection					
100 mA	NCV4949														√					1.0	0.2 V @ 50 mA	5.0	28		√	√									Power-On Reset, Input Voltage Sense					
100 mA	NCV2931	√													√					5.0	0.16 V @ 100 mA	–	40		√				√	√	√				60 V Load Dump Protection					
100 mA	NCV78LxxA														√			√		5.0	1.7 V @ 100 mA	7.0	30		√										Low Cost					
100 mA	NCV2951	√									√				√					2.5	350 mV @ 100 mA	2.0	30		√											ENABLE				

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Automotive (continued)

		Output Voltage															Input Voltage		Package																		
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	14 V	Tolerance (%)	Drop Out Voltage	Min.	Max.	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	TSSOP16	PDIP	Additional Features
150 mA	CS8321														✓					2.0	0.3 V @ 150 mA	–	26							✓		✓				μPower w/ 45 V Load Dump Protection	
150 mA	NCV4279														✓					2.0	400 mV @ 150 mA	6.0	45	SO-8, SO-14										Reset, Delay, Flag/Monitor, 60 V Load Dump Protection			
150 mA	NCV551		✓	✓	✓	✓	✓		✓	✓	✓				✓					3.0	130 mV @ 150 mA	2.5	6.0	✓												ENABLE	
150 mA	NCV8501	✓			✓						✓				✓	✓	✓			2.0	400 mV @ 150 mA	–15	45	SO-8, epod SO-16W										ENABLE, Delay, $\overline{\text{Reset}}$, Monitor			
150 mA	NCV8502	✓			✓						✓				✓	✓	✓			2.0	400 mV @ 150 mA	–15	45	SO-8, epod SO-16W										Delay, $\overline{\text{Reset}}$, Monitor			
200 mA	CS8182	2.8 to 45 V, Adjustable													± 10 mV		350 mV @ 200 mA	–15	45			✓				✓											Tracking LDO
250 mA	NCV8508														✓					3.0	450 mV @ 250 mA	6.0	45	D ² PAK, SO-16, SO-8 EP										Reset, Delay, Watchdog, 60 V Load Dump Protection			
300 mA	NCV33275														✓					2.0	260 mV @ 200 mV	3.5	13							✓					ENABLE		
400 mA	NCV8503	✓			✓						✓				✓					3.0	400 mV @ 400 mA	4.5	45	SO-16										ENABLE, Reset, Delay, Flag/Monitor, 60 V Load Dump Protection			
400 mA	NCV8504				✓						✓				✓					3.0	400 mV @ 400 mA	4.5	45	SO-16										Reset, Delay, Flag/Monitor, 60 V Load Dump Protection			
150 mA	NCV4269														✓					2.0	425 mV @ 150 mA	6.0	45	SO-8, SO-14										Reset, Delay Flag/Monitor 60 V Load Dump Protection			
250 mA	NCV8518														✓					2.0	425 mV @ 250 mA	4.5	45	SO-8EP, SO-16EP										Reset, Delay Flag/Monitor Watchdog, 60 V Load Dump Protection			

Automotive (continued)

		Output Voltage																Input Voltage		Package																	
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	14 V	Tolerance (%)	Drop Out Voltage	Min.	Max.	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	TSSOP16	PDIP	Additional Features
150 mA	NCV4299														✓					2.0	220 mV @ 100 mV	–	45	SO-14, SO-8										Sense, Reset			
400 mA	NCV8505	✓			✓						✓				✓					3.0	400 mV @ 400 mA	4.5	45								✓					ENABLE, Reset, Delay, 60 V Load Dump Protection	
400 mA	NCV8506	✓			✓						✓				✓					3.0	400 mV @ 400 mA	4.5	45								✓				Reset, Delay, 60 V Load Dump Protection		
400 mA	NCV4276	✓		✓	✓						✓				✓					4.0	250 mV @ 400 mV	4.5	45							✓	✓				ENABLE, Reset, Delay, 45 V Load Dump Protection		
450 mA	NCV4275														✓					2.0	250 mV @ 400 mV	6.0	45							✓	✓				Reset, Delay, 45 V Load Dump Protection		
500 mA	NCV8141														✓					4.0	1.25 V @ 500 mA	–	26								✓				w/ ENABLE, RESET and WATCHDOG, 60 V Load Dump Protection		
750 mA	CS8122														✓					2.0	0.35 V @ 500 mA	6.0	26										✓		w/ Delayed RESET, 60 V Load Dump Protection		
750 mA	CS8126–1														✓					3.0	0.35 V @ 500 mA	6.0	26								✓		✓		w/ Delayed RESET, 60 V Load Dump Protection		
750 mA	CS8129														✓					3.0	0.35 V @ 500 mA	6.0	26			✓				✓	✓	✓			w/ Delayed RESET, 60 V Load Dump Protection		
800 mA	NCV33269	✓									✓				✓			✓		1.0	1.1 V @ 800 mA	–	20			✓				✓	✓	✓				–	
500 mA	NCV5500	✓	✓												✓					2.9	20 mV @ 1.0 mA	2.6	16							✓					w/ Enable, Reverse Battery Protection		
500 mA	NCV5501	✓																		2.9	20 mV @ 1.0 mA	2.6	15							✓					Reverse Battery Protection		
400 mA	NCV4276	✓									✓				✓					2.0	250 mV @ 400 mV	4.5	45						✓	✓					ENABLE, Reset, Delay, 45 V Load Dump Protection		
400 mA	NCV4274										✓				✓					4.0	250 mV @ 400 mV	4.5	45						✓	✓					Reset, Delay, 45 V Load Dump Protection		
400 mA	NCV4274A										✓				✓					2.0	250 mV @ 400 mV	4.5	45						✓	✓					Reset, Delay, 45 V Load Dump Protection		

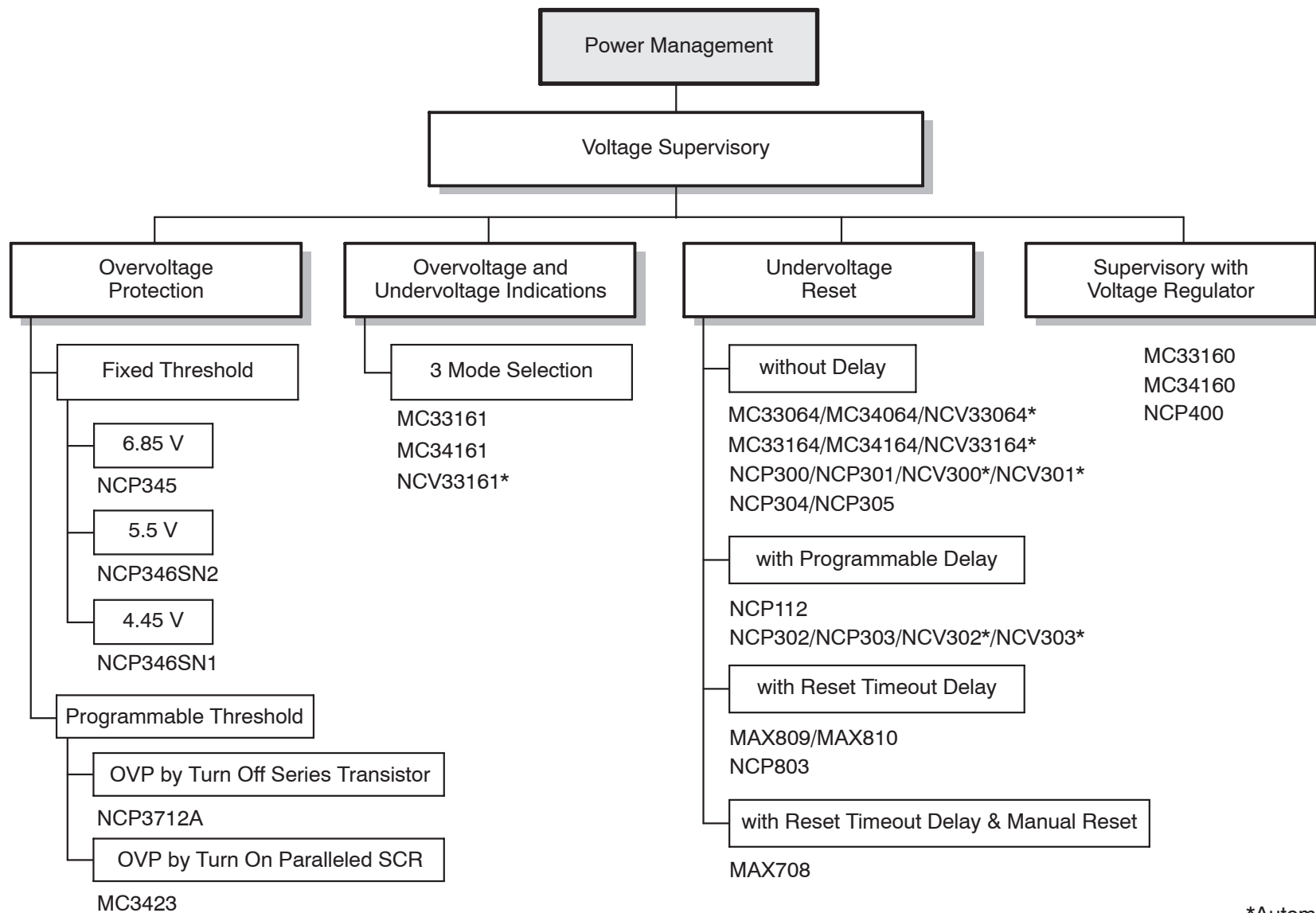
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Automotive (continued)

		Output Voltage															Input Voltage		Package																		
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	14 V	Tolerance (%)	Drop Out Voltage	Min.	Max.	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	TSSOP16	PDIP	Additional Features
100 mA, 250 mA	CS8361	✓													✓					2.0	0.4 V @ 100 mA, 0.4 V @ 250 mA	6.0	26				✓			✓							Dual, μPower w/ RESET and ENABLE
100 mA, 250 mA	CS8363	✓									✓									2.0	0.4 V @ 100 mA, 0.4 V @ 250 mA	6.0	26							✓							Dual, μPower w/ RESET and ENABLE
115 mA 100 mA	NCV8509	1.8, 2.5, 2.6, 3.3, 5.0 V													±25 mV 2.0	400 mV @ 115 mA		50	SO-16										Reset, Delay, Sequenced								
200 mA, 200 mA	CS8183	✓																		± 10 mV ± 10 mV	350 mV @ 200 mA	3.4	45				✓										Tracking Dual, μPower w/ ENABLE
400 mA, 200 mA	CS8161														✓			✓		5.0, 2.0	0.35 V @ 400 mA, 0.35 V @ 200 mA	6.0	26									✓				Dual, w/ ENABLE	
500 mA 500 mA	NCV5504	3.3 V, Adjustable													2.0 2.0	250 mV (max) @ 250 mA	2.25	12							✓												Dual, Fast Dynamic Response
750 mA, 100 mA	CS8156														✓			✓		5.0, 2.0	0.6 V @ 750 mA, 0.6 V @ 100 mA	6.0	26									✓				Dual, w/ ENABLE	
1.0 A, 250 mA	CS8371														✓	✓				5.0, 5.0	1.5 V @ 1.0 A, 2.5 V @ 250 mA	–	16									✓				Dual, Independent ENABLEs, NO CAP	

Automotive (continued)

		Output Voltage																Input Voltage		Package																	
Output Current	Part Number	Adjustable	1.5 V	1.8 V	2.5 V	2.7 V	2.8 V	2.85 V	3.0 V	3.2 V	3.3 V	3.8 V	4.0 V	4.75 V	5 V	8 V	10 V	12 V	14 V	Tolerance (%)	Drop Out Voltage	Min.	Max.	SOT-23	SOT-89	SO-8	SO(W)	DIP-8	Micro8	DPAK	D ² PAK	SOT-223	TO-92	TO-220	TSSOP16	PDIP	Additional Features
1.0 A	NCV1117	✓	✓	✓							✓									2.0	1.07 V @ 1.0 A	2.7	20						✓		✓						Safe Area Compensation
1.0 A	NCV78xx														✓			✓		5.0	2.0 V @ 1.0 A	7.0	35							✓		✓				Safe Area Compensation	
1.5 A	NCV317	✓																		4.0	2.25 V @ 1.5 A	–	40						✓		✓					–	



*Automotive

Supervisory

Description	Typical Threshold Voltage (V_{th}) (V)	Supply Voltage Range (V)	Typical Supply Current (μ A)	Maximum Supply Current (μ A)	Threshold Hysteresis (Typ) (mV)	Operating Temp. Range ($^{\circ}$ C)	Package	Description	Time Delay (Typ)
MAX809	4.90, 4.63, 4.55, 4.38, 4.00, 3.08, 2.93, 2.63, 2.32, 1.60 *	1.0 to 5.5	0.5	2.0	–	–40 to +105	SOT23	3-Pin Microprocessor Reset Monitors	240 msec
MAX810	4.63, 4.38, 3.08, 2.93, 2.63 *	1.0 to 5.5	0.5	2.0	–	–40 to +105	SOT23	3-Pin Microprocessor Reset Monitors	240 msec
MC33064	4.60	1.0 to 6.5	390	500	20	–40 to +85	SO–8, Micro8, TO–92	Undervoltage Sensing Circuit	Ext. Capacitor Dependent
MC34064	4.60	1.0 to 6.5	390	500	20	0 to +70	SO–8, Micro8, TO–92	Undervoltage Sensing Circuit	Ext. Capacitor Dependent
MC33161	1.27	2.0 to 40 (Pos Sensing) 4.0 to 40 (Neg Sensing)	560	900	25	–40 to +85	SO–8, DIP–8	Universal Voltage Monitor	Ext. Capacitor Dependent
MC34161	1.27	2.0 to 40 (Pos Sensing) 4.0 to 40 (Neg Sensing)	560	900	25	0 to +70	SO–8, DIP–8	Universal Voltage Monitor	Ext. Capacitor Dependent
MC33164	2.71 (V_{in} Increasing) 2.65 (V_{in} Decreasing)	1.0 to 10	24	40	60	–40 to +125	SO–8, Micro8, TO–92	Micropower Undervoltage Sensing Circuits	Ext. Capacitor Dependent
MC34164	2.71 (V_{in} Increasing) 2.65 (V_{in} Decreasing)	1.0 to 10	24	40	60	0 to +70	SO–8, Micro8, TO–92	Micropower Undervoltage Sensing Circuits	Ext. Capacitor Dependent
MC3423	2.6	4.5 to 40	6.0 mA	10 mA	–	0 to +70	SO–8, DIP–8	Overvoltage Crowbar Sensing Circuit	0.5 μ sec
NCP300/1	0.9, 1.8, 2.0, 2.7, 3.0, 4.5, 4.7	0.8 to 10	0.20 to 0.34**	1.2 to 1.4**	45 to 235 Depends on Threshold Voltage	–40 to +125	Thin SOT23–5 (Note 1)	Voltage Detector Series NCP300–CMOS, NCP301–Open Drain	High to Low 45–97** μ sec Low to High 77–130** μ sec

*Voltages from 1.6 to 4.9 V by steps of 0.1 V are available upon request.

**Depends on the voltage threshold of the part.

1. TSOP–5 – Also known as Thin SOT23–5.

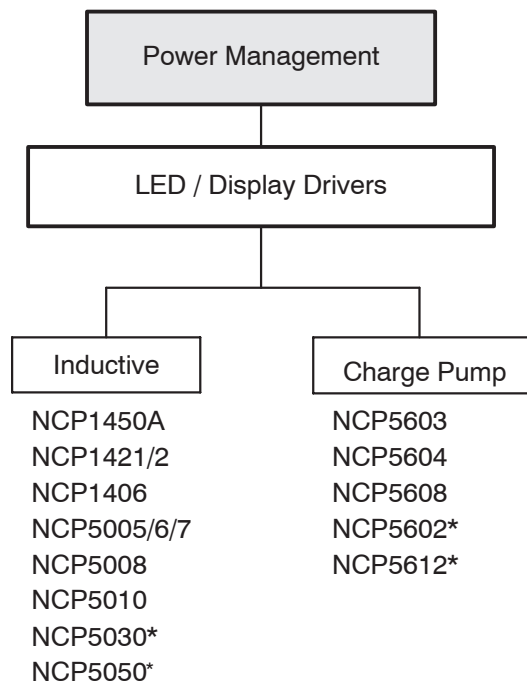
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Supervisory (continued)

Description	Typical Threshold Voltage (V_{th}) (V)	Supply Voltage Range (V)	Typical Supply Current (μ A)	Maximum Supply Current (μ A)	Threshold Hysteresis (Typ) (mV)	Operating Temp. Range ($^{\circ}$ C)	Package	Description	Time Delay (Typ)
NCP302/3	0.9, 1.8, 2.0, 2.7, 3.0, 4.5, 4.7	0.8 to 10	0.20 to 0.34**	1.2 to 1.4**	45 to 235 Depends on Threshold Voltage	–40 to +125	Thin SOT23–5 (Note 1)	Voltage Detector Series with Programmable Delay NCP302–CMOS, NCP303–Open Drain	Ext. Capacitor Dependent
NCP304/5	0.9, 1.8, 2.0, 2.7, 3.0, 4.5, 4.7	0.8 to 10	0.8 to 1.1**	3.0 to 3.9**	45 to 235 Depends on Threshold Voltage	–40 to +125	SC–82AB	Voltage Detector Series NCP304–CMOS, NCP305–Open Drain	High to Low 10–18** μ sec Low to High 6–21** μ sec
NCP345	6.85	3.0 to 25	750	1000	100	–40 to +85	Thin SOT23–5 (Note 1)	Overvoltage Protection IC	10 μ sec
NCP346	4.45, 5.5	3.0 to 25	750	1000	50	–40 to 85	Thin SOT23–5 (Note 1)	Overvoltage Protection IC	1.8 msec Turn–On 0.5 μ sec Turn–Off
NCP803	4.63, 4.38, 3.08, 2.93, 2.63, 2.32, 1.60	1.0 to 5.5	0.5	2.0	–	–40 to +105	SOT–23	3 Pin Microprocessor, Reset Monitors	240 ms
NCP112	3.3, 5.0, 12	4.5 to 16	3.0 mA	5.0 mA	–	0 to +85	SO–14 PDIP–14	Triple Supervisor for Desktop Power Supply Monitoring	Programmable ON/OFF, Power Good, Undervoltage Blocking

**Depends on the voltage threshold of the part.

1. TSOP–5 – Also known as Thin SOT23–5.



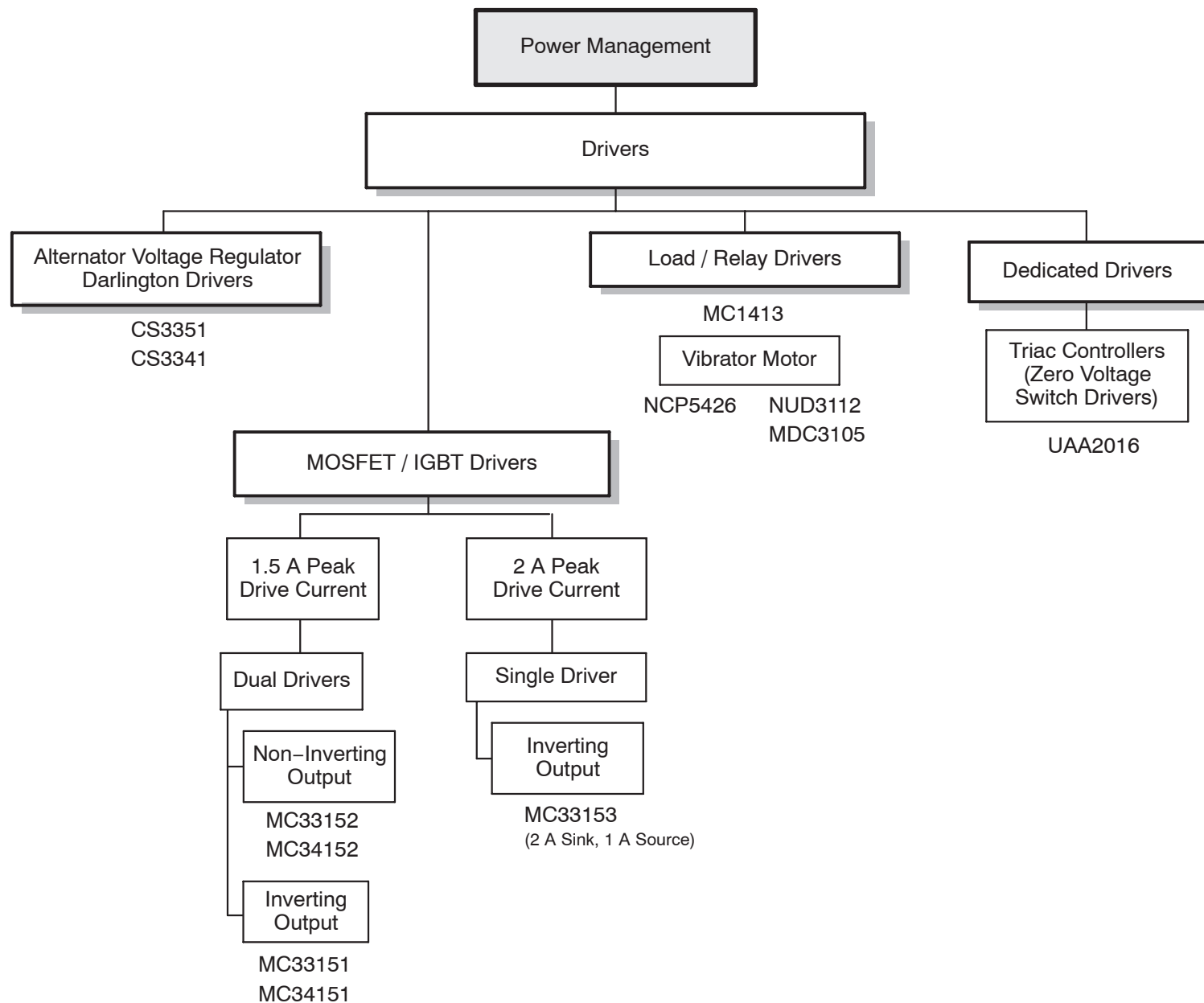
*Coming Soon.

ON Semiconductor Selector Guide – Analog Integrated Circuits

LED/DISPLAY DRIVERS

Application	WLED Type	Number of LED/ Connection	Converter Topology	ON Solution	Key Features	Availability
Display Backlighting	Standard, 10 mA – 25 mA	2 – 5 LED/Series	Inductive	NCP5006/5007: Up to 92% efficiency, PFM, Boost, 21 V / 1 W output, Thin SOT23–5	Simple	Now
		3 – 5 LED/Series	Inductive	NCP5005 : Enhanced version of NCP5006. High EMI immunity.	Simple	Now
		4 – 5 LED/Series	Inductive	NCP5010 : 1 MHz PWM Boost, 22 V/0.5 W output integrated rectifier and true-cutoff, Micro-Bump–8 (1.7 x 1.7 mm)	Highly Integrated Driver	Now
		2 LEDs/Parallel	Charge Pump	NCP5602 : 90% peak efficiency, 2 outputs (25 mA each); 2% current matching, I2C, LLGA 12 (2 x 2 mm)	ICON Model I2C Dimming Control	Now
		2 LEDs/Parallel	Charge Pump	NCP5612 : 2 outputs (25 mA each); I2C, LLG 12 (2 x 2 mm)	S-Wire Link Dimming Control	3Q06
		2 – 6 LEDs/Series	Inductive	NCP1406: Up to 90% efficiency, PFM (up to 1 MHz), 25 V/0.5 W output, Thin SOT23–5 (3 x 3 mm)	Can Operate from 1 or 2 Alkaline or NI-based Cells	Now
		3 or 4 LEDs/Parallel	Charge Pump	NCP5064A/B : Consistence 90% efficiency, 3 or 4 outputs (25 mA each); 0.5% current matching, TQFN16 (3 x 3 x 0.8 mm)	NCP5604A: Drives 4 LEDs NCP5604B: Drives 3 LEDs	Now
Flash (Torch)	Low Current – Up to 50 mA for 1 Cell / 100 mA for 2 Cell	Single LED	Inductive	NCP1400ASN50: Fixed frequency PWM micropower boost converter, Thin SOT23–5 (3 x 3 mm)	Can Operate from 1 or 2 Alkaline or NI-based Cells	Now
	Medium Current / Multi-die LED, 100 mA – 350 mA	Single or (Multiple in Parallel)	Charge Pump	NCP5603 : 200 mA cont./350 mA pulsed, voltage regulated output, 4.5 V or 5 V, 75% eff., DFN (3 x 3 mm)	High-Current Single Output Charge Pump	Now
	Medium Current Up to 50 mA for 2 Cells and 100 mA for 3 Cells	2 – 6 LEDs/Series	Inductive	NCP1406: Up to 90% efficiency, PFM (up to 1 MHz) 25 V/0.5 W output, Thin SOT23–5 (3 x 3 mm)	Simple, Low Cost	Now
	High Current LED, Up to 600 mA	Single or (Multiple in Parallel)	Inductive	NCP1421: PFM Boost (up to 1.2 MHz), Sync-rect, Output up to 5 V, 600 mA cont. 94% eff., true-cutoff, 50 nA shutdown current, Micro8 (3 x 4.9 mm)	Synchronous Rectification	Now
	High Current LED, Up to 800 mA	Single or (Multiple in Parallel)	Inductive	NCP1422: PFM Boost (up to 1.2 MHz), Sync-rect, Output up to 5 V, 800 mA cont. 94% eff., true-cutoff, 50 nA shutdown current, DFN10 (3 x 3 mm)	Synchronous Rectification	Now
	High Current LED, Up to 1 A	2 – 5 LEDs/Series	Inductive	NCP5050 : 23 V/4.5 W output, PWM, 1.7 MHz, DFN–10	Integrated Switch for 2 Adjustable Output Current Levels	4Q06
Single Driver for Backlight & Flash	LED (10 mA – 25 mA), Flash LED (100 mA – 300 mA)	4 LED + Flash LED	Charge Pump	NCP5608 : Consistent 90% efficiency, 8 outputs (4 @ 25 mA each + 4 @ 100 mA each); 0.5% current matching, TQFN24 (4 x 4 mm)	One Chip Lighting Solution	Now
OLDED Driver Supply	–	–	Inductive	NCP1406: Up to 90% efficiency, PFM (up to 1 MHz), 25 V/0.5 W output, Thin SOT23–5 (3 x 3 mm)	Can Operate from 1 or 2 Alkaline or NI-based Cells	Now

***BOLD** denotes a new device.



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MOSFET/IGBT Drivers

Part No.	Configuration	Peak Output Current (A)	Output Resistance (R _H /R _L) (Max Ω @ 25°C)	Max Supply Voltage (V)	Input/Output Delay (t _{D1} , t _{D2})* (nsec)	Package
MC33153	Single, Inverting Protection Circuits for IGBTs	1.0 A (source) 2.0 A (sink)	– –	20	300/300	DIP–8, SO–8
MC33151	Dual, Inverting Extended Operating Temp.	1.5	–	20	100/100	DIP–8, SO–8
MC34151	Dual, Inverting	1.5	–	20	100/100	DIP–8, SO–8
MC33152	Dual, Non–Inverting Extended Operating Temp.	1.5	–	20	120/120	DIP–8, SO–8
MC34152	Dual, Non–Inverting	1.5	–	20	120/120	DIP–8, SO–8

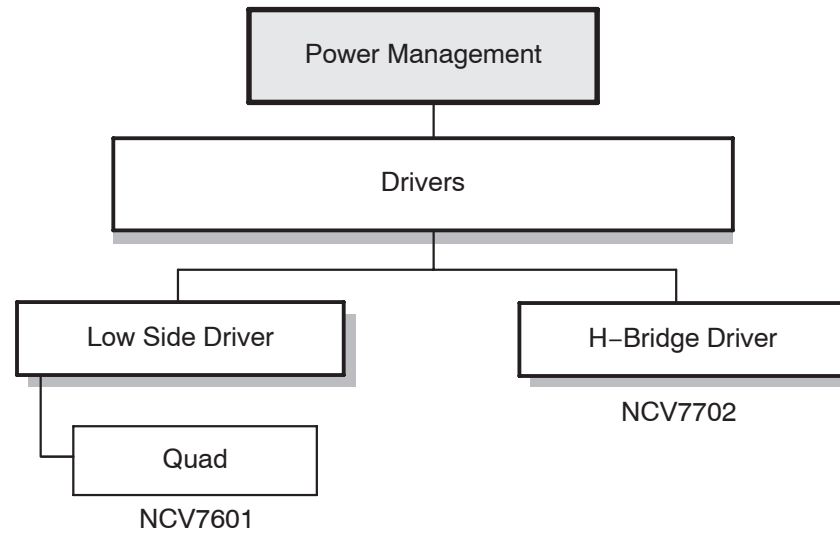
*t_{D1} = delay time from input low–to–high transition to output transition. t_{D2} = delay time from input high–to–low transition to output transition.

Alternator Voltage Regulator Darlington Drivers

Part Number	Description	Input Supply Voltage	Peak Transient	Supply Current (Enabled)	Features				Protection			Package
					Compensated Regulation Voltage	Lamp Output Pin	Sense Pin	Stator Powerup	Overtemperature	Overvoltage	Short Circuit	
CS3341	Alternator Voltage Regulator Darlington Driver	27 V	80 V	25 mA	✓	✓	✓		✓	✓	✓	SO–14
CS3351	Alternator Voltage Regulator Darlington Driver	8.0 V	80 V	25 mA	✓	✓	✓		✓	✓	✓	SO–14

Dedicated Drivers

Part Number	Description	Input Supply Voltage	Supply Current	Features								Package
				Zero Voltage Switch for Triacs	Direct AC Line Operation	Programmable Temp Reduction	Sensor Failsafe	Adj Hysteresis	Sense Pin	Proportional Temp Reg Over ±1°C	Stator Powerup	
UAA2016	Zero Voltage Switch Power Controller	–9.0 V	1.5 mA	✓	✓	✓	✓	✓	✓	✓	✓	SO–8, PIP–8



ON Semiconductor Selector Guide – Analog Integrated Circuits
Smart Drivers (High-Side, Low-Side & H-Bridge)

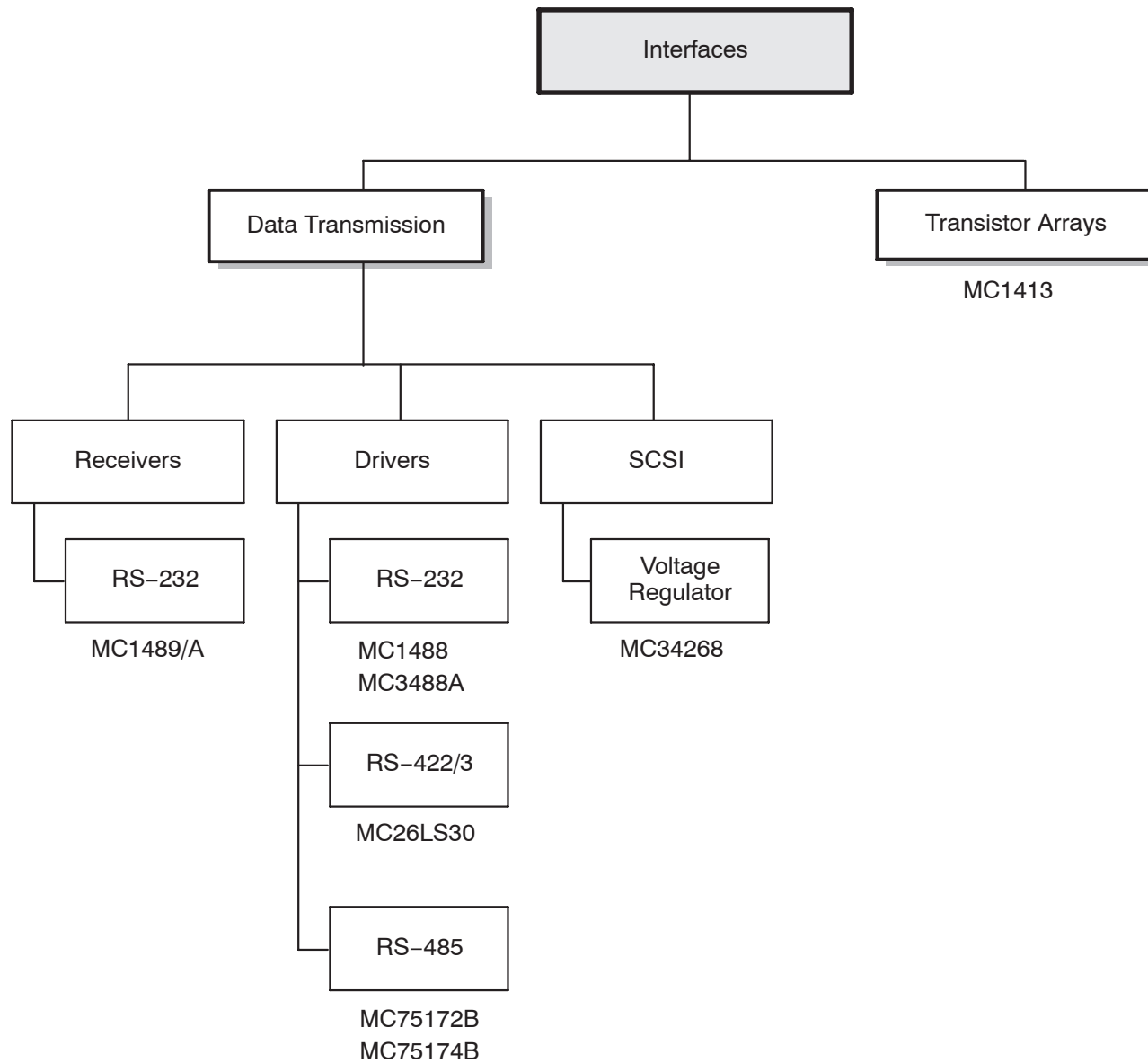
Part		Output		Features								Protection				
Number	Description	Current	$R_{DS(on)}$ @ 25°C	On-Chip Flyback Diode	Active Output Clamp	Parallel Inputs	Serial Interface	Fault Reporting	Undervoltage Lockout	Open Load Detection	Power On Reset	Current Limit	Overvoltage	Over Temperature	Low Duty Cycle Over Current Mode	Peak Transient
NCV7702B	Configurable Dual H-Bridge Driver	750 mA		√		√		√				√	√	√	√	30 V

LS Quad Driver

Part Number	Description	Input Supply Voltage	Drivers: Sustaining	Saturation Voltage	Output Clamping Diodes	Compatible Inputs	Package
NCV7601	LS Quad Driver	7.0 V	40 V	650 mV (max)	√	TTL/DTL/CMOS	DIP-16

LS PRE-DRIVER

Part Number	Description	Number of Channels	Output Current (mA)	Compatibility	Parallel Inputs	Serial Inputs	PowerOn Reset	Current Limit	Short to Ground	Open Load	Shorted to Load
NCV7513	Hex Low-Side Pre-Driver	6	1.9 – 5.25	3.3 V/5 V	√	√	√	√	√	√	√



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Data Transmission

Line Receivers – EIA Standard

S = Single Ended D = Differential	Type of Output	t _{prop} Delay Time Max (ns)	Party Line Operation	Strobe or Enable	Power Supplies (V)	Device	Suffix/Package	Receivers Per Package	Companion Drivers	Comments
S	R (Note 2)	85	–	–	+5.0	MC1489 MC1489A	DIP–16, SO–16	4	MC1488 MC14C88B	EIA–232–D

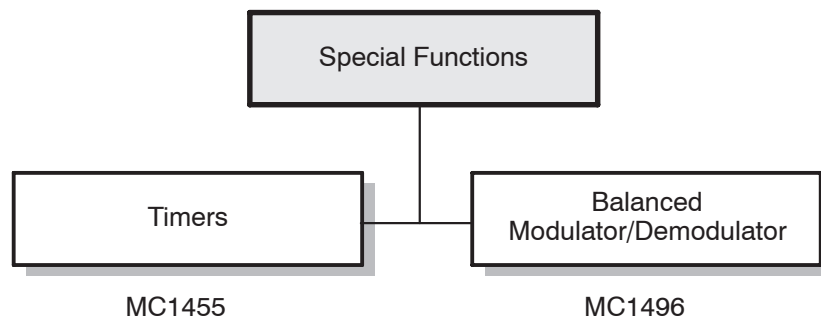
2. R = Resistor Pull–up, TP = Totem–pole output.

Line Drivers – EIA Standard

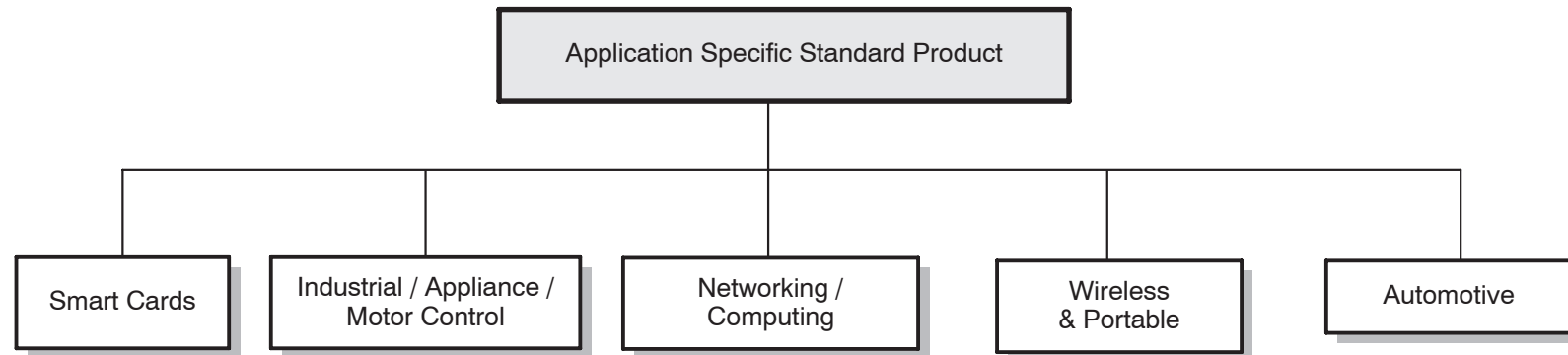
Output Current Capability (mA)	t _{prop} Delay Time Max (ns)	S = Single Ended D = Differential	Party Line Operation	Strobe or Enable	Power Supplies (V)	Device	Suffix/Package	Receivers Per Package	Companion Drivers	Comments
85	35	D	√	√	+5.0	MC75174B MC75172B	SO–20L	4	–	EIA–485
10	350	S	–	√	±9.0 to ±12	MC1488	DIP–8, SO–8	4	MC1489 MC1489A	EIA–232–D
60	300	S/D	–	EIA–422 √ EIA–423 –	±5.0	MC26LS30	SO–16	4 (423) 2 (422)	–	EIA–422 or EIA–423 Switchable
18	–	D	–	–	±10.8 to ±13.2	MC3488A	SO–8	1 (423) 1 (232)	–	Dual EIA–423 EIA–232D

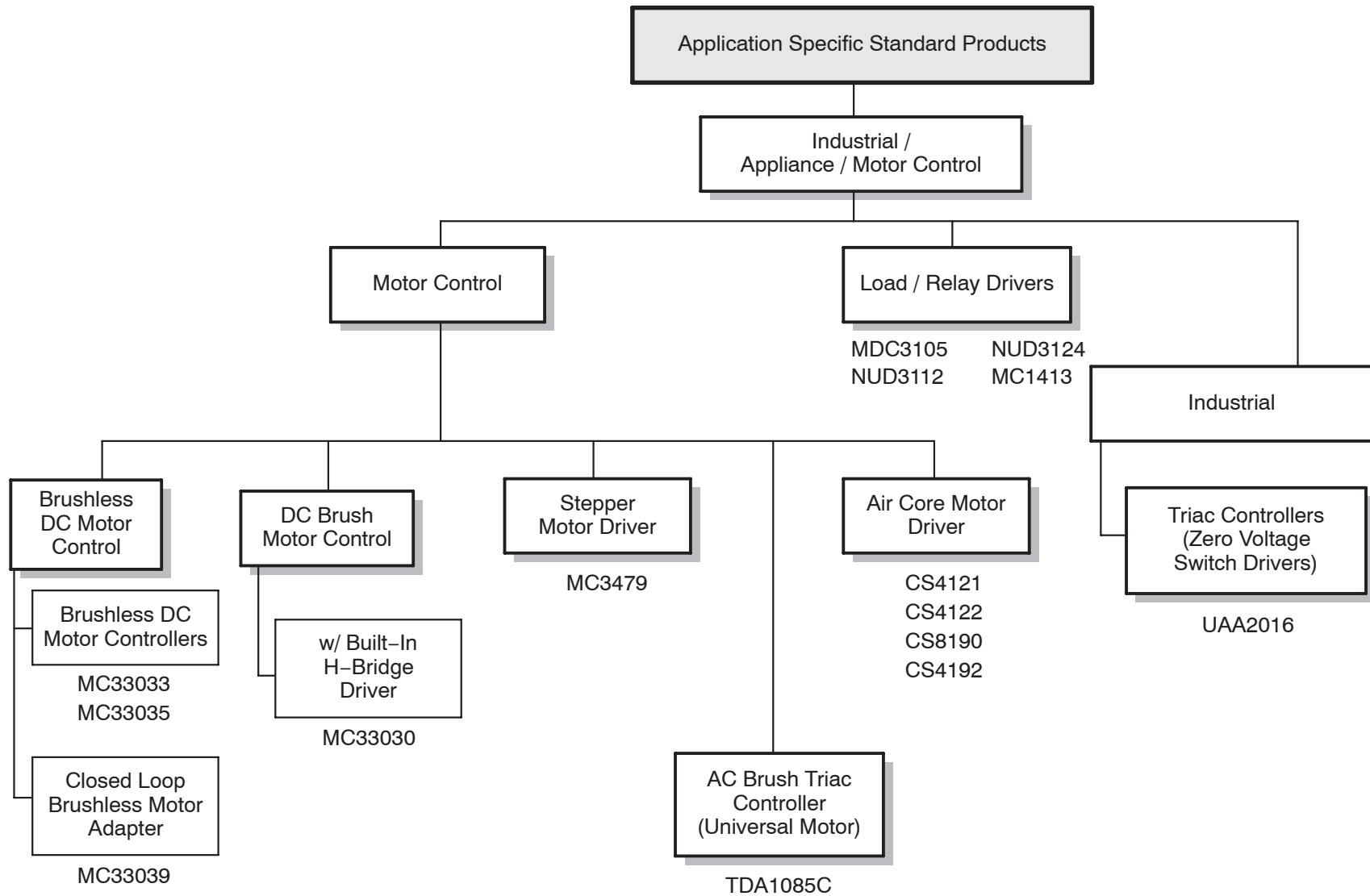
Peripheral Drivers

Output Current Capability (mA)	Input Capability	Propagation Delay Time Max (μs)	Output Clamp Diode	Off State Voltage Max (V)	Device	Drivers Per Package	Suffix/Package	Logic Function
500	TTL, 5.0 V CMOS	1.0	√	50	MC1413B	7	DIP–16, SO–16	Invert

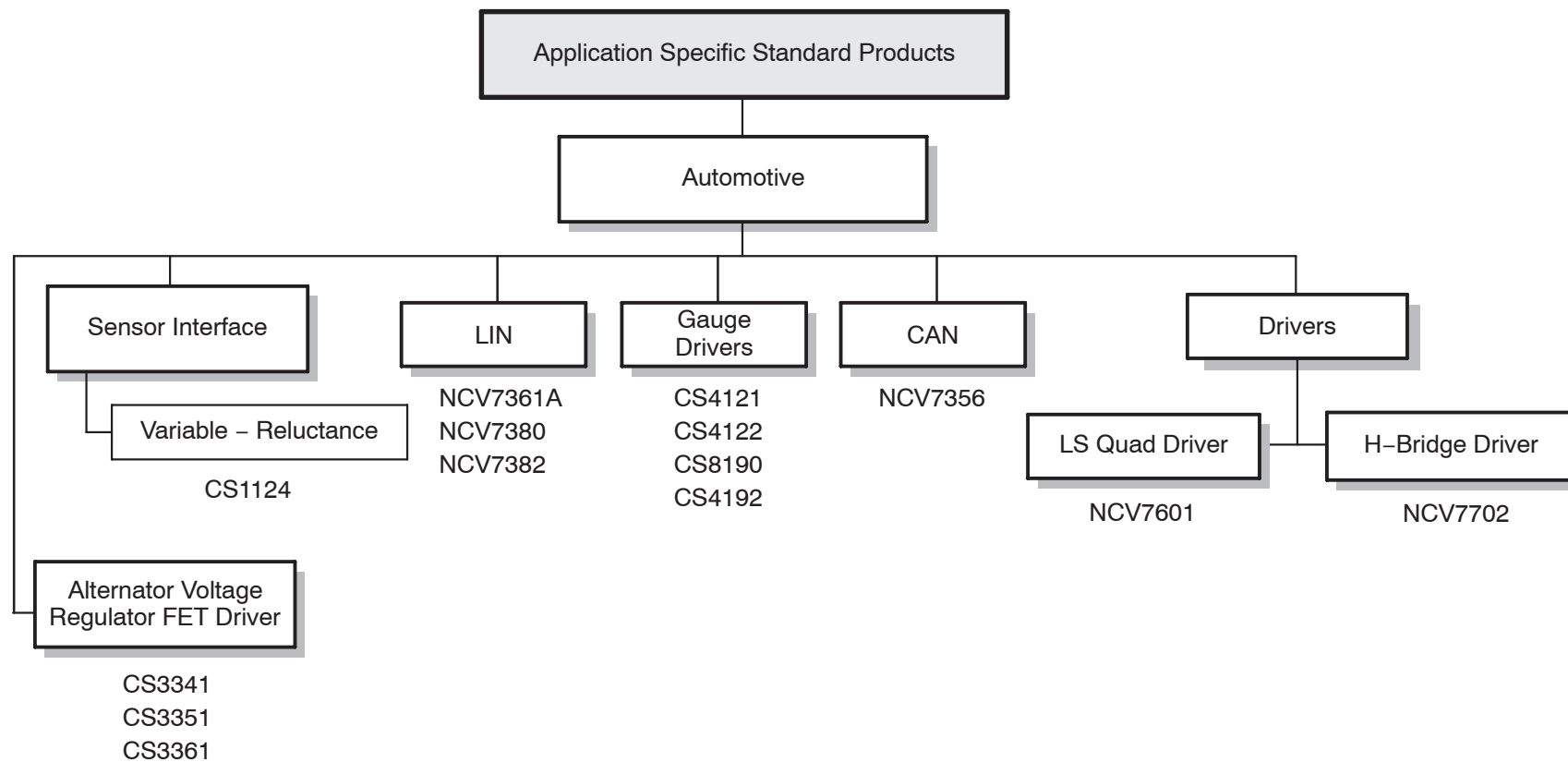


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Smart Drivers (High-Side, Low-Side & H-Bridge)

Part		Output		Features								Protection				
Number	Description	Current	R _{DS(on)} @ 25°C	On-Chip Flyback Diode	Active Output Clamp	Parallel Inputs	Serial Interface	Fault Reporting	Undervoltage Lockout	Open Load Detection	Power On Reset	Current Limit	Overvoltage	Over Temperature	Low Duty Cycle Over Current Mode	Peak Transient
NCV7702	Configurable Dual H-Bridge Driver	750 mA		✓		✓		✓				✓	✓	✓	✓	30 V

LIN Transceivers

Part Number	Operating Range		Supply Current (Recessive)		Supply Current (Dominant)		Supply Current (Sleep Mode)	BUS Short Ckt Current	LIN Compatibility
	Min	Max	I _S	I _{CC}	I _S	I _{CC}			
NCV7380	7.0	18 V	10 µA	14 µA	1.0 mA	0.8 mA	–	120 mA	LIN 1.3/2.0
NCV7382	7.0	18 V	25 µA	50 µA	0.9 mA	0.6 mA	6.5 µA	120 mA	LIN 1.3/2.0
NCV7361A	5.25	18 V	–	110 µA (max)	–	–	35 µA	40 mA	LIN 1.3/2.0 & SAE J2602

CAN Transceivers

Part Number	Description	Operating Range		Supply Current (Recessive)		Supply Current (Dominant)		Supply Current (Sleep Mode)
		Min	Max	Normal Mode	High Speed Mode	Normal Mode	High Speed Mode	
NCV7356	Single Wire Can Transceiver	5.0	27 V	5.0 mA	8.0 mA (max)	30 mA	70 mA	30 µA

ON Semiconductor Selector Guide – Analog Integrated Circuits

DC Brush Motor Control

				Features					Protection			
Part Number	Description	Input Supply Voltage	Power H-Switch	On-Chip Op Amp	Window Comparator	Self Centering Reference Input	Drive & Brake Logic w/Direction Memory	Temp Compensated Regulation Voltage	Programmable Overcurrent Detector	Programmable Shutdown Delay	Overvoltage	Package
MC33030	DC Servo Motor Controller/Driver	36 V	1.0 A	√	√	√	√	√	√	√	√	SO-14

LS Quad Driver

Part Number	Description	Input Supply Voltage	Drivers: Sustaining	Saturation Voltage	Output Clamping Diodes	Compatible Inputs	Package
NCV7601	LS Quad Driver	7.0 V	40 V	650 mV (max)	√	TTL/DTL/CMOS	DIP-16

Closed Loop Brushless Motor Adapter

						Features					
Part Number	Description	Input Supply Voltage	Supply Current	Constant Speed Operation	Internal Shunt Regulator	Sensor Electrical Phasing	TTL Compatible Inputs w/Hysteresis	Programmable Monostable	Digital Edge Detectors	Inverter Output	Package
MC33039	Designed Primarily for use w/MC33035 Brushless Motor	5.5 V	5.0 mA	Down to 100 RPM	8.25 V	60°/300° and 120°/240°	√	√	√	√	SO-8, DIP-8

Alternator Voltage Regulator FET Drivers

Part Number	Description				Features				Protection			Package
		Input Supply Voltage	Peak Transient	Supply Current (Enabled)	Compensated Regulation Voltage	Lamp Output Pin	Sense Pin	Stator Powerup	Overtemperature	Overvoltage	Short Circuit	
CS3341	Alternator Voltage Regulator Darlington Driver	27 V	80 V	25 mA	✓	✓	✓		✓	✓	✓	SO-14
CS3351	Alternator Voltage Regulator Darlington Driver	8.0 V	80 V	25 mA	✓	✓	✓		✓	✓	✓	SO-14
CS3361	Alternator Voltage Regulator FET Driver	27 V	80 V	10 mA	✓	✓	✓	✓	✓	✓	✓	SO-14

Triac Controllers

Part Number	Description			Features								Package
		Input Supply Voltage	Supply Current	Zero Voltage Switch for Triacs	Direct AC Line Operation	Programmable Temp Reduction	Sensor Failsafe	Adj Hysteresis	Sense Pin	Proportional Temp Reg Over $\pm 1^{\circ}\text{C}$	Stator Powerup	
UAA2016	Zero Voltage Switch Power Controller	-9.0 V	1.5 mA	✓	✓	✓	✓	✓	✓	✓	✓	SO-8, PIP-8

Stepper Motor Driver

Part Number	Description			Input Hysteresis	Output Driver	Features					Package
		Input Supply Voltage	Drive Capability			TTL/CMOS Compatible Inputs	Back-EMF Suppression	Selectable High/Low Output Impedance	Full/Half Step Operation	Allows Reversing Rotation of Motor	
MC3479	Drives a 2-Phase Stepper Motor in the Bipolar Mode	7.2 to 16.5 V	350 mA	400 mV (min)	Open-Collector	✓	✓	✓	✓	✓	PDIP-16

ON Semiconductor Selector Guide – Analog Integrated Circuits

Sensor Interface

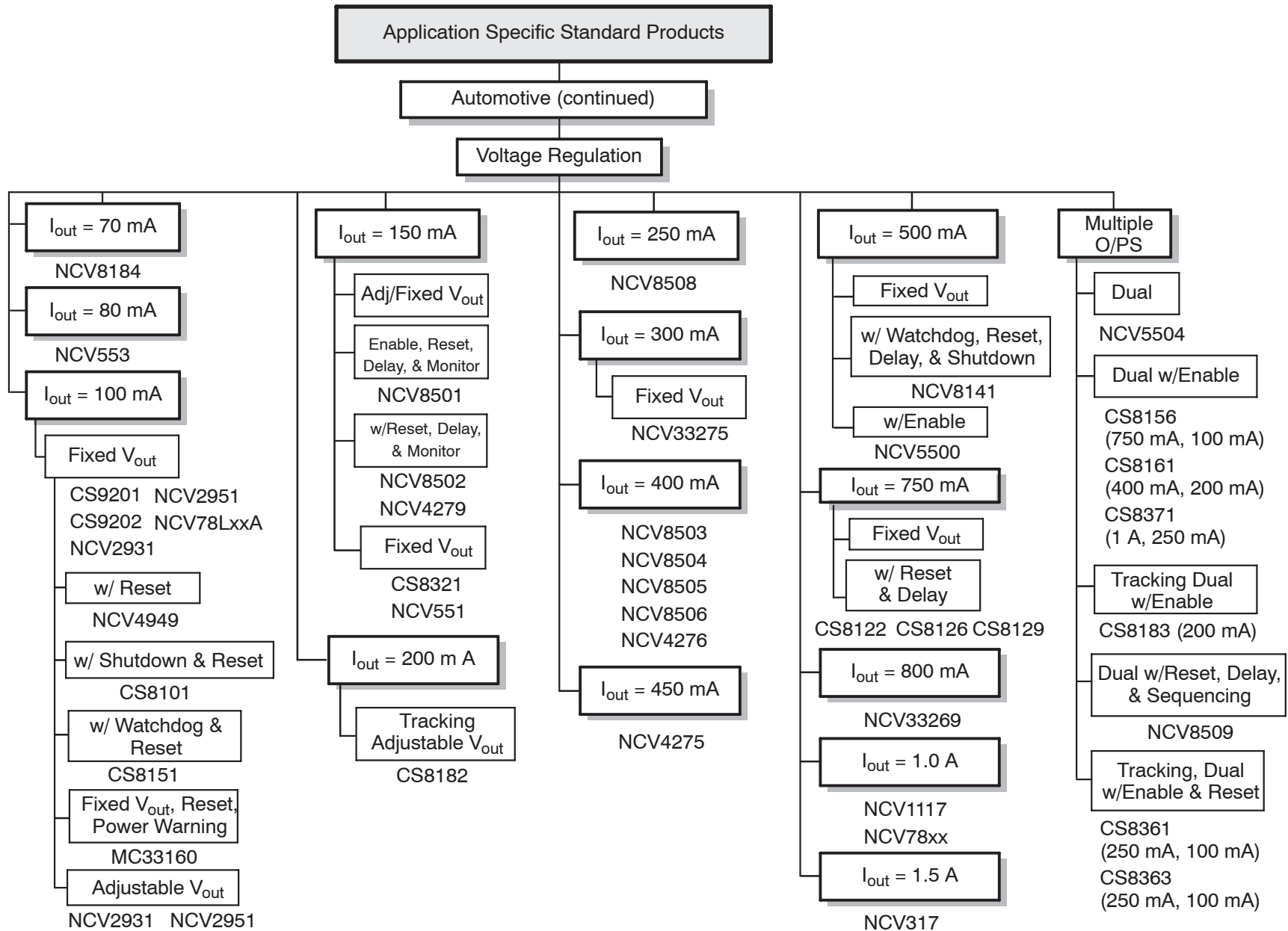
Part		Features					
Number	Description	Channels	Hysteresis	Programmable Trip Level	Trimming Method	Active Input Clamps	V _{CC} Max
CS1124	Variable-Reluctance Sensor Interface IC	2	±160 mV	√	N/A	√	7.0 V

Brushless DC Motor Controllers

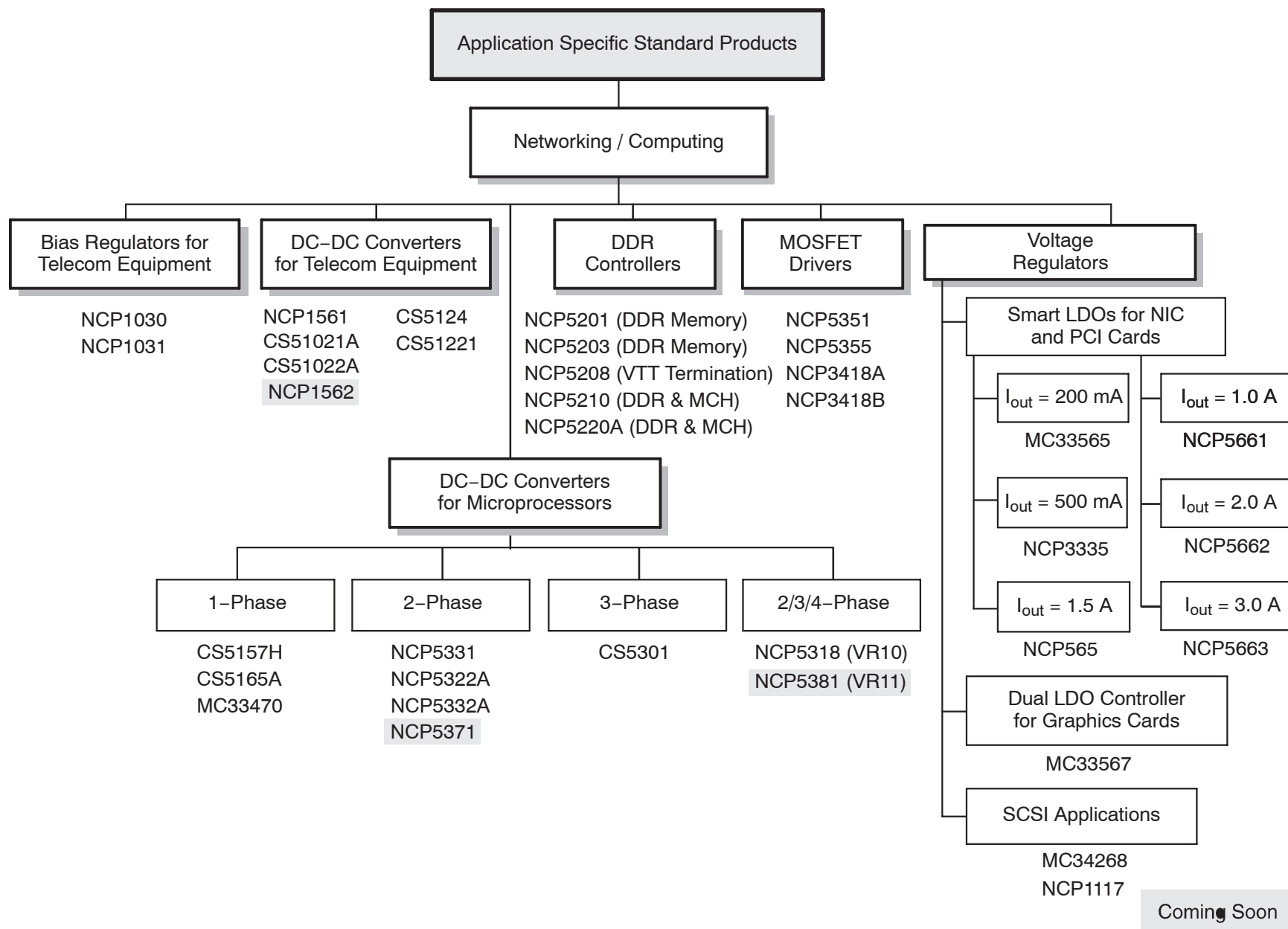
Device	Operating Voltage Range (V)		Undervoltage Lockout	Internal Thermal Shutdown	Fwd/Rev Control	Sensor Electrical Phasing	Output Enable	Output Drivers		6.25 V Reference Output	Current Sense Comparator Input(s)	Error Amplifier	FAULT Output	Separate Drive V _C	Brake Input	Package
	V _{CC}	V _C						Totem Pole (Bottom)	Open Collector (Top)							
MC33033	10 – 30	–	√	√	√	60°/300°	√	√	√	√	Noninv. Only	√	–	–	–	DIP-20, SO-20L
MC33035	10 – 40	10 – 30	√	√	√	and 120°/240°	√	√	√	√	Noninv. and Inv.	√	√	√	√	DIP-24, SO-24L

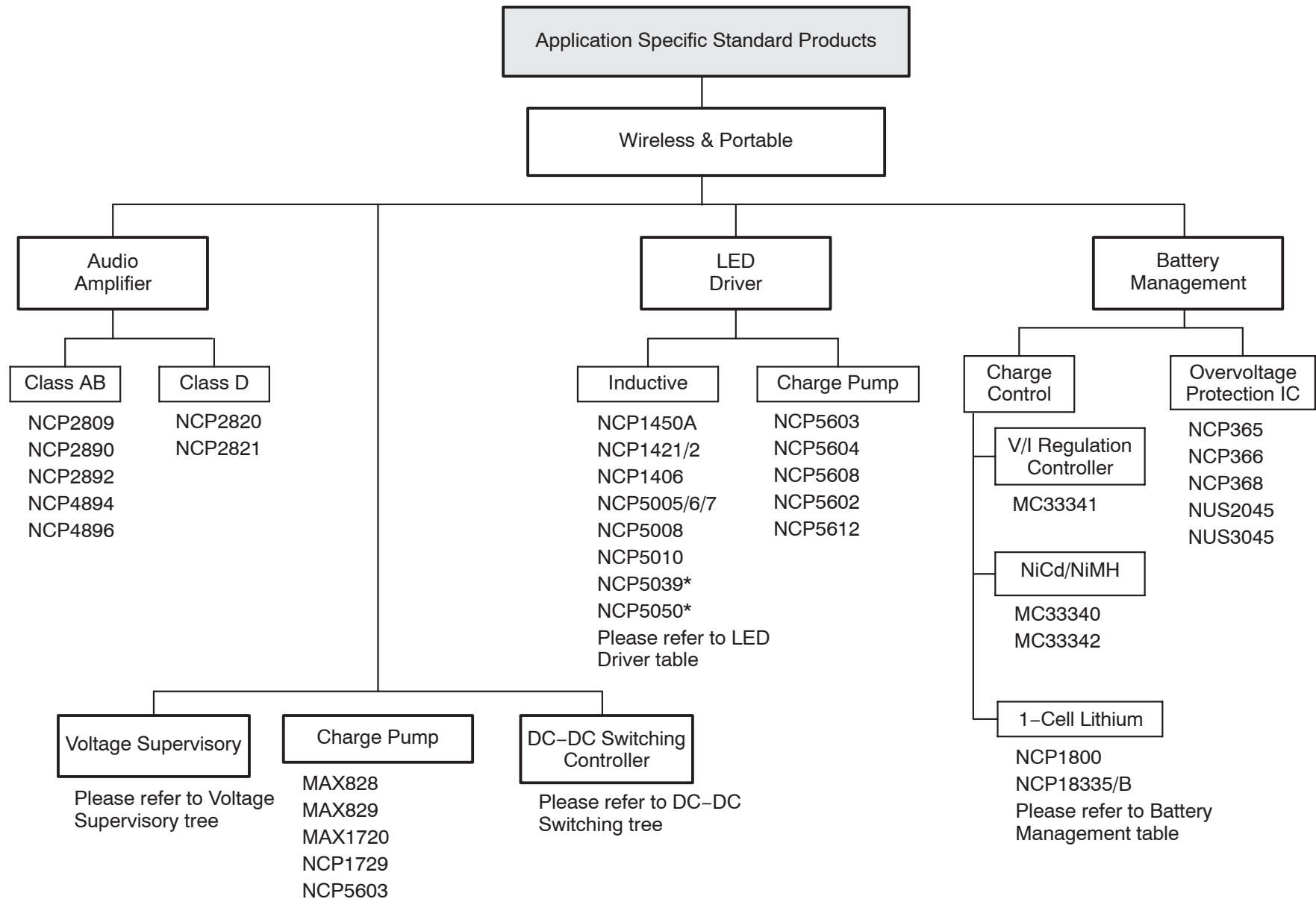
Air Core Motor Drivers/Gauge Drivers

Part Number	Gauges Driven		Input			Output		Features			Protection			
	Major	Minor	Freq.	PWM	SPI	Current	Method	Return to Zero	UVLO	Regulator Output	Current Limit	Over voltage	Over Temp.	Peak Transient
CS4121	1		√			33 mA	Differential			√		√		60 V
CS4122	1	2	√		√	80 mA	Differential				√	√	√	18 V
CS8190	1		√			33 mA	Differential	√	√			√		60 V
CS4192	1		√		√	70 mA	Differential				√	√	√	16 V



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*Coming Soon.

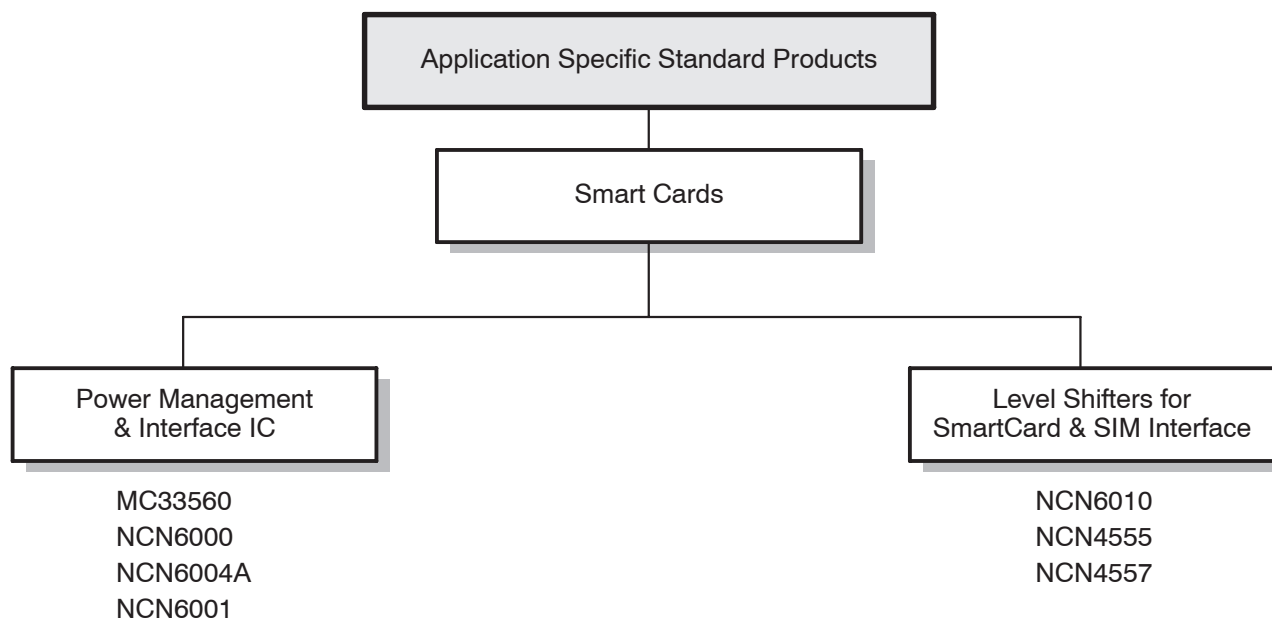
ON Semiconductor Selector Guide – Analog Integrated Circuits

White LED Drivers

Device	Topology	Frequency	Input Voltage	Output Voltage	Max Current	Typ Efficiency	Package	Features	# of LEDs in Series	# of LEDs in Parallel
NCP5007	PFM	1.0 MHz	2.7–5.0 V	Up to 22 V	60 mA	85%	SOT23–5	High voltage output for serial LED connection.	2–5	15
NCP5006	PFM	1.0 MHz	2.7–5.0 V	Up to 22 V	60 mA	85%	SOT23–5	Same function as NCP5007, same pinout as LT1937/LM2703/MP1523.	2–5	15
NCP5008	PFM	300 kHz	2.7–6.0 V	Up to 16 V	75 mA	78%	Micro8	Serial data input pin allows LED brightness control by μ P. Does not need a sense resistor.	2–4	10
NCP1406	PFM	1.0 MHz	1.2–5.0 V	Up to 25 V	100 mA	85%	SOT23–5	High voltage output for serial LED connection.	1–6	15
NCP1403	PFM	300 kHz	1.2–5.5 V	Up to 15 V	50 mA	82%	SOT23–5	For 2-cell Alkaline/NiMH battery applications.	1–4	15
NCP5603	Charge Pump	262 or 650 kHz	2.85–5.5 V	4.5 or 5.0 V	350 mA Pulsed 200 mA DC	90%	DFN–10		1	10

Low Voltage Audio Amplifier Selector Guide

Audio Output/ Application	Class	Topology/ Features	Output Power	PSRR @ 217 Hz	Efficiency	THD + N	Turn-On Time (typ)	Iq (typ)	Shutdown Current (typ)	Package	Device Solutions
Mono Speaker – Basic Telephone Operations and Polyphonic Ringtones	AB	BTL	1W+	–73 dB	63%	0.02%	285 ms	1.5 mA	10 nA	Micro8™ Microbump–9	NCP2890
	AB	BTL	1W+	–73 dB	63%	0.02%	100 ms	1.5 mA	10 nA	Micro8™ Microbump–9	NCP2892A
	AB	Differential	1W+	–80 dB	64%	0.006%	140 ms	1.9 mA	20 nA	Microbump–9 DFN–10	NCP4894
Stereo Headphones – MP3 Players, Bluetooth Headsets	AB	Virtual Ground No Output Cap	135mW/Ch	–82 dB	63%	0.003%	285 ms	1.54 mA	10 nA	Micro10	NCP2809
	AB	Differential	150mW/Ch	–80 dB	64%	0.006%	140 ms	1.9 mA	20 nA	Microbump–9 DFN10	NCP4894
Mono Speaker/Earpiece – Low Cost Integrated Solution	AB	Single-End/ Differential	1W to Speaker; 250mW to Earpiece	–70 dB	64%	SE 0.003% BTL 0.01%	140 ms	1.7 mA	20 nA	Microbump–9	NCP4896
Mono Speaker – Handsfree Speaker Phone	D	Filterless, Gain Select by Resistor	2W+	–65 dB	90%	0.05%	9 ms	2.2 mA	300 nA	Microbump–9 DFN–8	NCP2820
Stereo Speakers – Offer Stereo Sound Quality to Play Video/Music on Demand, MP3	D	Filterless, Gain Selection by Resistor	2W+ per Channel	–65 dB	90%	0.05%	9 ms	4.4 mA	600 nA	Microbump–9	2x NCP2820
Mono Speaker – Handsfree Speaker Phone	D	Filterless Integrated Gain. Selectable Gain of 6 dB or 12 dB on External Pin.	2.65W	–65 dB	90%	0.05%	9 ms	2.5 mA	500 nA	Microbump–9	NCP2821



Clock and Data Management

Clock and Data Management

In Brief . . .

Advanced clock management devices from ON Semiconductor deliver superior performance by providing the lowest skew and lowest jitter with the highest operating frequencies.

ON Semiconductor offers a complete family of Phase Lock Loop (PLL) based products for applications ranging from low cost portable MP3 players, to massive, mission critical servers. Our oscillator replacement ICs offer performance rivaling crystal oscillator solutions at a fraction of the cost, and our new Zero Delay Buffer family is one of the most complete in the industry. Lastly, ON Semiconductor has a series of EMI Suppression Clocks that utilize spread spectrum to minimize the peak electromagnetic interference emissions in consumer products.

This portfolio of products makes designing any low skew, high frequency clock tree an easy task with a large range of clock **distribution, generation** and **skew management** devices. We address the needs of today's systems whether operating at 2.5 V, 3.3 V or legacy systems at 5.0 V or –5.2 V.

ON Semiconductor's High Performance Data Management products are designed into state-of-the-art systems such as communication and networking switches, high-end servers, engineering workstations, high-density memory modules, storage networks and precision test and measurement systems.

While our ECLinPS™ families serve the market well at frequencies up to 6.0 GHz, GigaComm™ family of silicon germanium products enables safe and reliable design up to 12 GHz. GigaComm delivers the performance necessary for high frequency applications, while maintaining the manufacturability and price point required for cost-effective volume production.

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ON Semiconductor Selector Guide – Clock and Data Management Devices

Signal Translators (Specifications are at 25°C unless otherwise stated)

Device(s)	From	To	Voltage	# of Channels	Freq. (Typ) MHz	Prop. Delay (Typ) ps	Tr & Tf (Max) ps	Package
MC100EL90	LVNECL/NECL	PECL	3.3/5	3	650	500	500	SO-20
MC100EL91	LVPECL/PECL	NECL	3.3/5	3	700	670	400	SO-20
MC100ELT20	TTL	PECL	5	1	100 MHz (min)*	1200	1500	SO-8/TSSOP-8
MC100ELT21	PECL	TTL	5	1	TBD	5500	750 (10%–90%)	SO-8/TSSOP-8
MC100ELT22	TTL	PECL	5	2	100 MHz (min)*	1200	1600	SO-8/TSSOP-8
MC100ELT23	PECL	TTL	5	2	100	3500	1600 (10%–90%)	SO-8/TSSOP-8
MC100ELT24	TTL	NECL	5	1	400	950	1250	SO-8/TSSOP-8
MC100ELT25	NECL	TTL	5/–5.2	1	100	3300*	2300 (10%–90%)	SO-8/TSSOP-8
MC100ELT28	PECL to TTL & TTL to PECL (Dual)	PECL to TTL & TTL to PECL (Dual)	5	2	100	3500 PECL-to-TTL/ 1200 TTL-to-PECL	1500	SO-8/TSSOP-8
MC100EP90	LVNECL/NECL	LVPECL/PECL	0.66	3	>3000	260	180	SO-20
MC100EPT20	LVTTL/LVCMOS	LVPECL	3.3	1	>1000	370	180	SO-8/TSSOP-8
MC100EPT21	LVPECL	LVTTL	3.3	1	350	1400	600/900 (0.8–2.0 V)	SO-8/TSSOP-8
MC100EPT22	LVTTL/LVCMOS	LVPECL	3.3	2	1100	420	220	SO-8/TSSOP-8
MC100EPT23	LVPECL	LVTTL	3.3	2	350	1500	600/900 (0.8–2.0 V)	SO-8/TSSOP-8
MC100EPT24	LVTTL/LVCMOS	LVPECL	3.3	1	>1000	530	180	SO-8/TSSOP-8
MC100EPT25	LVNECL/NECL	LVTTL	3.3/–3.3 to –5.2	1	275	1100	1100/1400 (0.8–2.0 V)	SO-8/TSSOP-8
MC100EPT26	LVPECL	LVTTL	3.3	1	275	1500	900	SO-8/TSSOP-8
MC100EPT622	LVTTL/LVCMOS	PECL (10-Bit)	3.3	1	1500	450	250	LQFP-32
MC100LVEL90	LVNECL/NECL	LVPECL	0.66	3	650	500	500	SO-20
MC100LVEL91	LVPECL/PECL	LVNECL	3.3/5	3	600	620	580	
MC100LVEL92	PECL	LVPECL	3.3/5	3	600	610	580	SO-20
MC100LVELT22	LVTTL/LVCMOS	LVPECL	3.3	2	100 MHz (min)*	350	500	SO-8/TSSOP-8
MC100LVELT23	LVPECL	LVTTL	3.3	2	>180	1700	600/900 (0.8–2.0 V)	SO-8/TSSOP-8
MC10ELT20	TTL	PECL	5	1	100 MHz (min)*	1200	1500	SO-8/TSSOP-8
MC10ELT21	PECL	TTL	5	1	TBD	5500	750 (10%–90%)	SO-8/TSSOP-8
MC100LVELT20	LVTTL/LVCMOS	LVPECL	3.3	1	800	390	225	SO-8

Signal Translators (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	From	To	Voltage	# of Channels	Freq. (Typ) MHz	Prop. Delay (Typ) ps	Tr & Tf (Max) ps	Package
MC10ELT22	TTL	PECL	5	2	100MHz (min)*	1200	1600	SO-8/TSSOP-8
MC10ELT24	TTL	NECL	5	1	400	950	1250	SO-8/TSSOP-8
MC10ELT25	NECL	TTL	5/-5.2	1	100	3300*	2300 (10%-90%)	SO-8/TSSOP-8
MC10ELT28	PECL to TTL & TTL to PECL (Dual)	PECL to TTL & TTL to PECL (Dual)	5	2	100	3500 PECL-to-TTL/ 1200 TTL-to-PECL	1500	SO-8/TSSOP-8
MC10EP90	LVNECL/NECL	LVPECL/PECL	0.66	3	>3000	260	180	SO-20
MC10EPT20	LVTTTL/LVCMOS	LVPECL	3.3	1	>1000	370	180	SO-8/TSSOP-8
NB100ELT23L	LVPECL	LVTTTL	3.3	2	275	2.1	1300	SO-8/TSSOP-8
NB100LVEP91	LVPECL/LVTTTL/ LVCMOS/HSTL/ CML/LVDS	LVNECL/NECL	2.5/3.3	3	2500	430	85 (typ)	SO-20, QFN-24
*NB4N5275	LVPECL/LVTTTL/ LVCMOS/HSTL/ CML/LVDS	LVDS	3.3	2	1250	500	300	QFN-16
*NB4N8555	LVPECL/LVTTTL/ LVCMOS/HSTL/ CML/LVDS	LVDS	3.3	2	1000	490	180	Micro10

*Duplicate in Receiver/Driver category.

Crosspoint Switches

Device(s)	From	To	Voltage	# of Inputs	# of Outputs	Freq. (Typ) MHz	Prop. Delay (Typ) ps	Tr & Tf (Max) ps	Package
NB4L858M	LVPECL/CML	CML	2.5/3.3	2+2	2+2	3000	350	80	LQFP-32
NB4N840M	LVPECL/CML	CML	3.3	2+2	2+2	2700	225	80	QFN-32
NBSG72A	Any Level	LVPECL (w/o LS)	2.5/3.3	2	2	7000	200	55	QFN-16

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Clock Fan-out (Specifications are at 25°C unless otherwise stated)

Device(s)	Input Clock	Output Clock	Voltage	# of Input Channels	# of Outputs per Channel	Frequency (Typ) GHz	Output-to-Output Skew (Max) ps	Cycle-to-Cycle Jitter (Typ/Max) ps	Tr & Tf (Max) ps	Package
MC100E111	ECL/PECL	ECL/PECL	5	1	9	>1.5	50	0.2	600	PLCC-28
MC100E210	ECL/PECL	ECL/PECL	5	2	4/5	0.7	75	0.2	600	PLCC-28
MC100E211	ECL/PECL	ECL/PECL	5	1	6	>1.5	75	0.2	400	PLCC-28
MC100E310	ECL/PECL	ECL/PECL	5	1	8	1	50	0.2	600	PLCC-28
MC100EL11	ECL/PECL	ECL/PECL	5	1	2	2	5	0.2	350	SO-8, TSSOP-8
MC100EL13	ECL/PECL	ECL/PECL	5	2	3	1	50	0.2	500	SO-20
MC100EL14	ECL/PECL	ECL/PECL	5	1	5	1	50	0.2	500	SO-8, TSSOP-8
MC100EL15	ECL/PECL	ECL/PECL	5	1	4	1	50	0.2	575	SO-16
MC100EP11	ECL/PECL	ECL/PECL	3.3/5	1	2	>3	20	0.2	180	SO-8, TSSOP-8
MC100EP14	ECL/PECL/HSTL	ECL/PECL	3.3/5	1	5	>2	45	0.2	270	TSSOP-20
MC100EP210S	LVDS/PECL	LVDS	3.3	2	5	>1	20	0.2	225	LQFP-32
MC100EP809	ECL/PECL/HSTL	HSTL	3.3	1	9	>0.75	15	1.4	600	LQFP-32
MC100LVE111	ECL/PECL	ECL/PECL	3.3	1	9	>1.5	20	0.2	600	PLCC-28
MC100LVE210	ECL/PECL	ECL/PECL	3.3	2	4/5	0.7	75	0.2	600	PLCC-28
MC100LVE310	ECL/PECL	ECL/PECL	3.3	1	8	1.5	50	0.2	600	PLCC-28
MC100LVEL11	ECL/PECL	ECL/PECL	3.3	1	2	>3	20	0.2	180	SO-8, TSSOP-8
MC100LVEL13	ECL/PECL	ECL/PECL	3.3	2	3	1	50	0.2	500	SO-20
MC100LVEL14	ECL/PECL	ECL/PECL	3.3	1	5	>1	50	0.2	500	SOIC-20
MC100LVEP11	ECL/PECL	ECL/PECL	2.5/3.3	1	2	>3	20	0.2	180	SO-8, TSSOP-8
MC100LVEP111	ECL/PECL	ECL/PECL	2.5/3.3	1	10	>3	25	0.2	150	LQFP-32, QFN-32
MC100LVEP14	ECL/PECL/HSTL	ECL/PECL	2.5/3.3	1	5	>2	25	0.2	250	TSSOP-20
MC100LVEP210	ECL/PECL/HSTL	ECL/PECL	2.5/3.3	2	5	>3	20	0.2	270	LQFP-32
MC10E111	ECL/PECL	ECL/PECL	5	1	9	>1.5	50	0.2	600	PLCC-28
MC10E211	ECL/PECL	ECL/PECL	5	1	6	>1.5	75	0.2	400	PLCC-28

Clock Fan-out (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Input Clock	Output Clock	Voltage	# of Input Channels	# of Outputs per Channel	Frequency (Typ) GHz	Output-to-Output Skew (Max) ps	Cycle-to-Cycle Jitter (Typ/Max) ps	Tr & Tf (Max) ps	Package
MC10E411	ECL/PECL	ECL/PECL	5	1	9	1	50	0.2	600	PLCC-28
MC10EL11	ECL/PECL	ECL/PECL	5	1	2	2	5	0.2	350	SO-8, TSSOP-8
MC10EL15	ECL/PECL	ECL/PECL	5	1	4	1	50	0.2	575	SO-16
MC10EP11	ECL/PECL	ECL/PECL	3.3/5	1	2	>3	20	0.2	180	SO-8, TSSOP-8
MC10LVEP11	ECL/PECL	ECL/PECL	2.5/3.3	1	2	>3	20	0.2	180	SO-8, TSSOP-8
NB100EP223	ECL/PECL/HSTL	HSTL	3.3	1	22	>0.5	25	0.2	700	LQFP-64
NB100LVEP221	ECL/PECL/HSTL	ECL/PECL	2.5/3.3	1	20	>1	20	0.2	200 (typ)	LQFP-52
NB100LVEP224	ECL/PECL	ECL/PECL	2.5/3.3	1	24	>1	15	0.2	160 (min)	LQFP-64
NBSG11	ECL/TTL/CMOS/CML/LVDS	RSPECL/RSECL	2.5/3.3	1	2	>12	15	0.5	30	FCBGA-16
NBSG111	ECL/PECL/TTL/CMOS/CML/LVDS	RSPECL/RSECL	2.5/3.3	1	10	>6	15 (typ)	0.2	40 (typ)	FCBGA-14
NBSG14	ECL/PECL/TTL/CMOS/CML/LVDS	RSPECL/RSECL	2.5/3.3	1	5	12	15	0.5	55	FCBGA-16
NB6L11	LVPECL, LVDS, CML, LVCMOS or LVTTL	LVECL/LVPECL	2.5, 3.3	1	2	>6	15	0.2	120	SO-8, TSSOP-8
NB7L11M	ECL/TTL/CMOS/CML/LVDS	CML	2.5/3.3	1	2	>8	15	0.2	60	QFN-16
NB7L14M	ECL/TTL/CMOS/CML/LVDS	CML	2.5/3.3	1	5	>8	15	0.2	60	QFN-16
NB7L111M	ECL/TTL/CMOS/CML/LVDS	CML	2.5/3.3	1	10	>5.5	20	0.2	75	QFN-52
NB4N11S	ECL/TTL/CMOS/CML/LVDS	LVDS	3.3	1	2	2.0	25	0.5	170	QFN-16
NB4N11M	ECL/TTL/CMOS/CML/LVDS	CML	3.3	1	2	2.5	25	1	300	TSSOP-8

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Clock Dividers (Specifications are at 25°C unless otherwise stated)

Device(s)	Output	Frequency Division	# of Channels	Outputs per Bank	Voltage	Frequency (Typ) GHz	Propagation Delay (Typ) ps	Cycle-to-Cycle Jitter (Typ/Max) ps	Tr & Tf (Max) ps	Package
MC100EL32	ECL/PECL	Div2	1	1	5	>3	510	0.2 / 1.0	350	SO-8, TSSOP-8
MC100EL33	ECL/PECL	Div4	1	1	5	>4	650	1.0 (typ)	350	SO-8, TSSOP-8
MC100EL34	ECL/PECL	Div2, Div4, Div8	1	1+1+1	5	1.1	1000	<1 (typ)	525	SO-16
MC100EL38	ECL/PECL	Div2, Div4/6	1	2+2	5	1	900	0.2 / 1.0	550	SO-20
MC100EL39	ECL/PECL	Div2/4, Div4/6	1	2+2	5	1	900	0.2 / 1.0	550	SO-20
MC100EP139	ECL/PECL	Div2/4, Div4/5/6	1	2+2	3.3/5	>1	750	0.2 / 1.0	275	SO-20, TSSOP-20
MC100EP32	ECL/PECL	Div2	1	1	3.3/5	>4	350	0.2 / 1.0	170	SO-8, TSSOP-8, DFN-8
MC100EP33	ECL/PECL	Div4	1	1	3.3/5	>4	320	0.2 / 1.0	180	SO-8, TSSOP-8
MC100LVE222	ECL/PECL	1:15 Diff. Div1, Div2	2	15	3.3	1.5	1180	0.2 / 1.0	600	TQFP-52
MC100LVEL32	ECL/PECL	Div2	1	1	3.3	>2.6	510	0.2 / 1.0	320	SO-8, TSSOP-8
MC100LVEL33	ECL/PECL	Div4	1	1	3.3	>4	630	0.2 / 1.0	320	SO-8, TSSOP-8
MC100LVEL34	ECL/PECL	Div2, Div4, Div8	1	1+1+1	3.3	1.5	700	<1 (typ)	250	SO-16, TSSOP-16
MC100LVEL37	ECL/PECL	Div1 Div2	2	2+2	3.3	1	700	0.2 / 1.0	550	SO-20
MC100LVEL38	ECL/PECL	Div2 Div4/6	1	2+2	3.3	1	900	0.2 / 1.0	550	SO-20
MC100LVEL39	ECL/PECL	Div2/4, Div4/6	1	2+2	3.3	1	900	0.2 / 1.0	550	SO-20
MC100LVEP34	ECL/PECL	Div2, Div4, Div8	1	1+1+1	3.3	2.8	700	<1 (typ)	250	SO-16
MC10EL32	ECL/PECL	Div2	1	1	5	>3	510	0.2 / 1.0	350	SO-8, TSSOP-8
MC10EL33	ECL/PECL	Div4	1	1	5	>4	650	1.0 (typ)	350	SO-8, TSSOP-8
MC10EL34	ECL/PECL	Div2, Div4, Div8	1	1+1+1	5	1.1	1000	<1 (typ)	525	SO-16
MC10EP139	ECL/PECL	Div2/4, Div4/5/6	1	2+2	3.3/5	>1	750	0.2 / 1.0	275	SO-20, TSSOP-20
MC10EP32	ECL/PECL	Div2	1	1	3.3/5	>4	350	0.2 / 1.0	170	SO-8, TSSOP-8

Clock Dividers (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Output	Frequency Division	# of Channels	Outputs per Bank	Voltage	Frequency (Typ) GHz	Propagation Delay (Typ) ps	Cycle-to-Cycle Jitter (Typ/Max) ps	Tr & Tf (Max) ps	Package
MC10EP33	ECL/PECL	Div4	1	1	3.3/5	>4	320	0.2 / 1.0	180	SO-8, TSSOP-8
NB100LVEP222	ECL/PECL	1:15 Diff. Div1, Div2	2	15	2.5/3.3	1	875	0.2 / 1.0	160 (typ)	LQFP-52
NBSG53A	RSECL	Div1, Div2	2	1	2.5/3.3	>8	210	0.5 / 1.0	60	FCBGA-16
NB6L239	PECL	1/2/4/8, 2/4/8/16	2	1	2.5, 3.3	3	470	0.2 / 1.0	120	QFN-16
NB6N239S	LVDS	1/2/4/8, 2/4/8/16	2	1	3.3	3	470	0.2 / 1.0	120	QFN-16
NB7N017M	CML	Dual 8-Bit Modulus	1	1	3.3	3.5	500	3.0	65	QFN-52
NB7L32M	CML	Div2	1	1	2.5/3.3	14	200	<0.5	30	QFN-16

Skew Management (Specifications are at 25°C unless otherwise stated)

Device(s)	Voltage	Frequency (Typ) GHz	Min Programmable Delay (Typ) ns	Max Programmable Delay (Typ) ns	Step Delay Resolution (Typ) ps	Cycle-to-Cycle Jitter (Max) ps	Tr & Tf (Max) ps	Package
MC100E195	5	>1	2.05	2.6	20	<5	325	PLCC-28
MC100E196 ¹	5	>1	2.05	2.6	20	<5	325	PLCC-28
MC100EP195	3.3/5	>2.5	2.2	12.2	10	0.2 / 1.0	300	LQFP-32
MC100EP196 ²	3.3/5	>1.8	2.2	12.2	10	0.2 / 1.0	210	LQFP32
MC10E195	5	>1	2.05	2.6	20	<5	325	PLCC-28
MC10E196 ¹	5	>1	2.05	2.6	20	<5	325	PLCC-28
MC10EP195	3.3/5	>2.5	2.2	12.2	10	0.2 / 1.0	300	LQFP-32
MC10EP196 ²	3.3/5	>1.8	2.2	12.2	10	0.2 / 1.0	210	LQFP32

SPECIAL NOTES/FEATURES:

¹ FTUNE input provides < 20 pS resolution control.² FTUNE input provides 0 to 60 pS programmable resolution control.

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Prescalers (Specifications are at 25°C unless otherwise stated)

Device(s)	Frequency Division	Voltage	Supply Current (Icc-Max) mA	Frequency (Max) GHz	Supply Current Unloaded (Typ) mA	Input Voltage Sensitivity Min/Max (mV p-p)	Package
MC12026A	Div8/9 or Div16/17	5	5.3	1.1	4	100 / 1000	SO-8
MC12080	Div10, Div20, Div40, Div80	5	5	1.1	3.7	100 / 1000	SO-8
MC12093	Div2, Div4, Div8	3.3/5	4.5	1.1	3	100 / 1000	SO-8
MC12095	Div2, Div4, Div8	3.3/5	14	2.5	3	200 / 1000	SO-8

Clock Synthesizers (Specifications are at 25°C unless otherwise stated)

Device(s)	V _{CC} (Typ) V	Min Output Freq. (MHz)	Max Output Freq. (MHz)	Max Input Freq. XTAL (MHz)	t _{jitter} (+-ps)	Min Output Rise/Fall (ps)	Temperature Rating	Package
NBC12429	3.3, 5	25	400	20	20	300	0 to 70°C	28-PLCC, 32-LQFP
NBC12430	3.3, 5	50	800	20	20	175	0 to 70°C	28-PLCC, 32-LQFP
NBC12439	3.3, 5	50	800	20	25	300	0 to 70°C	28-PLCC, 32-LQFP
NBC12429A	3.3, 5	25	400	20	20	300	-40 to 85°C	28-PLCC, 32-LQFP, QFN-32
NBC12430A	3.3, 5	50	800	20	20	175	-40 to 85°C	28-PLCC, 32-LQFP, QFN-32
NBC12439A	3.3, 5	50	800	20	25	300	-40 to 85°C	28-PLCC, 32-LQFP, QFN-32
NB4N507A	3.3, 5	50	200	27	10	50	-40 to 85°C	SOIC-16

Zero Delay Buffers (Specifications are at 25°C unless otherwise stated)

Device(s)	Outputs Per Device	V _{DD} Typ (V)	tskew (O–O) Max (ps)	F Max (MHz)	t _{Jitter} Max (ps)	Package
NB2304AC1D	4	3.3	200	133.3	100	SOIC–8
NB2304AI1D	4	3.3	200	133.3	100	SOIC–8
NB2304AC1HD	4	3.3	200	133.3	100	SOIC–8
NB2304AI1HD	4	3.3	200	133.3	100	SOIC–8
NB2304AC2D	4	3.3	200	133.3	100	SOIC–8
NB2304AI2D	4	3.3	200	133.3	100	SOIC–8
NB2305AC1D	5	3.3	250	133.3	200	SOIC–8
NB2305AI1D	5	3.3	250	133.3	200	SOIC–8
NB2305AC1DT	5	3.3	250	133.3	200	TSSOP–8
NB2305AI1DT	5	3.3	250	133.3	200	TSSOP–8
NB2305AC1HD	5	3.3	250	133.3	200	SOIC–8
NB2305AI1HD	5	3.3	250	133.3	200	SOIC–8
NB2305AC1HDT	5	3.3	250	133.3	200	TSSOP–8
NB2305AI1HDT	5	3.3	250	133.3	200	TSSOP–8
NB2308AC1D	8	3.3	200	133.3	100	SOIC–16
NB2308AI1D	8	3.3	200	133.3	100	SOIC–16
NB2308AC1DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AI1DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AC1HD	8	3.3	200	133.3	100	SOIC–16
NB2308AI1HD	8	3.3	200	133.3	100	SOIC–16
NB2308AC1HDT	8	3.3	200	133.3	100	TSSOP–16
NB2308AI1HDT	8	3.3	200	133.3	100	TSSOP–16
NB2308AC2D	8	3.3	200	133.3	100	SOIC–16
NB2308AI2D	8	3.3	200	133.3	100	SOIC–16
NB2308AC2DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AI2DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AC3D	8	3.3	200	133.3	100	SOIC–16

Zero Delay Buffers (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Outputs Per Device	V _{DD} Typ (V)	tskew (O–O) Max (ps)	F Max (MHz)	t _{Jitter} Max (ps)	Package
NB2308AI3D	8	3.3	200	133.3	100	SOIC–16
NB2308AC3DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AI3DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AC4D	8	3.3	200	133.3	100	SOIC–16
NB2308AI4D	8	3.3	200	133.3	100	SOIC–16
NB2308AC4DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AI4DT	8	3.3	200	133.3	100	TSSOP–16
NB2308AC5HD	8	3.3	200	133.3	100	SOIC–16
NB2308AI5HD	8	3.3	200	133.3	100	SOIC–16
NB2308AC5HDT	8	3.3	200	133.3	100	TSSOP–16
NB2308AI5HDT	8	3.3	200	133.3	100	TSSOP–16
NB2309AC1D	9	3.3	250	133.3	200	SOIC–16
NB2309AI1D	9	3.3	250	133.3	200	SOIC–16
NB2309AC1DT	9	3.3	250	133.3	200	SOIC–16
NB2309AI1DT	9	3.3	250	133.3	200	TSSOP–16
NB2309AC1HD	9	3.3	250	133.3	200	SOIC–16
NB2309AI1HD	9	3.3	250	133.3	200	SOIC–16
NB2309AC1HDT	9	3.3	250	133.3	200	TSSOP–16
NB2309AI1HDT	9	3.3	250	133.3	200	TSSOP–16

EMI Suppression Clocks (Specifications are at 25°C unless otherwise stated) 133.3

Device(s)	V _{DD} Typ (V)	Modulation	F Max (MHz)	Duty Cycle	tR & tF Max (ps)	Package
NB2579A	3.3	± 1%	40	50	1100	TSSOP-6
NB2669A	3.3	± 1%	12	50	1100	TSSOP-6
NB2760A	3.3	± 0.75%	12	50	1100	TSSOP-6
NB2762A	3.3	-1.25%	12	50	1100	TSSOP-6
NB2769A	3.3	± 1%	12	50	1100	TSSOP-6
NB2779A	3.3	± 1%	30	50	1100	TSSOP-6
NB2780A	3.3	± 0.75%	50	50	1100	TSSOP-6
NB2869A	3.3	± 1%	12	50	1100	TSSOP-6
NB2870A	3.3	± 0.75%	30	50	1100	TSSOP-6
NB2872A	3.3	-1.25%	30	50	1100	TSSOP-6
NB2879A	3.3	± 1%	30	50	1100	TSSOP-6
NB2969A	3.3	± 1%	12	50	1100	TSSOP-6

VCO (PLL) (Specifications are at 25°C unless otherwise stated)

Device(s)	Frequency (Max) GHz	Voltage	Duty Cycle (Typ) %	SNR from Carrier (dB)	Package
MC100EL1648	1.1	5	50	40	SOIC-8, TSSOP-8, SOIC EIAJ-14

Phase/Frequency Detectors (Specifications are at 25°C unless otherwise stated)

Device(s)	Voltage	Transfer Gain mV/Degree	Vref & FB Inputs (S.E./Diff.)	Frequency (Typ) GHz	Propagation Delay (Typ) ps	Cycle-to-Cycle Jitter (Typ) ps	Tr & Tf (Max) ps	Package
MC100LVEL40	3.3/5	2	Diff	0.25	1350	0.2 / 1.0	475	SO-20
MC100EP40	3.3/5	0.93	Diff	>2	550	0.2 / 1.0	150	TSSOP-20
MC100EP140	3.3	1.2073	S.E.	>2	475	0.2 / 1.0	200	SO-8
MCH12140	3.3, 5	N/A	S.E.	800	0.44	N/A	350	SOIC 8
MCK12140	3.3, 5	N/A	S.E.	800	0.44	N/A	350	SOIC 8

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Flip-Flops (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Setup Time (Min) ps	Hold Time (Min) ps	Set/ Reset Recovery (Min) ps	Jitter (Typ) ps RMS	Tr & Tf (Max) ps	Package
MC100E131	3.3/5 V ECL Quad D Flip-Flop with Set, Reset and Differential Clock	5	1.1	500	150	175	290	1	480	LQFP-32
MC100E431	5 V ECL Triple Differential Data and Clock D Flip-Flop with Edge Triggered Set and Reset	5	1.1	600	200	200	400	<1	650	PLCC-28
MC100EL29	5 V ECL Dual Differential Data and Clock D Flip-Flop with Set and Reset	5	1.1	580	0	100	100	<1	550	SO-20
MC100EL30	5 V ECL Triple D Flip Flop with Set and Reset	5	1.2	450	150	200	400	<1	550	SO-20
MC100EL31	5 V ECL D Flip-Flop with Set and Reset	5	2.8	475	150	250	400	<1	350	SO-8, TSSOP-8
MC100EL35	5 V ECL JK Flip Flop	5	2.2	525	150	250	400	<1	350	SO-8, TSSOP-8
MC100EL51	5 V ECL Differential D Flip-Flop	3.3/5	2.8	475	150	250	400	<1	350	SO-8, TSSOP-8
MC100EL52	5 V Differential Data and Clock D Flip-Flop	5	2.8	365	125	150	N/A	<1	350	SO-8, TSSOP-8
MC100EP131	3.3/5 V ECL Quad D Flip-Flop with Set, Reset and Differential Clock	3.3/5	>3	460	120	120	290	0.2	290	LQFP-32
MC100EP29	3.3/5 V ECL Dual Differential Data and Clock D Flip-Flop with Set and Reset	3.3/5	3	420	100	100	150	0.2	300	TSSOP-20
MC100EP31	3.3/5 V ECL D Flip-Flop with Set and Reset	3.3/5	>3	340	100	150	225	0.2	200	SO-8, TSSOP-8
MC100EP35	3.3/5 V ECL JK Flip Flop	3.3/5	>3	410	150	150	150	0.2	180	SO-8, TSSOP-8
MC100EP51	3.3/5 V ECL Differential Data and Clock D Flip-Flop	3.3	>3	375	100	100	150	0.2	180	SO-8, TSSOP-8
MC100EP52	3.3/5 V Differential Data and Clock D Flip-Flop	3.3/5	>4	330	50	0	N/A	0.2	180	SO-8, TSSOP-8
MC100LVEL29	3.3 V ECL Dual Differential Data and Clock D Flip-Flop with Set and Reset	3.3	1.1	580	0	100	100	<1	550	SO-20
MC100LVEL30	3.3 V ECL Triple D Flip Flop with Set and Reset	5	1.2	450	150	200	400	<1	550	SO-20
MC100LVEL31	3.3 V ECL D Flip-Flop with Set & Reset	3.3	2.9 (min)	475	150	250	400	<1	320	SO-8, TSSOP-8

Flip-Flops (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Setup Time (Min) ps	Hold Time (Min) ps	Set/ Reset Recovery (Min) ps	Jitter (Typ) ps RMS	Tr & Tf (Max) ps	Package
MC100LVEL51	3.3 V ECL Differential D Flip-Flop	3.3	2.8	475	150	250	350	<1	320	SO-8, TSSOP-8
MC10E131	5 V ECL Quad Differential Data and S.E. Clock D Flip-Flop with Edge Triggered Set and Reset	5	1.1	500	150	175	400	<1	480 (typ)	PLCC-28
MC10E431	5 V ECL Triple Differential Data and Clock D Flip-Flop with Edge Triggered Set and Reset	5	1.1	600	200	200	400	<1	650	PLCC-28
MC10EL30	5 V ECL Triple D Flip Flop with Set and Reset	5	1.2	450	150	200	400	<1	550	SO-20
MC10EL31	5 V ECL D Flip-Flop with Set and Reset	5	2.8	475	150	250	400	<1	350	SO-8, TSSOP-8
MC10EL35	5 V ECL JK Flip Flop	5	2.2	525	150	250	400	<1	350	SO-8, TSSOP-8
MC10EL51	5 V ECL Differential D Flip-Flop	3.3/5	2.8	475	150	250	400	<1	350	SO-8, TSSOP-8
MC10EL52	5 V Differential Data and Clock D Flip-Flop	5	2.8	365	125	150	N/A	<1	350	SO-8, TSSOP-8
MC10EP29	3.3/5 V ECL Dual Differential Data and Clock D Flip-Flop with Set and Reset	3.3/5	3	420	100	100	150	0.2	300	TSSOP-20
MC10EP131	3.3/5 V ECL Quad D Flip-Flop with Set, Reset and Differential Clock	3.3/5	>3	460	120	120	290	0.2	290	LQFP-32
MC10EP31	3.3/5 V ECL D Flip-Flop with Set and Reset	3.3/5	>3	340	100	150	225	0.2	200	SO-8, TSSOP-8
MC10EP35	3.3/5 V ECL JK Flip Flop	3.3/5	>3	410	150	150	150	0.2	180	SO-8, TSSOP-8
MC10EP51	3.3/5 V ECL Differential Data and Clock D Flip-Flop	3.3	>3	375	100	100	150	0.2	180	SO-8, TSSOP-8
MC10EP52	3.3/5 V Differential Data and Clock D Flip-Flop	3.3/5	>4	330	50	0	N/A	<1	180	SO-8, TSSOP-8
NB4L52	2.5 to 5.5 V ECL D-Flip-Flop with Differential Reset and Input Termination	2.5/3.3/5	>4	330	145	50	100	<1	190	QFN-16

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Latches (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Setup Time (Min) ps	Hold Time (Min) ps	Set/Reset Recovery (Min) ps	Tr & Tf (Max) ps	Package
MC10E150	5 V ECL 6-Bit D Latch	5	>1	800	200	200	750	450	PLCC-28
MC10E151	5 V ECL 6-Bit Register	5	1.1	650	150	350	750	450	PLCC-28
MC100E150	5 V ECL 6-Bit D Latch	5	>1	800	200	200	750	450	PLCC-28
MC100E151	5 V ECL 6-Bit Register	5	1.1	650	150	350	750	450	PLCC-28
MC10E175	5 V ECL 9-Bit Latch With Parity	5	>1	600	275	175	850	800	PLCC-28
MC100E175	5 V ECL 9-Bit Latch With Parity	5	>1	600	275	175	850	800	PLCC-28
MC10E154	5 V ECL 5-Bit 2:1 Mux-Latch	5	>1	500	300	300	800	800	PLCC-28
MC10E155	5 V ECL 6-Bit 2:1 Mux-Latch	5	>1	500	300	300	800	800	PLCC-28
MC10E156	5 V ECL 3-Bit 4:1 Mux-Latch	5	>1	600	400	300	800	700	PLCC-28
MC100E154	5 V ECL 5-Bit 2:1 Mux-Latch	5	>1	500	300	300	800	800	PLCC-28
MC100E155	5 V ECL 6-Bit 2:1 Mux-Latch	5	>1	500	300	300	800	800	PLCC-28
MC100E156	5 V ECL 3-Bit 4:1 Mux-Latch	5	>1	600	400	300	800	700	PLCC-28

Shift Registers (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	# of Bits	Clock Source	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Setup Time (Min) ps	Hold Time (Min) ps	Set/Reset Recovery (Min) ps	Jitter (Typ) ps RMS	Tr & Tf (Max) ps	Package
MC100E141	5 V ECL 8–Bit Shift Register	5	8	S.E.	0.9	750	175	200	900	<1	800	PLCC–28
MC100E142	5 V ECL 9–Bit Shift Register	5	9	Dual S.E. (OR'ed)	0.9	800	50	300	900	<1	800	PLCC–28
MC100E143	5 V ECL 9–Bit Hold Register	5	S.E.	Dual (OR'ed)	>1	800	50	300	900	<1	800	PLCC–28
MC100E151	5 V ECL 6–Bit Register	5	S.E.	Dual (OR'ed)	1.1	650	150	350	750	<1	450	PLCC–28
MC100E212	5 V ECL 3–Bit Scannable Registered Address Driver	5	3	S.E.	0.9	800	175	250	600	<1	600	PLCC–28
MC100E241	5 V ECL 8–Bit Scannable Register	5	8	S.E.	0.9	750	175	200	900	<1	800	PLCC–28
MC100E451	5 V ECL 6–Bit D Register with Differential Data and Clock Inputs	5	Diff.	Diff.	1.1	650	150	350	750	<1	800	PLCC–28
MC100E452	5 V ECL 5–Bit Differential Register	5	Diff.	Diff.	1.1	600	175	225	750	<1	650	PLCC–28
MC100EP131	3.3/5 V ECL Quad D Flip–Flop with Set, Reset and Differential Clock	3.3/5	S.E.	Diff.	>3	460	120	120	290	0.2	290	LQFP–32
MC100EP142	5 V ECL 9–Bit Shift Register	3.3/5	9	Dual Diff. (OR'ed)	3.4	675	50	100	800	1	275	LQFP–32
MC100EP451	3.3/5 V ECL 6–Bit D Register with Differential Data and Clock Inputs	3.3/5	Diff.	Diff.	>3	450	80	80	250	0.2	260	LQFP–32
MC10E141	5 V ECL 8–Bit Shift Register	5	8	S.E.	0.9	750	175	200	900	<1	800	PLCC–28
MC10E142	5 V ECL 9–Bit Shift Register	5	9	Dual S.E. (OR'ed)	0.9	800	50	300	900	<1	800	PLCC–28
MC10E143	5 V ECL 9–Bit Hold Register	5	S.E.	Dual (OR'ed)	>1	800	50	300	900	<1	800	PLCC–28
MC10E151	5 V ECL 6–Bit Register	5	S.E.	Dual (OR'ed)	1.1	650	150	350	750	<1	450	PLCC–28
MC10E451	5 V ECL 6–Bit D Register with Differential Data and Clock Inputs	5	Diff.	Diff.	1.1	650	150	350	750	<1	800	PLCC–28
MC10E452	5 V ECL 5–Bit Differential Register	5	Diff.	Diff.	1.1	600	175	225	750	<1	650	PLCC–28
MC10EP142	5 V ECL 9–Bit Shift Register	3.3/5	9	Dual Diff. (OR'ed)	3.4	675	50	100	800	1	275	LQFP–32
MC10EP451	3.3/5 V ECL 6–Bit D Register with Differential Data and Clock Inputs	3.3/5	Diff.	Diff.	>3	450	80	80	250	0.2	260	LQFP–32
MC10H141	4–Bit Universal Shift Register	5	4	S.E.	0.25	1500	1500	1000	N/A	N/A	2400	PLCC–20, PDIP–16

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Multiplexers (Specifications are at 25°C unless otherwise stated)

Device(s)	Voltage	Mux Radio	# of Muxes	Data Path	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Within Device Skew (Max) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC100E157	5	2:1	4	S.E.	>1	380	70	<1	650	PLCC-28
MC100E158	5	2:1	5	S.E.	>1	385	60	<1	650	PLCC-28
MC100E163	5	8:1	2	S.E.	>1	550	40	<1	575	PLCC-28
MC100E164	5	16:1	1	S.E.	>1	600	50 (typ)	<1	550	PLCC-28
MC100E167	5	2:1	6	S.E.	1	650	75	<1	800	PLCC-28
MC100E171	5	4:1	3	S.E.	>1	480	60 (typ)	<1	650	PLCC-28
MC100E256	5	4:1	3	S.E.	>1	600	50	<1	700	PLCC-28
MC100E457	5	2:1	3	Diff.	>1	475	40	<1	500	PLCC-28
MC100EL56	3.3	2:1	2	Diff.	>1	440	80	<1	540	SO-20
MC100EL57	5	4:1	1	Diff.	>1	560	100	<1	375	SO-16
MC100EL58	5	2:1	1	S.E.	1.5	230	N/A	<1	350	SO-8
MC100EL59	5	2:1	3	S.E.	>1	500	100	<1	540	SO-20
MC100EP56	3.3/5	2:1	2	Diff.	>3	360	100	0.2	180	SO-20
MC100EP57	3.3/5	4:1	1	Diff.	>3	475	200	0.2	200	TSSOP-20
MC100EP58	3.3/5	2:1	1	S.E.	>3	310	N/A	0.2	180	SO-8
MC100LVE164	3.3	16:1	1	S.E.	>1	600	50	<1	550	TQFP-32
MC100LVEL56	3.3	2:1	2	Diff.	>1	440	80	<3 (typ)	540	SO-20
MC100LVEL58	3.3	2:1	1	S.E.	1.5	440	N/A	<1	320	SO-8
MC100LVEL59	3.3	2:1	3	S.E.	>1	500	100	<1	540	SO-20
MC10E154	5	2:1	5	S.E.	>1	500	50	<1	800	PLCC-28
MC10E155	5	2:1	6	S.E.	>1	500	75	<1	800	PLCC-28
MC10E156	5	4:1	3	S.E.	>1	600	50	<1	700	PLCC-28
MC10E157	5	2:1	4	S.E.	>1	380	70	<1	650	PLCC-28
MC10E158	5	2:1	5	S.E.	>1	385	60	<1	650	PLCC-28

Multiplexers (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Voltage	Mux Radio	# of Muxes	Data Path	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Within Device Skew (Max) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC10E163	5	8:1	2	S.E.	>1	550	40	<1	575	PLCC-28
MC10E164	5	16:1	1	S.E.	>1	600	50 (typ)	<1	550	PLCC-28
MC10E167	5	2:1	6	S.E.	1	650	75	<1	800	PLCC-28
MC10E171	5	4:1	3	S.E.	>1	480	60 (typ)	<1	650	PLCC-28
MC10E457	5	2:1	3	Diff.	>1	475	40	<1	500	PLCC-28
MC10EL56	3.3	2:1	2	Diff.	>1	440	80	<1	540	SO-20
MC10EL57	5	4:1	1	Diff.	>1	560	100	<1	375	SO-16
MC10EL58	5	2:1	1	S.E.	1.5	230	N/A	<1	350	SO-8
MC10EP56	3.3/5	2:1	2	Diff.	>3	360	100	0.2	180	SO-20
MC10EP57	3.3/5	4:1	1	Diff.	>3	475	200	0.2	200	TSSOP-20
MC10EP58	3.3/5	2:1	1	S.E.	>3	310	N/A	0.2	180	SO-8
MC10LVEL58	3.3	2:1	1	S.E.	1.5	440	N/A	<1	320	SO-8
NB100LVEP56	2.5/3.3/5	2:1	2	Diff.	>2.5	700	650	0.2	170	TSSOP-20, QFN-24
NBSG86A	2.5	2:1	1	Diff.	>8	165	15	0.5	65	FCBGA-16, QFN-16
NB7L86M	2.5/3.3	2:1	1	Diff.	>8	90	10	0.2	60	QFN-16

Serial/Parallel Converter and Parallel/Serial Converters (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Data Rate (Typ) Gbps	Prop. Delay (Typ) ps	Setup Time (Typ) ps	Hold Time (Typ) ps	Reset Recovery (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC100E445	5 V ECL 4-Bit Serial/Parallel Converter	5	2.0 (min)	1800	-250	300	300	<1	350	PLCC-28
MC100E446	5 V ECL 4-Bit Parallel/Serial Converter	5	1.6	1200	-450	650	N/A	<1	350	PLCC-28
MC100EP445	3.3/5 V ECL 8-Bit Serial/Parallel Converter	3.3/5	2.5	1300	-400	600	180	0.2	300	LQFP-32
MC100EP446	3.3/5 V ECL 8-Bit Parallel/Serial Converter	3.3/5	3.4	800	-450	-600	N/A	0.2	170	LQFP-32
MC10E445	5 V ECL 4-Bit Serial/Parallel Converter	5	2.0 (min)	1800	-250	300	300	<1	350	PLCC-28
MC10E446	5 V ECL 4-Bit Parallel/Serial Converter	5	1.6	1200	-450	650	N/A	<1	350	PLCC-28
MC10EP445	3.3/5 V ECL 8-Bit Serial/Parallel Converter	3.3/5	2.5	1300	-400	600	180	0.2	300	LQFP-32
MC10EP446	3.3/5 V ECL 8-Bit Parallel/Serial Converter	3.3/5	3.4	800	-450	-600	N/A	0.2	170	LQFP-32

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Gates (Specifications are at 25°C unless otherwise stated)

Device(s)	Output Type	Type	Frequency (Typ) GHz	Propagation Delay (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC100E101	ECL/PECL	OR/NOR	2	350	<1	575	PLCC–28
MC100E104	ECL/PECL	AND/NAND	2	385	<1	700	PLCC–28
MC100E107	ECL/PECL	XOR/XNOR	2	410	<1	700	PLCC–28
MC100E404	ECL/PECL	AND/NAND	2	475	<1	400	PLCC–28
MC100EL01	ECL/PECL	OR/NOR	2	230	<1	235	SO–8, TSSOP–8
MC100EL04	ECL/PECL	AND/NAND	2	240	<1	350	SO–8, TSSOP–8
MC100EL05	ECL/PECL	AND/NAND	2	275	<1	350	SO–8, TSSOP–8
MC100EL07	ECL/PECL	XOR/XNOR	2	260	<1	225	SO–8, TSSOP–8
MC100EP01	ECL/PECL	OR/NOR	>3	270	0.2	180	SO–8, TSSOP–8
MC100EP05	ECL/PECL	AND/NAND	>3	220	0.2	180	SO–8, TSSOP–8
MC100EP08	ECL/PECL	XOR/XNOR	>3	250	0.2	180	SO–8, TSSOP–8
MC100EP101	ECL/PECL	OR/NOR	>3	300	0.2	220	PLCC–28
MC100EP105	ECL/PECL	AND/NAND	>3	220	0.2	180	SO–8, TSSOP–8
MC100LVEL01	ECL/PECL	OR/NOR	2	370	<1	320	SO–8, TSSOP–8
MC100LVEL05	ECL/PECL	AND/NAND	2	340	<1	320	SO–8, TSSOP–8
MC10E101	ECL/PECL	OR/NOR	2	350	<1	575	PLCC–28
MC10E104	ECL/PECL	AND/NAND	2	385	<1	700	PLCC–28
MC10E107	ECL/PECL	XOR/XNOR	2	410	<1	700	PLCC–28
MC10E404	ECL/PECL	AND/NAND	2	475	<1	400	PLCC–28
MC10EL01	ECL/PECL	OR/NOR	2	230	<1	235	SO–8, TSSOP–8
MC10EL04	ECL/PECL	AND/NAND	2	240	<1	350	SO–8, TSSOP–8
MC10EL05	ECL/PECL	AND/NAND	2	275	<1	350	SO–8, TSSOP–8
MC10EL07	ECL/PECL	XOR/XNOR	2	260	<1	225	SO–8, TSSOP–8
MC10EP01	ECL/PECL	OR/NOR	>3	270	0.2	180	SO–8, TSSOP–8
MC10EP05	ECL/PECL	AND/NAND	>3	220	0.2	180	SO–8, TSSOP–8

Gates (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Output Type	Type	Frequency (Typ) GHz	Propagation Delay (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC10EP08	ECL/PECL	XOR/XNOR	>3	250	0.2	180	SO-8, TSSOP-8
MC10EP101	ECL/PECL	OR/NOR	>3	300	0.2	220	PLCC-28
MC10EP105	ECL/PECL	AND/NAND	>3	220	0.2	180	SO-8, TSSOP-8
NBSG86A	PECL with Output Level Select	Smart Gate (AND/NAND, OR/NOR, XOR/ XNOR. 2:1 MUX)	>8	165	0.5	65	FCBGA-16, QFN-16
NB7L86M	CML	Smart Gate (AND/NAND, OR/NOR, XOR/ XNOR. 2:1 MUX)	>8	120	0.2	60	QFN-16

Counters (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Count Freq. (Typ) GHz	Prop. Delay (Typ) ps	Setup Time (Typ) ps	Hold Time (Typ) ps	Reset Recovery (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC100E016	5 V ECL 8-Bit Synchronous Binary Up Counter	5	0.9	775	-30	100	700	3	800	PLCC-28
MC100E136	5 V ECL 6-Bit Universal Up/Down Counter	5	0.65	1150	650	-200	700	<5	600	PLCC-28
MC100E137	5 V ECL 8-Bit Ripple Counter	5	2.2	2900	-150	150	200	<5	600	PLCC-28
MC100EP016A	3.3 V ECL 8-Bit Synchronous Binary Up Counter	3.3	1.4	570	240	-155	205	2.5	320	LQFP-32
MC10E016	5 V ECL 8-Bit Synchronous Binary Up Counter	5	0.9	775	-30	100	700	3	800	PLCC-28
MC10E136	5 V ECL 6-Bit Universal Up/Down Counter	5	0.65	1150	650	-200	700	<5	600	PLCC-28
MC10E137	5 V ECL 8-Bit Ripple Counter	5	2.2	2900	-150	150	200	<5	600	PLCC-28

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Comparators (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Frequency (Typ) GHz	Propagation Delay (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC10E166	5 V ECL 9-Bit Magnitude Comparator	5	>1	850	<1	800	PLCC-28
MC100E166	5 V ECL 9-Bit Magnitude Comparator	5	>1	850	<1	800	PLCC-28
MC10E1651	5 V, -5 V ECL Dual ECL Output Comparator with Latch	5 / -5	>1	775	<1	475	CDIP-16, PLCC-20
MC10E1652	5 V ECL Dual ECL Output Comparator with Latch	5	>1	775	<1	475	CDIP-16, PLCC-20

Parity Checkers (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Propagation Delay (Typ) ps	Setup Time (Typ) ps	Hold Time (Typ) ps	Tr/Tf (Max) ps	Package
MC10/100E160	5 V ECL 12-Bit Parity Generator/Checker	5	650	900	-900	650	PLCC-28
MC100E193	5 V ECL Error Detection/Correction Circuit	5	775	350	-350	1100	PLCC-28

Drivers/Receivers (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Input I/O	Output I/O	Voltage	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC10/100EP16VB	3.3/5 V ECL Differential Receiver/Driver with High and Low Gain	ECL/PECL	ECL/PECL	3.3/5	>3	300	0.2	240	SO-8, TSSOP-8
MC10/100EP16VC	3.3/5 V ECL Differential Receiver/Driver with High Gain and Enable Output	ECL/PECL	ECL/PECL	3.3/5	>3	380	0.2	240	SO-8, TSSOP-8
MC100E116	5 V ECL Quint Differential Line Receiver	ECL/PECL	ECL/PECL	5	>1.2	300	0.2	575	PLCC-28
MC100E416	5 V ECL Quint Differential Line Receiver	ECL/PECL	ECL/PECL	5	>2	350	0.2	350	PLCC-28
MC100EL16	5 V ECL Differential Receiver	ECL/PECL	ECL/PECL	5	>2	250	0.2	350	SO-8, TSSOP-8
MC100EL17	5 V ECL Quad Differential Receiver	ECL/PECL	ECL/PECL	5	>2	425	0.2	550	SO-20
MC100EP116	3.3/5 V ECL Hex Differential Line Receiver/Driver	ECL/PECL	ECL/PECL	3.3/5	>3	260	0.2	240	LQFP-32
MC100EP16	3.3/5 V ECL Differential Receiver/Driver	ECL/PECL	ECL/PECL	3.3/5	>4	220	0.2	180	SO-8, TSSOP-8
MC100EP16F	3.3/5 V ECL Differential Receiver/Driver	ECL/PECL	ECL/PECL	2.5/3.3	>3	300	0.2	100	SO-8, TSSOP-8
MC100EP16T	3.3/5 V ECL Differential Receiver/Driver with Internal Input Termination	ECL/PECL	ECL/PECL	3.3/5	>3	220	0.2	180	SO-8, TSSOP-8
MC100EP16VA	3.3/5 V ECL Differential Receiver/Driver with High Gain	ECL/PECL	ECL/PECL	3.3/5	>3	270	0.2	180	SO-8, TSSOP-8
MC100EP16VB	3.3/5 V ECL Differential Receiver/Driver with High and Low Gain	ECL/PECL	ECL/PECL	3.3/5	>3	300	0.2	240	SO-8, TSSOP-8
MC100EP16VC	3.3/5 V ECL Differential Receiver/Driver with High Gain and Enable Output	ECL/PECL	ECL/PECL	3.3/5	>3	380	0.2	240	SO-8, TSSOP-8
MC100EP16VS	3.3/5 V ECL Differential Receiver/Driver with Variable Output Swing	ECL/PECL	ECL/PECL	3.3/5	>4	220	0.2	180	SO-8, TSSOP-8

ON Semiconductor Selector Guide – Clock and Data Management Devices

Drivers/Receivers (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Input I/O	Output I/O	Voltage	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
NB4L16M	2.5/3.3 V 5 Gb/s Multi Level Clock/Data Input to CML Driver/Receiver/Buffer/Translator with Internal Termination	LVPECL, LVTTTL, LVCMOS, CML, LVDS	CML	2.5/3.3	3.5	220	0.2	90	QFN-16
MC100EP16VT	3.3/5 V ECL Differential Receiver/Driver with Variable Output Swing and Internal Input Termination	ECL/PECL	ECL/PECL	3.3/5	>4	300	0.2	180	SO-8, TSSOP-8
MC100EP17	3.3 V ECL Quad Differential Receiver	ECL/PECL	ECL/PECL	3.3/5	>3	220	0.2	230	SO-20, TSSOP-20
MC100LVEL16	3.3 V ECL Differential Receiver	ECL/PECL	ECL/PECL	3.3	>2	300	0.2	320	SO-8, TSSOP-8
MC100LVEL17	3.3 V ECL Quad Differential Receiver	ECL/PECL	ECL/PECL	3.3	>2	425	0.2	550	SO-20
MC100LVEP16	2.5/3.3 V ECL Differential Receiver/Driver	ECL/PECL	ECL/PECL	2.5/3.3	>4	240	0.2	180	SO-8, TSSOP-8
MC10E116	5 V ECL Quint Differential Line Receiver	ECL/PECL	ECL/PECL	5	>2	300	0.2	575	PLCC-28
MC10E416	5 V ECL Quint Differential Line Receiver	ECL/PECL	ECL/PECL	5	>2	350	0.2	350	PLCC-28
MC10EL16	5 V ECL Differential Receiver	ECL/PECL	ECL/PECL	5	>2	250	0.2	350	SO-8, TSSOP-8
MC10EP116	3.3/5 V ECL Hex Differential Line Receiver/Driver	ECL/PECL	ECL/PECL	3.3/5	>3	260	0.2	240	LQFP-32
MC10EP16	3.3/5 V ECL Differential Receiver/Driver	ECL/PECL	ECL/PECL	3.3/5	>4	220	0.2	180	SO-8, TSSOP-8
MC10EP16T	3.3/5 V ECL Differential Receiver/Driver with Internal Input Termination	ECL/PECL	ECL/PECL	3.3/5	>3	220	0.2	180	SO-8, TSSOP-8
MC10EP16VA	3.3/5 V ECL Differential Receiver/Driver with High Gain	ECL/PECL	ECL/PECL	3.3/5	>3	270	0.2	180	SO-8, TSSOP-8
MC10EP16VB	3.3/5 V ECL Differential Receiver/Driver with High and Low Gain	ECL/PECL	ECL/PECL	3.3/5	>3	300	0.2	240	SO-8, TSSOP-8
MC10EP16VC	3.3/5 V ECL Differential Receiver/Driver with High Gain and Enable Output	ECL/PECL	ECL/PECL	3.3/5	>3	380	0.2	240	SO-8, TSSOP-8

Drivers/Receivers (continued) (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Input I/O	Output I/O	Voltage	Freq. (Typ) GHz	Prop. Delay (Typ) ps	Jitter (Typ) ps RMS	Tr/Tf (Max) ps	Package
MC10EP16VT	3.3/5 V ECL Differential Receiver/Driver with Variable Output Swing and Internal Input Termination	ECL/PECL	ECL/PECL	3.3/5	>4	300	0.2	180	SO-8, TSSOP-8
MC10EP17	3.3 V ECL Quad Differential Receiver	ECL/PECL	ECL/PECL	3.3/5	>3	220	0.2	230	SO-20, TSSOP-20
MC10LVEP16	2.5/3.3 V ECL Differential Receiver/Driver	ECL/PECL	ECL/PECL	2.5/3.3	>4	240	0.2	180	SO-8, TSSOP-8
NB100LVEP17	2.5 V/3.3 V/5 V ECL Quad Differential Driver/Receiver	ECL/PECL	ECL/PECL	2.5/3.3/5	>2.5	250	0.5	240	TSSOP-20, QFN-24
NBSG16	2.5/3.3 V SiGe Differential Receiver/Driver with RSPECL Output	ECL/PECL, HSTL, GTL, TTL, CMOS, CML or LVDS	RSECL	2.5/3.3	>12	120	0.3	65	FCBGA-16, QFN-16
NBSG16VS	2.5/3.3 V SiGe Differential Receiver/Driver with Variable Output Swing	ECL/PECL, TTL, CMOS, LVDS or LVDS	ECL/PECL	2.5/3.3	>12	125	0.8	55	FCBGA-16, QFN-16
NB6L16	2.5/3.3 V Multi-level Input to Differential LVECL Clock or Data Translator/Receiver/Driver Buffer	LVDS, LVPECL, LVNECL, CML, LVCMOS or LVTTTL	ECL/PECL	2.5/3.3	>6	130	0.2	120	SO-8, TSSOP-8
NBSG16M	2.5/3.3 V Multi-level Input to CML Clock/Data Receiver/Driver/Translator Buffer	ECL/PECL/LVTTTL/LVCMOS/CML/LVDS	CML	2.5/3.3	>10	120	0.2	53	QFN-16
NB4N527S	3.3 V 2.5 Gb/s Dual Any Level to LVDS Receiver/Driver/Buffer/Translator with Input Termination	LVNECL, LVPECL, LVTTTL, LVCMOS, CML, LVDS, HSTL	LVDS	3.3	>1.25	275	0.5	140	QFN-16
NB4L16M	2.5/3.3 V 5 Gb/s Multi Level Clock/Data Input to CML Driver/Receiver/Buffer/Translator with Internal Termination	LVPECL, LVDS, CML, LVCMOS, LVTTTL	CML	2.5/3.3	>3.5	220	0.2	90	QFN-16
NB7L216	2.5/3.3 V 12 Gb/s Multi Level Clock/Data Input to RSECL High Gain Receiver/Buffer/Translator with Internal Termination	LVNECL, LVPECL, HSTL, LVTTTL, LVCMOS, CML or LVDS	RSECL	2.5/3.3	>8.5	120	0.1	45	QFN-16
NB4N316M	3.3 V Any Level Input to Open Collector CML Output Buffer/Translator with Input Hysteresis	LVPECL, CML, LVCMOS, LVTTTL, LVDS	CML	3.3	>2	550	1	150	TSSOP-8

ON Semiconductor Selector Guide – Clock and Data Management Devices

Drivers/Buffers (Specifications are at 25°C unless otherwise stated)

Device(s)	Description	Voltage	Outputs	Propagation Delay (Typ) ps	Within Gate Skew (Max) ps	Tr/Tf (Max) ps	Package
MC10EL12	5 V ECL Low Impedance 1:2 Driver	5	OR/NOR ECL	290	N/A	550	SO-8, TSSOP-8
MC100EL12	5 V ECL Low Impedance 1:2 Driver	5	OR/NOR ECL	290	N/A	550	SO-8, TSSOP-8
MC100LVEL12	3.3 V ECL Low Impedance 1:2 Driver	3.3	OR/NOR ECL	445	N/A	550	SO-8, TSSOP-8
MC10E112	5 V ECL Quad Driver	5	OR/NOR ECL	400	40	700	PLCC-28
MC10E212	5 V ECL 3-Bit Scannable Registered Address Driver	5	OR/NOR ECL	800	50	650	PLCC-28
MC10E122	5 V ECL 9-Bit Buffer	5	S.E.	350	75	800	PLCC-28
MC100E112	5 V ECL Quad Driver	5	OR/NOR ECL	400	40	700	PLCC-28
MC100E212	5 V ECL 3-Bit Scannable Registered Address Driver	5	OR/NOR ECL	800	50	650	PLCC-28
MC100E122	5 V ECL 9-Bit Buffer	5	S.E.	350	75	800	PLCC-28

Standard Logic Devices

Standard Logic Devices

In Brief . . .

This selector guide is a quick reference to ON Semiconductor's offering of exciting new Analog Switches and MiniGate™ products as well as the traditional standard logic integrated circuits. ON Semiconductor continues to increase the breadth of its portfolio offering in the MiniGate arena, and continues to offer the traditional industry standard IC Logic families that have become the foundation for a multitude of legacy electronic systems. The company's standard logic portfolio provides designers with a wide selection of voltages and speed/drive combinations to meet their application needs.

The **MiniGate** family of devices takes advantage of ON Semiconductor's world class discrete micropackaging manufacturing technology to enable best-in-class products. The technologies offered in the MiniGate family are direct "relatives" of the standard IC Logic products, designed and manufactured in the same CMOS based technology. These include Analog Switch, LCX, VHC and HC technologies, with the majority of the popular functions available in these different families in industry standard 5, 6 and 8 pin packages.

The traditional industry standard Logic IC offerings consist of families in the high voltage standard logic arena (5.0 V and greater).

In the low voltage standard logic arena, ON Semiconductor offers the following families:

VCX: This is the fastest, lowest voltage logic family offered by ON Semiconductor. Ten devices in all are offered, with five of the most popular functions, as well as five enhanced devices with a bus hold option. It is specified at 0.9 V to 3.6 V, is offered in the industry standard 48 pin TSSOP package and is specifically well suited for networking/ communication equipment applications, demanding high speed and low power.

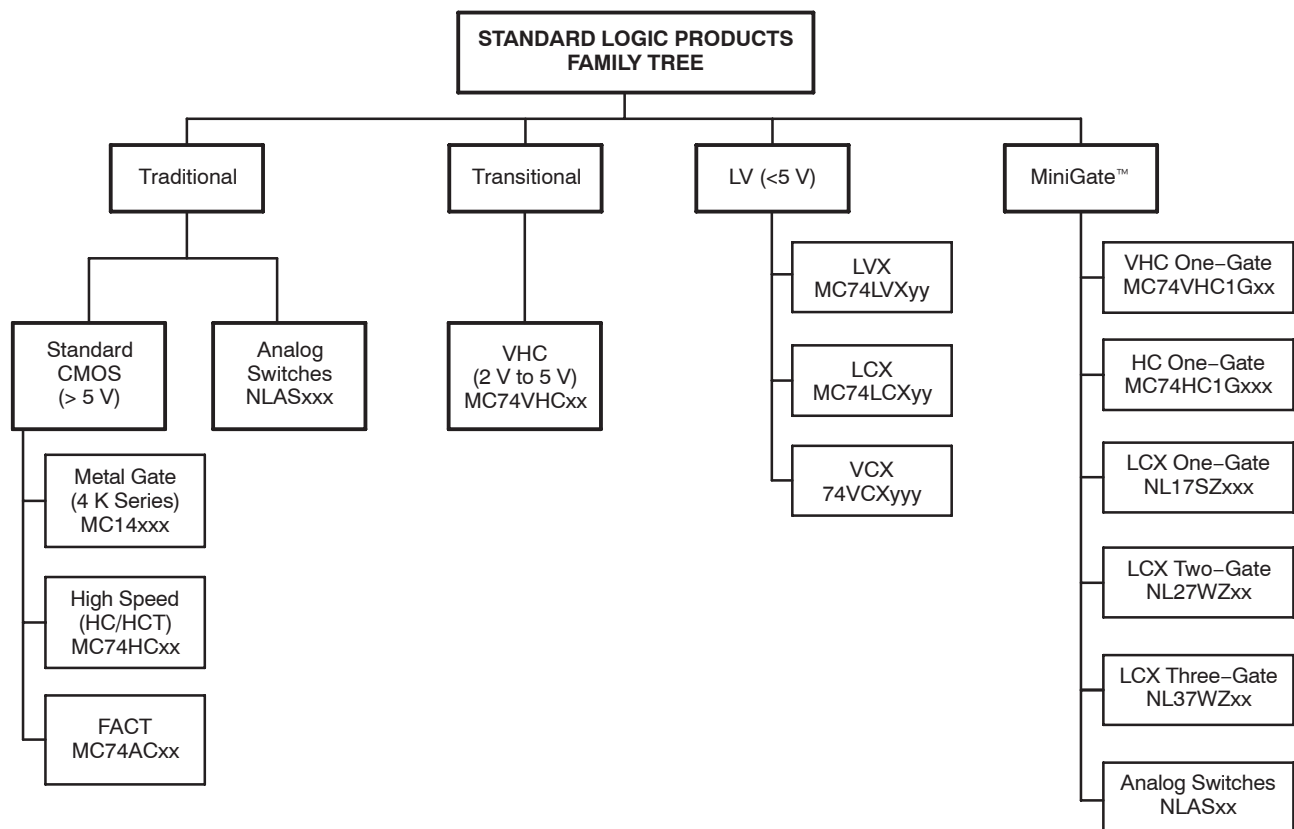
LCX: LCX is fast becoming the industry "workhorse" product family in 3.0 V applications. This family features 5.0 V tolerant inputs and outputs and is especially suited for mixed-voltage, high-end, advanced workstation designs, as well as for low-power portable applications.

LVX: LVX is specified from 2.0 V to 3.6 V and is similar in performance to VHC, but with lower output drive. It too has overvoltage tolerant (OVT) inputs to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems. This family is available in industry standard JEDEC SOIC, EIAJ SOIC, and the popular TSSOP packages. It is specified at –55 to +125°C.

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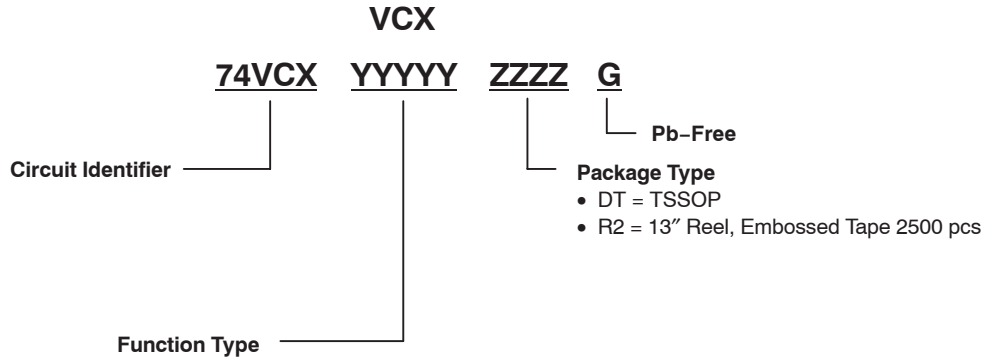
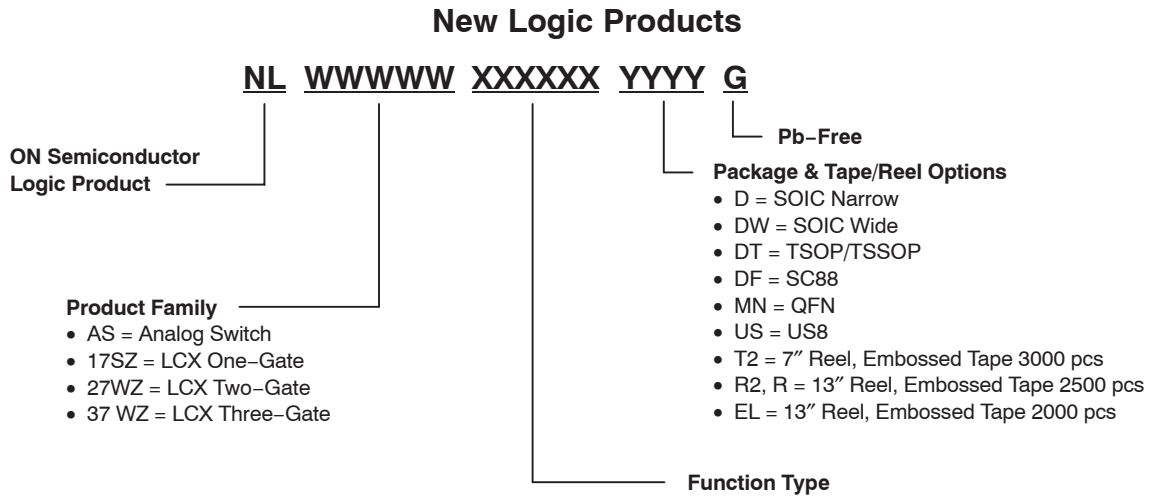
VHC: This "5.0 V to 3.0 V transitional family" is specified at 2.0 V to 5.5 V. When operating at supply voltages below 5.0 V, this family features 5.0 V tolerant inputs to support 3.0 V to 5.0 V mixed voltage system designs. Low power, low switching noise and fast switching speeds make this family perfect for low power, low cost applications. The VHCT functions offer TTL level compatibility with CMOS low power performance. VHCT accepts TTL level inputs and delivers full swing (4.5 V to 5.5 V) outputs. The supply voltage range for VHCT is $V_{CC} = 4.5 \text{ V} - 5.5 \text{ V}$. The temperature range for this family is also –55 to +125°C and is also available in the same packages as LVX family.

There are three families offered in the more mature 5.0 V and greater operating voltage arena. **FACT** (AC/ACT), **High Speed** (HC/HCT) and **Metal Gate** (14000 series), remain as the legacy logic families. These families, although past the maturity stage in the industry product life cycle, continue to find new applications and will remain industry standards for many more years.

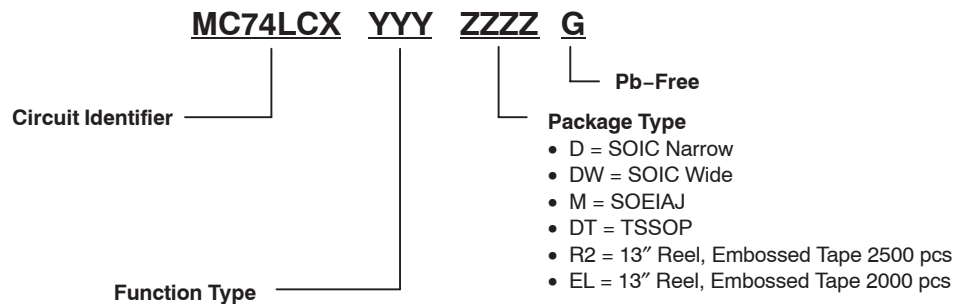


Ordering Information

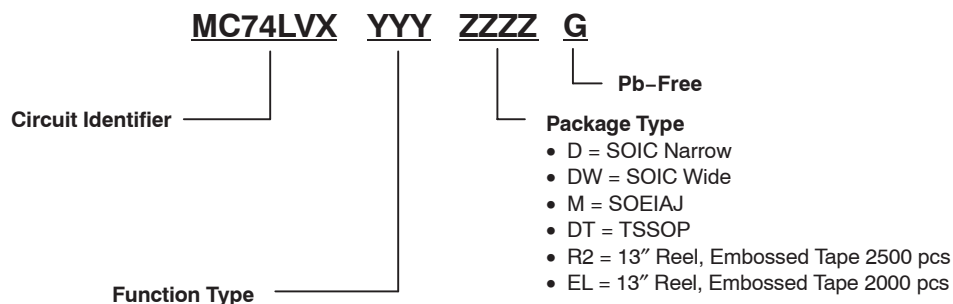
Device Nomenclatures



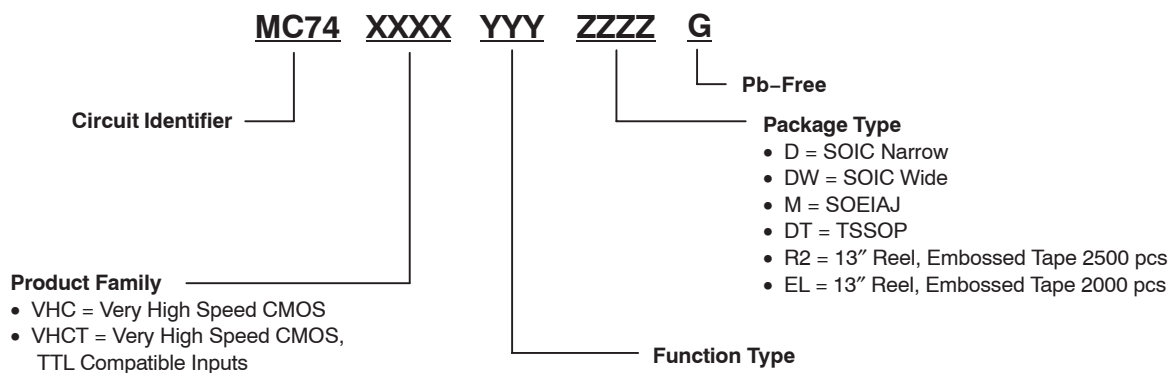
LCX



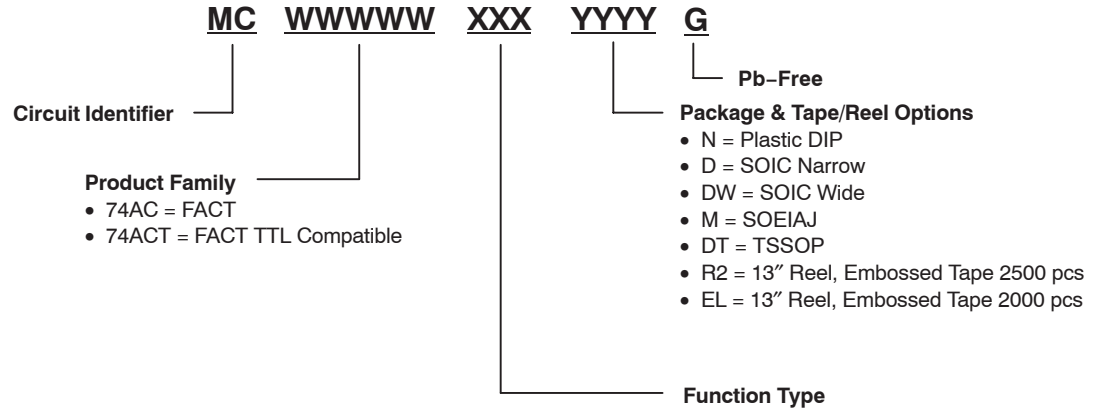
LVX



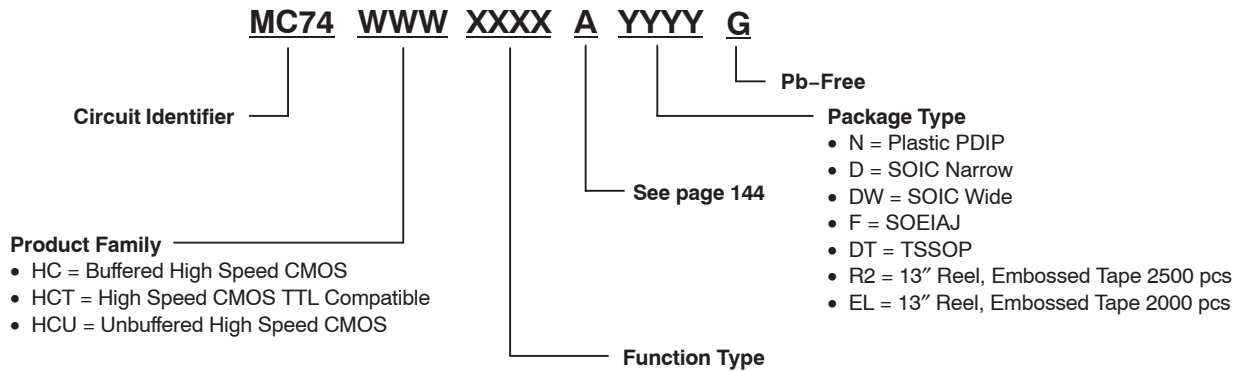
Very High Speed CMOS



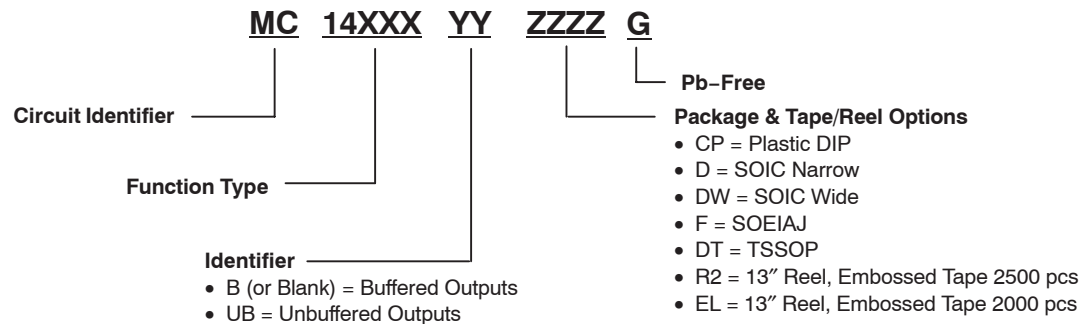
FACT



High Speed CMOS



Metal Gate Logic



Analog Switches

Ordering Suffixes: TSSOP–5/6 = DTT1, SC–88/A = DFT2, US = US8 (available in T & R only), DT = TSSOP Rail, DTR2 = TSSOP T & R, MN = QFN Rail, MNR2 = QFN T & R, FCT1 = Microbump, MR2 = Micro, G = Pb–Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74VHC1G66	Analog Switch	TSOP–5, SC–88A	–55 to +125	2.0 to 5.5 V
MC74VHC1GT66	Analog Switch, TTL/Low Threshold Compatible	TSOP–5, SC–88A	–55 to +125	2.0 to 5.5 V
MC74LVX4051	Analog Multiplexer/Demultiplexer	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
MC74LVXT4051	Analog Multiplexer/Demultiplexer, TTL Compatible	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
MC74LVX4052	Analog Multiplexer/Demultiplexer	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
MC74LVXT4052	Analog Multiplexer/Demultiplexer, TTL Compatible	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
MC74LVX4053	Analog Multiplexer/Demultiplexer	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
MC74LVXT4053	Analog Multiplexer/Demultiplexer, TTL Compatible	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
MC74LVX4066	Quad Analog Switch	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
MC74LVXT4066	Quad Analog Switch, TTL Compatible	SO–16, TSSOP–16	–40 to +85	2.0 to 3.6 V
NL7WB66	Ultra–Small SPST Analog Switch	US8	–55 to +125	1.65 to 5.5 V
NLAS323	SPST, Hi/Hi Enable Analog Switch	US8	–55 to +125	2.0 to 5.5 V
NLAS324	SPST, Lo/Lo Enable Analog Switch	US8	–55 to +125	2.0 to 5.5 V
NLAS325	SPST, Hi/Lo Enable Analog Switch	US8	–55 to +125	2.0 to 5.5 V
NLAS1053	2:1 Multiplexer w/Enable Analog Switch	US8	–55 to +125	2.0 to 5.5 V
NLAS2066	Dual SPST Analog Switch	US8	–55 to +125	2.0 to 5.5 V
NLASB3157	2:1 Multiplexer Analog Switch	SC–88	–55 to +125	2.0 to 5.5 V
NLAS3158	Dual SPDT Analog Switch, High Bandwidth	WDFN–12, DFN–12	–55 to +125	1.65 to 5.5 V
NLAS3699	Dual DPDT Analog Switch, Ultra Low Ron	QFN–16	–55 to +125	1.8 to 3.6 V
NLAS3799, New	Dual DPDT Analog Switch, Ultra Low Ron	WDFN–16, μ QFN–16	–55 to +125	1.8 to 3.6 V
NLAS4051	Analog Multiplexer/Demultiplexer, Single Pole, 8 Position	SO–16, TSSOP–16	–55 to +125	2.0 to 5.5 V
NLAST4051	Analog Mux/Demux, Single Pole, 8 Position, TTL Compatible	SO–16, TSSOP–16	–55 to +125	2.0 to 5.5 V
NLAS4053	Analog Mux/Demux, Triple 2:1	SO–16, TSSOP–16	–55 to +125	2.0 to 5.5 V
NLAS4066	Quad Analog Switch	SO–16, TSSOP–16	–55 to +125	2.0 to 5.5 V
NLAST4066	Quad Analog Switch	SO–16, TSSOP–16	–55 to +125	2.0 to 5.5 V
NLAS4157	Single SPDT Analog Switch, Low Ron	SC–88	–40 to +85	1.65 to 5.5 V
NLAS4501	SPST, Analog Switch	TSOP–5, SC–88A	–55 to +125	2.0 to 5.5 V
NLAST4501	SPST, Analog Switch, TTL Compatible Inputs	TSOP–5, SC–88A	–55 to +125	2.0 to 5.5 V
NLAS4599	SPDT Analog Switch	TSOP–6, SC–88	–55 to +125	2.0 to 5.5 V
NLAST4599	SPDT Analog Switch, TTL Compatible Inputs	TSOP–6, SC–88	–55 to +125	2.0 to 5.5 V
NLAS4684	Ultra Low Ron Dual SPDT Analog Switch	Microbump–10, Micro10, QFN	–55 to +125	1.8 to 5.5 V
NLAS4685	Ultra Low Ron Dual SPDT Analog Switch	Microbump–10, Micro10	–55 to +125	1.8 to 5.5 V
NLAS5123	1 Ω SPDT Analog Switch	WDFN–6	–40 to +85	1.65 to 5.5 V
NLAS5223, New	Ultra Low Ron Dual SPDT Analog Switch	μ QFN–10	–55 to +125	1.8 to 5.5 V
NLAS4717	Dual SPDT Analog Switch	Microbump–10, Micro10	–40 to +85	1.8 to 5.5 V
NLAS4717EP, New	Dual SPDT Analog Switch, High Bandwidth	Microbump–10	–40 to +85	1.65 to 5.5 V
NLAS4783	Triple SPDT Analog Switch, Ultra Low Ron	QFN–16	–40 to +85	1.65 to 4.7 V
NLAS9431	Low Voltage Single Supply Dual DPDT Analog Switch	WQFN–16	–55 to +125	2.0 to 5.5 V
NLAST9431T	Low Voltage Single Supply Dual DPDT Analog Switch, TTL Compatible	WQFN–16	–55 to +125	2.0 to 5.5 V
NLAS44599	Dual DPDT Analog Switch	QFN–16, TSSOP16	–55 to +125	2.0 to 5.5 V
NLAST44599	Dual DPDT Analog Switch, TTL Compatible Inputs	QFN–16, TSSOP16	–55 to +125	2.0 to 5.5 V

MiniGates

VHC One-Gates

Ordering Suffixes: TSSOP-5 = DTT1, SC-88A = DFT2 (available in T & R only), G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74VHC1G00	2-Input NAND Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT00	2-Input NAND Gate (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G01	2-Input NAND Gate (Open Drain)	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G02	2-Input NOR Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT02	2-Input NOR Gate (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G03	2-Input NOR Gate (Open Drain)	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G04	Inverter	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT04	Inverter (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1GU04	Inverter (Unbuffered)	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G05	Inverter w/Open-Drain Output	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G07	Buffer w/Open-Drain Output	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G08	2-Input AND Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT08	2-Input AND Gate (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G09	2-Input AND Gate (Open Drain)	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G14	Schmitt Trigger-Inverter	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT14	Schmitt Trigger Inverter (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G32	2-Input OR Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT32	2-Input OR Gate (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G50	Buffer	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT50	Buffer (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G66	Analog Switch	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT66	Analog Switch	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G86	2-Input Exclusive-OR Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT86	2-Input Exclusive-OR Gate (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G125	Bus Buffer (3-State)	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT125	Non-Inverting Tri-State Buffer, Low Enable	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G126	Non-Inverting Tri-State Buffer, High Enable	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1GT126	Bus Buffer Gate (3-State) (TTL Compatible)	TSOP-5, SC-88A	-55 to +125	3.0 to 5.5 V
MC74VHC1G132	Quad 2-Input Schmitt NAND Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V
MC74VHC1G135	2-Input NAND Schmitt-Trigger with Open Drain Output	TSOP-5, SC-88A	-55 to +125	2.0 to 5.5 V

HC One-Gates

Ordering Suffixes: TSSOP-5 = DTT1, SC-88A = DFT2 (available in T & R only), G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74HC1G00	2-Input NAND Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 6.0 V
MC74HC1G02	2-Input Positive-NOR Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 6.0 V
MC74HC1G04	Inverter	TSOP-5, SC-88A	-55 to +125	2.0 to 6.0 V
MC74HC1G08	2-Input AND Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 6.0 V
MC74HC1G14	Inverter with Schmitt Trigger	TSOP-5, SC-88A	-55 to +125	2.0 to 6.0 V
MC74HC1G32	2-Input OR Gate	TSOP-5, SC-88A	-55 to +125	2.0 to 6.0 V
MC74HC1GU04	Inverter (Unbuffered)	TSOP-5, SC-88A	-55 to +125	2.0 to 6.0 V

LCX One–Gates

Ordering Suffixes: SC–88/A = DFT2, US = US8 (available in T & R only), G = Pb–Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
NL7SZ18	2:1 Multiplexer, Tri–State	SC–88A	–40 to +85	1.65 to 5.5 V
NL7SZ19	2:1 Multiplexer	SC–88	–40 to +85	1.65 to 5.5 V
NL17SZ00	Single 2–Input NAND Gate	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ02	Single 2–Input NOR Gate	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ04	Single Inverter	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ06	Inverter w/Open Drain Outputs	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ07	Buffer w/Open–Drain Output	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ08	Single 2–Input AND Gate	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ14	Schmitt Trigger Inverter	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ16	Single Buffer	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ17	Non–Inverting Schmitt Trigger Buffer	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ32	Single 2–Input OR Gate	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V
NL17SZ74	D Flip–Flop	US8	–40 to +85	1.65 to 5.5 V
NL17SZ86	Exclusive OR Gate	SC–88A	–40 to +85	1.65 to 5.5 V
NL17SZ125	Non–Inverting Tri–State Buffer, Low Enable	SC–88A	–40 to +85	1.65 to 5.5 V
NL17SZ126	Non–Inverting Tri–State Buffer, High Enable	SC–88A	–40 to +85	1.65 to 5.5 V
NL17SZU04	Single Inverter, Unbuffered	SC–88A, SOT–553	–40 to +85	1.65 to 5.5 V

LCX Two–Gates and Three–Gates

Ordering Suffixes: TSSOP–5/6 = DTT1, SC–88/A = DFT2, US = US8 (available in T & R only), G = Pb–Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
NL27WZ00	Dual 2–Input NAND Gate	US8	–40 to +85	1.65 to 5.5 V
NL27WZ02	Dual 2–Input NOR Gate	US8	–40 to +85	1.65 to 5.5 V
NL27WZ04	Dual Inverter	TSOP–6, SC–88	–40 to +85	1.65 to 5.5 V
NL27WZ06	Dual Inverter w/Open Drain Outputs	TSOP–6, SC–88	–40 to +85	1.65 to 5.5 V
NL27WZ07	Dual Non–Inverting Buffer, Open Drain	TSOP–6, SC–88	–40 to +85	1.65 to 5.5 V
NL27WZ08	Dual 2–Input AND Gate	US8	–40 to +85	1.65 to 5.5 V
NL27WZ14	Dual Schmitt Trigger Inverter	TSOP–6, SC–88	–40 to +85	1.65 to 5.5 V
NL27WZ16	Dual Non–Inverting Buffer	TSOP–6, SC–88	–40 to +85	1.65 to 5.5 V
NL27WZ17	Dual Non–Inverting Schmitt Trigger Buffer	TSOP–6, SC–88	–40 to +85	1.65 to 5.5 V
NL27WZ32	Dual 2–Input OR Gate	US8	–40 to +85	1.65 to 5.5 V
NL27WZ86	Dual Exclusive OR Gate	US8	–40 to +85	1.65 to 5.5 V
NL27WZ125	Dual Non–Inverting Tri–State Buffer, Low Enable	US8	–40 to +85	1.65 to 5.5 V
NL27WZ126	Dual Non–Inverting Tri–State Buffer, High Enable	US8	–40 to +85	1.65 to 5.5 V
NL27WZU04	Dual Inverter, Unbuffered	TSOP–6, SC–88	–40 to +85	1.65 to 5.5 V
NL37WZ04	Triple Inverter	US8	–40 to +85	1.65 to 5.5 V
NL37WZ06	Triple Inverter w/Open Drain Outputs	US8	–40 to +85	1.65 to 5.5 V
NL37WZ07	Triple Non–Inverting Buffer, Open Drain	US8	–40 to +85	1.65 to 5.5 V
NL37WZ14	Triple Schmitt Trigger Inverter	US8	–40 to +85	1.65 to 5.5 V
NL37WZ16	Triple Buffer	US8	–40 to +85	1.65 to 5.5 V
NL37WZ17	Triple Non–Inverting Schmitt Trigger Buffer	US8	–40 to +85	1.65 to 5.5 V

VCX One Gates

Ordering Suffixes: XV5T2 = SOT-553 (available in T & R only), G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
NL17SV00	Single 2-Input NAND Gate	SOT-553	-40 to +85	0.9 to 3.6 V
NL17SV02	Single 2-Input NOR Gate	SOT-553	-40 to +85	0.9 to 3.6 V
NL17SV04	Single Inverter	SOT-553	-40 to +85	0.9 to 3.6 V
NL17SV08	Single 2-Input AND Gate	SOT-553	-40 to +85	0.9 to 3.6 V
NL17SV16	Single Buffer	SOT-553	-40 to +85	0.9 to 3.6 V
NL17SV32	Single 2-Input OR Gate	SOT-553	-40 to +85	0.9 to 3.6 V

Low Voltage Standard Logic

VCX

Ordering Suffixes: DTR = TSSOP T & R, MNR2 = DFN, G = Pb-Free

Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
74VCXH245	8-Bit Bus Buffer (3-State, Bus Hold)	QFN-20	-40 to +85	1.65 to 3.6 V
74VCXH16245	16-Bit Bus Transceiver (3-State, Bus Hold)	TSSOP-48	-40 to +85	1.65 to 3.6 V

VHC

Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-Free

Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74VHC00	Quad 2-Input NAND Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT00A	Quad 2-Input NAND Gate (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC02	Quad 2-Input Positive-NOR Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT02A	Quad 2-Input Positive-NOR Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC04	Hex Inverter	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT04A	Hex Inverter (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHCU04	Hex Inverter (Unbuffered)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHC08	Quad 2-Input AND Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT08A	Quad 2-Input AND Gate, TTL Compatible	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC14	Hex Schmitt Trigger	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT14A	Hex Schmitt Trigger, TTL Compatible	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC32	Quad 2-Input OR Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT32A	Quad 2-Input OR Gate (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC50	Hex Buffer	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT50A	Hex Buffer (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC74	Dual D Flip-Flop w/Preset and Clear	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT74A	Dual D Flip-Flop w/Preset and Clear (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC86	Quad Exclusive-OR Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT86A	Quad 2-Input Exclusive-OR Gate (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC125	Quad Bus Buffer (3-State)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT125A	Quad Bus Buffer Gate (3-State) (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC126	Quad Bus Buffer (3-State)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT126A	Quad Bus Buffer Gate (3-State) (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC132	Quad 2-Input Schmitt NAND Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT132A	Quad 2-Input Schmitt NAND Gate	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC138	3-to-8 Line Decoder/Demultiplexer	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC74VHCT138A	3-to-8 Line Decoder (TTL Compatible)	SO-16, TSSOP-16, EIAJ-16	-55 to +125	4.5 to 5.5 V
MC74VHC139	Dual 2-to-4 Line Decoder/Demultiplexer	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC74VHCT139A	Dual 2-to-4 Line Decoder/Demultiplexer (TTL Compatible)	SO-16, TSSOP-16, EIAJ-16	-55 to +125	4.5 to 5.5 V
MC74VHC157	Quad 2-Channel Multiplexer	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC74VHCT157A	Quad 2-to-1 Data Selector/Multiplexer (TTL Compatible)	SO-16, TSSOP-16, EIAJ-16	-55 to +125	4.5 to 5.5 V
MC74VHC240	Octal Bus Buffer (3-State/Inverted)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT240A	Octal Bus Buffer (3-State/Inverted) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V

VHC (continued)

Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74VHC244	Octal Bus Buffer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT244A	Octal Bus Buffer (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC245	Octal Bus Transceiver (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT245A	Octal Bus Transceiver (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC257	Quad 2-Line to 1-Line Data Selectors/Multiplexer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT257A	Quad 2-to-1 Data Selectors/Mux (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC259	8-Bit Addressable Latch	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHCT259A	8-Bit Addressable Latch (TTL Compatible)	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74VHC373	Octal D-Type Latch (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT373A	Octal D-Type Latch (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC374	Octal D-Type Flip-Flop (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT374A	Octal D-Type Flip-Flop (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC540	Octal Bus Buffer (3-State/Inverted)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT540A	Octal Bus Buffer (3-State/Inverted) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC541	Octal Bus Buffer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT541A	Octal Bus Buffer (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC573	Octal D-Type Latch (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT573A	Octal D-Type Latch (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC574	Octal D-Type Flip-Flop (3-State)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74VHCT574A	Octal D-Type Flip-Flop (3-State) (TTL Compatible)	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74VHC4051	8-to-1 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC74VHC4052	Dual 4 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC74VHC4053	Triple 2 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC74VHC4066	Quad Analog Switch	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC74VHC4316	Quad Analog Switch w/Translator	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 5.5 V

LCX

Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74LCX00	Quad 2-Input NAND Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX02	Quad 2-Input Positive-NOR Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX04	Hex Inverter	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCXU04	Hex Inverter (Unbuffered)	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX06	Hex Inverter w/Open-Drain Output	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX07	Hex Buffer w/Open-Drain Output	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX08	Quad 2-Input AND Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX14	Hex Schmitt Trigger	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX32	Quad 2-Input OR Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX74	Dual D Flip-Flop w/Presets and Clear	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V

LCX (continued)

Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74LCX86	Quad Exclusive-OR Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX125	Quad Bus Buffer (3-State)	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LCX138	3-to-8 Line Decoder/Demultiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LCX139	Dual 2-to-4 Line Decoder/Demultiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LCX157	Quad 2-Channel Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LCX158	Quad 2-to-1 Data Selector/Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LCX240	Octal Bus Buffer (3-State/Inverted)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX244	Octal Bus Buffer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX245	Octal Bus Transceiver (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX257	Quad 2-Line To 1-Line Data Selectors/Multiplexer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX258	Quad 2-Line To 1-Line Data Selectors/Multiplexer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX373	Octal D-Type Latch (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX374	Octal D-Type Flip-Flop (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX540	Octal Bus Buffer (3-State/Inverted)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX541	Octal Bus Buffer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX573	Octal D-Type Latch (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX574	Octal D-Type Flip-Flop (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LCX16240	16-Bit Bus Buffer (3-State/Inverted)	TSSOP-48	-40 to +85	2.0 to 3.6 V
MC74LCX16244	16-Bit Bus Buffer (3-State)	TSSOP-48	-40 to +85	2.0 to 3.6 V
MC74LCX16245	16-Bit Bus Transceiver (3-State)	TSSOP-48	-40 to +85	2.0 to 3.6 V
MC74LCX16373	16-Bit D-Type Latch (3-State)	TSSOP-48	-40 to +85	2.0 to 3.6 V
MC74LCX16374	16-Bit D-Type Flip-Flop (3-State)	TSSOP-48	-40 to +85	2.0 to 3.6 V

LVX

Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74LVX00	Quad 2-Input NAND Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX02	Quad 2-Input Positive-NOR Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX04	Hex Inverter	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVXU04	Hex Inverter (Unbuffered)	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX08	Quad 2-Input AND Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX14	Hex Schmitt Trigger	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX32	Quad 2-Input OR Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX50	Hex Buffer	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX74	Dual D Flip-Flop w/Presets and Clear	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX86	Quad Exclusive-OR Gate	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX125	Non-Inverting Tri-State Buffer, Low Enable	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX126	Quad Bus Buffer	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX132	Quad 2-Input NAND Schmitt Trigger	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX138	3-to-8 Line Decoder/Demultiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX139	Dual 2-to-4 Line Decoder/Demultiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX157	Quad 2-Channel Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX240	Octal Bus Buffer (3-State/Inverted)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LVX244	Octal Bus Buffer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LVX245	Octal Bus Transceiver (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V

LVX (continued)

Ordering Suffixes: D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-Free, G = Pb-Free				
Part Number	Description	Surface Mount Packages	Temperature	Operating Voltage
MC74LVX257	Quad 2-Line to 1-Line Data Selectors/Multiplexer (3-State)	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX259	8-Bit Addressable Latch	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX373	Octal D-Type Latch (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LVX374	Octal D-Type Flip-Flop (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LVX540	Octal Inverting Bus Buffer	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.6 to 3.6 V
MC74LVX541	Octal Bus Buffer (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LVX573	Octal D-Type Latch (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LVX574	Octal D-Type Flip-Flop (3-State)	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 3.6 V
MC74LVXC3245	Octal Dual Supply Translating Bus Transceiver	SO-24W, TSSOP-24	-40 to +85	2.0 to 3.6 V
MC74LVX4051	8-to-1 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVXT4051	8-to-1 Channel Analog Multiplexer (TTL Compatible Inputs)	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX4052	Dual 4 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVXT4052	Dual 4 Channel Analog Multiplexer (TTL Compatible Inputs)	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX4053	Triple 2 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVXT4053	Triple 2 Channel Analog Multiplexer (TTL Compatible Inputs)	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX4066	Quad Analog Switch	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVXT4066	Quad Analog Switch (TTL Compatible Inputs)	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 3.6 V
MC74LVX4245	Octal Dual Supply Translating Bus Transceiver	SO-24W, TSSOP-24	-40 to +85	2.0 to 3.6 V
MC74LVX8051	8-to-1 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVXT8051	8-to-1 Channel Analog Multiplexer (TTL Compatible Inputs)	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVX8053	Triple 2 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V
MC74LVXT8053	Triple 2 Channel Analog Multiplexer	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 3.6 V

5.0 V and Greater Standard Logic

High Speed CMOS: HC

Ordering Suffixes: N = PDIP Rail, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, F = SOEIAJ Rail, FEL = SOEIAJ T & R, G = Pb-Free					
Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
MC74HC00A	Quad 2-Input NAND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC02A	Quad 2-Input Positive-NOR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC03A	Quad 2-Input NAND Gate (Open Drain)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC04A	Hex Inverter	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HCT04A	Hex Inverter (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74HCU04A	Hex Inverter (Unbuffered)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC08A	Quad 2-Input AND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC14A	Hex Schmitt Trigger	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HCT14A	Hex Schmitt Trigger Inverter (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74HC32A	Quad 2-Input OR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC74A	Dual D Flip-Flop w/Preset and Clear	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HCT74A	Dual D Flip-Flop w/ Preset and Clear (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	4.5 to 5.5 V
MC74HC86A	Quad Exclusive-OR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC125A	Quad Bus Buffer (3-State)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC126A	Quad Bus Buffer (3-State)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC132A	Quad 2-Input Schmitt NAND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC138A	3-to-8 Line Decoder/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HCT138A	Dual 2-to-4 Line Decoder/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	4.5 to 5.5 V
MC74HC139A	Dual 1-of-4 Decoder/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC157A	Quad 2-Channel Multiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC161A	Synchronous Binary Counter w/Asynchronous Clear	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC163A	Synchronous Binary Counter w/Asynchronous Clear	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC164A	8-Bit SIPO Shift Register	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC165A	8-Bit PISO Shift Register	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC174A	Hex D Flip-Flop w/Clear	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC175A	Quad D Flip-Flop w/Clear	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC240A	Octal Bus Buffer (3-State/Inverted)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HC244A	Octal Bus Buffer (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HCT244A	Octal Bus Buffer (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC245A	Octal Bus Transceiver (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V

High Speed CMOS: HC (continued)

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Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
MC74HCT245A	Octal Bus Transceiver (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC273A	Octal D-Type Flip-Flop	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 5.5 V
MC74HCT273A	Octal D-Type Flip-Flop w/Clear (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC373A	Octal D-Type Latch (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HCT373A	Octal D-Type Latch (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC374A	Octal D-Type Flip-Flop (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HCT374A	Octal D-Type Flip-Flop (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC390A	Dual Binary Counter w/ +2 +5 Sections	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC393A	Dual 4-Stage Binary Ripple Counter	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC540A	Octal Bus Buffer (3-State/Inverted)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HC541A	Octal Bus Buffer (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HCT541A	Octal Bus Buffer (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC573A	Octal D-Type Latch (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HCT573A	Octal D-Type Latch (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC574A	Octal D-Type Flip-Flop (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	2.0 to 6.0 V
MC74HCT574A	Octal D-Type Flip-Flop (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-55 to +125	4.5 to 5.5 V
MC74HC589A	8-Bit Shift Register	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC595A	8-Bit Shift Register/Latch (3-State)	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4020A	14-Stage Binary Ripple Counter	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4040A	12-Stage Binary Ripple Counter	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4046A	Phase Lock Loop	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4051A	8-to-1 Channel Analog Multiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4052A	Dual 4 Channel Analog Multiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4053A	Triple 2 Channel Analog Multiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4060A	14-Stage Binary Ripple Counter w/Oscillator	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4066A	Quad Analog Switch	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 6.0 V
MC74HC4316A	Quad Analog Switch w/Translator	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V

High Speed CMOS: HC (continued)

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Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
MC74HC4538A	Dual Re-triggerable Precision Monostable Multivibrator	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4851A	8-to-1 Channel Analog Multiplexer w/Inj Current Control	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V
MC74HC4852A	Dual 4 Channel Analog Multiplexer w/Inj Current Control	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	2.0 to 6.0 V

AC/ACT

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Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
MC74AC00	Quad 2-Input NAND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT00	Quad 2-Input NAND Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC02	Quad 2-Input NOR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT02	Quad 2-Input NOR Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC04	Hex Inverter	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT04	Hex Inverter (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC05	Hex Inverter w/Open-Drain Output	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT05	Hex Inverter w/Open-Drain Output (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC08	Quad 2-Input AND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT08	Quad 2-Input AND Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC10	Triple 3-Input NAND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT10	Triple 3-Input NAND Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC11	Triple 3-Input AND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT11	Triple 3-Input AND Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC14	Hex Schmitt Trigger	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT14	Hex Schmitt Trigger Inverter (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC20	Dual 4-Input NAND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT20	Dual 4-Input NAND Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC32	Quad 2-Input OR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT32	Quad 2-Input OR Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC74	Dual D Flip-Flop w/Preset and Clear	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT74	Dual D Flip-Flop w/Preset and Clear (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V

AC/ACT (continued)

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MC74AC86	Quad Exclusive-OR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT86	Quad 2-Input Exclusive-OR Gate (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC125	Quad Bus Buffer (3-State)	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT125	Quad Bus Buffer Gate (3-State) (TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC132	Quad 2-Input NAND Gate (Schmitt-Trigger)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	2.0 to 6.0 V
MC74ACT132	Quad 2-Input NAND Gate (Schmitt-Trigger, TTL Compatible)	DIP-14	SO-14, TSSOP-14, EIAJ-14	-40 to +85	4.5 to 5.5 V
MC74AC138	3-to-8 Line Decoder/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT138	3-to-8 Line Decoder (TTL Compatible)	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74AC139	Dual 2-to-4 Line Decoder/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT139	Dual 2-to-4 Line Decoder/DeMultiplexer (TTL Compatible)	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74ACT153	Dual 4-Input Multiplexer, TTL Compatible Inputs	DIP-16	SO-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74AC157	Quad 2-Channel Multiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT157	Quad 2-to-1 Data Selector/Multiplexer (TTL Compatible)	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74AC161	Synchronous Presettable Binary Counter	DIP-16	SO-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT161	Synchronous Presettable Binary Counter, TTL Compatible Inputs	DIP-16	SO-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74AC163	Synchronous Presettable Binary Counter	DIP-16	SO-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT163	Synchronous Presettable Binary Counter, TTL Compatible Inputs	DIP-16	SO-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74AC240	Octal Bus Buffer (3-State/Inverted)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT240	Octal Bus Buffer (3-State/Inverted) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74ACT241	Octal Bus Buffer (3-State/Non-Inverted) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC244	Octal Bus Buffer (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT244	Octal Bus Buffer (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC245	Octal Bus Transceiver (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT245	Octal Bus Transceiver (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC253	Dual 4-Input Multiplexer w/3-State Outputs	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT253	Dual 4-Input Multiplexer w/3-State Outputs	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	4.5 to 5.5 V

AC/ACT (continued)

Ordering Suffixes: N = PDIP Rail, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, M = SOEIAJ Rail, MEL = SOEIAJ T & R, G = Pb-Free					
MC74AC257	Quad 2-Line to 1-Line Data Selectors/Multiplexer (3-State)	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT257	Quad 2-to-1 Data Selectors/Mux (3-State) (TTL Compatible)	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74AC259	8-Bit Addressable Latch	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V
MC74ACT259	8-Bit Addressable Latch	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	4.5 to 5.5 V
MC74AC273	Octal D-Type Flip-Flop	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT273	Octal D-Type Flip-Flop w/Clear (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC373	Octal D-Type Latch (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT373	Octal D-Type Latch (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC374	Octal D-Type Flip-Flop (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT374	Octal D-Type Flip-Flop (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC377	Octal D-Type Flip-Flop w/Data Enable (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT377	Octal D-Type Flip-Flop w/Data Enable (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC540	Octal Bus Buffer (3-State/Inverted)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT540	Octal Bus Buffer (3-State/Inverted) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC541	Octal Bus Buffer (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT541	Octal Bus Buffer (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74ACT564	Octal D-Type Latch w/3-State Outputs (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC573	Octal D-Type Latch (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT573	Octal D-Type Latch (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC574	Octal D-Type Flip-Flop (3-State)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	2.0 to 6.0 V
MC74ACT574	Octal D-Type Flip-Flop (3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74ACT640	Octal Bus Transceiver (Inverting, 3-State) (TTL Compatible)	DIP-20	SO-20W, TSSOP-20, EIAJ-20	-40 to +85	4.5 to 5.5 V
MC74AC646	Octal Bus Transceiver/Register (3-State)	DIP-24	SO-24W, TSSOP-24, EIAJ-24	-40 to +85	2.0 to 6.0 V
MC74ACT646	Octal Bus Transceiver/Register (3-State) (TTL Compatible)	DIP-24	SO-24W, TSSOP-24, EIAJ-24	-40 to +85	4.5 to 5.5 V
MC74AC652	Octal Bus Transceiver/Register (3-State)	DIP-24	SO-24W, TSSOP-24, EIAJ-24	-40 to +85	2.0 to 6.0 V
MC74ACT652	Octal Bus Transceiver/Register (3-State) (TTL Compatible)	DIP-24	SO-24W, TSSOP-24, EIAJ-24	-40 to +85	4.5 to 5.5 V
MC74AC4040	12-Stage Binary Ripple Counter	DIP-16	SO-16, TSSOP-16, EIAJ-16	-40 to +85	2.0 to 6.0 V

Metal Gate CMOS

Ordering Suffixes: CP = PDIP, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, F = SOEIAJ Rail, FEL = SOEIAJ T & R, G = Pb-Free					
Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
MC14001B	Quad 2-Input NOR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14001UB	Quad 2-Input NOR Gate Unbuffered	DIP-14	SO-14	-55 to +125	3.0 to 18 V
MC14007UB	Dual Complementary Pair plus Inverter	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14008B	4-Bit Full Adder	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14011B	Quad 2-Input NAND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14011UB	Quad 2-Input NAND Gate Unbuffered	DIP-14	SO-14	-55 to +125	3.0 to 18 V
MC14012B	Dual 4-Input NAND Gate	DIP-14	SO-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14013B	Dual D Flip-Flop	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14014B	8-Bit Static Shift Register	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14015B	Dual 4-Bit Static Shift Register	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14016B	Quad Analog Switch/Multiplexer	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14017B	Decade Counter	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14018B	Presetable Divide-by-N Counter	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14020B	14-Bit Binary Counter	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14021B	8-Bit Static Shift Register	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14022B	Octal Counter	DIP-16	SO-16	-55 to +125	3.0 to 18 V
MC14023B	Triple 3-Input NAND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14024B	7-Stage Ripple Counter	DIP-14	SO-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14025B	Triple 3-Input NOR Gate	DIP-14	SO-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14027B	Dual J-K Flip-Flop	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14028B	BCD-to-Decimal/Binary-to-Octal Decoder	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14029B	Presetable Binary/BCD Up/Down Counter	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14040B	12-Stage Ripple-Carry Binary Counter/Divider	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14042B	Quad Clocked D-Latch	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14043B	Quad NOR R-S Latch	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14044B	Quad NAND R-S Latch	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14046B	Phase-Locked Loop	DIP-16	SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14049B	Hex Inverter	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14049UB	Hex Inverter Unbuffered	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14050B	Hex Buffer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V

Metal Gate CMOS (continued)

Ordering Suffixes: CP = PDIP, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, F = SOEIAJ Rail, FEL = SOEIAJ T & R, G = Pb-Free					
Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
MC14051B	8-Channel Analog Multiplexer/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14052B	Dual 4-Channel Analog Multiplexer/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14053B	Triple 2-Channel Analog Multiplexer/Demultiplexer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14060B	14-Stage Binary Counter/Oscillator	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14066B	Quad Analog Switch	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14067B	16-Channel Analog Multiplexer/Demultiplexer	DIP-24	SO-24W, TSSOP-24	-55 to +125	3.0 to 18 V
MC14069UB	Hex Inverter	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14070B	Quad 2-Input Exclusive-OR Gate	DIP-14	SO-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14071B	Quad 2-Input OR Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14073B	Triple 3-Input AND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14076B	Quad D-Type Register w/3-State Outputs	DIP-24	SO-24	-55 to +125	3.0 to 18 V
MC14077B	Quad 2-Input Exclusive-NOR Gate	DIP-14	SO-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14081B	Quad 2-Input AND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14082B	Dual 4-Input AND Gate	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14093B	Quad 2-Input Schmitt Trigger NAND	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	3.0 to 18 V
MC14094B	8-Stage Shift/Store Register w/3-State Outputs	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14099B	8-Bit Addressable Latch	DIP-16	SO-16W	-55 to +125	3.0 to 18 V
MC14106B	Hex Schmitt Trigger	DIP-14	SO-14, TSSOP-14	-55 to +125	3.0 to 18 V
MC14174B	Hex D Flip-Flop	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14175B	Quad D Flip-Flop	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14490	Hex Contact Bounce Eliminator	DIP-16	SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14503B	Hex 3-State Buffer	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14504B	TTL or CMOS to CMOS Hex Level Shifter	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14511B	BCD-to-7 Segment Latch/Decoder/Driver	DIP-16	SO-16, SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14512B	8-Channel Data Selector	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14513B	BCD-to-7 Segment Latch/Decoder/Driver w/Ripple Blanking	DIP-18	N/A	-55 to +125	3.0 to 18 V
MC14514B	4-Bit Transparent Latch/4-to-16 Line Decoder (High)	DIP-24	SO-24W	-55 to +125	3.0 to 18 V
MC14515B	4-Bit Transparent Latch/4-to-16 Line Decoder (Low)	DIP-24	SO-24W	-55 to +125	3.0 to 18 V
MC14516B	Presetable Binary Up/Down Counter	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V

Metal Gate CMOS (continued)

Ordering Suffixes: CP = PDIP, D = SOIC Rail, DR2 = SOIC T & R, DW = SOICW Rail, DWR2 = SOICW T & R, DT = TSSOP Rail, DTR2 = TSSOP T & R, F = SOEIAJ Rail, FEL = SOEIAJ T & R, G = Pb-Free					
Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
MC14517B	Dual 64-Bit Static Shift Register	DIP-16	SO-16W	-55 to +125	3.0 to 18 V
MC14518B	Dual BCD Up Counter	DIP-16	SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14520B	Dual Binary Up Counter	DIP-16	SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14521B	24-Stage Frequency Divider	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14526B	Presetable 4-Bit Binary Down Counter	DIP-16	SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14528B	Dual Monostable Multivibrator	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14532B	8-Bit Priority Encoder	DIP-16	SO-16, EIAJ-16,	-55 to +125	3.0 to 18 V
MC14536B	Programmable Timer	DIP-16	SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14538B	Dual Precision Monostable Multivibrator	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14541B	Programmable Oscillator/Timer	DIP-16	SO-16, TSSOP-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14543B	BCD-to-7 Segment Latch/Decoder/Driver for LCD	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14549B	Successive Approximation Register	DIP-16	SO-16W	-55 to +125	3.0 to 18 V
MC14551B	Quad 2-Channel Analog Multiplexer/Demultiplexer	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14553B	3-Digit BCD Counter	DIP-16	SO-16W	-55 to +125	3.0 to 18 V
MC14555B	Dual Binary to 1-of-4 Decoder (Active High Outputs)	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14556B	Dual Binary to 1-or-4 Decoder/Demultiplexer	DIP-16	SO-16, EIAJ-16	-55 to +125	3.0 to 18 V
MC14557B	1-to-64 Bit Variable Length Shift Register	DIP-16	SO-16W, EIAJ-16	-55 to +125	3.0 to 18 V
MC14559B	Successive Approximation Register	DIP-16	SO-16W	-55 to +125	3.0 to 18 V
MC14562B	128-Bit Static Shift Register	DIP-14	N/A	-55 to +125	3.0 to 18 V
MC14569B	Programmable Dual 4-Bit Binary/BCD Down Converter	DIP-16	SO-16W, TSSOP-16	-55 to +125	3.0 to 18 V
MC14572UB	Hex Gate Unbuffered	DIP-16	SO-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC14584B	Hex Schmitt Trigger	DIP-14	SO-14, TSSOP-14, EIAJ-14	-55 to +125	2.0 to 5.5 V
MC14585B	4-Bit Magnitude Comparator	DIP-16	SO-16, EIAJ-16	-55 to +125	2.0 to 5.5 V
MC14598B	8-Bit Bus-Compatible Addressable Latch	DIP-18	N/A	-55 to +125	2.0 to 5.5 V

Logic Special Functions

Part Number	Description	Dual-In-Line Packages	Surface Mount Packages	Temperature	Operating Voltage
JLC1562	I2C Bus I/O Expander	DIP-16	EIAJ-16	-40 to +85	4.2 to 6.0 V
NL7SZ18	2:1 Digital MUX, 3-State Output		SC-88	-40 to +85	1.65 to 5.5 V
NL7SZ19	2:1 Digital MUX		SC-88	-40 to +85	1.65 to 5.5 V
NLSF1174	Hex D Flip-Flop with Clear		QFN-16, 3x3mm	-55 to +125	2.0 to 6.0 V
NLSF2500	Keypad Multiplexer		QFN-16, 3x3mm	-40 to +85	1.5 to 5.5 V
NLSF3T125	Quad Bus Buffer, TTL Compatible		QFN-16, 3x3mm	-40 to +85	2.5 to 5.5 V
NLSF3T126	Quad Bus Buffer, TTL Compatible		QFN-16, 3x3mm	-40 to +85	2.5 to 5.5 V
NLSF595	Serial (SPI) Tri-Color LED Driver		TSSOP-16, SOIC-16, QFN-16	-55 to +125	2.0 to 5.5 V

High-Speed CMOS Product Designation Definitions

HC vs. HCT

ON Semiconductor's High-Speed CMOS product family, intended to give the designer an alternative to LSTTL. HSCMOS, with the faster speed advantage over metal-gate CMOS (MC14000 series) and the lower power consumption advantage over LSTTL, is an optimum choice for midrange designs. With the availability of high-speed CMOS microprocessors and memories, the ability to design a 100% CMOS system is possible.

HCT devices offer a short-term solution to the TTL/NMOS-to-CMOS interface problem. To achieve this interface capability, some CMOS advantages had to be compromised. These compromises include power consumption, operating voltage range, and noise immunity.

In most cases HCT devices are drop-in replacements of TTL devices with significant advantages over the TTL devices. However, in some cases, an equivalent HCT device may not replace a TTL device without some form of circuit modification.

Designers can use HCT devices to perform logic level conversions only. In newer designs, the designer wants all the advantages of a true CMOS system and designs using only HC devices.

“A” versus “Non-A”

“A” Versus “Non-A” — ON Semiconductor has a device performance enhancement program for the High-Speed CMOS family. This is indicated by an “A” suffix on the device identification. Some of the characteristics of this “A” enhancement program are improved design, a better quality process, faster performing AC propagation delays and enhancements to various DC characteristics.

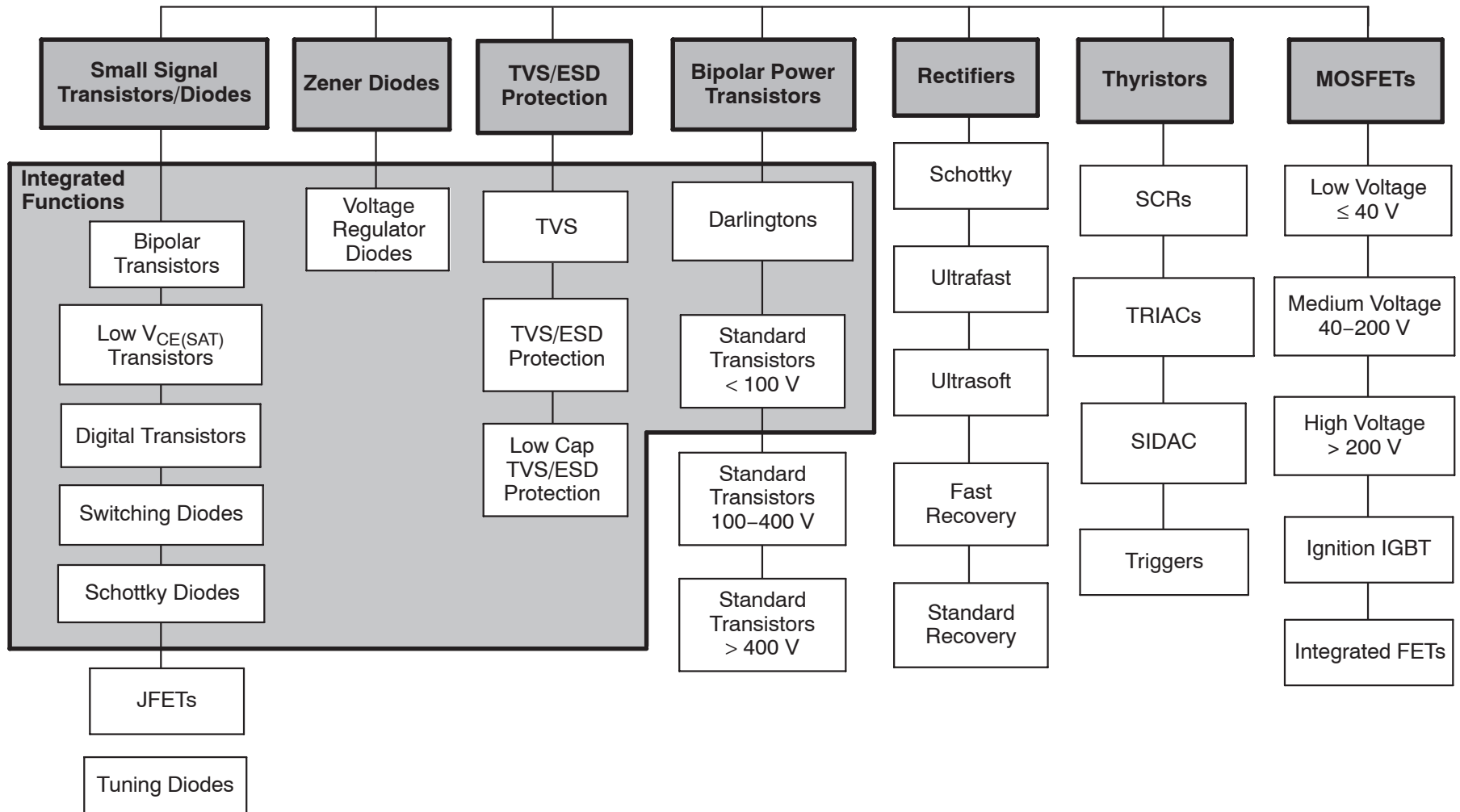
The old “Non-A” process was a 5 micron process that was modified to run a 3.5 micron family. The new “A” process is a true 3 micron process and gives better process control, with improved performance and quality.

Please see the specific device data sheet for “A” designation parameters.

Discretes

Small Signal
Zeners
TVS/ESD Protection
Bipolar
Rectifiers
Thyristors

Discrete Products Family Tree



Small-Signal

Bipolar Transistors, JFETs, and Diodes

In Brief . . .

This section highlights semiconductors that are the most popular and have a history of high usage for most applications.

It covers a wide range of Small-Signal semi-conductors. A large selection of bipolar transistors, JFETs and diodes are available for surface mount and insertion assembly technology.

Small-Signal Package Cross-Reference Table

EIAJ	IEC	JEDEC	Other
	SOT-23		SST3, Micro3
SC-59	SOT-346		SMT3, MPAK, Mini3, S-Mini
SC-70	SOT-323	USM, S-Mini3	UMT3, CMPAK
SC-75, SC-90	SOT-416	SOT-523, SS-Mini3, SSM	EMT3, SMPAK
SC-89	SOT-490	SOT-523, SS-Mini3	EMT3, FL/ESM
	SOT-723		VMT3, 3SS-Mini3, VSM, TSFP-3
SC-74	SOT-457	TSOP6	SMT6, SC-59-6, SOT-23-6
SC-74A		TSOP5	SMT5, SC-59-5, SOT-23-5
SC-88	SOT-363		UMT6, SC-70-6
SC-88A	SOT-353		UMT5, SC-70-5
	SOT-563		EMT6, SOT-666
	SOT-553		EMT5, SOT-665
SC-77	SOD-123		SMD2
SC-76	SOD-323		UMD2, URP, USC
SC-79	SOD-523		EMD2, UFP, SS-Mini2, ESC
	SOD-723		VMD2
	SOD-923		VMN2
SC-62	SOT-89		MPT3, UPAK
SC-73	SOT-223		
SC-43	SOT-54	TO-92	SPT

BOLD denotes an ON Semiconductor package name.

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Bipolar Transistors

General-Purpose Transistors

NPN	PNP	V _{(BR)CEO}	I _C mA Max	h _{FE}		f _T MHz Min	NF dB Max	Package
				Min	Max			
BC449	–	100	300	50	460	100	–	 TO-226AA, TO-92 Case 29-11
BC449A	–	100	300	120	220	100	–	
BC447	–	80	500	50	460	100	–	
MPS8099	MPS8599	80	500	100	300	150	–	
MPSA06	MPSA56	80	500	100	–	100	–	
–	MPS6729	80	500	50	250	–	–	
BC489	BC490	80	1000	60	400	200/150 (Typ)	0.3/0.5	
BC639	BC640	80	500	40	160	60	0.5	
BC489A	BC490A	80	1000	100	250	100	0.5	
BC489B	–	80	1000	160	400	100	0.5	
BC639-16	BC640-16	80	1000	100	250	60	0.5	
BC546B	BC556B	65	100	180	450	150	10	
BC487B	BC488B	60	500	160	400	–	–	
MPSA05	MPSA55	60	500	100	–	100	–	
–	MPS2907A	60	600	100	300	200	–	
MPS651	MPS751	60	2000	75	–	75	0.5	
BC637	BC638	60	500	40	160	–	0.5	
–	2N5087	50	50	250	800	40	2.0	
BC182	–	50	100	120	500	200 (Typ)	10	
BC182A	–	50	100	120	260	200	10	
BC182B	BC212B	50	100	200	500	200	10	
BC237	–	45	100	120	800	150	10	
BC237B	BC307B	45	100	200	460	150	10	
BC237C	BC307C	45	100	380	800	150	10	
BC337	BC327	45	800	100	630	210 (Typ)	–	
BC337-16	BC327-16	45	800	100	250	260 (Typ)	–	
BC337-25	BC327-25	45	800	160	400	260 (Typ)	–	
BC337-40	BC327-40	45	800	250	630	260 (Typ)	–	
BC550C	BC560C	45	100	380	800	250 (Typ)	2.5	
BC547A	BC557A	45	100	120	220	150	10	
BC547B	BC557B	45	100	180	450	150	10	
BC547C	BC557C	45	100	380	800	150	10	
MPSA18	–	45	200	500	–	100	1.5	
BC635	–	45	500	40	250	200/150 (Typ)	–	
MPSA20	–	40	100	40	400	125	–	
MPS2222A	–	40	600	100	300	300	–	
2N4401	2N4403	40	600	100	300	200	–	
MPS6602	MPS6652	40	1000	50	–	100	–	
2N3904	2N3906	40	200	100	300	250	5.0	
–	MPS4250	40	–	250	800	–	2.0	
–	MPSA70	40	100	40	400	125	–	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

General-Purpose Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
BC548B	BC558B	30	100	200	450	300 (Typ)	10	 TO-226AA, TO-92 Case 29-11
BC548C	BC558C	30	100	420	800	300	10	
BC549C	–	30	100	420	800	–	–	
MPS2222	–	30	600	100	300	250	–	
2N5088	–	30	50	350	–	50	3.0	
2N5089	–	25	50	450	–	50	2.0	
2N4124	–	25	200	120	360	300	–	
BC239C	–	25	100	380	800	150	4.0	
BC338–25	–	25	800	160	400	150	–	
MPS4124	–	25	200	120	360	170	5.0	
–	MPS4126	25	200	120	360	170	4.0	
MPS5172	–	25	100	100	500	–	–	
MPS6521	MPS6523	25	100	300	600	–	3.0	
BC368	BC369	20	1000	60	–	65	0.5	
MPS3646	–	15	300	15	–	350	–	
–	MPS6729	80	500	50	250	–	–	 TO-226AE (1-WATT) TO-92 Case 29-10
MPSW06	MPSW56	80	500	80	–	50	–	
MPS6717	–	80	500	50	250	100	–	
MPSW05	MPSW55	60	500	60	–	50	250	
MPSW01A	MPSW51A	40	1000	50	–	50	–	
MPS6727	–	40	1000	50	250	–	–	
MPSW01	MPSW51	30	1000	50	–	50	–	
MPS6726	–	30	1000	50	250	–	–	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

General-Purpose Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
MMBT5550L	–	140	600	60	250	–	–	 TO-236AB, SOT-23 Case 318-08
–	BSS63L	100	100	30	–	50	–0.25	
BSS64L	–	80	100	20	–	60	0.15	
MMBT06L	MMBTA56L	80	500	100	–	100	–	
MMBT8099L	–	80	500	100	300	150	–	
BC846AL	–	65	100	110	220	100	10	
BC846BL	–	65	100	200	450	100	10	
–	BC856AL	65	100	125	250	100	10	
–	BC856BL	65	100	220	475	100	10	
–	MMBT2907AL	60	600	100	300	200	–	
MMBT2484L	–	60	50	250	–	–	3.0	
MMBTA05L	–	60	500	100	–	100	–	
–	MMBTA55L	60	500	100	–	50	–	
MMBT6428L	–	50	200	250	–	100	3.0 (Typ)	
–	MMBT5087L	50	50	250	–	40	2.0	
MMBT6429L	–	45	200	500	–	100	3.0 (Typ)	
BC817-16L	–	45	500	100	250	100	–	
BC817-25L	–	45	500	160	400	100	–	
BC817-40L	–	45	500	250	600	100	–	
–	BC807-16L	45	500	100	250	100	–	
–	BC807-25L	45	500	160	400	100	–	
–	BC807-40L	45	500	250	600	100	–	
BC847AL	–	45	100	110	220	100	10	
BC847BL	–	45	100	200	450	100	10	
BC847CL	–	45	100	420	800	100	10	
BC850BL	–	45	100	200	450	100	4.0	
BC850CL	–	45	100	420	800	100	4.0	
–	BC857AL	45	100	125	250	100	10	
–	BC857BL	45	100	220	475	100	10	
–	BC857CL	45	100	420	800	100	10	
–	BCW68GL	45	800	120	400	100	10	
–	BCW70L	45	100	215	500	–	10	
BCW72L	–	45	100	200	450	300	10	
–	BCX17L	45	500	100	600	–	–	
BCX19L	–	45	500	100	600	–	–	
MMBT2222AL	–	40	600	100	300	300	4.0	
MMBT3904L	–	40	200	100	300	200	5.0	
–	MMBT3906L	40	200	100	300	250	4.0	
MMBT4401L	–	40	600	100	300	250	–	
–	MMBT4403L	40	600	100	300	200	–	
MMBT3416LT3	–	40	100	75	225	–	–	
MMBTA20L	–	40	100	40	400	125	–	
–	MMBTA70L	40	100	40	400	125	–	
–	BCW30L	32	100	215	500	–	10	
BCW32L	–	32	100	200	450	–	10	
BCW65AL	–	32	800	100	250	100	10	
BCW65CL	–	32	100	250	630	100	10	
BC848AL	–	30	100	110	220	100	10	
BC848BL	–	30	100	200	450	100	10	
BC848CL	–	30	100	420	800	100	10	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

General-Purpose Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
<i>BC849BL</i>	–	30	100	200	450	100	4.0	 TO-236AB, SOT-23 Case 318-08
<i>BC849CL</i>	–	30	100	420	800	100	4.0	
MMBT489L	–	30	1000	300	900	100	–	
–	MMBT589L	30	1000	100	300	100	–	
–	<i>BC858AL</i>	30	100	125	250	100	10	
–	<i>BC858BL</i>	30	100	220	475	100	10	
–	<i>BC858CL</i>	30	100	420	800	100	10	
–	<i>BC859BL</i>	30	100	220	475	100	4.0	
–	<i>BC859CL</i>	30	100	420	800	100	4.0	
<i>MMBT5088L</i>	–	30	50	300	900	5	3.0	
MMBT2222L	–	30	600	100	300	250	4.0	
MMBT6521L	–	25	100	300	600	–	–	
<i>MMBT5089L</i>	–	25	50	400	1200	50	2.0	
<i>MMBT4124L</i>	–	25	200	120	360	300	5.0	
BC818-40L	–	25	500	250	600	100	–	
–	BCX18L	25	500	100	600	–	–	
–	MMBT4126L	25	200	120	300	250	4.0	
–	BC808-25L	25	500	160	400	100	–	
–	BC808-40L	25	500	250	600	100	–	
BCW33L	–	20	100	420	800	–	10	
<i>MSD601-R</i>	–	50	100	210	340	–	–	 SC-59 Case 318D-04
<i>MSD602-R</i>	–	50	500	120	240	–	–	
<i>MSC2712G</i>	–	50	100	200	400	–	–	
–	2SA1162G	50	150	200	400	90	–	
–	2SA1162Y	50	150	120	240	80	–	
–	<i>MSA1162G</i>	50	100	200	400	–	–	
MSC2712Y	–	50	100	120	240	–	–	
–	<i>MSA1162Y</i>	50	100	120	240	–	–	
–	<i>MSB710-R</i>	50	500	120	240	–	–	
–	<i>MSB709-R</i>	45	100	210	340	–	–	
MSD1328-R	–	20	500	200	350	–	–	
MSD1328-S	–	20	500	300	500	–	–	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

General-Purpose Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
MMBTA06W	MMBTA56W	80	500	100	–	100	–	 SC-70, SOT-323 Case 419-04
BC846AW	–	65	100	110	220	100	10	
BC846BW	–	65	100	200	450	100	10	
–	BC856BW	65	100	220	475	100	10	
–	MMBT2907AW	60	600	100	–	200	–	
MSD1819A-R	–	50	100	210	340	–	–	
2SC4081R	2SA1576AR	50	100	180	390	–	–	
BC847AW	–	45	100	110	220	100	10	
BC847BW	–	45	100	200	450	100	10	
BC847CW	–	45	100	420	800	100	4.0	
–	BC857BW	45	100	220	475	100	10	
–	BC857CW	45	100	420	800	100	10	
–	MSB1218A-R	45	100	210	340	–	–	
MMBT4401W	–	40	600	100	300	250	–	
–	MMBT4403W	40	600	100	300	200	–	
MMBT2222AW	–	40	600	100	300	300	4.0	
MMBT3904W	–	40	200	100	300	300	5.0	
–	MMBT3906W	40	200	100	300	250	4.0	
BC848AW	–	30	100	110	220	100	10	
BC848BW	–	30	100	200	450	100	10	
BC848CW	–	30	100	420	800	100	4.0	
–	BC858AW	30	100	110	220	100	10	
–	BC858BW	30	100	200	450	100	10	
MSC3930-B	–	20	30	70	140	150	–	
2SC4617	–	50	100	120	560	180 (Typ)	–	 SOT-416, SC-75, SC-90 Case 463-01
–	2SA1774	50	100	120	560	140 (Typ)	–	
BC847BT	–	45	100	200	450	100	10	
BC847CT	–	45	100	420	800	100	4.0	
–	BC857BT	45	100	220	475	100	10	
MMBT3904T	–	40	200	100	300	300	5.0	
–	MMBT3906T	40	200	100	300	250	4.0	
MMBT2222AT	–	40	600	100	300	300	4.0	
–	2SA2029BM3	50	100	120	560	140 (Typ)	–	 SOT-723 Case 631AA-01
–	BC856BM3	45	100	220	475	100	10	
–	MMBT2907AM3	60	600	100	–	200	–	
BC846BM3	–	65	100	200	450	100	10	
2SC5658BM3	–	50	100	120	560	180 (Typ)	–	
BC847BM3	–	45	100	200	450	100	10	
BC847CM3	–	45	100	420	800	100	10	
–	–	40	600	100	300	300	4.0	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

General-Purpose Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
<i>BCP56</i>	<i>BCP53</i>	80	1000	40	250	50 (Typ)	–	 SOT-223 Case 318E-04
<i>BCP56-10</i>	<i>BCP53-10</i>	80	1000	63	160	50 (Typ)	–	
<i>BCP56-16</i>	<i>BCP53-16</i>	80	1000	100	250	50 (Typ)	–	
–	<i>PZT2907A</i>	60	600	100	300	200	–	
<i>PZT651</i>	<i>PZT751</i>	60	2000	75	–	75	–	
<i>PZT2222A</i>	–	40	600	100	300	300	–	
<i>BCP68</i>	<i>BCP69</i>	25	1000	85	375	60 (Typ)	–	
MMBT2132	MMBT2131	30	700	150	–	–	–	 SO-74 Case 318F-05
–	MBT35200M	35	2000	100	400	100	–	 TSOP-6 SINGLE Case 318G-02
–	MMBT6589	30	1000	100	300	100	–	
NST489AM	–	30	3000	300	900	200	–	
–	NSL12AW	12	2000	100	300	100	–	 SC-88, SOT-363 Case 419B-02

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

General-Purpose Multiple Transistors

Device	Type	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
<i>BC846BDW1</i>	Dual NPN	65	100	200	450	100	10	 SC-88, SOT-363 Case 419B-02
<i>BC856BDW1</i>	Dual PNP	65	100	220	475	100	10	
<i>BC846BPDW1</i>	Dual Complementary	65	100	200	475	100	10	
<i>BC847BDW1</i>	Dual NPN	45	100	200	290	100	10	
<i>BC847CDW1</i>	Dual NPN	45	100	420	520	100	4.0	
<i>BC857BDW1</i>	Dual PNP	45	100	220	290	100	10	
<i>BC857CDW1</i>	Dual PNP	45	100	420	520	100	10	
<i>BC847BPDW1</i>	Dual Complementary	45	100	200	290	100	10	
<i>MBT3904DW1</i>	Dual NPN	40	200	100	300	300	5.0	
<i>MBT3906DW1</i>	Dual PNP	40	200	100	300	250	4.0	
<i>MBT3946DW1</i>	Dual Complementary	40	200	100	300	250	5.0/4.0	
<i>MBT2222ADW1</i>	Dual NPN	40	600	100	300	300	4.0	
MBT6429DW1		45	200	500	1250	100	–	
UMZ1N		50	200	200	400	114 (Typ)	–	
<i>BC848CDW1</i>	Dual NPN	30	100	420	250	100	4.0	
<i>BC858CDW1</i>	Dual PNP	30	100	420	520	100	10	
<i>BC848CPDW1</i>	Dual Complementary	30	100	420	520	100	4.0/10	
<i>BC847CDXV6</i>	NPN	45	100	420	520	100	–	 SOT-563 Case 463A-01
EMDXV6		60	100	120	560	140 (Typ)	–	
EMT2DXV6		60	100	120	560	140 (Typ)	–	
EMX1DXV6		50	100	120	560	180 (Typ)	–	
EMX2DXV6		50	100	120	560	180 (Typ)	–	
EMZ1DXV6		60	100	120	560	140 (Typ)	–	
<i>BC847BPDXV6</i>	Complementary	45	100	200	290	100	–	
<i>NST3904DXV6</i>	NPN	40	200	100	300	300	–	
<i>NST3906DXV6</i>	PNP	40	200	100	300	250	–	
<i>NST3946DXV6</i>	Complementary	40	200	100	300	250	–	
<i>BC848CDXV6</i>	NPN	30	100	420	250	100	–	
<i>BC858CDXV6</i>	PNP	30	100	420	520	100	–	
HN1B01FDW1	Complimentary	50	200	200	400	–	–	 SO-74 Case 318F-05

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors

Low Noise and Good h_{FE} Linearity

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
–	2N5087	50	50	250	800	40	2.0	 TO-226AA, TO-92 Case 29-11 (Note 1)
BC550C	BC560C	45	100	380	800	250 (Typ)	2.5	
MPSA18	–	45	200	500	–	100	1.5	
2N5088	–	30	50	350	–	50	3.0	
2N5089	–	25	50	450	–	50	2.0	
MPS6521	MPS6523	25	100	300	600	–	3.0	
MMBT2484L	–	60	50	250	–	–	3.0	 TO-236AB, SOT-23 Case 318-08
MMBT6428L	–	50	200	250	–	100	3.0 (Typ)	
–	MMBT5087L	50	50	250	–	40	2.0	
MMBT6429L	–	45	200	500	–	100	3.0 (Typ)	
MMBT5088L	–	30	50	300	900	5	3.0	
MMBT5089L	–	25	50	400	–	50	2.0	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

1. N_F : Noise Figure at $R_S = 2.0\text{ k}\Omega$, $I_C = 200\text{ }\mu\text{A}$, $V_{CE} = 5.0\text{ Volts}$. $f = 30\text{ Hz to }15\text{ kHz}$.

Darlington Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
MPSW45A	–	50	1000	25K	150K	100	1.5	 TO-226AE (1-WATT) TO-92 Case 29-10
MPS6725	–	50	1000	4000	40000	–	–	
MPSW45	–	40	1000	25K	150K	100	1.5	
MPS6724	–	40	1000	4000	40000	–	–	
–	MPSW63	30	500	10K	–	125	1.5	
MPSW13	–	30	1000	10K	–	125	1.5	
MPSA29	–	100	500	10K	–	125	1.5	 TO-226AA, TO-92 Case 29-11
BC372	–	100	1000	10K	160K	100	1.1	
BC373	–	80	1000	10K	160K	100	1.1	
MPSA27	MPSA77	60	500	10K	–	–	1.5	
BC618	–	55	1000	10K	50K	150	1.1	
–	MPSA75	40	500	10K	–	–	1.5	
2N6427	–	40	500	20K	200K	–	1.5	
2N6426	–	40	500	30K	300K	125	1.5	
MPSA14	MPSA64	30	500	20K	–	125	1.5	
MPSA13	MPSA63	30	500	10K	–	125	1.5	
BC517	–	30	1000	30K	–	200 (Typ)	1.0	
MMBT6427L	–	40	500	20000	200000	–	10	 TO-236AB, SOT-23 Case 318-08
MMBTA14L	MMBTA64L	30	300	20K	–	125	–	
MMBTA13L	–	30	300	10000	–	125	–	
–	MMBTA63L	30	500	10000	–	125	–	
BSP52	–	80	1000	2000	–	–	–	 SOT-223 Case 318E-04

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

High Current Transistors (≥ 500 mA)

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
BC489	BC490	80	1000	60	400	200/150 (Typ)	0.3/0.5	 TO-226AA, TO-92 Case 29-11
BC639	BC640	80	500	40	160	60	0.5	
BC489A	BC490A	80	1000	100	250	100	0.5	
BC489B	–	80	1000	160	400	100	0.5	
BC639-16	BC640-16	80	1000	100	250	60	0.5	
BC447	–	80	500	50	460	100	–	
MPS8099	MPS8599	80	500	100	300	150	–	
MPSA06	MPSA56	80	500	100	–	100	–	
–	MPS6729	80	500	50	250	–	–	
MPS651	MPS751	60	2000	75	–	75	0.5	
BC637	BC638	60	500	40	160	–	0.5	
BC487	–	60	500	60	400	–	–	
BC487B	BC488B	60	500	160	400	–	–	
MPSA05	MPSA55	60	500	100	–	100	–	
MPS8098	–	60	500	100	300	150	–	
–	MPS2907A	60	600	100	300	200	–	
–	P2N2907A	60	600	100	300	200	–	
–	PN2907A	60	600	100	300	200	–	
BC635	–	45	500	40	250	200/150 (Typ)	–	
BC337	BC327	45	800	100	630	210 (Typ)	–	
BC337-16	BC327-16	45	800	100	250	260 (Typ)	–	
BC337-25	BC327-25	45	800	160	400	260 (Typ)	–	
BC337-40	BC327-40	45	800	250	630	260 (Typ)	–	
MPS650	MPS750	40	2000	40	–	75	–	
MPS2222A	–	40	600	100	300	300	–	
2N4401	2N4403	40	600	100	300	200	–	
P2N2222A	–	40	600	100	300	300	–	
PN2222A	–	40	600	100	300	300	–	
MPS6602	MPS6652	40	1000	50	–	100	–	
PN2222	–	30	600	100	300	250	–	
MPS2222	–	30	600	100	300	250	–	
BC338-25	–	25	800	160	400	150	–	
MPS6560	–	25	500	50	200	60	–	
MPS6601	–	25	1000	50	–	100	–	
–	MPS3638A	25	500	20	–	150	–	
BC368	BC369	20	1000	60	–	65	0.5	
–	MPS6729	80	500	50	250	–	–	 TO-226AE (1-WATT) TO-92 Case 29-10
MPSW06	MPSW56	80	500	80	–	50	–	
MPS6717	–	80	500	50	250	100	–	
MPSW05	MPSW55	60	500	60	–	50	250	
MPSW01A	MPSW51A	40	1000	50	–	50	–	
MPS6727	–	40	1000	50	250	–	–	
MPSW01	MPSW51	30	1000	50	–	50	–	
MPS6726	–	30	1000	50	250	–	–	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

High Current Transistors (≥ 500 mA)

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
MMBT5550L	–	140	600	60	250	–	–	 TO-236AB, SOT-23 Case 318-08
MMBTA06L	MMBTA56L	80	500	100	–	100	–	
MMBT8099L	–	80	500	100	300	150	–	
–	MMBT2907AL	60	600	100	300	200	–	
MMBTA05L	–	60	500	100	–	100	–	
–	MMBTA55L	60	500	100	–	50	–	
–	BCW68GL	45	800	120	400	100	10	
BCW66GL	–	45	800	160	400	100	10	
–	BCX17L	45	500	100	600	–	–	
BCX19L	–	45	500	100	600	–	–	
MMBT2222AL	–	40	600	100	300	300	4.0	
MMBT4401L	–	40	600	100	300	250	–	
–	MMBT4403L	40	600	100	300	200	–	
BCW65AL	–	32	800	100	250	100	10	
MMBT2222L	–	30	600	100	300	250	4.0	
–	BCX18L	25	500	100	600	–	–	
BCP56	BCP53	80	1000	40	250	50 (Typ)	–	 SOT-223 Case 318E-04
BCP56-10	BCP53-10	80	1000	63	160	50 (Typ)	–	
BCP56-16	BCP53-16	80	1000	100	250	50 (Typ)	–	
–	PZT2907A	60	600	100	300	200	–	
PZT651	PZT751	60	2000	75	–	75	–	
PZT2222A	–	40	600	100	300	300	–	
BCP68	BCP69	25	1000	85	375	60 (Typ)	–	
MMBT2222AT	–	40	600	100	300	300	4.0	 SOT-416, SC-75, SC-90 Case 463-01
–	MMBT2907AW	60	600	100	–	200	–	 SC-70, SOT-323 Case 419-04
MMBT2222AW	–	40	600	100	300	300	4.0	
–	MSB92ASW	300	500	120	200	50	–	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

High Voltage Transistors (> 100 V)

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	NF dB Max	Package
				Min	Max			
–	BF493S	350	500	40	–	50	20	 TO-226AE (1-WATT) TO-92 Case 29-10
MPSW42	–	300	500	40	–	50	0.5	
–	MPSW92	300	500	25	–	50	0.5	
BF393	–	300	500	40	–	50	–	
2N5551	–	160	600	80	250	100	8.0	
–	2N5401	150	600	60	240	100	8.0	
BDC01DRL1	–	100	1500	40	400	50	–	 TO-226AA, TO-92 Case 29-11
MPSA44	–	400	300	50	200	–	–	
2N6517	2N6520	350	500	30	200	40	–	
MPSA42	–	300	500	40	–	50	0.5	
–	MPSA92	300	500	40	–	50	0.5	
BF420ZL1	BF421ZL1	300	500	50	–	60	–	
BF422	BF423	250	500	50	–	60	–	
MPSA43	–	200	500	40	–	50	–	
–	MPSA93	200	500	25	–	50	–	
2N5550	–	160	600	80	–	100	0.15	
–	2N5400	120	500	40	180	100	–	
2N6515	–	250	500	50	300	40	0.3	
MMBT6517L	–	350	500	15	–	40	–	 TO-236AB, SOT-23 Case 318-08
–	MMBT6520L	350	500	15	–	40	–	
MMBT42L	–	300	500	40	–	50	–	
–	MMBT492L	300	500	25	–	50	–	
–	MMBT493L	200	500	25	–	50	–	
MMBT43L	–	200	500	40	–	50	–	
MMBT5551L	–	160	600	80	250	–	–	
–	MMBT5401L	150	500	50	–	100	8.0	
MMBT5550L	–	140	600	60	250	–	–	 SOT-223 Case 318E-04
PZTA96S	–	450	500	50	150	–	–	
BSP19A	–	350	1000	40	–	70	–	
PZTA42	PZTA92	300	500	40	–	50	–	
–	PZTA96S	450	500	50	150	–	–	
–	BSP16	300	1000	30	120	15	–	
BF720	BF721	250	100	50	–	60	–	 SC-70, SOT-323 Case 419-04
MSD42W	–	300	150	40	–	–	–	
–	MSB92W	300	500	25	–	50	–	
–	MSB92AW	300	500	120	200	50	–	
–	MSB92ASW	300	500	120	200	50	–	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Bipolar Transistors

RF Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	Cap pF Max	Package
				Min	Max			
<i>MPSH10</i>	–	25	–	60	–	650	$C_{RB} = 0.65$	 TO-226AA, TO-92 Case 29-11
BF959	–	20	100	40	–	600	$C_{RE} = 0.65$ (Typ)	
<i>MPSH17</i>	–	15	–	25	250	800	$C_{CB} = 0.9$	
<i>MPS918</i>	–	15	50	20	–	600	$C_{OBO} = 1.7$	
<i>MPS5179</i>	–	12	50	25	250	900	$C_{CB} = 1.0$	
MPS3563	–	12	50	20	200	600	$C_{OBO} = 1.7$	
<i>MMBTH10L</i>	–	25	–	60	–	650	$C_{CB} = 0.7$	 TO-236AB, SOT-23 Case 318-08
<i>MMBTH10-4L</i>	–	25	–	120	240	800	$C_{CB} = 0.7$	
MMBT918L	–	15	50	20	–	600	$C_{OBO} = 1.7$	
BSV52L	–	12	100	40	120	400	–	
<i>MSD2714A</i>	–	25	–	90	180	650	$C_{CB} = 0.7$	 SC-59 Case 318D-04
<i>MSC2295-B</i>	–	20	30	70	140	150	$C_{RE} = 1.5$	
<i>MSC2295-C</i>	–	20	30	110	220	150	$C_{RE} = 1.5$	
NSF2250W	–	15	50	120	250	2000	$C_{OB} = 1.2$ pF $C_{RE} = 0.45$ pF (Typ)	 SC-70, SOT-323 Case 419-04

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Switching Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	T_{off} ns Max	Package
				Min	Max			
–	P2N2907A	60	600	100	300	200	110	 TO-226AA, TO-92 Case 29-11
–	<i>MPS2907A</i>	60	600	100	300	200	110	
<i>2N4401</i>	<i>2N4403</i>	40	600	100	300	200	–	
<i>2N3904</i>	<i>2N3906</i>	40	200	100	300	250	300	
P2N2222A	–	40	600	100	300	300	285	
<i>MPS2222A</i>	–	40	600	100	300	300	285	
–	MPS3638A	25	500	100	–	150	–	
<i>MPS3646</i>	–	15	300	30	120	350	28	
<i>MPS2369</i>	–	15	200	40	120	–	18	
<i>MPS2369A</i>	–	15	200	40	120	–	18	
–	<i>MMBT2907AL</i>	60	600	100	300	200	100	 TO-236AB, SOT-23 Case 318-08
<i>MMBT2222AL</i>	–	40	600	100	300	300	285	
<i>MMBT3904L</i>	–	40	200	100	300	300	250	
–	<i>MMBT3906L</i>	40	200	100	300	250	300	
<i>MMBT4401L</i>	–	40	600	100	300	250	255	
–	<i>MMBT4403L</i>	40	600	100	300	200	255	
<i>MMBT2369L</i>	–	15	200	40	120	–	18	
<i>MMBT2369AL</i>	–	15	200	40	120	–	18	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

Switching Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	T_{off} ns Max	Package
				Min	Max			
–	<i>MMBT2907AW</i>	60	600	100	300	200	100	 SC-70, SOT-323 Case 419-04
<i>MMBT3904W</i>	–	40	200	100	300	300	250	
–	<i>MMBT3906W</i>	40	200	100	300	250	300	
<i>MMBT2222AW</i>	–	40	600	100	300	300	285	
<i>MMBT4401W</i>	–	40	600	100	300	250	255	
–	<i>MMBT4403W</i>	40	600	100	300	200	255	 SOT-416, SC-75, SC-90 Case 463-01
<i>MMBT3904T</i>	–	40	200	100	300	300	250	
–	<i>MMBT3906T</i>	40	200	100	300	250	300	
<i>MMBT2222AT</i>	–	40	600	100	300	300	285	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Multiple Switching Transistors

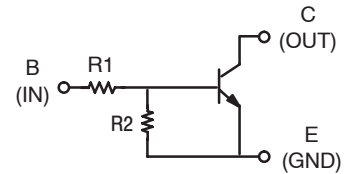
Device	Type	$V_{(BR)CEO}$	I_C mA Max	h_{FE}		f_T MHz Min	T_{off} ns Max	Package
				Min	Max			
<i>MBT3904DW1</i>	Dual NPN	40	200	100	300	300	250	 SC-88, SOT-363 Case 419B-02
<i>MBT3906DW1</i>	Dual PNP	40	200	100	300	250	300	
<i>MBT3946DW1</i>	Dual Complementary	40	200	100	300	250	250/300	
<i>MBT2222ADW1</i>	Dual NPN	40	600	100	300	300	285	
HN1B01FDW1	Dual Complementary	50	200	200	400	–	–	 SC-74 Case 318F-05

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

Digital Transistors (Bias Resistor Transistors)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



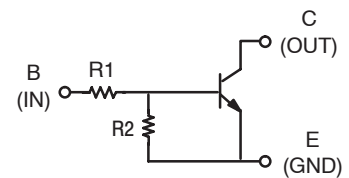
NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE} Min	R_1 Ω	R_2 Ω	Package
<i>MUN2211</i>	<i>MUN2111</i>	50	100	35	10K	10K	 SC-59 Case 318D-04
<i>MUN2212</i>	<i>MUN2112</i>	50	100	60	22K	22K	
<i>MUN2213</i>	<i>MUN2113</i>	50	100	80	47K	47K	
<i>MUN2214</i>	<i>MUN2114</i>	50	100	80	10K	47K	
<i>MUN2215</i>	<i>MUN2115</i>	50	100	160	10K	∞	
<i>MUN2216</i>	<i>MUN2116</i>	50	100	160	4.7K	∞	
<i>MUN2230</i>	<i>MUN2130</i>	50	100	3.0	1.0K	1.0K	
<i>MUN2231</i>	<i>MUN2131</i>	50	100	8.0	2.2K	2.2K	
<i>MUN2232</i>	<i>MUN2132</i>	50	100	15	4.7K	4.7K	
<i>MUN2233</i>	<i>MUN2133</i>	50	100	80	4.7K	47K	
<i>MUN2234</i>	<i>MUN2134</i>	50	100	80	22K	47K	
<i>MUN2236</i>	<i>MUN2136</i>	50	100	80	100K	100K	
<i>MUN2237</i>	<i>MUN2137</i>	50	100	80	47K	22K	
<i>MUN2240</i>	–	50	100	160	47K	∞	
<i>MUN2241</i>	–	50	100	160	100K	∞	
<i>DTC144T</i>	–	50	100	160	47K	∞	
<i>MMUN2211L</i>	<i>MMUN2111L</i>	50	100	35	10K	10K	 TO-236AB, SOT-23 Case 318-08
<i>MMUN2212L</i>	<i>MMUN2112L</i>	50	100	60	22K	22K	
<i>MMUN2213L</i>	<i>MMUN2113L</i>	50	100	80	47K	47K	
<i>MMUN2214L</i>	<i>MMUN2114L</i>	50	100	80	10K	47K	
<i>MMUN2215L</i>	<i>MMUN2115L</i>	50	100	160	10K	∞	
<i>MMUN2216L</i>	<i>MMUN2116L</i>	50	100	160	4.7K	∞	
<i>MMUN2230L</i>	<i>MMUN2130L</i>	50	100	3.0	1.0K	1.0K	
<i>MMUN2231L</i>	<i>MMUN2131L</i>	50	100	8.0	2.2K	2.2K	
<i>MMUN2232L</i>	<i>MMUN2132L</i>	50	100	15	4.7K	4.7K	
<i>MMUN2233L</i>	<i>MMUN2133L</i>	50	100	80	4.7K	47K	
<i>MMUN2234L</i>	<i>MMUN2134L</i>	50	100	80	22K	47K	
<i>MMUN2238L</i>	–	50	100	160	2.2K	∞	
<i>MMUN2241L</i>	–	50	100	160	100K	∞	
<i>MUN5211</i>	<i>MUN5111</i>	50	100	35	10K	10K	 SC-70, SOT-323 Case 419-04
<i>MUN5212</i>	<i>MUN5112</i>	50	100	60	22K	22K	
<i>MUN5213</i>	<i>MUN5113</i>	50	100	80	47K	47K	
<i>MUN5214</i>	<i>MUN5114</i>	50	100	80	10K	47K	
<i>MUN5215</i>	<i>MUN5115</i>	50	100	160	10K	∞	
<i>MUN5216</i>	<i>MUN5116</i>	50	100	160	4.7K	∞	
<i>MUN5230</i>	<i>MUN5130</i>	50	100	3.0	1.0K	1.0K	
<i>MUN5231</i>	<i>MUN5131</i>	50	100	8.0	2.2K	2.2K	
<i>MUN5232</i>	<i>MUN5132</i>	50	100	15	4.7K	4.7K	
<i>MUN5233</i>	<i>MUN5133</i>	50	100	80	4.7K	47K	
<i>MUN5234</i>	<i>MUN5134</i>	50	100	80	22K	47K	
<i>MUN5235</i>	<i>MUN5135</i>	50	100	80	2.2K	47K	
<i>MUN5236</i>	–	50	100	80	100K	100K	
<i>MUN5237</i>	<i>MUN5137</i>	50	100	80	47K	22K	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

Digital Transistors (Bias Resistor Transistors)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



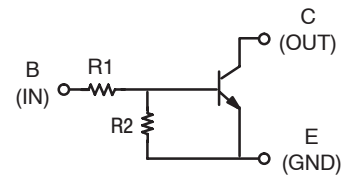
NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE} Min	R_1 Ω	R_2 Ω	Package
<i>DTC114EE</i>	<i>DTA114EE</i>	50	100	35	10K	10K	 SOT-416, SC-75, SC-90 Case 463-01
<i>DTC124EE</i>	<i>DTA124EE</i>	50	100	60	22K	22K	
<i>DTC144EE</i>	<i>DTA144EE</i>	50	100	80	47K	47K	
<i>DTC114YE</i>	<i>DTA114YE</i>	50	100	80	10K	47K	
<i>DTC114TE</i>	<i>DTA114TE</i>	50	100	160	10K	∞	
<i>DTC143TE</i>	<i>DTA143TE</i>	50	100	160	4.7K	∞	
<i>DTC123EE</i>	<i>DTA123EE</i>	50	100	8.0	2.2K	2.2K	
<i>DTC143EE</i>	<i>DTA143EE</i>	50	100	15	4.7K	4.7K	
<i>DTC143ZE</i>	<i>DTA143ZE</i>	50	100	80	4.7K	4.7K	
<i>DTC124XE</i>	–	50	100	80	22K	47K	
<i>DTC123JE</i>	<i>DTA123JE</i>	50	100	80	2.2K	47K	
<i>DTC115EE</i>	<i>DTA115EE</i>	50	100	80	100K	100K	
–	<i>DTA144WE</i>	50	100	80	47K	22K	
<i>DTC114EM3</i>	<i>DTA114EM3</i>	50	100	35	10K	10K	 SOT-723 Case 631AA-01
<i>DTC124EM3</i>	<i>DTA124EM3</i>	50	100	60	22K	22K	
<i>DTC144EM3</i>	<i>DTA144EM3</i>	50	100	80	47K	47K	
<i>DTC114YM3</i>	<i>DTA114YM3</i>	50	100	80	10K	47K	
<i>DTC114TM3</i>	<i>DTA114TM3</i>	50	100	160	10K	∞	
<i>DTC143TM3</i>	<i>DTA143TM3</i>	50	100	160	4.7K	∞	
<i>DTC123EM3</i>	<i>DTA123EM3</i>	50	100	8.0	2.2K	2.2K	
<i>DTC143EM3</i>	<i>DTA143EM3</i>	50	100	15	4.7K	4.7K	
<i>DTC143ZM3</i>	<i>DTA143ZM3</i>	50	100	80	4.7K	4.7K	
<i>DTC124XM3</i>	<i>DTA124XM3</i>	50	100	80	22K	47K	
<i>DTC123JM3</i>	<i>DTA123JM3</i>	50	100	80	2.2K	47K	
<i>DTC115EM3</i>	<i>DTA115EM3</i>	50	100	80	100K	100K	
<i>DTC144WM3</i>	<i>DTA144WM3</i>	50	100	80	47K	22K	
<i>DTC144TM3</i>	<i>DTA144TM3</i>	50	100	160	47K	∞	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

Dual Digital Transistors (Bias Resistor Transistors)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



NPN	PNP	$V_{(BR)CEO}$	I_C mA Max	h_{FE} Min	R_1 Ω	R_2 Ω	Package
<i>MUN5211DW1</i>	<i>MUN5111DW1</i>	50	100	35	10K	10K	 SC-88, SOT-363 Duals Case 419B-02
<i>MUN5212DW1</i>	<i>MUN5112DW1</i>	50	100	60	22K	22K	
<i>MUN5213DW1</i>	<i>MUN5113DW1</i>	50	100	80	47K	47K	
<i>MUN5214DW1</i>	<i>MUN5114DW1</i>	50	100	80	10K	47K	
<i>MUN5215DW1</i>	<i>MUN5115DW1</i>	50	100	160	10K	∞	
<i>MUN5216DW1</i>	<i>MUN5116DW1</i>	50	100	160	4.7K	∞	
<i>MUN5230DW1</i>	<i>MUN5130DW1</i>	50	100	3.0	1.0K	1.0K	
<i>MUN5231DW1</i>	<i>MUN5131DW1</i>	50	100	8.0	2.2K	2.2K	
<i>MUN5232DW1</i>	<i>MUN5132DW1</i>	50	100	15	4.7K	4.7K	
<i>MUN5233DW1</i>	<i>MUN5133DW1</i>	50	100	80	4.7K	47K	
<i>MUN5234DW1</i>	<i>MUN5134DW1</i>	50	100	80	22K	47K	
<i>MUN5235DW1</i>	<i>MUN5135DW1</i>	50	100	80	2.2K	47K	
<i>MUN5236DW1</i>	–	50	100	80	100K	100K	
<i>MUN5237DW1</i>	<i>MUN5137DW1</i>	50	100	80	47K	22K	
NSBC114EDXV6	NSBA114EDXV6	50	100	35	10K	10K	 SOT-563 Duals Case 463A-01
NSBC124EDXV6	NSBA124EDXV6	50	100	60	22K	22K	
NSBC144EDXV6	NSBA144EDXV6	50	100	80	47K	47K	
NSBC114YDXV6	NSBA114YDXV6	50	100	80	10K	10K	
NSBC114TDXV6	NSBA114TDXV6	50	100	160	10K	–	
NSBC143TDXV6	NSBA143TDXV6	50	100	160	4.7K	–	
–	NSBA113EDXV6	50	100	3.0	1.0K	1.0K	
NSBC123EDXV6	NSBA123EDXV6	50	100	8.0	2.2K	2.2K	
NSBC143EDXV6	NSBA143EDXV6	50	100	15	4.7K	4.7K	
NSBC143ZDXV6	NSBA143ZDXV6	50	100	80	4.7K	4.7K	
NSBC124XDXV6	–	50	100	80	22K	47K	
NSBC123JDXV6	NSBA123JDXV6	50	100	80	2.2K	47K	
NSBC115EDXV6	NSBA115EDXV6	50	100	80	100K	100K	
IMH20TR1	–	15	600	100	2.2K	–	 SC-74 Case 318F-05

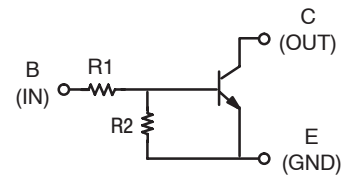
Devices listed in **bold italic** are ON Semiconductor preferred devices.

1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors

Combinational Digital Transistors (Bias Resistor Transistors)

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



Device	Type	$V_{(BR)CEO}$	I_C mA Max	h_{FE} Min	Q1	Q2	Package
<i>MUN5311DW1</i>	Dual Complementary	50	100	35	MUN5211	MUN5111	 SC-88, SOT-363 Case 419B-02
<i>MUN5312DW1</i>		50	100	60	MUN5212	MUN5112	
<i>MUN5313DW1</i>		50	100	80	MUN5213	MUN5113	
<i>MUN5314DW1</i>		50	100	80	MUN5214	MUN5114	
<i>MUN5315DW1</i>		50	100	160	MUN5215	MUN5115	
<i>MUN5316DW1</i>		50	100	160	MUN5216	MUN5116	
<i>MUN5330DW1</i>		50	100	3.0	MUN5230	MUN5130	
<i>MUN5331DW1</i>		50	100	8.0	MUN5231	MUN5131	
<i>MUN5332DW1</i>		50	100	15	MUN5232	MUN5132	
<i>MUN5333DW1</i>		50	100	80	MUN5233	MUN5133	
<i>MUN5334DW1</i>		50	100	80	MUN5234	MUN5134	
<i>MUN5335DW1</i>		50	100	80	MUN5235	MUN5135	
<i>UMA4N</i>	Dual Common Emitter	50	100	160	10K/10K	10K/10K	 SC-88A, SOT-353 SC70-5 Case 419A-02
<i>UMC2N</i>	Dual Common Base Collector	50	100	60	10K/10K	10K/10K	
<i>UMC3N</i>	Dual Common Base Collector	50	100	35	4.7K/10K	47K/47K	
<i>UMC5N</i>	Dual Common Base Collector	50	100	20	47K/∞	47K/∞	
NSB1706DMW5	Dual Common Emitter	50	100	80	4.7K/47K	4.7K/47K	 SOT-553 Case 463B-01
EMA6DXV5	Dual Common Emitter	50	100	160	47K	47K	
EMC2DXV5	Dual Common Base Collector	50	100	80	22K/22K	22K/22K	
EMC3DXV5	Dual Common Base Collector	50	100	35	10K/10K	10K/10K	
EMC4DXV5	Dual Common Base Collector	50	100	80	10K/47K	4.7K/47K	
EMC5DXV5	Dual Common Base Collector	50	100	35	4.7K/10K	4.7K/47K	
EMG2DXV5	Dual Common Base, Common Emitter	50	100	80	4.7K/47K	4.7K/47K	
EMG5DXV5	Dual Common Base, Common Emitter	50	100	80	10K/47K	10K/47K	
NSB1010XV5	Dual Common Base Collector	50	100	–	4.7K/4.7K	10K/10K	 SOT-563 Case 463A-01
EMD4DXV6	Dual Complementary	50	100	80	10K/47K	47K/47K	
NSB1011XV6	Dual	50	100	–	2.2K/47K	10K/10K	

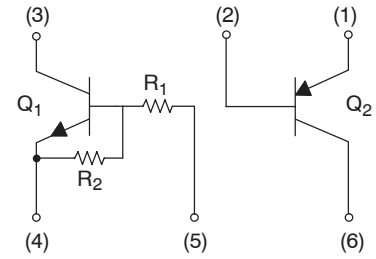
Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors

Complex Digital Transistors

These devices include bias resistors on the semiconductor chip with the transistor. See the BRT diagram for orientation of resistors.



Device	Switching Transistor				Digital Transistor			Package
	$V_{(BR)CEO}$ V	I_C (mA) Max	h_{FE}					
			Min	Max	h_{FE} Min	R_1 Ω	R_2 Ω	
EMF5XV6	12	500	270	680	80	47K	47K	 SOT-563 Case 463A-01
EMF18XV6	60	100	120	560	80	47K	47K	
EMF23XV6	60	100	120	560	35	10K	10K	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Bipolar Transistors

Low Saturation Voltage Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C DC A Max	I_C Peak A Max	h_{FE} @ 1.0 A		f_t MHz Min	$V_{CE(sat)}$ @ 1.0 A Max	Package
					Min	Max			
NSS40201L	–	40	2	4	200	500	150	0.060	 TO-236AB, SOT-23 Case 318-08 STYLE 6
–	NSS40200L	40	2	4	200	500	150	0.090	
NSS30101L	–	30	1	2	100	500	100	0.200	
–	NSS30100L	30	1	2	100	500	100	0.300	
NSS20201L	–	20	2	4	200	500	150	0.050	
–	NSS20200L	20	2	4	200	500	150	0.080	
NSS12201L	–	12	2	4	200	500	150	0.055	
–	NSS12200L	12	2	4	200	500	150	0.080	
NSS30071MR6	–	30	0.7	2	150	500	100	0.250	 SC-74 Case 318F-05 STYLE 2
–	NSS30070MR6	30	0.7	2	150	500	100	0.250	
–	NSS35200MR6	35	2	5	100	400	100	0.150	 TSOP-6 Single Case 318G-02 STYLE 6
NSS30201MR6	–	30	2	5	200	900	100	0.150	
NSS20201MR6	–	20	2	5	200	900	100	0.150	
–	NSS20300MR6	20	2	5	100	400	100	0.150	
NSS40601CF8	–	40	6	6	225	500	100	0.065	 ChipFET™ Case 1206A-03 STYLE 4
–	NSS40600CF8	40	6	6	220	500	100	0.065	
–	NSS40400CF8	40	2	7	100	400	100	0.150	
–	NSS35200CF8	35	2	7	100	400	100	0.150	
NSS20601CF8	–	20	6	6	250	500	100	0.050	
–	NSS20600CF8	20	6	6	220	500	100	0.060	
NSS12601CF8	–	12	6	6	250	500	100	0.050	
–	NSS12600CF8	12	6	6	210	500	100	0.060	
NSS40501UW3	–	40	5	6	250	500	100	0.045	 WDFN3 Case 506AU-01
–	NSS40500UW3	40	5	6	250	500	100	0.080	
NSS20501UW3	–	20	5	6	250	500	100	0.045	
–	NSS20500UW3	20	5	6	250	500	100	0.090	
NSS12501UW3	–	12	5	6	250	500	100	0.045	
–	NSS12500UW3	12	5	6	250	500	100	0.070	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Bipolar Transistors

Low Saturation Voltage Transistors

NPN	PNP	$V_{(BR)CEO}$	I_C DC A Max	I_C Peak A Max	h_{FE} @ 1.0 A		f_t MHz Min	$V_{CE(sat)}$ @ 1.0 A Max	Package
					Min	Max			
–	NSS40200UW6	40	2	4	150	500	100	0.120	 WDFN6 Case 506AS–01
–	NSS12200W	12	3	3	100	300	100	0.160	 SC–88, SOT–363 Case 419B–02 STYLE 20
NJD2873	–	50	2	3	120	360	65	0.300	 DPAK Case 369C–01
–	NSB9435	30	3	5	125	500	110	0.210	 SOT–223 Case 318E–04

Load Switch Transistors (Low Saturation Voltage Transistors with BRT Driver)

NPN	PNP	$V_{(BR)CEO}$	I_C DC A Max	I_C Peak A Max	h_{FE} @ 1.0 A		f_t MHz Min	$V_{CE(sat)}$ @ 1.0 A Max	Package
					Min	Max			
–	EMF5XV6	12	1.0	0.5	270	680	–	0.250	 SOT–416, SC–75, SC–90 Case 463–01

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Junctional Field-Effect Transistors

JFETs

Low-Frequency/Low-Noise

N-Channel	P-Channel	$R_e Y_{fs} $ @ 1 kHz	$R_e Y_{os} $ @ 1 kHz	C_{iss} pF	C_{rss} pF	V_{GSS} V_{GDO}	$V_{GS(off)}$ Volts		I_{DSS} mA		Package
		mmho Min	μ mho Max	Max	Max	Volts Min	Min	Max	Min	Max	
<i>2N5457</i>	–	1.0	50	7.0	3.0	25	0.5	6.0	1.0	5.0	 TO-226AA, TO-92 Case 29-11
<i>2N5458</i>	–	1.5	50	7.0	3.0	25	1.0	7.0	2.0	9.0	
–	<i>2N5460</i>	1.0	75	7.0	2.0	40	0.75	6.0	1.0	5.0	
–	<i>2N5461</i>	1.5	75	7.0	2.0	40	1.0	7.5	2.0	9.0	
–	<i>2N5462</i>	2.0	75	7.0	2.0	40	1.8	9.0	4.0	16	
<i>BF256A</i>	–	4.5	–	–	–	30	0.5	7.5	3.0	7.0	
–	<i>MMBF5460L</i>	1.0	75	7.0	2.0	40	0.8	6.0	1.0	5.0	 TO-236AB, SOT-23 Case 318-08
<i>BFR30L</i>	–	1.0	40	5.0	1.5	25	–	5.0	4.0	10	
<i>BFR31L</i>	–	1.5	20	5.0	1.5	25	–	2.5	1.0	5.0	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

High-Frequency Amplifiers

N-Channel	$R_e Y_{fs} $ mmho Min	$R_e Y_{os} $ μ mho Max	C_{iss} pF Max	C_{rss} pF Max	NF dB Max	V_{GSS} V_{GDO} Volts Min	$V_{GS(off)}$ Volts		I_{DSS} mA		Package
							Min	Max	Min	Max	
MPF102	1.6	200	7.0	3.0	–	25	–	8.0	2.0	20	 TO-226AA, TO-92 Case 29-11
<i>2N5486</i>	3.5	100	5.0	1.0	4.0	25	2.0	6.0	8.0	20	
<i>J309</i>	12 (Typ)	250 (Typ)	7.5	2.5	1.5 (Typ)	25	1.0	4.0	12	30	
<i>J310</i>	12 (Typ)	250 (Typ)	7.5	2.5	1.5 (Typ)	25	2.0	6.5	24	60	
<i>MMBF5457L</i>	1.0	50	7.0	3.0	4.0	25	0.5	6.0	1.0	5.0	 TO-236AB, SOT-23 Case 318-08
<i>MMBF5484L</i>	3.0	50	5.0	1.0	3.0	25	0.3	3.0	1.0	5.0	
<i>MMBFJ309L</i>	10	250	5.0	2.5	4.0	25	1.0	4.0	12	30	
<i>MMBFJ310L</i>	8.0	250	5.0	2.5	4.0	25	2.0	6.5	24	60	
<i>MMBFU310L</i>	10	250	5.0	2.5	4.0	25	2.5	6.0	24	60	
<i>MMBF4416L</i>	4.5	50	4.0	0.8	2.0	30	–	6.0	5.0	15	

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Junctional Field-Effect Transistors

JFETs

Switches and Choppers

N-Channel	P-Channel	R _{DS(on)} Ω Max	C _{iss} pF Max	C _{rss} pF Max	V _{GSS} V _{GDO} Volts Min	V _{GS(off)} Volts		I _{DSS} mA		t _{on} ns Max	t _{off} ns Max	Package
						Min	Max	Min	Max			
J112	–	50	28	5.0	35	1.0	5.0	5.0	–	–	–	 TO-226AA, TO-92 Case 29-11
MPF4392	–	60	10	3.5	30	–	–	25	75	15	35	
2N5639	–	60	10	4.0	30	–	8.0 (Typ)	25	–	–	–	
MPF4393	–	100	10	3.5	30	–	12 (Typ)	5.0	30	15	55	
J110	–	18	–	–	25	0.5	4.0	10	–	–	–	
2N5638	–	30	10	4.0	30	–	–	50	–	4.0	5.0	
J111	–	30	28	5.0	35	3.0	10	20	–	–	–	
BSR58L	–	60	28	5.0	40	0.8	4.0	8.0	80	–	–	 TO-236AB, SOT-23 Case 318-08
MMBF4391L	–	30	10	3.5	30	4.0	10	50	150	–	–	
MMBF4392L	–	60	10	3.5	30	2.0	5.0	25	75	–	–	
MMBF4393L	–	100	10	3.5	30	0.5	3.0	5.0	30	–	–	
–	MMBFJ175L	125	11	5.5	30	3.0	6.0	7.0	60	–	–	
–	MMBFJ177L	300	–	–	30	0.8	2.5	1.5	20	–	–	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Tuning and Switching Diodes

Tuning Diodes – Abrupt Junction

Device	V _R Volts	C _T @ V _R = 4.0 V, 1.0 MHz			Cap Ratio Min	Q @ 4.0 V 50 MHz Typ	Package
		pF Min	pF Nominal	pF Max			
MV2101	30	6.1	6.8	7.5	2.5	450	 TO-226AC, TO-92 2-Lead Case 182-06
MV2105	30	13.5	15	16.5	2.5	400	
MV2109	30	29.7	33	36.3	2.5	200	
LV2209	25	26.4	–	39.6	2.5	150	
MMBV2105L	30	13.5	15	16.5	2.5	400	 TO-236AB, SOT-23 Case 318-08
MMBV2107L	30	19.8	22	24.2	2.5	350	
MMBV2109L	30	29.7	33	36.3	2.5	200	
MMBV2101L	30	6.1	6.8	7.5	2.5	450	
MMBV2108L	30	24.3	–	29.7	2.5	200	
MMBV3102L	30	20	–	25	4.5	200	
MMVL2101	30	6.1	6.8	7.5	2.5	400 (Min)	 SOD-323 Case 477-02
MMVL2105	30	13.5	15	16.5	2.5	350 (Min)	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Tuning Diodes – Hyper-Abrupt Junction

Device	V _R Volts	C _T (f = 1.0 MHz)			Cap Ratio			Q 3.0 V Min	Type	Package
		pF Min	pF Max	Volts	Min	Max	Volts			
MV209	30	26	32	3.0	5.0	6.5	3.0/25	200	Single	 TO-226AC, TO-92 2-Lead Case 182-06
MV104	32	37	42	3.0	2.5	2.8	–	100	Single	
MMBV105GL	30	1.5	2.8	25	4.0	6.5	3.0/25	200	Single	 TO-236AB, SOT-23 Case 318-08
MMBV109L	30	26	32	3.0	5.0	6.5	3.0/25	200	Single	
MMBV409L	20	26	32	3.0	1.5	1.9	3.0/8.0	200	Single	
MMBV809L	20	4.5	6.1	2.0	1.8	2.6	2.0/8.0	300	Single	
MMBV432L	14	43	48	2.0	1.5	2.0	–	100@ 2.0V	Single	
MMBV609L	20	26	32	3.0	1.8	2.4	3/8	250	Dual Common Cathode	
MMVL809	20	4.5	6.1	2	1.8	2.6	2.0/8.0	300	Single	 SOD-323 Case 477-02
MMVL3102	30	20	25	3	4.5	–	3.0/25	200	Single	
MMVL109	30	26	32	3	5.0	6.5	3.0/25	200	Single	
MMVL409	20	26	32	3	1.5	1.9	3.0/8.0	200	Single	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Schottky Diodes

Device	V _R Volts	C _T @ V		V _F Volts Max	I _R @ V		Type	Package
		pF Max	Volts		nA Max	Volts		
<i>MBD701</i>	70	1.0	20	1.0	200	35	Single	 TO-226AC, TO-92 2-Lead Case 182-06
<i>MBD301</i>	30	1.5	15	0.6	200	25	Single	
<i>MBD101</i>	7.0	1.0	0	0.6	250	3.0	Single	
<i>MMSD701</i>	70	1.0	20	1.0	200	35	Single	 SOD-123 Case 425-04
<i>BAT54</i>	30	10	1.0	0.4	2000	25	Single	
<i>MMSD301</i>	30	1.5	15	0.6	200	25	Single	
<i>MMDL770</i>	70	1.0	20	1.0	200	35	Single	 SOD-323 Case 477-02
<i>BAT54H</i>	30	10	1.0	0.4	2000	25	Single	
<i>MMDL301</i>	30	1.5	15	0.6	200	25	Single	
<i>RB751V40</i>	30	2.5	1.0	0.37	500	30	Single	
<i>MMDL101</i>	7.0	1.0	0	0.6	250	3.0	Single	
<i>NSR0320MW2</i>	23	35	5.0	0.27	1000	15	Single	
<i>BAS70L</i>	70	2.0	0	0.75	100	50	Single	 TO-236AB, SOT-23 Case 318-08
<i>BAS70-04L</i>	70	2.0	0	0.75	100	50	Dual Series	
<i>MMBD701L</i>	70	1.0	20	1.0	200	35	Single	
<i>BAS40L</i>	40	5.0	1.0	0.5	1000	25	Single	
<i>BAS40-04L</i>	40	5.0	1.0	0.5	1000	25	Dual Series	
<i>BAS40-06L</i>	40	5.0	1.0	0.5	1000	25	Dual Common Anode	
<i>BAT54CL</i>	30	10	1.0	0.4	2000	25	Dual Common Cathode	
<i>BAT54L</i>	30	10	1.0	0.4	2000	25	Single	
<i>BAT54AL</i>	30	10	1.0	0.4	2000	25	Dual Common Anode	
<i>BAT54SL</i>	30	10	1.0	0.4	2000	25	Dual Series	
<i>MMBD301L</i>	30	1.5	15	0.6	200	25	Single	
<i>MMBD452L</i>	30	1.5	15	0.6	200	25	Dual Series	
<i>MMBD101L</i>	7.0	1.0	0	0.6	250	3.0	Single	
<i>MMBD352L</i>	7.0	1.0	0	0.6	250	3.0	Dual Series	
<i>MMBD353L</i>	7.0	1.0	0	0.6	250	3.0	Dual Series	
<i>MMBD354L</i>	7.0	1.0	0	0.6	250	3.0	Dual Common Cathode	
<i>MMBD355L</i>	7.0	1.0	0	0.6	250	3.0	Dual Common Anode	
<i>MMBD770</i>	70	1.0	20	1.0	200	35	Single	 SC-70, SOT-323 Case 419-04
<i>BAT54AW</i>	30	10	1.0	0.4	2000	25	Dual Common Anode	
<i>BAT54CW</i>	30	10	1.0	0.4	2000	25	Dual Common Cathode	
<i>BAT54W</i>	30	10	1.0	0.4	2000	25	Single	
<i>BAT54SW</i>	30	10	1.0	0.4	2000	25	Dual Series	
<i>MMBD330</i>	30	1.5	15	0.6	200	25	Single	
<i>MMBD717L</i>	20	2.5	1.0	0.37	1000	10	Dual Common Anode	
<i>MMBD352W</i>	7.0	1.0	0	0.6	250	3.0	Dual Series	
<i>BAT54CT</i>	30	10	1.0	0.4	2000	25	Dual Common Cathode	 SOT-416, SC-75, SC-90 Case 463-01

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

Schottky Diodes

Device	V _R Volts	C _T @ V		V _F Volts Max	I _R @ V		Type	Package
		pF Max	Volts		nA Max	Volts		
MBD770DW	70	1.0	0	0.5	200	35	Dual Series	 SC-88, SOT-363 Case 419B-02
MBD54DW	30	1.0	0	0.32	2000	25	Dual Series	
MBD330DW	30	1.5	0	0.4	200	25	Dual Series	
NSR15TW1T2	15	1.0	0	0.415	50	1.0	Triple	
NSR15DW1	15	1.0	0	0.415	50	1.0	Dual Series	
NSR15SDW1	15	1.0	0	0.415	50	1.0	Dual Series	
MBD110DW	7.0	1.0	0	0.6	250	3.0	Dual Series	 SOT-563 Case 463A-01
NSR0320XV6	23	35	5.0	0.27	1000	15	Single	
NSR15ADXV6	15	1.0	0	0.415	50	1.0	Dual	 SC-89 Case 463C-03
BAT54CXV3	30	10	1.0	0.4	2000	25	Dual Common Cathode	
RB751S40	40	2.5	1.0	0.37	500	30	Single	 SOD-523 Case 502-01
BAT54XV2	30	10	1.0	0.4	2000	25	Single	
RB520S30	30	–	–	0.5	1000	10	Single	
RB521S30	30	–	–	0.6	30000	10	Single	

Device	Technology	V _R Volts	C _T @ V		V _F Max	I _R @ V		T _{RR} nS	Package
			pF Max	Volts	Volts	nA Max	Volts		
NSR30CM3	Schottky	30	0	1.0	0.8	2.0	25	5	 SOT-723 Case 631AA-01

Device	V _R Volts	C _T @ V		V _F Max	I _R @ V		Type	Package
		pF Max	Volts	Volts Max	μA Max	Volts		
NSR0130M2	30	–	–	0.385	0.350	10	Single	 SOD-723 Case 509AA-01
NSR0140M2	40	2.5	1.0	0.350	0.500	30	Single	
NSR0230M2	30	–	–	0.325	10	10	Single	
NSR0130P2	30	–	–	0.385	0.350	10	Single	 SOD-923 Case 514AA-01
NSR0140P2	40	2.5	1.0	0.350	0.500	30	Single	
NSR0230P2	30	–	–	0.325	10	10	Single	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Switching Diodes

PIN Switching Diodes

Device	V _R Volts Min	C _T @ V		Resistance Ω Max	I _R μA Max	Type	Package
		pF Max	Volts				
MPN3700	200	1.0	20	1.0	0.1	Single	 TO-226AC, TO-92 2-Lead Case 182-06
MPN3404	20	2.0	15	0.85	0.1	Single	
MSD6100	100	1.5	0.0	–	0.1	Dual Common Cathode	 TO-226AA, TO-92 Case 29-11
MMBV3700L	200	1.0	20	1.0	0.1	Single	 TO-236AB, SOT-23 Case 318-08
MMBV3401L	35	1.0	20	0.7	0.1	Single	
MMVL3401	35	1.0	20	0.7	0.1	Single	 SOD-323 Case 477-02

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Switching Diodes

General-Purpose Signal and Switching Diodes

Device	V _R Min Volts	I _R Max μA	V _F		C _T Max pF	t _{rr} Max ns	Type	Package
			Min Volts	Max Volts				
BAS21L	250	0.1	–	1.0	5.0	50	Single	 TO-236AB, SOT-23 Case 318-08
BAS21SL	250	0.1	–	1.0	5.0	50	Dual Series	
MMBD914L	100	5.0	–	1.0	4.0	4.0	Single	
BAS16L	75	1.0	–	1.0	2.0	6.0	Single	
MMBD6050L	70	0.1	0.85	1.1	2.5	4.0	Single	
BAL99L	70	2.5	–	1.0	1.5	6.0	Single	
BAS116L	75	0.005	–	0.9	2.0	3000	Single	
MMBD7000L	100	1.0	0.75	1.1	1.5	4.0	Dual Series	
MMBD2836L	75	0.1	–	1.0	4.0	4.0	Dual Common Anode	
MMBD2838L	75	0.1	–	1.0	4.0	4.0	Dual Common Cathode	
BAV70L	70	5.0	–	1.0	1.5	6.0	Dual Common Cathode	
BAV99L	70	2.5	–	1.0	1.5	4.0	Dual Series	
BAW56L	70	2.5	–	1.0	2.0	6.0	Dual Common Anode	
MMBD6100L	70	0.1	0.85	1.1	2.5	4.0	Dual Common Cathode	
BAV74L	50	0.1	–	1.0	2.0	4.0	Dual Common Cathode	
MMBD2835L	35	0.1	–	1.0	4.0	4.0	Dual Common Anode	
MMBD2837L	35	0.1	–	1.0	4.0	4.0	Dual Common Cathode	
BAV199L	70	0.005	–	0.9	2.0	3000	Dual Series	
BAS20L	200	0.1	–	1.0	5.0	50	Single	
BAS19L	120	0.1	–	1.0	5.0	50	Single	
M1MA151A	40	0.1	–	1.2	2.0	3.0	Single	 SC-59 Case 318D-04
M1MA151K	40	0.1	–	1.2	2.0	3.0	Single	
M1MA152A	80	0.1	–	1.2	2.0	3.0	Single	
M1MA152K	80	0.1	–	1.2	2.0	3.0	Single	
M1MA151WA	40	0.1	–	1.2	15	10	Dual Common Anode	
M1MA151WK	40	0.1	–	1.2	2.0	3.0	Dual Common Cathode	
M1MA152WA	80	0.1	–	1.2	15	10	Dual Common Anode	
M1MA152WK	80	0.1	–	1.2	2.0	3.0	Dual Common Cathode	
BAS16W	75	1.0	–	1.25	2.0	6.0	Single	 SC-70, SOT-323 Case 419-04
M1MA141K	40	0.1	–	1.2	2.0	3.0	Single	
M1MA142K	80	0.1	–	1.2	2.0	3.0	Single	
M1MA174	100	5.0	–	1.0	4.0	4.0	Single	
M1MA142WK	80	0.1	–	1.2	2.0	3.0	Dual Common Cathode	
M1MA142WA	80	0.1	–	1.2	15	10	Dual Common Anode	
BAW56W	70	2.5	–	1.0	2.0	6.0	Dual Common Anode	
BAV70W	70	5.0	–	1.0	1.5	6.0	Dual Common Cathode	
BAV99W	70	2.5	–	1.0	1.5	6.0	Dual Series	
BAV99RW	70	2.5	–	1.0	1.5	6.0	Dual Series	
M1MA141WK	40	0.1	–	1.2	2.0	3.0	Dual Common Cathode	
M1MA141WA	40	0.1	–	1.2	15	10	Dual Common Anode	
DAP202U	–	0.1	–	1.2	3.5	10	Dual Common Anode	
MMSD914	100	5.0	–	1.0	4.0	4.0	Single	 SOD-123 Case 425-04
MMSD71RK	80	0.5	–	1.2	2.0	4.0	Single	
MMSD103	250	100	–	1.0	5.0	50	Single	
MMSD4148	100	5.0	–	1.0	4.0	4.0	Single	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Switching Diodes

General-Purpose Signal and Switching Diodes

Device	V _R Min Volts	I _R Max μA	V _F		C _T Max pF	t _{rr} Max ns	Type	Package
			Min Volts	Max Volts				
BAS16H	75	1.0	–	1.0	2.0	6.0	Single	 SOD-323 Case 477-02
BAS20H	200	0.1	–	1.0	5.0	50	Single	
BAS21H	250	0.1	–	1.0	5.0	50	Single	
MMDL914	100	5.0	–	1.0	4.0	4.0	Single	
MMDL6050	70	0.1	0.85	1.1	2.5	4.0	Single	
BAS16T	75	1.0	–	1.0	2.0	6.0	Single	 SOT-416, SC-75, SC-90 Case 463-01
DA121T	80	1.0	–	1.0	2.0	6.0	Single	
DAP222	80	0.1	–	1.2	3.5	4.0	Dual Common Anode	
BAW56T	70	2.5	–	1.0	2.0	6.0	Dual Common Anode	
DAN222	80	0.1	–	1.2	3.5	4.0	Dual Common Cathode	
BAV70T	70	5.0	–	1.0	1.5	6.0	Dual Common Cathode	
HN2D02FUTW1	85	0.1	–	1.2	2.0	3.0	Triple Independent	 SC-88 Case 419B-02
BAS21DW5	250	0.1	–	1.0	5.0	50	Single	 SC-88A Case 419A-02
1SS400	100	0.1	–	1.2	3.0	4.0	Single	 SOD-523 Case 502-01
BAS16XV2	75	1.0	–	1.0	2.0	6.0	Single	
NSD914XV2	100	–	–	1.0	4.0	4.0	Single	
DAN222M3	80	0.1	–	1.2	3.5	4.0	Dual Common Cathode	 SOT-723 Case 631AA-01
DAP222M3	80	0.1	–	1.2	3.5	4.0	Dual Common Anode	
BAS16M3	75	1.0	–	1.0	2.0	6.0	Single	

Devices listed in **bold italic** are ON Semiconductor preferred devices.

Switching and Schottky Diode Arrays

Device	Technology	V _R Volts	C _T @ V		V _F Max		I _R @ V		T _{RR} nS	Package
			pF Max	Volts	Volts	I _F	nA Max	Volts		
BAV70DXV6	Switching	70	1.5	0	1.25	150 mA	5000	70	6	 SOT-563 Case 463A-01
NSDEMN11XV6	Switching	80	3.5	6.0	1.2	100 mA	100	70	4	
NSDEMP11XV6	Switching	70	3.5	6	1.2	100 mA	100	70	4	
BAS16DXV6	Switching	75	2.0	0	1.25	150 mA	1.0	75	6	
NSR15ADXV6	Schottky	15	1.0	0	0.68	10 mA	0.05	1.0	–	 SOT-563 Case 463A-01

Devices listed in **bold italic** are ON Semiconductor preferred devices.

1. Devices in **bold**, samples starting Oct. 2002, production starting Dec. 2002.
2. Remainder of devices, 4 to 8 weeks after receipt of request based on note 1 timetable.

Zener Regulator Diodes

In Brief . . .

All systems have an unregulated or loosely regulated voltage source. Zener diodes provide a constant reverse voltage for the regulation of this source to create a clean, accurately regulated current supply that can be used to power system electronics.

ON Semiconductor has one of the broadest Zener portfolios in the industry, specializing in micropackaging for space-constrained applications. Whether your application requirements include automotive, computing, industrial, consumer, or portable, ON Semiconductor has a solution for you.

Our line features the following:

- Wide Voltage Range: 1.8 V to 200 V
- Steady State Power Dissipation from 200 mW to 5.0 W
- Leading Edge Micropackaging: SOD-323, SOD-523
- 2% Tolerance Available: SOD-323, SOD-523, SOT-23
- Energy Rated Zeners in SOT-23, SOD-123
- Lead (Pb) Free Available
(MSL1, 260° +5/-0 °C reflow capable)

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Zener Diodes – Regulation in Axial Leads

Table 1. Axial Leaded – 3, 5 Watt

Nominal Zener Breakdown Voltage	3 Watt		5 Watt
	Cathode = Polarity Band		Cathode = Polarity Band
Volts	 Plastic Surmetic 30 Case 59-10 (DO-41)		 Plastic Surmetic 40 Case 17
1.8 2.0 2.2 2.4 2.5			
2.7 2.8 3.0 3.3 3.6	MZP4729A	1N5913B	1N5333B 1N5334B
3.9 4.3 4.7 5.1 5.6	MZP4734A	1N5917B 1N5919B	1N5335B 1N5336B 1N5337B 1N5338B 1N5339B
6.0 6.2 6.8 7.5 8.2	MZP4735A MZP4738A	1N5920B 1N5921B 1N5923B	1N5340B 1N5341B 1N5342B 1N5343B 1N5344B
8.7 9.1 10 11 12	MZP4740A	1N5924B 1N5925B 1N5927B	1N5346B 1N5347B 1N5348B 1N5349B
13 14 15 16 17	3EZ16D MZP4746A	1N5929B 1N5930B	1N5350B 1N5351B 1N5352B 1N5353B 1N5354B
18 19 20 22 24	3EZ18D MZP4749A	1N5931B 1N5932B 1N5934B	1N5355B 1N5356B 1N5357B 1N5358B 1N5359B

Zener Diodes – Regulation in Axial Leads (continued)

Table 1. Axial Leaded – 3, 5 Watt (continued)

Nominal Zener Breakdown Voltage	3 Watt		5 Watt
	Cathode = Polarity Band		Cathode = Polarity Band
Volts	 Plastic Surmetic 30 Case 59-10 (DO-41)		 Plastic Surmetic 40 Case 17
25	MZP4750A	1N5935B	1N5360B
27			1N5361B
28			1N5362B
30			1N5363B
33			1N5364B
	MZP4751A	1N5936B 1N5937B	1N5365B 1N5366B 1N5367B 1N5368B 1N5369B
36			
39			
43			
47			
51		1N5942B	
56		1N5946B	1N5370B
60			1N5371B
62			1N5372B
68			1N5373B
75			1N5374B
82		1N5948B	1N5375B
87			1N5376B
91			1N5377B
100			1N5378B
110			1N5379B
120		1N5953B	1N5380B
130			1N5381B
140			
150			1N5383B
160			1N5384B
170		1N5955B	1N5386B
180			
190			
200			
		1N5956B	1N5388B

Zener Diodes – Regulation in Surface Mount

Table 2. Surface Mount Packages – 0.2 Watt

Nominal Zener Breakdown Voltage	200 mW Standard Tolerance SOD-523	200 mW Tight Tolerance SOD-523	200 mW Standard Tolerance SOD-323	200 mW Tight Tolerance SOD-323
Volts	 Case 502	 Case 502	 Case 477 Style 1	 Case 477 Style 1
1.8 2.0 2.2 2.4 2.5	MM5Z2V4	MM5Z2V4S	MM3Z2V4	
2.7 2.8 3.0 3.3 3.6 3.7	MM5Z2V7 MM5Z3V0 MM5Z3V3 MM5Z3V6		MM3Z2V7 MM3Z3V0 MM3Z3V3 MM3Z3V6	MM3Z3V3S
3.9 4.0 4.3 4.7 5.1 5.6	MM5Z3V9 MM5Z4V3 MM5Z4V7 MM5Z5V1 MM5Z5V6	MM5Z4V3S MM5Z4V7S MM5Z5V1S MM5Z5V6S	MM3Z3V9 MM3Z4V3 MM3Z4V7 MM3Z5V1 MM3Z5V6	MM3Z3V9S MM3Z4V3S MM3Z4V7S MM3Z5V1S MM3Z5V6S
6.0 6.2 6.8 7.5 8.2	MM5Z6V2 MM5Z6V8 MM5Z7V5 MM5Z8V2	MM5Z6V2S MM5Z6V8S MM5Z7V5S MM5Z8V2S	MM3Z6V2 MM3Z6V8 MM3Z7V5 MM3Z8V2	MM3Z6V2S MM3Z6V8S MM3Z7V5S MM3Z8V2S
8.7 9.1 10 11 12	MM5Z9V1 MM5Z10V MM5Z12V	MM5Z9V1S MM5Z12VS	MM3Z9V1 MM3Z10V MM3Z11V MM3Z12V	MM3Z9V1S MM3Z10VS MM3Z11VS MM3Z12VS
13 14 14.5 15 16 17	MM5Z13V MM5Z15V MM5Z16V		MM3Z13V MM3Z15V MM3Z16V	MM3Z16VS
18 19 20 22 24		MM5Z18VS	MM3Z18V MM3Z20V MM3Z22V MM3Z24V	MM3Z18VS
25 27 28 30 33	MM5Z27V MM5Z30V MM5Z33V		MM3Z27V MM3Z30V MM3Z33V	

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

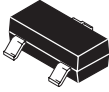
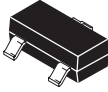
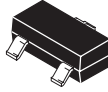
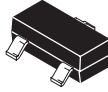
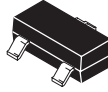
Zener Diodes – Regulation in Surface Mount (continued)

Table 2. Surface Mount Packages – 0.2 Watt (continued)

Nominal Zener Breakdown Voltage	200 mW Standard Tolerance SOD-523	200 mW Tight Tolerance SOD-523	200 mW Standard Tolerance SOD-323	200 mW Tight Tolerance SOD-323
Volts	 Case 502	 Case 502	 Case 477 Style 1	 Case 477 Style 1
36 39 43 47 51			MM3Z36V MM3Z39V MM3Z43V	

Zener Diodes – Regulation in Surface Mount (continued)

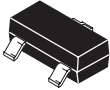
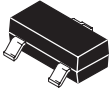
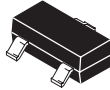
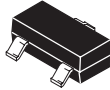
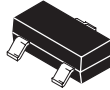
Table 3. Surface Mount Packages – 0.225 Watt

Nominal Zener Breakdown Voltage	225 mW Standard Tolerance SOT-23	225 mW Tight Tolerance SOT-23	225 mW Energy Rated SOT-23	225 mW Standard Tolerance SOT-23	225 mW Energy Rated SOT-23
Volts	 Case 318	 Case 318	 Case 318	 Case 318	 Case 318
1.8 2.0 2.2 2.4 2.5	BZX84C2V4L			MMBZ5221BL MMBZ5222BL	
2.7 2.8 3.0 3.3 3.6 3.7	BZX84C2V7L BZX84C3V0L BZX84C3V3L BZX84C3V6L		BZX84C3V3E	MMBZ5223BL MMBZ5225BL MMBZ5226BL MMBZ5227BL	MMBZ5227EL
3.9 4.0 4.3 4.7 5.1 5.6	BZX84C3V9L BZX84C4V3L BZX84C4V7L BZX84C5V1L BZX84C5V6L	 BZX84B5V1L BZX84B5V6L	BZX84C3V9E BZX84C4V7E BZX84C5V1E BZX84C5V6E	MMBZ5228BL MMBZ5229BL MMBZ5230BL MMBZ5231BL MMBZ5232BL	MMBZ5228EL MMBZ5229EL MMBZ5230EL MMBZ5231EL MMBZ5232EL
6.0 6.2 6.8 7.5 8.2	BZX84C6V2L BZX84C6V8L BZX84C7V5L BZX84C8V2L	BZX84B6V2L	BZX84C6V2E BZX84C6V8E BZX84C7V5E BZX84C8V2E	MMBZ5233BL MMBZ5234BL MMBZ5235BL MMBZ5236BL MMBZ5237BL	MMBZ5234EL MMBZ5237EL
8.7 9.1 10 11 12	BZX84C9V1L BZX84C10L BZX84C11L BZX84C12L		BZX84C9V1E BZX84C10E BZX84C12E	MMBZ5238BL MMBZ5239BL MMBZ5240BL MMBZ5241BL MMBZ5242BL	MMBZ5239EL MMBZ5240EL MMBZ5242EL
13 14 15 16 17	BZX84C13L BZX84C15L BZX84C16L		BZX84C13E BZX84C15E BZX84C16E	MMBZ5243BL MMBZ5244BL MMBZ5245BL MMBZ5246BL MMBZ5247BL	MMBZ5243EL MMBZ5244EL MMBZ5245EL MMBZ5246EL
18 19 20 22 24	BZX84C18L BZX84C20L BZX84C22L BZX84C24L	BZX84B18L	BZX84C18E BZX84C24E	MMBZ5248BL MMBZ5249BL MMBZ5250BL MMBZ5251BL MMBZ5252BL	MMBZ5248EL MMBZ5250EL MMBZ5252EL
25 27 28 30 33	BZX84C27L BZX84C30L BZX84C33L		BZX84C27E	MMBZ5253BL MMBZ5254BL MMBZ5255BL MMBZ5256BL MMBZ5257BL	MMBZ5254EL MMBZ5257EL

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

Zener Diodes – Regulation in Surface Mount (continued)

Table 3. Surface Mount Packages – 0.225 Watt (continued)

Nominal Zener Breakdown Voltage	225 mW Standard Tolerance SOT-23	225 mW Tight Tolerance SOT-23	225 mW Energy Rated SOT-23	225 mW Standard Tolerance SOT-23	225 mW Energy Rated SOT-23
Volts	 Case 318	 Case 318	 Case 318	 Case 318	 Case 318
36 39 43 47 51	BZX84C36L BZX84C39L BZX84C43L BZX84C47L BZX84C51L		BZ84C36E BZX84C43E	MMBZ5258BL MMBZ5259BL MMBZ5261BL MMBZ5262BL	MMBZ5261EL
56 60 62 68 75	BZX84C56L BZX84C62L BZX84C68L BZX84C75L			MMBZ5263BL MMBZ5264BL MMBZ5265BL	
82 87 91				MMBZ5268BL MMBZ5270BL	

Zener Diodes – Regulation in Surface Mount (continued)

Table 4. Surface Mount Packages – 0.5 Watt

Nominal Zener Breakdown Voltage	500 mW SOD-123	500 mW Energy Rated SOD-123	500 mW SOD-123	500 mW Energy Rated SOD-123	500 mW SOD-123	500 mW Energy Rated SOD-123
Volts	 Case 425	 Case 425	 Case 425	 Case 425	 Case 425	 Case 425
1.8 2.0 2.2 2.4 2.5	MMSZ2V4		MMSZ4678 MMSZ4679 MMSZ4680 MMSZ4681		MMSZ5221B MMSZ5222B	MMSZ5221E MMSZ5222E
2.7 2.8 3.0 3.3 3.6 3.7	MMSZ2V7 MMSZ3V0 MMSZ3V3 MMSZ3V6	MMSZ2V7E	MMSZ4682 MMSZ4683 MMSZ4684 MMSZ4685	MMSZ4684E	MMSZ5223B MMSZ5224B MMSZ5225B MMSZ5226B MMSZ5227B	MMSZ5223E MMSZ5226E
3.9 4.0 4.3 4.7 5.1 5.6	MMSZ3V9 MMSZ4V3 MMSZ4V7 MMSZ5V1 MMSZ5V6	MMSZ4V7E	MMSZ4686 MMSZ4687 MMSZ4688 MMSZ4689 MMSZ4690	MMSZ4688E MMSZ4689E MMSZ4690E	MMSZ5228B MMSZ5229B MMSZ5230B MMSZ5231B MMSZ5232B	MMSZ5232E
6.0 6.2 6.8 7.5 8.2	MMSZ6V2 MMSZ6V8 MMSZ7V5 MMSZ8V2	MMSZ8V2E	MMSZ4691 MMSZ4692 MMSZ4693 MMSZ4694		MMSZ5233B MMSZ5234B MMSZ5235B MMSZ5236B MMSZ5237B	MMSZ5235E MMSZ5236E MMSZ5237E
8.7 9.1 10 11 12	MMSZ9V1 MMSZ10 MMSZ11 MMSZ12		MMSZ4695 MMSZ4696 MMSZ4697 MMSZ4698 MMSZ4699	MMSZ4697E MMSZ4699E	MMSZ5238B MMSZ5239B MMSZ5240B MMSZ5241B MMSZ5242B	MMSZ5240E MMSZ5242E
13 14 15 16 17	MMSZ13 MMSZ15 MMSZ16	MMSZ15E	MMSZ4700 MMSZ4701 MMSZ4702 MMSZ4703 MMSZ4704	MMSZ4701E MMSZ4702E MMSZ4704E	MMSZ5243B MMSZ5244B MMSZ5245B MMSZ5246B MMSZ5247B	MMSZ5244E MMSZ5245E MMSZ5246E
18 19 20 22 24	MMSZ18 MMSZ20 MMSZ22 MMSZ24	MMSZ18E	MMSZ4705 MMSZ4706 MMSZ4707 MMSZ4708 MMSZ4709	MMSZ4705E	MMSZ5248B MMSZ5249B MMSZ5250B MMSZ5251B MMSZ5252B	MMSZ5248E MMSZ5250E MMSZ5252E
25 27 28 30 33	MMSZ27 MMSZ30 MMSZ33		MMSZ4710 MMSZ4711 MMSZ4712 MMSZ4713 MMSZ4714		MMSZ5253B MMSZ5254B MMSZ5255B MMSZ5256B MMSZ5257B	MMSZ5254E MMSZ5256E MMSZ5257E

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

Zener Diodes – Regulation in Surface Mount (continued)

Table 4. Surface Mount Packages – 0.5 Watt (continued)

Nominal Zener Breakdown Voltage	500 mW SOD-123	500 mW Energy Rated SOD-123	500 mW SOD-123	500 mW Energy Rated SOD-123	500 mW SOD-123	500 mW Energy Rated SOD-123
Volts	 Case 425	 Case 425	 Case 425	 Case 425	 Case 425	 Case 425
36 39 43 47 51	MMSZ36 MMSZ39 MMSZ43 MMSZ51		MMSZ4715 MMSZ4717		MMSZ5258B MMSZ5259B MMSZ5260B MMSZ5261B MMSZ5262B	MMSZ5259E MMSZ5260E
56 60 62 68 75	MMSZ56				MMSZ5263B MMSZ5264B MMSZ5265B MMSZ5266B MMSZ5267B	MMSZ5263E
82 87 91 100 110					MMSZ5268B MMSZ5270B MMSZ5272B	

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

Zener Diodes – Regulation in Surface Mount (continued)

Table 5. Surface Mount Packages – 1.5, 3 Watt

Nominal Zener Breakdown Voltage	1.5 Watt SMA	1.5 Watt SMA	3 Watt POWERMITE®	3 Watt SMB
Volts	 Plastic Case 403B Cathode = Notch	 Plastic Case 403B Cathode = Notch	 Cathode Anode Plastic Case 457	 Plastic Case 403A
1.8 2.0 2.2 2.4 2.5				
2.7 2.8 3.0 3.3 3.6	1SMA5913B 1SMA5914B			1SMB5913B 1SMB5914B
3.9 4.3 4.7 5.1 5.6	1SMA5915B 1SMA5916B 1SMA5917B 1SMA5918B 1SMA5919B			1SMB5915B 1SMB5916B 1SMB5917B 1SMB5918B 1SMB5919B
6.0 6.2 6.8 7.5 8.2	1SMA5920B 1SMA5921B 1SMA5922B 1SMA5923B		1PMT5920B 1PMT5921B 1PMT5922B 1PMT5923B	1SMB5920B 1SMB5921B 1SMB5922B 1SMB5923B
8.7 9.1 10 11 12	1SMA5924B 1SMA5925B 1SMA5926B 1SMA5927B		1PMT5924B 1PMT5925B 1PMT5927B	1SMB5924B 1SMB5925B 1SMB5926B 1SMB5927B
13 14 15 16 17	1SMA5928B 1SMA5929B 1SMA5930B	BZG03C15	1PMT5929B 1PMT5930B	1SMB5928B 1SMB5929B 1SMB5930B
18 19 20 22 24	1SMA5931B 1SMA5932B 1SMA5933B 1SMA5934B		1PMT5931B 1PMT5933B 1PMT5934B	1SMB5931B 1SMB5932B 1SMB5933B 1SMB5934B
25 27 28 30 33	1SMA5935B 1SMA5936B 1SMA5937B		1PMT5936B	1SMB5935B 1SMB5936B 1SMB5937B

Zener Diodes – Regulation in Surface Mount (continued)

Table 5. Surface Mount Packages – 1.5, 3 Watt (continued)

Nominal Zener Breakdown Voltage	1.5 Watt SMA	1.5 Watt SMA	3 Watt POWERMITE®	3 Watt SMB
Volts	 Plastic Case 403B Cathode = Notch	 Plastic Case 403B Cathode = Notch	Cathode  Anode Plastic Case 457	 Plastic Case 403A
36 39 43 47 51	1SMA5938B 1SMA5939B 1SMA5940B 1SMA5941B 1SMA5942B		1PMT5939B 1PMT5941B	1SMB5938B 1SMB5939B 1SMB5940B 1SMB5941B 1SMB5942B
56 60 62 68 75	1SMA5943B 1SMA5944B 1SMA5945B			1SMB5943B 1SMB5944B 1SMB5945B 1SMB5946B
82 87 91 100 110				1SMB5947B 1SMB5948B 1SMB5949B
120 130 150 160 180 200		BZG03C150		1SMB5951B 1SMB5952B 1SMB5953B 1SMB5954B 1SMB5955B 1SMB5956B

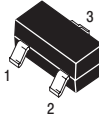
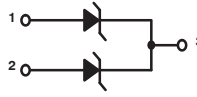
Dual Zeners – Duals in Surface Mount

MMBZ15VDLT1 – Common Cathode Series

Table 6. SOT-23 Dual Common Cathode Zener; 40 Watts Peak Power (10 x 1000 μ s)ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

BIDIRECTIONAL (Circuit tied to Pins 1 and 2)

($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

Device	Breakdown Voltage				Reverse Voltage Working Peak V_{RWM} (V)	Max Reverse Leakage Current I_R (nA)	Max Reverse Surge Current I_{PP} (A)	Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V)	Maximum Temperature Coefficient of V_{BR} (mV/°C)
	V_{BR} (Note 1) (V)			@ I_T (mA)					
	Min	Nom	Max						
 CASE 318-08 TO-236AB LOW PROFILE SOT-23 									
MMBZ15VDL	14.3	15	15.8	1.0	12.8	100	1.9	21.2	12

($V_F = 1.1\text{ V Max @ } I_F = 200\text{ mA}$)

MMBZ27VCL	25.65	27	28.35	1.0	22	50	1.0	38	26
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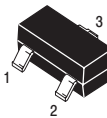
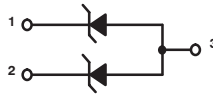
1. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

MMBZ5V6ALT1 – Common Anode Series

Table 7. SOT-23 Dual Common Anode Zener; 24 Watts Peak Power (10 x 1000 μ s)ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or Pins 2 and 3)

($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

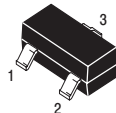
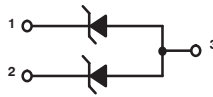
Device	Breakdown Voltage				Max Reverse Leakage Current		Max Zener Impedance (Note 3)			Max Reverse Surge Current I_{PP} (A)	Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V)	Max Temp Coefficient of V_{BR} (mV/°C)
	V_{BR} (Note 2) (V)			@ I_T (mA)	I_R @ V_R (μA) (V)	Z_{ZT} @ I_{ZT} (Ω) (mA)	Z_{ZK} @ I_{ZK} (Ω) (mA)					
	Min	Nom	Max									
 CASE 318-08 STYLE 12 LOW PROFILE SOT-23 PLASTIC 												
MMBZ5V6AL	5.32	5.6	5.88	20	5.0	3.0	11	1600	0.25	3.0	8.0	1.26
MMBZ6V2AL	5.89	6.2	6.51	1.0	0.5	3.0	–	–	–	2.76	8.7	2.80
MMBZ6V8AL	6.46	6.8	7.14	1.0	0.5	4.5	–	–	–	2.5	9.6	3.40
MMBZ9V1AL	8.65	9.1	9.56	1.0	0.3	6.0	–	–	–	1.7	14	7.50

2. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .3. Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current supplied. The specified limits are $I_{Z(AC)} = 0.1 I_{Z(DC)}$, with AC frequency = 1 kHz.

Dual Zeners – Duals in Surface Mount (continued)

MMBZ5V6ALT1 – Common Anode Series

Table 8. SOT-23 Dual Common Anode Zener; 40 Watts Peak Power (10 x 1000 μ s)**ELECTRICAL CHARACTERISTICS** ($T_A = 25^\circ\text{C}$ unless otherwise noted)**UNIDIRECTIONAL** (Circuit tied to Pins 1 and 3 or Pins 2 and 3)($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

Device	Breakdown Voltage				Reverse Voltage Working Peak V_{RWM} (Volts)	Max Reverse Leakage Current I_R (nA)	Max Reverse Surge Current I_{PP} (A)	Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V)	Maximum Temperature Coefficient of V_{BR} (mV/°C)
	V_{BR} (Note 4) (V)			@ I_T (mA)					
	Min	Nom	Max						
 CASE 318-08 STYLE 12 LOW PROFILE SOT-23 PLASTIC 									
MMBZ12VAL	11.40	12	12.60	1.0	8.5	200	2.35	17	7.50
MMBZ15VAL	14.25	15	15.75	1.0	12.0	50	1.9	21	12.30
MMBZ18VAL	17.10	18	18.90	1.0	14.5	50	1.6	25	15.30
MMBZ20VAL	19.00	20	21.00	1.0	17.0	50	1.4	28	17.20
MMBZ27VAL	25.65	27	28.35	1.0	22.0	50	1.0	40	24.30
MMBZ33VAL	31.35	33	34.65	1.0	26.0	50	0.87	46	30.40

4. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

TVS and ESD Protection Devices

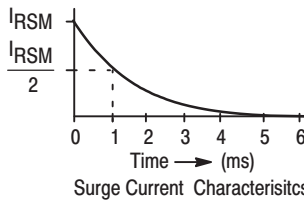
In Brief . . .

Today's electronic systems face EMI and ESD threats from a wide variety of sources. ON Semiconductor's TVS and ESD Protection products provide superior protection from ESD and other transient voltages and are offered in a wide variety of configurations and packages. These products are characterized by low clamping voltage, fast response time, low leakage, and can withstand multiple transient voltage strikes without degradation. All of our products are designed to exceed the highest levels of ESD immunity per the IEC61000-4-2, Human Body Model, and Machine Model standards. The ESD protection family of devices takes advantage of ON Semiconductor's world class micropackaging manufacturing technology to offer ESD protection in some of the smallest packages available today for portable applications where board space is at a premium. The TVS family of devices are rated using the 10 x 1000 μ sec exponential decay surge waveform and are available from 200 W to 1500 W. The Low Capacitance series is suitable for protecting high speed data lines such as USB2.0, Ethernet and DVI. ON Semiconductor's deep portfolio of TVS and ESD protection products are used by industry leaders in automotive, wireless, computing and other high end markets to assure immunity from field failures due to ESD and other transient voltages.

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TVS – in Axial Leads

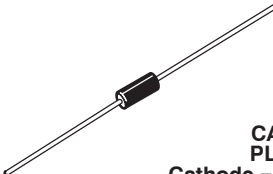
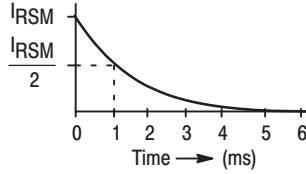
Table 1. Peak Power Dissipation, 500 Watts @ 1 ms Surge (10 x 1000 μ s)
Case 59 – MiniMOSORB™

 CASE 59 (MiniMOSORB™) PLASTIC Cathode = Polarity Band					 Surge Current Characteristics		
ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 35 A Pulse (except bidirectional devices).							
Working Peak Reverse Voltage V _{RWM} (Volts) (Note 1)	Device	Breakdown Voltage		@ I _T Pulse (mA)	Maximum Reverse Leakage @ V _{RWM} I _R (μA)	Maximum Reverse Surge Current I _{RSM} (Amps) (Note 3)	Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)
		V _{BR} (Volts)					
		Min (Note 2)	Max				
5	SA5.0A	6.4	7	10	600	54.3	9.2
6	SA6.0A	6.67	7.37	10	600	48.5	10.3
7	SA7.0A	7.78	8.6	10	150	41.7	12
7.5	SA7.5A	8.33	9.21	1	50	38.8	12.9
8	SA8.0A	8.89	9.83	1	25	36.7	13.6
9	SA9.0A	10	11.1	1	1	32.5	15.4
10	SA10A	11.1	12.3	1	1	29.4	17
11	SA11A	12.2	13.5	1	1	27.4	18.2
12	SA12A	13.3	14.7	1	1	25.1	19.9
13	SA13A	14.4	15.9	1	1	23.2	21.5
14	SA14A	15.6	17.2	1	1	21.5	23.2
15	SA15A	16.7	18.5	1	1	20.6	24.4
16	SA16A	17.8	19.7	1	1	19.2	26
17	SA17A	18.9	20.9	1	1	18.1	27.6
18	SA18A	20	22.1	1	1	17.2	29.2
20	SA20A	22.2	24.5	1	1	15.4	32.4
24	SA24A	26.7	29.5	1	1	12.8	38.9
26	SA26A	28.9	31.9	1	1	11.9	42.1
28	SA28A	31.1	34.4	1	1	11	45.4
30	SA30A	33.3	36.8	1	1	10.3	48.4
33	SA33A	36.7	40.6	1	1	9.4	53.3
36	SA36A	40	44.2	1	1	8.6	58.1
40	SA40A	44.4	49.1	1	1	7.8	64.5
43	SA43A	47.8	52.8	1	1	7.2	69.4
45	SA45A	50	55.3	1	1	6.9	72.7
48	SA48A	53.3	58.9	1	1	6.5	77.4
51	SA51A	56.7	62.7	1	1	6.1	82.4
58	SA58A	64.4	71.2	1	1	5.3	93.6
60	SA60A	66.7	73.7	1	1	5.2	96.8
64	SA64A	71.1	78.6	1	1	4.9	103
170	SA170A	189	209	1	1	1.8	275

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Axial Leads (continued)

Table 2. Peak Power Dissipation, 600 Watts @ 1 ms Surge (10 x 1000 μ s)
Case 17 – Surmetic 40

 CASE 17 PLASTIC Cathode = Polarity Band			 Surge Current Characteristics			
ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}\text{C}$ unless otherwise noted) $V_F = 3.5\text{ V Max}$, $I_F = 50\text{ A Pulse}$ (except bidirectional devices).						
Breakdown Voltage (Note 2)		Device	Working Peak Reverse Voltage V_{RWM} (Volts) (Note 1)	Maximum Reverse Leakage @ V_{RWM} I_R (μA)	Maximum Reverse Surge Current I_{RSM} (Amps) (Note 3)	Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_{RSM} (Volts)
V_{BR} (Volts)	@ I_T Pulse (mA)					
Nom						
6.8	10	P6KE6.8A	5.8	1000	57	10.5
7.5	10	P6KE7.5A	6.4	500	53	11.3
9.1	1	P6KE9.1A	7.78	50	45	13.4
10	1	P6KE10A	8.55	10	41	14.5
11	1	P6KE11A	9.4	5	38	15.6
12	1	P6KE12A	10.2	5	36	16.7
13	1	P6KE13A	11.1	5	33	18.2
15	1	P6KE15A	12.8	5	28	21.2
16	1	P6KE16A	13.6	5	27	22.5
18	1	P6KE18A	15.3	5	24	25.2
20	1	P6KE20A	17.1	5	22	27.7
22	1	P6KE22A	18.8	5	20	30.6
24	1	P6KE24A	20.5	5	18	33.2
27	1	P6KE27A	23.1	5	16	37.5
30	1	P6KE30A	25.6	5	14.4	41.4
33	1	P6KE33A	28.2	5	13.2	45.7
36	1	P6KE36A	30.8	5	12	49.9
39	1	P6KE39A	33.3	5	11.2	53.9
43	1	P6KE43A	36.8	5	10.1	59.3
47	1	P6KE47A	40.2	5	9.3	64.8
51	1	P6KE51A	43.6	5	8.6	70.1
56	1	P6KE56A	47.8	5	7.8	77
62	1	P6KE62A	53	5	7.1	85
68	1	P6KE68A	58.1	5	6.5	92
75	1	P6KE75A	64.1	5	5.8	103
82	1	P6KE82A	70.1	5	5.3	113
100	1	P6KE100A	85.5	5	4.4	137
150	1	P6KE150A	128	5	2.9	207
160	1	P6KE160A	136	5	2.7	219
170	1	P6KE170A	145	5	2.6	234
180	1	P6KE180A	154	5	2.4	246
200	1	P6KE200A	171	5	2.2	274

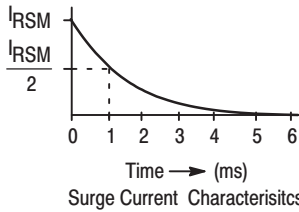
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Axial Leads (continued)

Table 3. Peak Power Dissipation, 1500 Watts @ 1 ms Surge (10 x 1000 μ s)
Case 41A – MOSORB™



**CASE 41A
PLASTIC**
Cathode = Polarity Band



Surge Current Characteristics

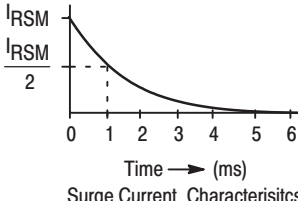
ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}\text{C}$ unless otherwise noted) $V_F = 3.5\text{ V Max}$, $I_F = 100\text{ A Pulse}$
(C suffix denotes standard back to back bidirectional versions. Test both polarities)

Max Re-verse Stand-Off Volt-age V_{RWM} (Volts) (Note 1)	JEDEC Device	Device	Breakdown Voltage		Maximum Reverse Leakage @ V_{RWM} I_R (μA)	Maximum Reverse Surge Current I_{RSM} (Volts) (Note 3)	Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_{RSM} (Volts)	Clamping Voltage	
			V_{BR} Volts Min (Note 2)	@ I_T Pulse (mA)				Peak Pulse Current @ $I_{pp1} = 1\text{ A}$ V_{C1} (Volts max)	Peak Pulse Current @ $I_{pp2} = 10\text{ A}$ V_{C2} (Volts max)
5	1N5908	ICTE-5/MPTE-5	6	1	300	120	8.5	7.6 @ 30 A	8 @ 60 A
5	1N6373		6	1	300	160	9.4	7.1	7.5
8	1N6374		9.4	1	25	100	15	11.3	11.5
12	1N6376	ICTE-12/MPTE-12	14.1	1	2	70	21.2	16.1	16.5
15	1N6377	ICTE-15/MPTE-15	17.6	1	2	60	25	20.1	20.6
18		ICTE-18/MPTE-18	21.2	1	2	50	30	24.2	25.2
22	1N6379		25.9	1	2	40	37.5	29.8	32
36	1N6380	ICTE-36	42.4	1	2	23	65.2	50.6	54.3

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Axial Leads (continued)

Table 4. Peak Power Dissipation, 1500 Watts @ 1 ms Surge (10 x 1000 μ s)
Case 41A – MOSORB

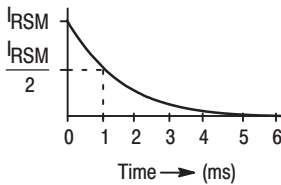
							
ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted) V _F = 3.5 V Max, I _F = 100 A Pulse							
Breakdown Voltage (Note 2)		JEDEC Device	Device	Working Peak Reverse Voltage V _{RWM} (Volts) (Note 1)	Maximum Reverse Leakage @ V _{RWM} I _R (μA)	Maximum Reverse Surge Current I _{RSM} (Amps) (Note 3)	Maximum Reverse Voltage @ I _{RSM} (Clamping Voltage) V _{RSM} (Volts)
V _{BR} Volts	@ I _T Pulse (mA)						
Nom							
6.8 8.2	10 10	1N6267A	1.5KE6.8A 1.5KE8.2A	5.8 7.02	1000 200	143 124	10.5 12.1
10 11 12 13	1 1 1 1	1N6271A 1N6272A 1N6273A 1N6274A	1.5KE10A 1.5KE11A 1.5KE12A 1.5KE13A	8.55 9.4 10.2 11.1	10 5 5 5	103 96 90 82	14.5 15.6 16.7 18.2
15 16 18 20	1 1 1 1	1N6275A 1N6276A 1N6277A 1N6278A	1.5KE15A 1.5KE16A 1.5KE18A 1.5KE20A	12.8 13.6 15.3 17.1	5 5 5 5	71 67 59.5 54	21.2 22.5 25.2 27.7
22 24 27 30	1 1 1 1	1N6279A 1N6280A 1N6281A 1N6282A	1.5KE22A 1.5KE24A 1.5KE27A 1.5KE30A	18.8 20.5 23.1 25.6	5 5 5 5	49 45 40 36	30.6 33.2 37.5 41.4
33 36 39 43	1 1 1 1	1N6283A 1N6284A 1N6285A 1N6286A	1.5KE33A 1.5KE36A 1.5KE39A 1.5KE43A	28.2 30.8 33.3 36.8	5 5 5 5	33 30 28 25.3	45.7 49.9 53.9 59.3
47 51 56 62	1 1 1 1	1N6287A 1N6288A 1N6289A 1N6290A	1.5KE47A 1.5KE51A 1.5KE56A 1.5KE62A	40.2 43.6 47.8 53	5 5 5 5	23.2 21.4 19.5 17.7	64.8 70.1 77 85
68 75 82 91	1 1 1 1	1N6291A 1N6292A 1N6293A 1N6294A	1.5KE68A 1.5KE75A 1.5KE82A 1.5KE91A	58.1 64.1 70.1 77.8	5 5 5 5	16.3 14.6 13.3 12	92 103 113 125
100	1	1N6295A		85.5	5	11	137

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Surface Mount

**Table 5. 1PMT Series Unidirectional Overvoltage Transient Suppressors, 200 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)**

ELECTRICAL CHARACTERISTICS ($T_L = 30^\circ\text{C}$ unless otherwise noted) ($V_F = 1.25$ Volts @ 200 mA)

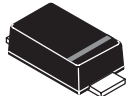
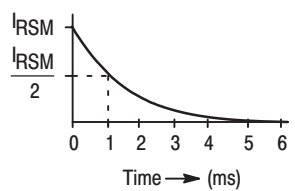
Device	Marking	V _{RWM} (V)	V _{BR} @ I _T (V) (Note 2)			I _T	I _R @ V _{RWM}	V _C @ I _{PP}	I _{PP} (A)
		(Note 1)	Min	Nom	Max	(mA)	(μA)	(V)	(Note 3)
 POWERMITE® CASE 457 PLASTIC  Surge Current Characterisitcs									
1PMT5.0A	MKE	5.0	6.4	6.7	7.0	10	800	9.2	19
1PMT7.0A	MKM	7.0	7.78	8.2	8.6	10	500	12	14.6
1PMT12A	MLE	12	13.3	14	14.7	1.0	5.0	19.9	8.8
1PMT16A	MLP	16	17.8	18.75	19.7	1.0	5.0	26	7.0
1PMT22A	MLX	22	24.4	25.6	26.9	1.0	5.0	35.5	4.9
1PMT24A	MLZ	24	26.7	28.1	29.5	1.0	5.0	38.9	4.5
1PMT26A	MME	26	28.9	30.4	31.9	1.0	5.0	42.1	4.2
1PMT28A	MMG	28	31.1	32.8	34.4	1.0	5.0	45.4	3.9
1PMT30A	MMK	30	33.3	35.1	36.8	1.0	5.0	48.4	3.6
1PMT33A	MMM	33	36.7	38.7	40.6	1.0	5.0	53.3	3.3
1PMT36A	MMP	36	40	42.1	44.2	1.0	5.0	58.1	3.0
1PMT40A	MMR	40	44.4	46.8	49.1	1.0	5.0	64.5	2.7

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Surface Mount (continued)

**Table 6. SMF Series Unidirectional Overvoltage Transient Suppressors, 200 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)**

ELECTRICAL CHARACTERISTICS ($T_L = 30^\circ\text{C}$ unless otherwise noted) ($V_F = 1.25$ Volts @ 200 mA)

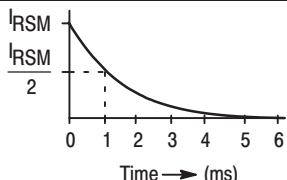
Device	Marking	V _{RWM} (V)	V _{BR} @ I _T (V) (Note 2)			I _T	I _R @ V _{RWM}	V _C @ I _{PP}	I _{PP} (A)
		(Note 1)	Min	Nom	Max	(mA)	(μA)	(V)	(Note 3)
 SOD-123FL CASE 498 PLASTIC  Time → (ms) Surge Current Characteristics									
SMF5.0A	KE	5.0	6.4	6.7	7.0	10	400	9.2	16.3
SMF6.0A	KG	6.0	6.67	7.02	7.37	10	400	10.3	14.6
SMF6.5A	KK	6.5	7.22	7.6	7.98	10	250	11.2	13.4
SMF7.0A	KM	7.0	7.78	8.2	8.6	10	100	12	12.5
SMF7.5A	KP	7.5	8.33	8.77	9.21	1.0	50	12.9	11.6
SMF8.0A	KR	8.0	8.89	9.36	9.83	1.0	25	13.6	11
SMF8.5A	KT	8.5	9.44	9.92	10.4	1.0	10	14.4	10.4
SMF9.0A	KV	9.0	10	10.55	11.1	1.0	5.0	15.4	9.7
SMF10A	KX	10	11.1	11.7	12.3	1.0	2.5	17	8.8
SMF11A	KZ	11	12.2	12.85	13.5	1.0	2.5	18.2	8.2
SMF12A	LE	12	13.3	14	14.7	1.0	2.5	19.9	7.5
SMF13A	LG	13	14.4	15.15	15.9	1.0	1.0	21.5	7.0
SMF14A	LK	14	15.6	16.4	17.2	1.0	1.0	23.2	6.5
SMF15A	LM	15	16.7	17.6	18.5	1.0	1.0	24.4	6.1
SMF16A	LP	16	17.8	18.75	19.7	1.0	1.0	26	5.8
SMF17A	LR	17	18.9	19.9	20.9	1.0	1.0	27.6	5.4
SMF18A	LT	18	20	21	22.1	1.0	1.0	29.2	5.1
SMF20A	LV	20	22.2	23.35	24.5	1.0	1.0	32.4	4.6
SMF22A	LX	22	24.4	25.6	26.9	1.0	1.0	35.5	4.2
SMF24A	LZ	24	26.7	28.1	29.5	1.0	1.0	38.9	3.9
SMF26A	ME	26	28.9	30.4	31.9	1.0	1.0	42.1	3.6
SMF28A	MG	28	31.1	32.8	34.4	1.0	1.0	45.4	3.3
SMF30A	MK	30	33.3	35.1	36.8	1.0	1.0	48.4	3.1
SMF33A	MM	33	36.7	38.7	40.6	1.0	1.0	53.3	2.8
SMF36A	MP	36	40	42.1	44.2	1.0	1.0	58.1	2.6
SMF40A	MR	40	44.4	46.8	49.1	1.0	1.0	64.5	2.3
SMF43A	MT	43	47.8	50.3	52.8	1.0	1.0	69.4	2.2
SMF45A	MV	45	50	52.65	55.3	1.0	1.0	72.7	2.1
SMF48A	MX	48	53.3	56.1	58.9	1.0	1.0	77.4	1.9
SMF51A	MZ	51	56.7	59.7	62.7	1.0	1.0	82.4	1.8
SMF54A	NE	54	60	63.15	66.3	1.0	1.0	87.1	1.7

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Surface Mount (continued)

Table 7. 1SMA Series Unidirectional Overvoltage Transient Suppressors; 400 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) ($V_F = 3.5$ Volts @ $I_F = 40$ A for all types) (Note 4)

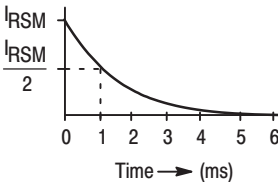
Device	Working Peak Reverse Voltage V_{RWM} (Volts) (Note 1)	Breakdown Voltage		Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_C (Volts)	Maximum Reverse Surge Current I_{PP} (Amps) (Note 3)	Maximum Reverse Leakage @ V_{RWM} I_R (μA)	Device Marking
		V_{BR} Volts (Min) (Note 2)	I_T mA				
 SMA CASE 403B PLASTIC  Surge Current Characteristics							
1SMA5.0A	5.0	6.4	10	9.2	43.5	400	QE
1SMA6.0A	6.0	6.67	10	10.3	38.8	400	QG
1SMA6.5A	6.5	7.22	10	11.2	35.7	250	QK
1SMA7.0A	7.0	7.78	10	12.0	33.3	250	QM
1SMA7.5A	7.5	8.33	1	12.9	31.0	50	QP
1SMA8.0A	8.0	8.89	1	13.6	29.4	25	QR
1SMA8.5A	8.5	9.44	1	14.4	27.8	5.0	QT
1SMA9.0A	9.0	10	1	15.4	26.0	2.5	QV
1SMA10A	10	11.1	1	17.0	23.5	2.5	QX
1SMA11A	11	12.2	1	18.2	22.0	2.5	QZ
1SMA12A	12	13.3	1	19.9	20.1	2.5	RE
1SMA13A	13	14.4	1	21.5	18.6	2.5	RG
1SMA15A	15	16.7	1	24.4	16.4	2.5	RM
1SMA16A	16	17.8	1	26.0	15.4	2.5	RP
1SMA17A	17	18.9	1	27.6	14.5	2.5	RR
1SMA18A	18	20	1	29.2	13.7	2.5	RT
1SMA20A	20	22.2	1	32.4	12.3	2.5	RV
1SMA22A	22	24.4	1	35.5	11.3	2.5	RX
1SMA24A	24	26.7	1	38.9	10.3	2.5	RZ
1SMA26A	26	28.9	1	42.1	9.5	2.5	SE
1SMA28A	28	31.1	1	45.4	8.8	2.5	SG
1SMA30A	30	33.3	1	48.4	8.3	2.5	SK
1SMA33A	33	36.7	1	53.3	7.5	2.5	SM
1SMA36A	36	40	1	58.1	6.9	2.5	SP
1SMA40A	40	44.4	1	64.5	6.2	2.5	SR
1SMA43A	43	47.8	1	69.4	5.8	2.5	ST
1SMA45A	45	50	1	72.2	5.5	2.5	SV
1SMA48A	48	53.3	1	77.4	5.2	2.5	SX
1SMA51A	51	56.7	1	82.4	4.9	2.5	SZ
1SMA54A	54	60	1	87.1	4.6	2.5	TE
1SMA58A	58	64.4	1	93.6	4.8	2.5	TG
1SMA64A	64	71.1	1	103.0	3.9	2.5	TM
1SMA70A	70	77.8	1	113.0	3.5	2.5	TP
1SMA75A	75	83.3	1	121.0	3.3	2.5	TR

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

TVS – in Surface Mount (continued)

**Table 8. 1SMA Series Bidirectional Zener Overvoltage Transient Suppressors; 400 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)**

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

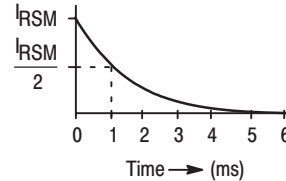
Device	Working Peak Reverse Voltage V_{RWM} (Volts) (Note 1)	Breakdown Voltage		Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_C (Volts)	Maximum Reverse Surge Current I_{PP} (Amps) (Note 3)	Maximum Reverse Leakage @ V_{RWM} I_R (μA)	Device Marking
		V_{BR} Volts (Min) (Note 2)	I_T mA				
 SMA CASE 403B PLASTIC  Time $\rightarrow$ (ms) Surge Current Characterisitcs							
1SMA10CA	10	11.1	1	17.0	23.5	2.5	QXC
1SMA11CA	11	12.2	1	18.2	22.0	2.5	QZC
1SMA12CA	12	13.3	1	19.9	20.1	2.5	REC
1SMA13CA	13	14.4	1	21.5	18.6	2.5	RGC
1SMA14CA	14	15.6	1	23.2	17.2	2.5	RKC
1SMA15CA	15	16.7	1	24.4	16.4	2.5	RMC
1SMA16CA	16	17.8	1	26.0	15.4	2.5	RPC
1SMA18CA	18	20	1	29.2	13.7	2.5	RTC
1SMA20CA	20	22.2	1	32.4	12.3	2.5	RVC
1SMA22CA	22	24.4	1	35.5	11.3	2.5	RXC
1SMA24CA	24	26.7	1	38.9	10.3	2.5	RZC
1SMA26CA	26	28.9	1	42.1	9.5	2.5	SEC
1SMA28CA	28	31.1	1	45.4	8.8	2.5	SGC
1SMA30CA	30	33.3	1	48.4	8.3	2.5	SKC
1SMA33CA	33	36.7	1	53.3	7.5	2.5	SMC
1SMA36CA	36	40	1	58.1	6.9	2.5	SPC
1SMA40CA	40	44.4	1	64.5	6.2	2.5	SRC
1SMA43CA	43	47.8	1	69.4	5.8	2.5	STC
1SMA48CA	48	53.3	1	77.4	5.2	2.5	SXC
1SMA51CA	51	56.7	1	82.4	4.9	2.5	SZC
1SMA54CA	54	60	1	87.1	4.6	2.5	TEC
1SMA58CA	58	64.4	1	93.6	4.3	2.5	TGC
1SMA60CA	60	66.7	1	96.8	4.1	2.5	TKC
1SMA64CA	64	71.1	1	103.0	3.9	2.5	TMC
1SMA70CA	70	77.8	1	113.0	3.5	2.5	TPC
1SMA78CA	78	86.7	1	126.0	3.2	2.5	TSC

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Surface Mount (continued)

Table 9. 1SMB Series Unidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power
@ 1ms Surge (10 x 1000 μ s)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) ($V_F = 3.5\text{ V Max @ } I_F = 30\text{ A}$) (Note 4)

Device	Working Peak Reverse Voltage V _{RWM} Volts (Note 1)	Breakdown Voltage		Maximum Clamping Voltage V _C @ I _{pp} Volts	Peak Pulse Current I _{pp} Amps (Note 3)	Maximum Reverse Leakage @ V _R I _R μA	Device Marking
		V _{BR} @ I _T					
 SMB CASE 403A PLASTIC  Surge Current Characteristics							
1SMB5.0A	5.0	6.40	10	9.2	65.2	800	KE
1SMB6.0A	6.0	6.67	10	10.3	58.3	800	KG
1SMB6.5A	6.5	7.22	10	11.2	53.6	500	KK
1SMB7.0A	7.0	7.78	10	12.0	50.0	200	KM
1SMB7.5A	7.5	8.33	1.0	12.9	46.5	100	KP
1SMB8.0A	8.0	8.89	1.0	13.6	44.1	50	KR
1SMB8.5A	8.5	9.44	1.0	14.4	41.7	10	KT
1SMB9.0A	9.0	10.0	1.0	15.4	39.0	5.0	KV
1SMB10A	10	11.1	1.0	17.0	35.3	5.0	KX
1SMB11A	11	12.2	1.0	18.2	33.0	5.0	KZ
1SMB12A	12	13.3	1.0	19.9	30.2	5.0	LE
1SMB13A	13	14.4	1.0	21.5	27.9	5.0	LG
1SMB14A	14	15.6	1.0	23.2	25.8	5.0	LK
1SMB15A	15	16.7	1.0	24.4	24.0	5.0	LM
1SMB16A	16	17.8	1.0	26.0	23.1	5.0	LP
1SMB17A	17	18.9	1.0	27.6	21.7	5.0	LR
1SMB18A	18	20.0	1.0	29.2	20.5	5.0	LT
1SMB20A	20	22.2	1.0	32.4	18.5	5.0	LV
1SMB22A	22	24.4	1.0	35.5	16.9	5.0	LX
1SMB24A	24	26.7	1.0	38.9	15.4	5.0	LZ
1SMB26A	26	28.9	1.0	42.1	14.2	5.0	ME
1SMB28A	28	31.1	1.0	45.4	13.2	5.0	MG
1SMB30A	30	33.3	1.0	48.4	12.4	5.0	MK
1SMB33A	33	36.7	1.0	53.3	11.3	5.0	MM
1SMB36A	36	40.0	1.0	58.1	10.3	5.0	MP
1SMB40A	40	44.4	1.0	64.5	9.3	5.0	MR
1SMB43A	43	47.8	1.0	69.4	8.6	5.0	MT
1SMB45A	45	50.0	1.0	72.7	8.3	5.0	MV
1SMB48A	48	53.3	1.0	77.4	7.7	5.0	MX
1SMB51A	51	56.7	1.0	82.4	7.3	5.0	MZ
1SMB54A	54	60.0	1.0	87.1	6.9	5.0	NE
1SMB58A	58	64.4	1.0	93.6	6.4	5.0	NG
1SMB60A	60	66.7	1.0	96.8	6.2	5.0	NK
1SMB64A	64	71.1	1.0	103	5.8	5.0	NM
1SMB70A	70	77.8	1.0	113	5.3	5.0	NP
1SMB75A	75	83.3	1.0	121	4.9	5.0	NR
1SMB85A	85	94.4	1.0	137	4.4	5.0	NV
1SMB90A	90	100	1.0	146	4.1	5.0	NX
1SMB100A	100	111	1.0	162	3.7	5.0	NZ

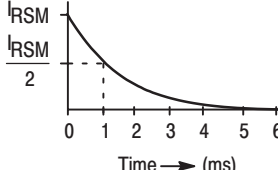
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

Devices listed in **bold, italic** are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

Table 9. 1SMB Series Unidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power
@ 1ms Surge (10 x 1000 μ s) (continued)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) ($V_F = 3.5\text{ V Max @ } I_F = 30\text{ A}$) (Note 4)

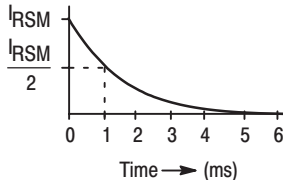
Device	Working Peak Reverse Voltage V_{RWM} Volts (Note 1)	Breakdown Voltage		Maximum Clamping Voltage $V_C @ I_{pp}$ Volts	Peak Pulse Current I_{pp} Amps (Note 3)	Maximum Reverse Leakage @ V_R I_R μA	Device Marking
		$V_{BR} @ I_T$ Volts (Min) (Note 2)	mA				
 SMB CASE 403A PLASTIC  Time → (ms) Surge Current Characteristics							
1SMB110A	110	122	1.0	177	3.4	5.0	PE
1SMB120A	120	133	1.0	193	3.1	5.0	PG
1SMB130A	130	144	1.0	209	2.9	5.0	PK
1SMB150A	150	167	1.0	243	2.5	5.0	PM
1SMB160A	160	178	1.0	259	2.3	5.0	PP
1SMB170A	170	189	1.0	275	2.2	5.0	PR

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

TVS – in Surface Mount (continued)

Table 10. 1SMB Series Bidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power
@ 1ms Surge (10 x 1000 μ s)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted).

Device	Working Peak Reverse Voltage V _{RWM} Volts (Note 1)	Breakdown Voltage V _{BR} @ I _T		Maximum Clamping Voltage V _C @ I _{pp} Volts	Peak Pulse Current I _{pp} Amps (Note 3)	Maximum Reverse Leakage @ V _R I _R μA	Device Marking
		Volts (Min) (Note 2)	mA				
 SMB CASE 403A PLASTIC  Surge Current Characteristics							
1SMB10CA	10	11.1	1.0	17.0	35.3	5.0	KXC
1SMB11CA	11	12.2	1.0	18.2	33.0	5.0	KZC
1SMB12CA	12	13.3	1.0	19.9	30.2	5.0	LEC
1SMB13CA	13	14.4	1.0	21.5	27.9	5.0	LGC
1SMB14CA	14	15.6	1.0	23.2	25.8	5.0	LKC
1SMB15CA	15	16.7	1.0	24.4	24.0	5.0	LMC
1SMB16CA	16	17.8	1.0	26.0	23.1	5.0	LPC
1SMB17CA	17	18.9	1.0	27.6	21.7	5.0	LRC
1SMB18CA	18	20.0	1.0	29.2	20.5	5.0	LTC
1SMB20CA	20	22.2	1.0	32.4	18.5	5.0	LVC
1SMB22CA	22	24.4	1.0	35.5	16.9	5.0	LXC
1SMB24CA	24	26.7	1.0	38.9	15.4	5.0	LZC
1SMB26CA	26	28.9	1.0	42.1	14.2	5.0	MEC
1SMB28CA	28	31.1	1.0	45.4	13.2	5.0	MGC
1SMB30CA	30	33.3	1.0	48.4	12.4	5.0	MKC
1SMB33CA	33	36.7	1.0	53.3	11.3	5.0	MMC
1SMB36CA	36	40.0	1.0	58.1	10.3	5.0	MPC
1SMB40CA	40	44.4	1.0	64.5	9.3	5.0	MRC
1SMB43CA	43	47.8	1.0	69.4	8.6	5.0	MTC
1SMB45CA	45	50.0	1.0	72.7	8.3	5.0	MVC
1SMB48CA	48	53.3	1.0	77.4	7.7	5.0	MXC
1SMB51CA	51	56.7	1.0	82.4	7.3	5.0	MZC
1SMB54CA	54	60.0	1.0	87.1	6.9	5.0	NEC
1SMB58CA	58	64.4	1.0	93.6	6.4	5.0	NGC
1SMB60CA	60	66.7	1.0	96.8	6.2	5.0	NKC
1SMB64CA	64	71.1	1.0	103	5.8	5.0	NMC
1SMB75CA	75	83.3	1.0	121	4.9	5.0	NRC

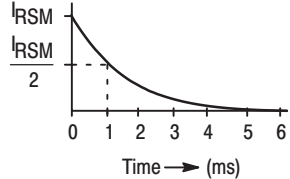
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

Table 11. P6SMB Series Unidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) ($V_F = 3.5\text{ V Max}$, $I_F = 50\text{ A}$ for all types) (Note 4)

Device	Breakdown Voltage				Working Peak Reverse Voltage V_{RWM} Volts (Note 1)	Maximum Reverse Leakage @ V_{RWM} I_R μA	Maximum Reverse Surge Current I_{pp} Amps (Note 3)	Maximum Reverse Voltage @ I_{pp} (Clamping Voltage) V_C Volts	Maximum Temperature Coefficient of V_{BR} %/ $^{\circ}C$	Device Marking
	V_{BR} @ I_T Volts (Note 2)									
	Min	Nom	Max	mA						

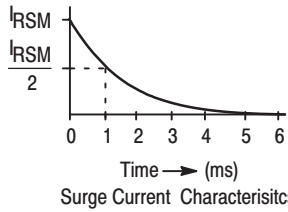
	SMB CASE 403A PLASTIC									
Surge Current Characteristics										
P6SMB6.8A	6.45	6.8	7.14	10	5.8	1000	57	10.5	0.057	6V8A
P6SMB7.5A	7.13	7.5	7.88	10	6.4	500	53	11.3	0.061	7V5A
P6SMB8.2A	7.79	8.2	8.61	10	7.02	200	50	12.1	0.065	8V2A
P6SMB9.1A	8.65	9.1	9.55	1	7.78	50	45	13.4	0.068	9V1A
P6SMB10A	9.5	10	10.5	1	8.55	10	41	14.5	0.073	10A
P6SMB11A	10.5	11	11.6	1	9.4	5	38	15.6	0.075	11A
P6SMB12A	11.4	12	12.6	1	10.2	5	36	16.7	0.078	12A
P6SMB13A	12.4	13	13.7	1	11.1	5	33	18.2	0.081	13A
P6SMB15A	14.3	15	15.8	1	12.8	5	28	21.2	0.084	15A
P6SMB16A	15.2	16	16.8	1	13.6	5	27	22.5	0.086	16A
P6SMB18A	17.1	18	18.9	1	15.3	5	24	25.2	0.088	18A
P6SMB20A	19	20	21	1	17.1	5	22	27.7	0.09	20A
P6SMB22A	20.9	22	23.1	1	18.8	5	20	30.6	0.092	22A
P6SMB24A	22.8	24	25.2	1	20.5	5	18	33.2	0.094	24A
P6SMB27A	25.7	27	28.4	1	23.1	5	16	37.5	0.096	27A
P6SMB30A	28.5	30	31.5	1	25.6	5	14.4	41.4	0.097	30A
P6SMB33A	31.4	33	34.7	1	28.2	5	13.2	45.7	0.098	33A
P6SMB36A	34.2	36	37.8	1	30.8	5	12	49.9	0.099	36A
P6SMB39A	37.1	39	41	1	33.3	5	11.2	53.9	0.1	39A
P6SMB43A	40.9	43	45.2	1	36.8	5	10.1	59.3	0.101	43A
P6SMB47A	44.7	47	49.4	1	40.2	5	9.3	64.8	0.101	47A
P6SMB51A	48.5	51	53.6	1	43.6	5	8.6	70.1	0.102	51A
P6SMB56A	53.2	56	58.8	1	47.8	5	7.8	77	0.103	56A
P6SMB62A	58.9	62	65.1	1	53	5	7.1	85	0.104	62A
P6SMB68A	64.6	68	71.4	1	58.1	5	6.5	92	0.104	68A
P6SMB75A	71.3	75	78.8	1	64.1	5	5.8	103	0.105	75A
P6SMB82A	77.9	82	86.1	1	70.1	5	5.3	113	0.105	82A
P6SMB91A	86.5	91	95.5	1	77.8	5	4.8	125	0.106	91A
P6SMB100A	95	100	105	1	85.5	5	4.4	137	0.106	100A
P6SMB110A	105	110	116	1	94	5	4	152	0.107	110A
P6SMB120A	114	120	126	1	102	5	3.6	165	0.107	120A
P6SMB130A	124	130	137	1	111	5	3.3	179	0.107	130A
P6SMB150A	143	150	158	1	128	5	2.9	207	0.108	150A
P6SMB160A	152	160	168	1	136	5	2.7	219	0.108	160A
P6SMB180A	171	180	189	1	154	5	2.4	246	0.108	180A
P6SMB200A	190	200	210	1	171	5	2.2	274	0.108	200A

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. $10 \times 1000\text{ }\mu\text{s}$ exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, $PW = 8.3\text{ ms}$, duty cycle = 4 pulses per minute).

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

Table 12. P6SMB Series Bidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Device	Breakdown Voltage				Working Peak Reverse Voltage V _{RWM} Volts (Note 1)	Maximum Reverse Leakage @ V _{RWM} I _R μA	Maximum Reverse Surge Current I _{pp} Amps (Note 3)	Maximum Reverse Voltage @ I _{pp} (Clamping Voltage) V _C Volts	Maximum Temperature Coefficient of V _{BR} %/°C	Device Marking
	V _{BR} @ I _T Volts (Note 2)									
	Min	Nom	Max	mA						
 SMB CASE 403A PLASTIC  Surge Current Characteristics										
P6SMB11CA	10.5	11	11.6	1	9.4	5	38	15.6	0.075	11C
P6SMB12CA	11.4	12	12.6	1	10.2	5	36	16.7	0.078	12C
P6SMB13CA	12.4	13	13.7	1	11.1	5	33	18.2	0.081	13C
P6SMB15CA	14.3	15	15.8	1	12.8	5	28	21.2	0.084	15C
P6SMB16CA	15.2	16	16.8	1	13.6	5	27	22.5	0.086	16C
P6SMB18CA	17.1	18	18.9	1	15.3	5	24	25.2	0.088	18C
P6SMB20CA	19	20	21	1	17.1	5	22	27.7	0.09	20C
P6SMB22CA	20.9	22	23.1	1	18.8	5	20	30.6	0.092	22C
P6SMB24CA	22.8	24	25.2	1	20.5	5	18	33.2	0.094	24C
P6SMB27CA	25.7	27	28.4	1	23.1	5	16	37.5	0.096	27C
P6SMB30CA	28.5	30	31.5	1	25.6	5	14.4	41.4	0.097	30C
P6SMB33CA	31.4	33	34.7	1	28.2	5	13.2	45.7	0.098	33C
P6SMB36CA	34.2	36	37.8	1	30.8	5	12	49.9	0.099	36C
P6SMB39CA	37.1	39	41	1	33.3	5	11.2	53.9	0.1	39C
P6SMB43CA	40.9	43	45.2	1	36.8	5	10.1	59.3	0.101	43C
P6SMB47CA	44.7	47	49.4	1	40.2	5	9.3	64.8	0.101	47C
P6SMB51CA	48.5	51	53.6	1	43.6	5	8.6	70.1	0.102	51C
P6SMB56CA	53.2	56	58.8	1	47.8	5	7.8	77	0.103	56C
P6SMB62CA	58.9	62	65.1	1	53	5	7.1	85	0.104	62C
P6SMB68CA	64.6	68	71.4	1	58.1	5	6.5	92	0.104	68C
P6SMB75CA	71.3	75	78.8	1	64.1	5	5.8	103	0.105	75C
P6SMB82CA	77.9	82	86.1	1	70.1	5	5.3	113	0.105	82C
P6SMB91CA	86.5	91	95.5	1	77.8	5	4.8	125	0.106	91C

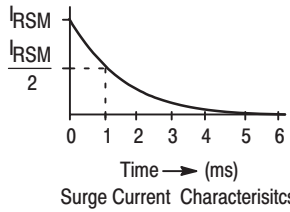
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

**Table 13. SMBJ12AON Series Bidirectional Overvoltage Transient Suppressors; 600 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)**

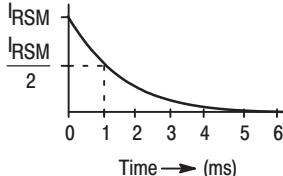
ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Device	Breakdown Voltage				Working Peak Reverse Voltage V_{RWM} Volts (Note 1)	Maximum Reverse Leakage @ V_{RWM} I_R μA	Maximum Reverse Surge Current I_{PP} Amps (Note 3)	Maximum Reverse Voltage @ I_{PP} (Clamping Voltage) V_C Volts
	V_{BR} @ I_T Volts (Note 2)							
	Min	Nom	Max	mA				
 SMB CASE 403A PLASTIC  Time $\rightarrow$ (ms) Surge Current Characteristics								
SMBJ12AON	13.2	13.75	14.3	1	12	5	17.5	15.6

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.

TVS – in Surface Mount (continued)

Table 14. 1SMC Series Unidirectional Overvoltage Transient Suppressors; 1500 Watts Peak Power @ 1 ms Surge (10 x 1000 μ s)ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) ($V_F = 3.5\text{ V Max @ }I_F = 100\text{ A}$) (Note 4)

Device	Working Peak Reverse Voltage V_R Volts (Note 1)	Breakdown Voltage		Maximum Clamping Voltage $V_C @ I_{PP}$ Volts	Peak Pulse Current I_{PP} Amps (Note 3)	Maximum Reverse Leakage @ V_R I_R μA	Device Marking
		$V_{BR} @ I_T$					
		Volts (Min) (Note 2)	mA				
 SMC CASE 403B PLASTIC  Time $\longrightarrow$ (ms) Surge Current Characteristics							
1SMC5.0A	5.0	6.40	10	9.2	163.0	1000	GDE
1SMC6.0A	6.0	6.67	10	10.3	145.6	1000	GDG
1SMC6.5A	6.5	7.22	10	11.2	133.9	500	GDK
1SMC7.0A	7.0	7.78	10	12.0	125.0	200	GDM
1SMC7.5A	7.5	8.33	1.0	12.9	116.3	100	GDP
1SMC8.0A	8.0	8.89	1.0	13.6	110.3	50	GDR
1SMC8.5A	8.5	9.44	1.0	14.4	104.2	20	GDT
1SMC9.0A	9.0	10.0	1.0	15.4	97.4	10	GDV
1SMC10A	10	11.1	1.0	17.0	88.2	5.0	GDX
1SMC12A	12	13.3	1.0	19.9	75.3	5.0	GEE
1SMC13A	13	14.4	1.0	21.5	69.7	5.0	GEG
1SMC14A	14	15.6	1.0	23.2	64.7	5.0	GEK
1SMC15A	15	16.7	1.0	24.4	61.5	5.0	GEM
1SMC16A	16	17.8	1.0	26.0	57.7	5.0	GEP
1SMC17A	17	18.9	1.0	27.6	53.3	5.0	GER
1SMC18A	18	20.0	1.0	29.2	51.4	5.0	GET
1SMC20A	20	22.2	1.0	32.4	46.3	5.0	GEV
1SMC22A	22	24.4	1.0	35.5	42.2	5.0	GEX
1SMC24A	24	26.7	1.0	38.9	38.6	5.0	GEZ
1SMC26A	26	28.9	1.0	42.1	35.6	5.0	GFE
1SMC28A	28	31.1	1.0	45.4	33.0	5.0	GFG
1SMC30A	30	33.3	1.0	48.4	31.0	5.0	GFK
1SMC33A	33	36.7	1.0	53.3	28.1	5.0	GFM
1SMC36A	36	40.0	1.0	58.1	25.8	5.0	GFP
1SMC40A	40	44.4	1.0	64.5	23.2	5.0	GFR
1SMC43A	43	47.8	1.0	69.4	21.6	5.0	GFT
1SMC45A	45	50.0	1.0	72.7	20.6	5.0	GFV
1SMC48A	48	53.3	1.0	77.4	19.4	5.0	GFX
1SMC51A	51	56.7	1.0	82.4	18.2	5.0	GFZ
1SMC54A	54	60.0	1.0	87.1	17.2	5.0	GGE
1SMC58A	58	64.4	1.0	93.6	16.0	5.0	GGG
1SMC60A	60	66.7	1.0	96.8	15.5	5.0	GGK
1SMC64A	64	71.1	1.0	103	14.6	5.0	GGM
1SMC70A	70	77.8	1.0	113	13.3	5.0	GGP
1SMC75A	75	83.3	1.0	121	12.4	5.0	GGR
1SMC78A	78	86.7	1.0	126	11.4	5.0	GGT

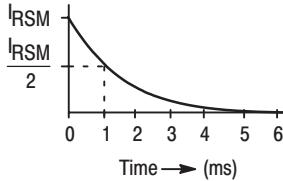
1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μs exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

TVS – in Surface Mount (continued)

**Table 15. 1.5 SMC Series Unidirectional Overvoltage Transient Suppressors; 1500 Watts Peak Power
@ 1 ms Surge (10 x 1000 μ s)**

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) ($V_F = 3.5\text{ V Max}$, $I_F = 100\text{ A}$ for all types) (Note 4)

Device	Breakdown Voltage				Working Peak Reverse Voltage V _{RWM} Volts (Note 1)	Maximum Reverse Leakage @ V _{RWM} I _R μA	Maximum Reverse Surge Current I _{PP} Amps (Note 3)	Maximum Reverse Voltage @ I _{PP} (Clamping Voltage) V _C Volts	Maximum Temperature Coefficient of V _{BR} %/°C	Device Marking
	V _{BR} @ I _T Volts (Note 2)									
	Min	Nom	Max	mA						
 SMC CASE 403 PLASTIC  Time → (ms) Surge Current Characteristics										
1.5SMC6.8A	6.45	6.8	7.14	10	5.8	1000	143	10.5	0.057	6V8A
1.5SMC7.5A	7.13	7.5	7.88	10	6.4	500	132	11.3	0.061	7V5A
1.5SMC8.2A	7.79	8.2	8.61	10	7.02	200	124	12.1	0.065	8V2A
1.5SMC9.1A	8.65	9.1	9.55	1	7.78	50	112	13.4	0.068	9V1A
1.5SMC10A	9.5	10	10.5	1	8.55	10	103	14.5	0.073	10A
1.5SMC12A	11.4	12	12.6	1	10.2	5	90	16.7	0.078	12A
1.5SMC13A	12.4	13	13.7	1	11.1	5	82	18.2	0.081	13A
1.5SMC15A	14.3	15	15.8	1	12.8	5	71	21.2	0.084	15A
1.5SMC16A	15.2	16	16.8	1	13.6	5	67	22.5	0.086	16A
1.5SMC18A	17.1	18	18.9	1	15.3	5	59.5	25.2	0.088	18A
1.5SMC20A	19	20	21	1	17.1	5	54	27.7	0.09	20A
1.5SMC22A	20.9	22	23.1	1	18.8	5	49	30.6	0.092	22A
1.5SMC24A	22.8	24	25.2	1	20.5	5	45	33.2	0.094	24A
1.5SMC27A	25.7	27	28.4	1	23.1	5	40	37.5	0.096	27A
1.5SMC30A	28.5	30	31.5	1	25.6	5	36	41.4	0.097	30A
1.5SMC33A	31.4	33	34.7	1	28.2	5	33	45.7	0.098	33A
1.5SMC36A	34.2	36	37.8	1	30.8	5	30	49.9	0.099	36A
1.5SMC39A	37.1	39	41	1	33.3	5	28	53.9	0.1	39A
1.5SMC43A	40.9	43	45.2	1	36.8	5	25.3	59.3	0.101	43A
1.5SMC47A	44.7	47	49.4	1	40.2	5	23.2	64.8	0.101	47A
1.5SMC51A	48.5	51	53.6	1	43.6	5	21.4	70.1	0.102	51A
1.5SMC56A	53.2	56	58.8	1	47.8	5	19.5	77	0.103	56A
1.5SMC62A	58.9	62	65.1	1	53	5	17.7	85	0.104	62A
1.5SMC68A	64.6	68	71.4	1	58.1	5	16.3	92	0.104	68A
1.5SMC75A	71.3	75	78.8	1	64.1	5	14.6	103	0.105	75A
1.5SMC82A	77.9	82	86.1	1	70.1	5	13.3	113	0.105	82A
1.5SMC91A	86.5	91	95.5	1	77.8	5	12	125	0.106	91A

1. A transient suppressor is normally selected according to the Working Peak Reverse Voltage (V_{RWM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
2. V_{BR} measured at pulse test current I_T at ambient temperature of 25°C .
3. 10 x 1000 μ s exponential decay surge waveform.
4. 1/2 sine wave (or equivalent square pulse, PW = 8.3 ms, duty cycle = 4 pulses per minute).

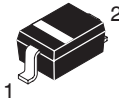
Devices listed in **bold**, *italic* are ON Semiconductor preferred devices.

TVS/ESD Protection – One Line

SD05 Series

Table 16. Single Line TVS/ESD in SOD–323; 350 Watts Peak Power (8 x 20 μ s); Meets IEC61000–4–2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
UNIDIRECTIONAL

Device	Breakdown Voltage				Reverse Voltage Working Peak V_{RWM} (Volts)	Max Reverse Leakage Current I_R (μA)	Max Reverse Surge Current I_{PP} (A)	Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V)	Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts
	V_{BR} (Note 5) (V)			@ I_T (mA)					
	Min	Nom	Max						
2 1 CASE 477 STYLE 1 SOD-323 1 2									
SD05	6.2	6.75	7.3	1.0	5.0	10	24	14.5	350
SD12	13.3	14.5	15.75	1.0	12	1.0	15	25	150

5. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

SD12C

Table 17. Single Line TVS/ESD in SOD–323; 350 Watts Peak Power (8 x 20 μ s); Meets IEC61000–4–2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
BIDIRECTIONAL

Device	Breakdown Voltage				Reverse Voltage Working Peak V_{RWM} (Volts)	Max Reverse Leakage Current I_R (μA)	Max Reverse Surge Current I_{PP} (A)	Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V)	Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts
	V_{BR} (Note 6) (V)			@ I_T (mA)					
	Min	Nom	Max						
 CASE 477 STYLE 1 SOD–323 									
SD12C	13.3	–	–	1.0	12	1.0	15	24	64

6. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

TVS/ESD Protection – One Line (continued)

ESD5Z Series

Table 18. Single Line TVS/ESD in SOD-523; 200 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
UNIDIRECTIONAL

Device	Breakdown Voltage				Reverse Voltage Working Peak V_{RWM} (Volts)	Max Reverse Leakage Current I_R (μ A)	Max Reverse Surge Current I_{PP} (A)	Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V)	Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts
	V_{BR} (Note 7) (V)			@ I_T (mA)					
	Min	Nom	Max						
² 1 CASE 502 SOD-523 1  2									
ESD5Z2.5	4.0	–	–	1.0	2.5	6.0	11	10.9	145
ESD5Z3.3	5.0	–	–	1.0	3.3	0.05	11.2	14.1	105
ESD5Z5.0	6.2	–	–	1.0	5.0	0.05	9.4	18.6	80
ESD5Z6.0	6.8	–	–	1.0	6.0	0.01	8.8	20.5	70
ESD5Z7.0	7.5	–	–	1.0	7.0	0.01	8.8	22.7	65
ESD5Z12	14.1	–	–	1.0	12	0.01	9.6	25	55

7. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C . μ ESD SeriesTable 19. Single Line TVS/ESD in SOD-723; 100 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
UNIDIRECTIONAL

Device	Breakdown Voltage				Reverse Voltage Working Peak V_{RWM} (V)	Max Reverse Leakage Current I_R (μ A)	Max Reverse Surge Current I_{PP} (A)	Max Reverse Voltage @ I_{PP} (Clamping Voltage) V_C (V)	Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts
	V_{BR} (V) @ I_T (Note 8)			@ I_T (mA)					
	Min	Nom	Max						
 CASE 509AA SOD-723 									
μ ESD3.3S	5.0	–	–	1.0	3.3	2.5	10.4	10.9	80
μ ESD5.0S	6.2	–	–	1.0	5.0	1.0	8.8	13.3	65
μ ESD12S	13.5	–	–	1.0	12	1.0	5.4	23.7	30

8. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

TVS/ESD Protection – One Line (continued)

ESD9X Series

Table 20. Single Line TVS/ESD in SOD-923; 100 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
UNIDIRECTIONAL

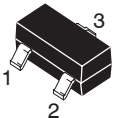
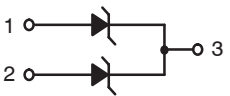
Device	Breakdown Voltage				Reverse Voltage Working Peak V _{RWM} (V)	Max Reverse Leakage Current I _R (μA)	Max Reverse Surge Current I _{PP} (A)	Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V)	Typical Capacitance (pF) Pin 1 to 2 @ 0 Volts
	V _{BR} (V) @ I _T (Note 9)			@ I _T (mA)					
	Min	Nom	Max						
CASE 514AA SOD-923 1 0  2									
ESD9X3.3S	5.0	–	–	1.0	3.3	2.5	9.8	10.4	80
ESD9X5.0S	6.2	–	–	1.0	5.0	1.0	8.7	13.3	65
ESD9X12S	13.5	–	–	1.0	12	1.0	5.9	23.7	30

9. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

NUP1105L – LIN Bus Protector

Table 21. Single Line TVS/ESD in SOT-23; 350 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
BIDIRECTIONAL

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I _{PP} (Clamping Voltage)	Peak Power Rating (8x20 μsec) (Note 10)
		V _{BR} (V)		@ I _T	I _R	V _{RWM}					
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max	I _{PP} (A)	V _C (V)	
 CASE 318 STYLE 27 SOT-23 											
NUP1105L	25.7	–	28.4	1.0	0.1	24	–	30	8.0	44	350

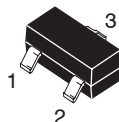
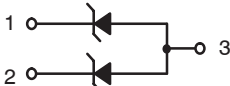
10. Surge waveform 8 x 20 μ sec.

TVS/ESD Protection – Two Line

SM05 – Common Anode Series

Table 22. Two Line TVS/ESD in SOT-23; 300 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
UNIDIRECTIONAL

Device	Breakdown Voltage				Reverse Voltage Working Peak V _{RWM} (Volts)	Max Reverse Leakage Current I _R (μA)	Max Reverse Surge Current I _{PP} (A)	Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V)	Typical Capacitance (pF) Pin 1 to 3 @ 0 Volts
	V _{BR} (Note 11) (V)			@ I _T (mA)					
	Min	Nom	Max						
 CASE 318 STYLE 12 LOW PROFILE SOT-23 PLASTIC 									
SM05	6.2	6.75	7.3	1.0	5.0	10	17	9.8	225
SM12	13.3	14.5	15.75	1.0	12	1.0	12	19	95

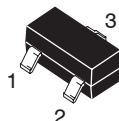
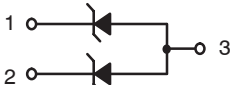
11. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

MA3075WAL

Table 23. Two Line TVS/ESD in SOT-23; Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
UNIDIRECTIONAL

($V_F = 0.9$ V Max @ $I_F = 10$ mA)

Device	Breakdown Voltage				Max Reverse Leakage Current I_R (μA @ 5 V)	Maximum Temperature Coefficient of V_{BR} (mV/°C)
	V_{BR} (Note 12) (V)			@ I_T (mA)		
	Min	Nom	Max			
 CASE 318 STYLE 12 LOW PROFILE SOT-23 PLASTIC 						
MA3075WAL	7.2	7.5	7.9	5.0	1.0	5.3

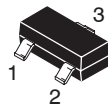
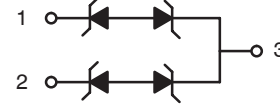
12. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

TVS/ESD Protection – Two Line (continued)

NUP2105L – CAN Bus Protector

Table 24. Two Line TVS/ESD in SOT-23; 350 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
 BIDIRECTIONAL

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I _{pp} (Clamping Voltage)	Peak Power Rating (8x20 μsec) (Note 13)
		V _{BR} (V)		@ I _T	I _R	V _{RWM}					
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max	I _{pp} (A)	V _C (V)	Watts
 CASE 318 SOT-23 											
NUP2105L	26.2	–	32	1.0	0.1	24	30	–	8.0	44	350

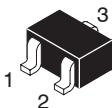
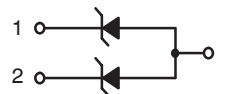
13. Surge waveform 8 x 20 μ sec.

DF3A6.8FU

Table 25. Two Line TVS/ESD in SC-70; 150 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)
 UNIDIRECTIONAL

($V_F = 0.9$ V Max @ $I_F = 10$ mA)

Device	Breakdown Voltage				Max Reverse Leakage Current		Max Reverse Surge Current I _{PP} (A)	Max Reverse Voltage @ I _{PP} (Clamping Voltage) V _C (V)
	V _{BR} (Note 14) (V)			@ I _T (mA)	I _R @ V _R (μA) (V)			
	Min	Nom	Max					
 CASE 419 SC-70 (SOT-323) 								
DF3A6.8FU	6.4	6.8	7.2	5.0	0.5	5.0	2.0	9.6

14. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

TVS/ESD Protection – Two Line (continued)

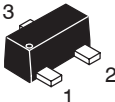
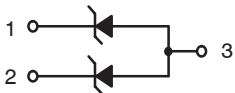
NZL5V6AXV Series

Table 26. Two Line ESD Protection in SC-89; Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

UNIDIRECTIONAL

($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

Device	Breakdown Voltage				Max Reverse Leakage Current	
	V _{BR} (Note 15) (V)			@ I _T (mA)	I _R @ V _R (μA) (V)	
	Min	Nom	Max			
 CASE 463C SC-89 						
NZL5V6AXV3	5.32	5.6	5.88	5.0	5.0	3.0
NZL6V8AXV3	6.46	6.8	7.14	5.0	1.0	4.5
NZL7V5AXV3	7.12	7.5	7.88	5.0	1.0	5.0

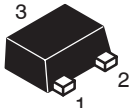
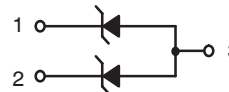
15. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C . $\mu\text{ESD3.3D}$ Series

Table 27. Two Line ESD Protection in SOT-723; Meets IEC61000-4-2, Level 4

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

UNIDIRECTIONAL

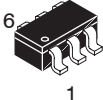
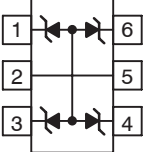
($V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$)

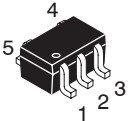
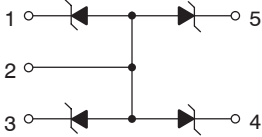
Device	Breakdown Voltage				Max Reverse Leakage Current I_R (μA) @ V_{RWM}
	V_{BR} (Note 16) (V)			@ I_T (mA)	
	Min	Nom	Max		
 CASE 631AA STYLE 4 SOT-723 					
$\mu ESD3.3D$	5.0	–	–	1.0	1.0
$\mu ESD5.0D$	6.2	–	–	1.0	0.1
$\mu ESD6.0D$	7.0	–	–	1.0	0.1

16. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

TVS/ESD Protection – Four Line

Table 28. Four Line TVS/ESD Protection; Meets IEC61000–4–2, Level 4

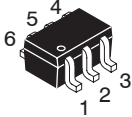
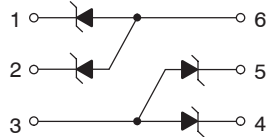
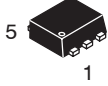
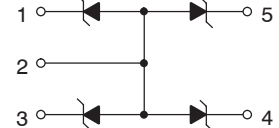
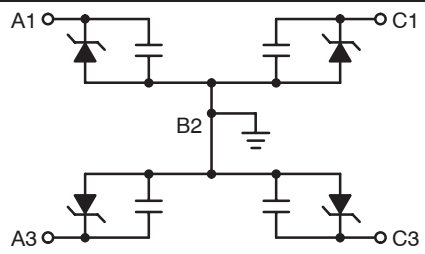
Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec) (Note 17)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 318F STYLE 1 SC-74 PLASTIC 											
MMQA5V6	5.32	5.6	5.88	1.0	2.0	3.0	257	–	3.0	8.0	150
MMQA6V2	5.89	6.2	6.51	1.0	0.7	4.0	225	–	2.66	9.0	150
MMQA6V8	6.46	6.8	7.14	1.0	0.5	4.3	210	–	2.45	9.8	150
MMQA12V	11.4	12	12.6	1.0	0.075	9.1	117	–	1.39	17.3	150
MMQA13V	12.4	13	13.7	1.0	0.075	9.8	108	–	1.29	18.6	150
MMQA15V	14.3	15	15.8	1.0	0.075	11	93	–	1.1	21.7	150
MMQA18V	17.1	18	18.9	1.0	0.075	14	77	–	0.923	26	150
MMQA20V	19	20	21	1.0	0.075	15	69	–	0.84	28.6	150
MMQA22V	20.9	22	23.1	1.0	0.075	17	63	–	0.758	31.7	150
MMQA24V	22.8	24	25.2	1.0	0.075	18	58	–	0.694	34.6	150
MMQA27V	25.7	27	28.4	1.0	0.075	21	50	–	0.615	39	150
MMQA30V	28.5	30	31.5	1.0	0.075	23	40	–	0.554	43.3	150
MMQA33V	31.4	33	34.7	1.0	0.075	25	42	–	0.504	48.6	150
SMS05	6.0	–	7.2	1.0	20	5.0	300	400	23	15.5	350
SMS12	13.3	–	15	1.0	1.0	12	120	150	15	23	350
SMS15	16.7	–	18.5	1.0	1.0	15	100	125	12	29	350
SMS24	26.7	–	32	1.0	1.0	24	60	75	8.0	44	350

 CASE 419A SC-88A (SOT-353) 											
MSQA6V1W5	6.1	6.6	7.2	1.0	1.0	3.0	90	–	–	–	150
SMF05	6.0	–	7.2	1.0	5.0	5.0	90	–	12	12.5	200

17. Surge waveform 8 x 20 μ sec.

TVS/ESD Protection – Four Line (continued)

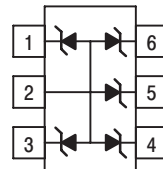
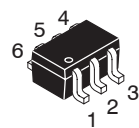
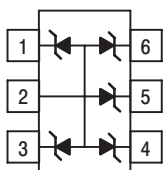
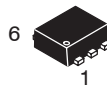
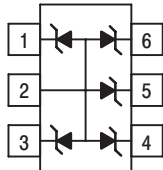
Table 28. Four Line TVS/ESD Protection; Meets IEC61000–4–2, Level 4 (continued)

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec) (Note 18)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}				V_C (V)	
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)		Watts
 CASE 419B SC-88 (SOT-363) 											
DF6A6.8FU	6.4	6.8	7.2	1.0	1.0	5.0	40	–	7.0	11.4	75
 CASE 463B SOT-553 											
NZQA5V6XV5	5.32	5.6	5.88	1.0	1.0	3.0	90	–	10	10.5	100
NZQA6V2XV5	5.89	6.2	6.51	1.0	0.5	4.0	80	–	9.0	11.5	100
NZQA6V8XV5	6.46	6.8	7.14	1.0	0.1	4.3	70	–	8.0	12.5	100
 CASE 766AB 5 PIN FLIP-CHIP CSP 											
NUP4103FC	6.0	7.0	8.0	1.0	0.1	3.3	47	–	–	–	–

18. Surge waveform 8 x 20 μ sec.

TVS/ESD Protection – Five Line

Table 29. Five Line TVS/ESD Protection; Meets IEC61000–4–2, Level 4

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec) (Note 19)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 318F STYLE 1 SC-74 PLASTIC 											
SMS05C	6.2	–	7.2	1.0	5.0	5.0	260	–	24	14.5	350
SMS12C	13.3	–	15	1.0	1.0	12	120	–	15	23	350
SMS15C	17	–	19	1.0	1.0	15	95	–	12	29	350
SMS24C	26.7	–	32	1.0	1.0	24	60	–	8.0	44	350
 CASE 419B SC-88 (SOT-363) 											
SMF05C	6.2	–	7.2	1.0	5.0	5.0	80	–	8.0	12.5	100
SMF12C	13.3	–	15	1.0	1.0	12	40	–	6.0	23	100
SMF15C	17	–	19	1.0	1.0	15	33	–	5.0	29	100
SMF24C	26.7	–	32	1.0	1.0	24	21	–	2.5	44	100
 CASE 463A SOT-563 											
NUP5120X6	6.2	6.8	7.2	1.0	0.5	3.0	54	–	–	–	90

19. Surge waveform 8 x 20 μ sec.

Low Capacitance TVS/ESD Protection – One Line

SL05 Series

Table 30. Single Line Low Cap TVS/ESD in SOT-23; 300 Watts Peak Power (8 x 20 μ s); Meets IEC61000-4-2, Level 4

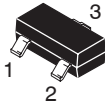
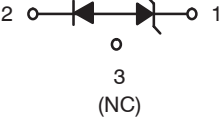
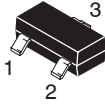
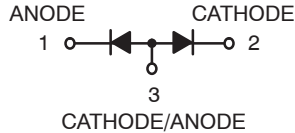
Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 318 STYLE 26 SOT-23 											
SL05	6.0	–	8.0	1.0	20	5.0	3.5	5.0	17	11	300
SL15	16.7	–	18.5	1.0	1.0	15	3.5	5.0	10	30	300
SL24	26.7	–	29	1.0	1.0	24	3.5	5.0	5.0	55	300

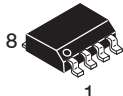
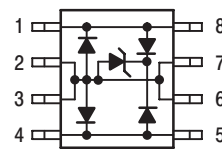
Table 31. Meets IEC61000-4-2, Level 4

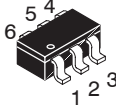
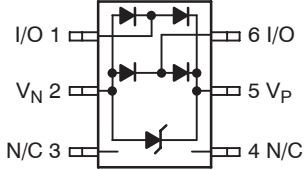
Device	Breakdown Voltage		Forward Voltage		Capacitance* (pF) @ 0 V, 1.0 MHz	
	V_{BR} (V)	@ I_{br}	V_f (V)	I_f		
	Min	μ A	Max	mA	Typ	Max
 CASE 318 SOT-23 						
USB 2.0						
NUP1301ML3	70	100	0.855	10	–	0.9

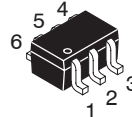
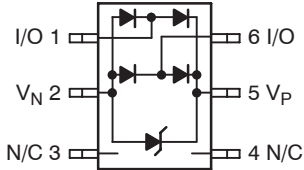
* C_j = Between I/O pin and ground.

Low Capacitance TVS/ESD Protection – Two Line

Table 32. Two Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4

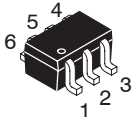
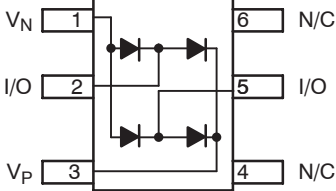
Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Re-verse Surge Current	Max Reverse Voltage @ I _{pp} (Clamping Voltage)	Peak Power Rating (8x20 μsec)
		V _{BR} (V)		@ I _T	I _R	V _{RWM}					
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max	I _{pp} (A)	V _C (V)	Watts
 8 1 CASE 751 SO-8  1 2 3 4 5 6 7 8											
USB 1.1											
LC03-6	6.8	–	–	1.0	20	5.0	16	25	50	15	2000

 CASE 318G TSOP-6 											
USB 2.0											
NUP2201MR6	6.0	–	–	1.0	5.0	5.0	3.0	5.0	25	20	500

 CASE 419B SC-88 (SOT-363) 											
USB 2.0											
NUP2202W1	6.0	–	–	1.0	5.0	5.0	3.0	5.0	28	20	500

* C_j = Between I/O pin and ground.

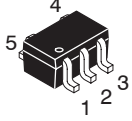
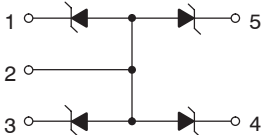
Table 33. Meets IEC61000-4-2, Level 4

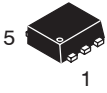
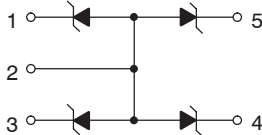
Device	Breakdown Voltage		Forward Voltage		Capacitance* (pF) @ 0 V, 1.0 MHz	
	V_{BR} (V)	@ I_{br}	V_f (V)	I_f		
	Min	μ A	Max	mA	Typ	Max
 CASE 419B SC-88 						
USB 2.0						
NUP2301MW6	70	100	0.855	10	1.6	3.0

* C_j = Between I/O pin and ground.

Low Capacitance TVS/ESD Protection – Four Line

Table 34. Four Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4

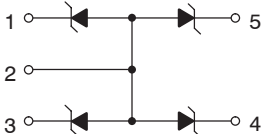
Device	Breakdown Voltage			Max Reverse Leakage Current			Capacitance* (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec) (Note 20)
	V_{BR} (V)			@ I_T							
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 419A SC-88A (SOT-353) 											
NSQA6V8AW5	6.4	6.8	7.1	1.0	1.0	5.0	12	15	1.6	13	20
NSQA12VAV5	11.4	12	12.7	5.0	0.05	9.0	7.0	15	0.9	23	20

 CASE 463B SOT-553 											
NZQA5V6AXV5	5.3	5.6	5.9	1.0	1.0	3.0	13	17	1.6	13	20
NZQA6V8AXV5	6.1	6.8	7.2	1.0	1.0	4.3	12	15	1.6	13	20

* C_j = Between I/O pin and ground.

20. Surge waveform 8 x 20 μ sec.

Table 35. Four Line Low Cap TVS/ESD Protection in SOT-953; Meets IEC61000–4–2, Level 4

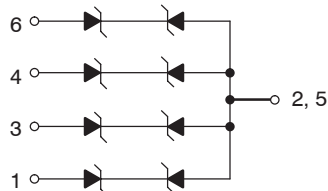
Device	Breakdown Voltage V_{BR} @ 1.0 mA (Volts)			Leakage Current I_{RM} @ V_{RM}		Typ Capacitance @ 0 V Bias (pF)		Typ Capacitance @ 3.0 V Bias (pF)	
	Min	Nom	Max	V_{RWM}	I_{RWM} (μ A)	Typ	Max	Typ	Max
 CASE 527AB SOT-953 									
NUP45V6P5	5.3	5.6	5.9	3.0	1.0	13	17	7.0	11.5
NUP46V8P5	6.47	6.8	7.14	4.3	1.0	12	15	6.7	9.5
NUP412VP5	11.4	12	12.7	9.0	1.0	6.5	10	3.5	5.0

Low Capacitance TVS/ESD Protection – Four Line (continued)

Table 36. Four Line Low Cap TVS/ESD Protection in SOT-563; Meets IEC61000-4-2, Level 4

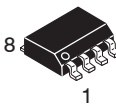
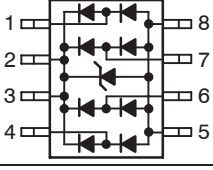
Device	Breakdown Voltage (D ₁ , D ₂ , and D ₃)				Breakdown Voltage (V _{CC})				Working Peak Reverse Voltage (D ₁ , D ₂ , and D ₃)	Max Reverse Leakage Current (D ₁ , D ₂ , and D ₃)		Max Reverse Leakage Current (V _{CC})		Capacitance (pF) @ 3.0 V, 1.0 MHz		Peak Power Rating (8x20 μsec) (D ₁ , D ₂ , and D ₃)	Peak Power Rating (8x20 μsec) (V _{CC})	
	V _{BR} (V)		@ I _T		V _{BR} (V)		@ I _T		V _{RWM}	I _R	V _{RWM}	I _R	V _R	Typ	Max	Watts	(mW)	
	Min	Nom	Max	(mA)	Min	Nom	Max	(mA)	(V)	(μA)	(V)	(μA)	(V)					
6  1 CASE 463A SOT-563 D₁ 1  6 GND D₂ 2  5 D₃ V_{CC} 3  4 GND																		
NUP4060AXV6	6.2	6.8	7.2	1.0	15.3	16	17.1	5.0	5.0	0.5	3.0	0.05	11	7.0	10	20	200	

Table 37. Four Line Low Cap Bidirectional TVS/ESD Protection in SOT-563; Meets IEC61000-4-2, Level 4

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I _{pp} (Clamping Voltage)	Peak Power Rating (8x20 μsec)
	V _{BR} (V)		@ I _T		nA	V _{RWM}	Max		I _{pp} (A)	V _C (V)	Watts
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max			
 CASE 463A SOT-563 											
NUP4102XV6	13.6	–	17.8	1.0	100	12	13	15	3.0	25	75

*C_J = Between I/O pin and ground.

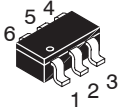
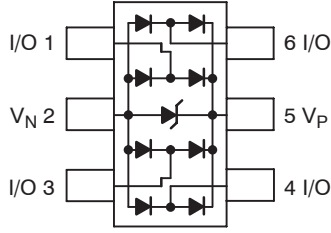
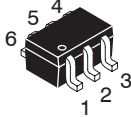
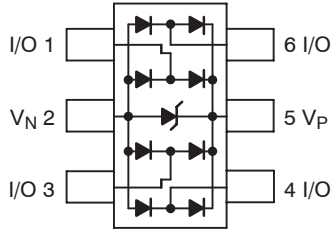
Table 38. Four Line Low Cap TVS/ESD Protection; Meets IEC61000-4-2, Level 4

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I _{pp} (Clamping Voltage)	Peak Power Rating (8x20 μsec)
	V _{BR} (V)		@ I _T		I _R	V _{RWM}	Max		I _{pp} (A)	V _C (V)	Watts
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max			
 CASE 751 SO-8 											
USB 2.0											
NUP4201DR2	6.0	–	–	1.0	10	5.0	5.0	10	10	12	500
SRDA05-4R2	6.0	–	–	1.0	10	5.0	10	15	10	12	500

*C_J = Between I/O pin and ground.

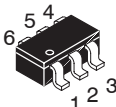
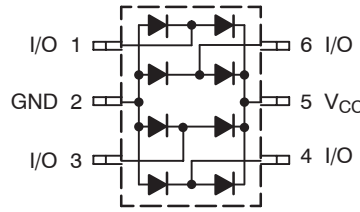
Low Capacitance TVS/ESD Protection – Four Line (continued)

Table 38. Four Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4 (continued)

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 318G TSOP-6 											
USB 2.0											
NUP4201MR6	6.0	–	–	1.0	5.0	5.0	3.0	5.0	25	20	500
 CASE 419B SC-88 (SOT-363) 											
USB 2.0											
NUP4202W1	6.0	–	–	1.0	5.0	5.0	3.0	5.0	28	20	500

* C_j = Between I/O pin and ground.

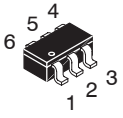
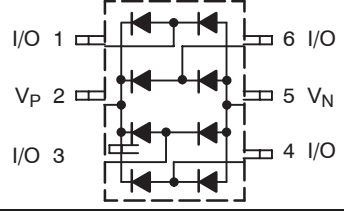
Table 39. Four Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4

Device	Breakdown Voltage		Forward Voltage		Capacitance* (pF) @ 0 V, 1.0 MHz	
	V_{BR} (V)	@ I_{br}	V_f (V)	I_f		
	Min	μ A	Max	mA	Typ	Max
 CASE 318G TSOP-6 						
USB 2.0						
NUP4301MR6	70	100	0.855	10	1.6	3.0

* C_j = Between I/O pin and ground.

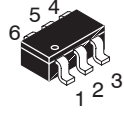
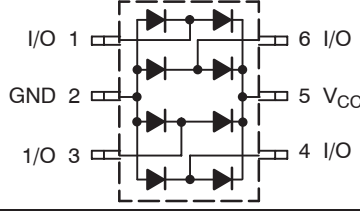
Low Capacitance TVS/ESD Protection – Four Line (continued)

Table 39. Four Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4 (continued)

Device	Breakdown Voltage		Forward Voltage		Capacitance* (pF) @ 0 V, 1.0 MHz	
	V_{BR} (V)	@ I_{br}	V_f (V)	I_f		
	Min	μA	Max	mA	Typ	Max
 CASE 318F TSOP-6 						
USB 2.0						
NUP4304MR6	70	100	0.855	10	1.6	3.0

* C_j = Between I/O pin and ground.

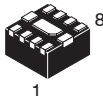
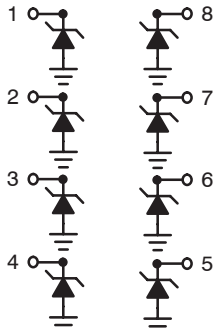
Table 40. Four Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{pp} (Clamping Voltage)	Peak Power Rating (8x20 μsec)
					I_R	V_{RWM}				V_C	
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max	I_{pp} (A)	(V)	Watts
 CASE 318G TSOP-6 											
USB 2.0											
NUP4302MR6	30	–	–	0.1	30	–	–	28	–	–	–

* C_j = Between I/O pin and ground.

Low Capacitance TVS/ESD Protection – Eight Line

Table 41. Eight Line Low Cap TVS/ESD Protection; Meets IEC61000–4–2, Level 4

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Re- verse Surge Current	Max Reverse Voltage @ I _{pp} (Clamping Voltage)	Peak Power Rating (8x20 μsec)
		V _{BR} (V)		@ I _T	I _R	V _{RWM}					
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max	I _{pp} (A)	V _C (V)	Watts
 CASE 506AK DFN8 											
NUP8010MN	5.3	5.6	5.9	1.0	1.0	3.3	13	17	1.6	13	20

* C_j = Between I/O pin and ground.

Bipolar Power Transistors

In Brief . . .

Through ON Semiconductor's extensive process improvements and stringent quality control standards, we are proud to offer a broad line of bipolar power transistors that meet or exceed those of other suppliers. This portfolio consists of discrete and Darlington transistors in a variety of popular packages from the low power surface mount SOT-223 to the high power TO-3.

Product Highlights

Audio Transistors:

- Improved gain linearity, complementary pair gain matching and optimized die area for symmetrical characteristics in complementary configurations.
- Unsurpassed high voltage FBSOA performance.
- New state of the art 150 W and 180 W high frequency discrete transistors.
- ThermalTrak™ output transistors with internal bias control eliminate amplifier warm-up period, enable instant temperature adjustment, upgrade sound quality and improve bias stability.
- High voltage discrete audio output transistors that reach higher voltages than previously available.

Electronic Lamp Ballast:

- High frequency, high gain bipolar transistors that utilize monolithic collector/emitter diode tailored to meet the needs of lamp ballasts.
- Active anti-saturation network to provide short and highly reproducible collector current storage time.

Low $V_{CE(sat)}$ Transistors:

- Devices with combination of low saturation voltage and high gain are ideal for high speed switching applications where power savings is a concern.

Ultra High Current Transistors:

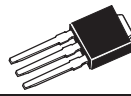
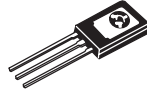
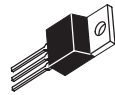
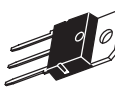
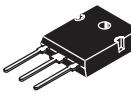
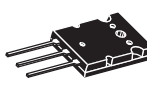
- Dual matched die configurations up to 60 A.
- Working voltages from 60 V to 120 V.

ON Semiconductor has a commitment to quality and total customer satisfaction. We will continue to demonstrate this in the new and innovative products we plan to announce in the coming year.

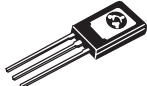
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BIPOLAR POWER TRANSISTORS SELECTOR GUIDE

SELECTION BY PACKAGE

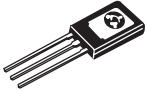
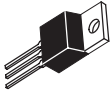
Package		I _C Range (Amps)	V _{CE} Range (Volts)	P _D (Watts)
	SOT-223	0.5-3.0	30-300	2.75-3.0
	DPAK	0.5-10	25-450	12.5-25
	D ² PAK	6.0-10	80-350	50-75
	DPAK	0.5-10	25-450	12.5-25
	TO-225AA	0.3-5.0	25-500	12.5-50
	TO-220AB	0.5-15	32-400	30-150
	Isolated TO-220	1.0-10	60-450	28-45
	TO-218	10-25	60-350	80-150
	TO-247	8.0-30	150-250	100-200
	TO-264	15-20	250-350	200-250
	TO-264 5-Lead	15	260	200
	TO-3 (TO-204AA) 40 Mil Pins	4.0-30	40-250	115-250
	TO-3 (TO-204AE) 60 Mil Pins	40-60	60-250	150-300

Discrete Transistors

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	f _T MHz Min	P _D (Case) Watts @ 25°C	Package
		NPN	PNP					
0.5	300		MMJT350T1	30/240	0.05	30	2.75	 SOT-223
3.0	30	MMJT9410T1	MMJT9435T1	50	1.0	100 typ	3.0	
0.5	300	MJD340T4	MJD350T4	30/240	0.05	30	15	 DPAK
1.0	250	MJD47T4		30/150	0.3	10	15	
	350		MJD5731T4	10 min	1.0	10	15	
	400	MJD50T4		30/150	0.3	10	15	
2.0	45		MJD148T4	50 min	2.0	3.0	20	
	50	NJD2873T4		40 min	2.0	30	12.5	
	450	MJD18002D2T4		6.0 min	2.0	13 typ	25	
3.0	40	MJD31T4	MJD32T4	10 min	1.0	3.0	15	
	100	MJD31CT4	MJD32CT4	10 min	1.0	3.0	15	
4.0	100	MJD243T4	MJD253T4	40/180	0.2	40	12.5	
5.0	25	MJD200T4	MJD210T4	45/180	2.0	65	12.5	
6.0	100	MJD41CT4	MJD42CT4	15/75	3.0	3.0	20	
8.0	80	MJD44H11T4	MJD45H11T4	40 min	4.0	50 typ	20	
10	60	MJD3055T4	MJD2955T4	20/100	4.0	2.0	20	
6.0	100	MJB41CT4	MJB42CT4	15/75	3.0	3.0	65	 D²PAK
8.0	80	MJB44H11T4	MJB45H11T4	40/100	4.0	40	50	
0.3	350	MJE3439		40/160	0.02	15	15	 TO-225AA
0.5	200	MJE344		30/300	0.05	15	20.8	
	250	2N5655		30/250	0.1	10	20	
	300	MJE340	MJE350	30/240	0.05	30	20.8	
	350	2N5657		30/250	0.1	10	20	
		BD159		30/240	0.05	30	20	
1.0	40	2N4921	2N4918	20/100	0.5	3.0	30	
	60	2N4922	2N4919	20/100	0.5	3.0	30	
	80	2N4923	2N4920	20/100	0.5	3.0	30	
1.5	45	BD135	BD136	40/250	0.15	50	12.5	
	60	BD137	BD138	40/250	0.15	50	12.5	
	80	BD139	BD140	40/250	0.15	50	12.5	
2.0	45		BD234	25 min	1.0	3.0	25	
	80	BD237		25 min	1.0	3.0	25	
3.0	40	MJE180	MJE170	50/250	0.1	50	12.5	
	60	MJE181	MJE171	50/250	0.1	50	12.5	
	80	BD179	BD180	40/250	0.15	3.0	25	
		MJE182	MJE172	50/250	0.1	50	12.5	
	500	BUH51 †		8.0 min	1.0	12 typ	50	

†Style 3.

Discrete Transistors (continued)

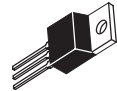
I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	f _T MHz Min	P _D (Case) Watts @ 25°C	Package
		NPN	PNP					
4.0	32	BD435	BD436	50 min	2.0	3.0	36	 TO-225AA
	40	MJE521	MJE371	40 min	1.0	3.0	40	
		2N5190		25 min	1.5	2.0	40	
	45	BD437	BD438	40 min	2.0	3.0	36	
	60	BD439	BD440	25 min	2.0	3.0	36	
		BD787	BD788	20 min	2.0	50	15	
		2N5191	2N5194	25/100	1.5	2.0	40	
	80	2N5192	2N5195	25/100	1.5	2.0	40	
		BD441	BD442	15 min	2.0	3.0	36	
	100	MJE243	MJE253	40/120	0.2	40	15	
5.0	25	MJE200	MJE210	45/180	2.0	65	15	 TO-220AB
1.0	40		TIP30	15/75	1.0	3.0	30	
	60	TIP29A	TIP30A	15/75	1.0	3.0	30	
	80	TIP29B		15/75	1.0	3.0	30	
	100	TIP29C	TIP30C	15/75	1.0	3.0	30	
	250	TIP47		30/150	0.3	10	40	
	300	TIP48	MJE5730	30/150	0.3	10	40	
	350		MJE5731	30/150	0.3	10	40	
	375		MJE5731A	30/150	0.3	10	40	
	400	TIP50		30/150	0.3	10	40	
2.0	400/700	BUL44		14/36	0.4	13 typ	50	
	450/1000	BUX85		30	0.1	4.0	50	
		MJE18002		14/34	0.2	12 typ	40	
3.0	40	TIP31	TIP32	25 min	1.0	3.0	40	
	60	TIP31A	TIP32A	25 min	1.0	3.0	40	
	80		BD242B	25 min	1.0	3.0	40	
		TIP31B	TIP32B	25 min	1.0	3.0	40	
	100	BD241C	BD242C	25 min	1.0	3.0	40	
		TIP31C	TIP32C	25 min	1.0	3.0	40	
4.0	80	D44C12	D45C12	40/120	0.2	40 typ	30	
	350	MJE15034	MJE15035	10 min	2.0	30	50	
	400/700	MJE13005		6/30	3.0	4.0	60	
	500/800	BUH50		10 typ	2.0	4.0	50	
5.0	250	2N6497		10/75	2.5	5.0	80	
	400/700	BUL45		14/34	0.3	12 typ	75	
		BUL45D2*		22 min	0.8	13 typ	75	
	450/1000	MJE18004		14/34	0.3	13	75	
		MJE18004D2*		15 min	0.8	13	75	

NOTE: When two voltages are given, the format is V_{CEO(sus)}/V_{CES}.

*D2 suffix indicates transistor with built-in C-E freewheeling diode and antisaturation network.

Discrete Transistors (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	f _T MHz Min	P _D (Case) Watts @ 25°C	Package
		NPN	PNP					
6.0	40		TIP42	15/75	3.0	3.0	65	
	60	TIP41A	TIP42A	15/75	3.0	3.0	65	
	80	TIP41B	TIP42B	15/75	3.0	3.0	65	
			BD244B	15 min	3.0	3.0	65	
	100	BD243C	BD244C	15 min	3.0	3.0	65	
		TIP41C	TIP42C	15/75	3.0	3.0	65	
	400/700	BUL146		14/34	0.5	14 typ	100	
	450/1000	MJE18006		14/34	0.5	14 typ	100	
7.0	30	2N6288	2N6111	30/150	3.0	4.0	40	
	50		2N6109	30/150	2.5	4.0	40	
	70	2N6292	2N6107	30/150	2.0	4.0	40	
	200	BU406		30 min	1.5	10	60	
8.0	120	MJE15028	MJE15029	20 min	4.0	30	50	
	150	MJE15030	MJE15031	20 min	4.0	30	50	
	250	MJE15032	MJE15033	10 min	2.0	30	50	
	300		MJE5850	15 min	2.0	30 typ	80	
	350		MJE5851	15 min	2.0	30 typ	80	
	400		MJE5852	15 min	2.0	30 typ	80	
		MJE13007		5/30	5.0	14 typ	80	
	450/1000	MJE18008		16/34	1.0	13 typ	125	
10	60	D44H8	D45H8	40 min	4.0	3.0	50	
		MJE3055T	MJE2955T	20/70	4.0	3.0	75	
	80	BD809	BD810	15 min	4.0	1.5	90	
		D44H11	D45H11	40 min	4.0	50 typ	50	
	400/700	BUH100		6.0 min	10	23 typ	100	
12	90	BUV26		12 min	12	30 typ	85	
	120	BUV27		12 min	8.0	30 typ	70	
	400/700	MJE13009		6/30	8.0	4.0	100	
15	60	2N6487	2N6490	20/150	5.0	5.0	75	
	80	2N6488	2N6491	20/150	5.0	5.0	75	
		D44VH10	D45VH10	20 min	4.0	50 typ	83	
	400/700	BUH150		4.0 min	20	23 typ	150	



TO-220AB

NOTE: When two voltages are given, the format is V_{CEO(sus)}/V_{CES}.

Discrete Transistors (continued)

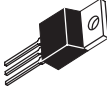
I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	f _T MHz Min	P _D (Case) Watts @ 25°C	Package
		NPN	PNP					
1.0	250	MJF47		30/150	0.3	10	28	 Isolated TO-220
3.0	100	MJF31C	MJF32C	10 min	1.0	3.0	28	
5.0	450/1000	MJF18004		14/34	0.3	13 typ	35	
6.0	400/700	BUL146F		14/34	0.5	14 typ	40	
8.0	150	MJF15030	MJF15031	40 min	3.0	30	35	
	450/1000	MJF18008		16/34	1.0	13 typ	45	
10	60	MJF3055	MJF2955	20/100	4.0	2.0	40	
	80	MJF44H11	MJF45H11	40/100	4.0	40	35	
10	100	TIP33C		20/100	3.0	3.0	80	 TO-218
15	60	TIP3055	TIP2955	5 min	10	2.5	80	
16	160	MJE4343	MJE4353	15 min	8.0	1.0	125	
25	60	TIP35A	TIP36A	15/75	15	3.0	125	
	100	TIP35C	TIP36C	15/75	15	3.0	125	
8.0	150	MJW21192	MJW21191	15 min	8.0	4.0	100	 TO-247
15	260	MJW0281A	MJW0302A	75/150	3.0	30	150	
		MJW3281A	MJW1302A	75/150	4.0	30	200	
16	250	MJW21194	MJW21193	20/60	8.0	4.0	200	
		MJW21196	MJW21195	20/60	8.0	4.0	200	
15	260	MJL3281A	MJL1302A	75/150	4.0	30	200	 TO-264
		MJL0281A	MJL0302A	75/150	3.0	30	180	
	350	MJL4281A	MJL4302A	80/250	5.0	35	230	
16	250	MJL21194	MJL21193	25/75	8.0	4.0	200	
		MJL21196	MJL21195	25/75	8.0	4.0	200	
15	260	NJL0281D	NJL0302D	75/150	3.0	30	180	 TO-264 (5-Lead)
	260	NJL3281D	NJL1302D	75/150	4.0	30	200	
	350	NJL4281D	NJL4302D	75/150	5.0	30	250	
16	250	NJL21194D	NJL21193D	25/75	8.0	4.0	200	
4.0	250	MJ15020	MJ15021	30 min	1.0	20	150	 TO-3 (TO-204AA)
10	140	2N3442		20/70	4.0	3.0	117	
	250	MJ15011		20/100	2.0	3.0	200	
15	60	2N3055	MJ2955	20/70	4.0	2.5	115	
		2N3055A		20/70	4.0	0.8	115	
	120	MJ15015	MJ15016	20/70	4.0	1.0	180	
	140	MJ15001	MJ15002	25/150	4.0	2.0	200	

NOTE: When two voltages are given, the format is V_{CEO(sus)}/V_{CES}.

Discrete Transistors (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	f _T MHz Min	P _D (Case) Watts @ 25°C	Package
		NPN	PNP					
16	140	2N3773	2N6609	15/60	8.0	4.0	150	 TO-3 (TO-204AA)
	200	MJ15022	MJ15023	15/60	8.0	5.0	250	
	250	MJ15024	MJ15025	15/60	8.0	5.0	250	
		MJ21194	MJ21193	25/75	8.0	4.0	250	
		MJ21196	MJ21195	25/75	8.0	4.0	250	
20	60	2N3772		15/60	10	2.0	150	
	90	2N5038		20/100	12	60	140	
	140	MJ15003	MJ15004	25/150	5.0	2.0	250	
25	60	2N5885	2N5883	20/100	10	4.0	200	
	80	2N5886	2N5884	20/100	10	4.0	200	
	100	2N6338		30/120	10	40	200	
	150	2N6341		30/120	10	40	200	
30	40	2N3771		15/60	15	2.0	150	
	60	2N5302		15/60	15	2.0	200	
	100	MJ802	MJ4502	25/100	7.5	2.0	200	
40	200	BUV21		10 min	25	8.0	150	 TO-3 (TO-204AE)
	250	BUV22		10 min	20	8.0	250	
50	80	2N5686	2N5684	15/60	25	2.0	300	
60	60		MJ14001	15/100	50	3.0	300	
	80	MJ14002		15/100	50	3.0	300	

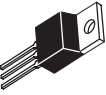
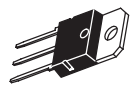
Darlington Transistors

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	f _T MHz Min	P _D (Case) Watts @ 25°C	Package
		NPN	PNP					
2.0	100	MJD112T4	MJD117T4	1000 min	2.0	25	20	 DPAK
4.0	80	MJD6039T4		1k/2k	2.0	25	20	
	350	NJD35N04		2000 min	2.0	90	45	
8.0	100	MJD122T4	MJD127T4	1k/2k	4.0	4	20	
	120		MJD128T4	1k/2k	4.0	4	20	
10	80	MJD44E3T4		1k min	5.0		20	
10	350	BUB323Z		500/3400	5.0	2.0	75	 D ² PAK
2.0	100	MJE270†	MJE271†	1.5k min	0.12	6.0	15	 TO-225AA
4.0	40		2N6034	25 min	1.5	2.0	40	
	45	BD675	BD676	750	1.5	3.0	40	
		BD675A	BD676A	750	2.0	3.0	40	
	60	BD677	BD678	750 min	1.5		40	
		BD677A	BD678A	750 min	2.0		40	
		MJE800	MJE700	750 min	1.5	1.0	40	
		2N6038		750/18k	2.0	25	40	
	80	BD679	BD680	750 min	1.5		40	
		BD679A	BD680A	750 min	2.0		40	
		MJE802	MJE702	750 min	1.5	1.0	40	
		MJE803	MJE703	750 min	2.0	1.0	40	
		2N6039	2N6036	750/18k	2.0	25	40	
	100	BD681	BD682	750 min	1.5		40	
2.0	60	TIP110	TIP115	500 min	2.0	25	50	 TO-220AB
	80	TIP111	TIP116	500 min	2.0	25	50	
	100	TIP112	TIP117	500 min	2.0	25	50	
5.0	60	TIP120	TIP125	1k min	3.0	4.0	65	
	80	TIP121	TIP126	1k min	3.0	4.0	65	
	100	TIP122	TIP127	1k min	3.0	4.0	75	
8.0	60	2N6043	2N6040	1k/10k	4.0	4.0	75	
		TIP100		1k/20k	3.0	4.0	80	
	80	BDX53B	BDX54B	750 min	3.0	4.0	60	
		TIP101	TIP106	1k/20k	3.0	4.0	80	
		TIP131		1k/15k	4.0		70	
	100	TIP132		1k/15k	4.0		70	
		2N6045	2N6042	1k/10k	3.0	4.0	75	
		BDX53C	BDX54C	750 min	3.0			
		TIP102	TIP107	1k/20k	3.0	4.0	80	
	400	MJE5742		200 min	4.0		80	

NOTE: When two voltages are given, the format is V_{CEO(sus)}/V_{CES}.

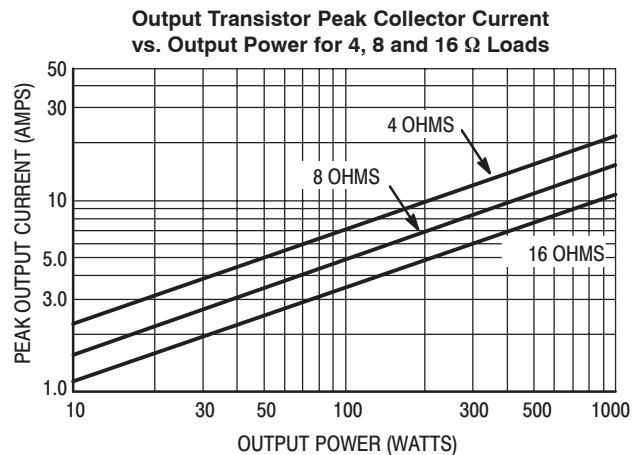
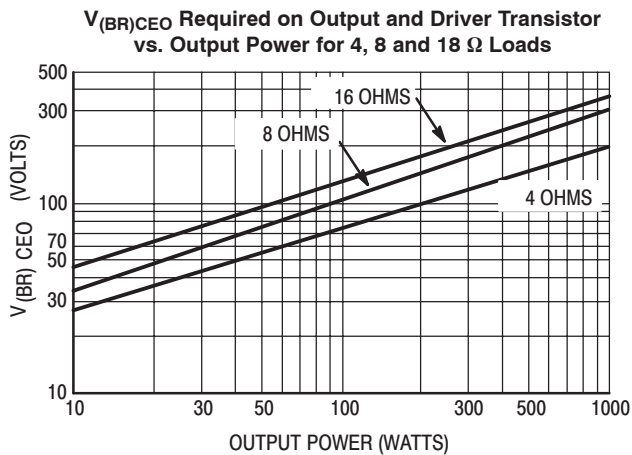
†Style 3.

Darlington Transistors (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	f _T MHz Min	P _D (Case) Watts @ 25°C	Package
		NPN	PNP					
10	60	2N6387	2N6667	1k/20k	5.0	20	65	 TO-220AB
	80	BDX33B	BDX34B	750 min	3.0	3.0	70	
		2N6388		1k/20k	5.0	20	65	
	100	BDX33C	BDX34C	750 min	3.0	3.0	70	
15	80		BDW46	1k min	5.0	4.0	85	
	100	BDW42	BDW47	1k min	5.0	4.0	85	
5.0	100	MJF122	MJF127	2000 min	3.0	4.0	28	 Isolated TO-220
10	100	MJF6388	MJF6668	3k/20k	3.0	20	40	
10	60	TIP140		500 min	10	4.0	125	 TO-218
		TIP141		500 min	10	4.0	125	
	100	BDV65B	BDV64B	1k min	5.0		125	
		TIP142	TIP147	500 min	10	4.0	125	
	350	BU323Z		500/3400	5.0		150	
15	150		MJH11017	400/15k	10	3.0	150	
	200	MJH11020	MJH11019	400/15k	10	3.0	150	
	250	MJH11022	MJH11021	400/15k	10	3.0	150	
20	100	MJH6284	MJH6287	750/18k	10	4.0	125	
12	100		2N6052	750/18k	6.0	4.0	150	 TO-3 (TO-204AA)
15	250	MJ11022	MJ11021	100 min	15	3.0	175	
20	80		2N6286	750/18k	10	4.0	160	
	100	2N6284	2N6287	750/18k	10	4.0	160	
30	60	MJ11012		1k min	20	4.0	200	
	120	MJ11016	MJ11015	1k min	20	4.0	200	
	250	MJ11022	MJ11021	400/15k	10	3.0	200	
50	60	MJ11028		400 min	50		300	 TO-3 (TO-204AE)
	90	MJ11030		400 min	50		300	
	120	MJ11032	MJ11033	400 min	50		300	

Audio

GENERAL DESIGN CURVES FOR POWER AUDIO OUTPUT STAGES



Another important parameter that must be considered before selecting the output transistors is the safe-operating area these devices must withstand. For a complete discussion see Application Note AN485.

Recommended Power Transistors for Audio/Servo Loads

RMS Power Output	NPN	PNP	Package	P_D Watts @ 25°C	V_{CEO}	I_C Max	h_{FE}		f_T MHz Typ
							Min/Max	@ I_C Amps	
To 25 W	MJE15030	MJE15031	TO-220	50	150	8.0	20 min	4.0	30
	MJE15032	MJE15033	TO-220	50	250	8.0	50 min	1.0	30
25 to 50 W	MJE15034	MJE15035	TO-220	50	350	4.0	50 min	1.0	30
	MJ15001	MJ15002	TO-3	200	140	15	25/150	4.0	3.0
50 to 100 W	MJ15003	MJ15004	TO-3	150	140	20	25/150	5.0	3.0
	MJ15015	MJ15016	TO-3	180	120	15	20/70	4.0	3.0
	MJ15020	MJ15021	TO-3	250	250	4.0	30 min	1.0	30
Over 100 W	MJW21192	MJW21191	TO-3	100	150	8.0	15 min	4.0	4.0
	MJW0281A	MJW0302A	TO-3	150	260	15	75/150	3.0	30
	MJL0281A	MJL0302A	TO-264	180	260	15	75/150	3.0	30
	NJL0281D	NJL0302D	TO-264 (5-Lead)	180	260	15	75/150	3.0	30
	MJL21194	MJL21193	TO-264	200	250	16	25/75	8.0	4.0
	NJL21194D	NJL21193D	TO-264 (5-Lead)	200	250	16	25/75	8.0	4.0
	MJL21196	MJL21195	TO-264	200	250	16	25/75	8.0	4.0
	MJW21194	MJW21193	TO-247	200	250	16	20/60	8.0	4.0
	MJW21196	MJW21195	TO-247	200	250	16	25/60	8.0	4.0
	MJL3281A	MJL1302A	TO-264	200	260	15	75/150	5.0	30

Recommended Power Transistors for Audio/Servo Loads (continued)

RMS Power Output	NPN	PNP	Package	P _D Watts @ 25°C	V _{CEO}	I _C Max	h _{FE}		f _T MHz Typ
							Min/Max	@ I _C Amps	
	MJW3281A	MJW1302A	TO-247	200	260	15	75/150	5.0	30
	MJL4281A	MJL4302A	TO-264	200	350	15	80/200	5.0	35
	NJL3281D	NJL1302D	TO-264 (5-Lead)	200	260	15	75/150	7.0	30
	NJL4281D	NJL4302D	TO-264 (5-Lead)	250	350	15	75/150	5.0	30
	MJ15024	MJ15025	TO-3	250	250	16	15/60	8.0	4.0
	MJ21194	MJ21193	TO-3	250	250	16	25/75	8.0	4.0

The Power Transistors shown are provided for reference only and show device capability. The final choice of the Power Transistors used is left to the circuit designer and depends upon the particular safe-operating area required and the mounting and heat sinking configuration used.

Bipolar Power Transistors for Electronic Lamp Ballasts

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	V _{CES} Volts Min	Device Type	I _C Operating Amps	h _{FE} min @ I _C Operating V _{CE} = 1.0 V	Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs)	P _D (Case) Watts @ 25°C	Package
2.0	400	700	BUL44	1.0	8.0	2.75/0.175	50	 TO-220AB
	450	1000	MJE18002	1.0	6.0	2.75/0.175	50	
4.0	500	800	BUH50	2.0	8.0 typ	2.75/0.15	50	
5.0	400	700	BUL45	2.0	7.0	3.8/0.17	75	
		700	BUL45D2*	2.0	10	2.25/0.015	75	
	450	1000	MJE18004	2.0	6.0	2.5/0.175	75	
		1000	MJE18004D2*	2.0	6.0	2.4/0.15	75	
6.0	400	700	BUL146	3.0	8.0	2.5/0.15	100	
	450	1000	MJE18006	3.0	6.0	3.2/0.15	100	
8.0	450	1000	MJE18008	4.5	6.0	3.2/0.15	125	
10	400	700	BUH100	5.0	10 typ	3.5/0.15	100	
15	400	700	BUH150	10	8.0 typ	2.75/0.175	150	

Isolated TO-220

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	V _{CES} Volts Min	Device Type	I _C Operating Amps	h _{FE} min @ I _C Operating V _{CE} = 1.0 V	Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs)	P _D (Case) Watts @ 25°C	Package
5.0	450	1000	MJF18004	2.0	6.0	2.5/0.175	35	 Isolated TO-220
6.0	400	700	BUL146F	3.0	8.0	2.5/0.15	40	
8.0	450	1000	MJF18008	4.5	6.0	3.2/0.15	45	

DPAK

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	V _{CES} Volts Min	Device Type	I _C Operating Amps	h _{FE} min @ I _C Operating V _{CE} = 1.0 V	Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs)	P _D (Case) Watts @ 25°C	Package
2.0	450	1000	MJD18002D2T4	1.0	6.0	1.2/0.150	25	 DPAK

TO-225AA (TO-126)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	V _{CES} Volts Min	Device Type	I _C Operating Amps	h _{FE} min @ I _C Operating V _{CE} = 1.0 V	Inductive Switching @ I _C Operating t _{si} /t _{fi} Max (μs)	P _D (Case) Watts @ 25°C	Package
3.0	500	800	BUH51†	1.0	8.0	3.75/0.3	50	 TO-225AA

BUH-Series are specified for Halogen applications.

*D2 suffix indicates transistor with built-in C-E freewheeling diode and antisaturation network.

†Style 3.

The isolated TO-220 is UL RECOGNIZED for its isolation feature and has been evaluated to 3500 volts RMS. Actual isolation rating depends on specific mounting position and maintaining required strike and creepage distances.

Rectifiers

In Brief . . .

Continuing investment in research and development for discrete products has created a rectifier manufacturing facility that matches the precision and versatility of the most advanced integrated circuits. As a result, ON Semiconductor's silicon rectifiers span all high tech applications with quality levels capable of passing the most stringent environmental tests . . . including those for automotive under-hood applications.

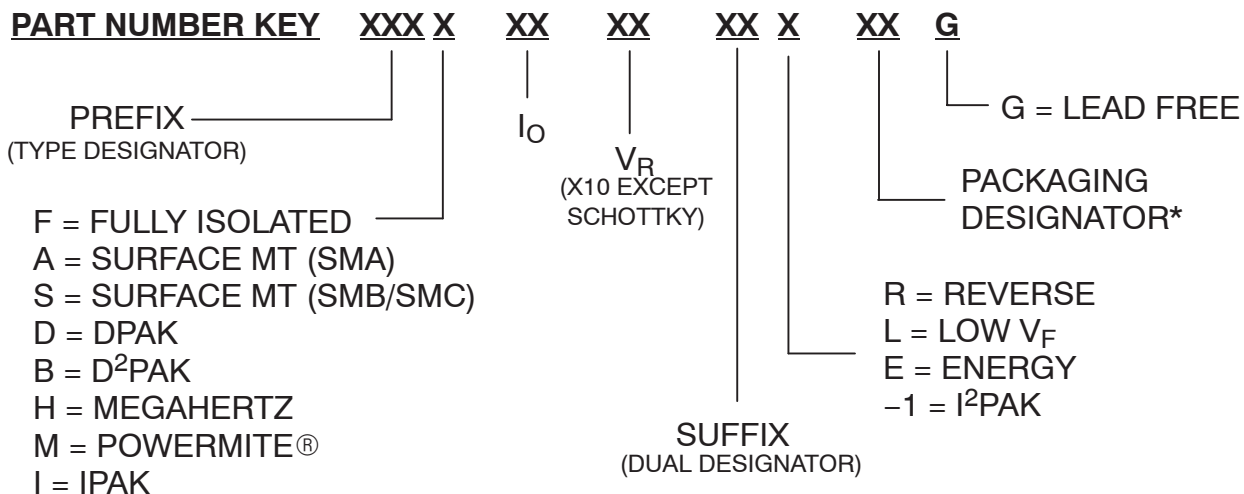
Product Highlights:

- Surface Mount Devices – A major thrust has been the development and introduction of a broad range of power rectifiers, Schottky and Ultrafast, 1/2 amp to 40 amp, 10 to 600 volts.
- Application Specific Rectifiers –
 - Schottky rectifiers having lower forward voltage drop (0.3 to 0.6 volts) for use in low voltage SMPS outputs and as “OR”ing diodes.
 - MEGAHERTZ™ series for high frequency power supplies and power factor correction.
 - UltraSoft rectifiers for high speed rectification.
 - Energy rated rectifiers with guaranteed energy handling capability.
 - Automotive transient suppressors.
- Ultrafast rectifiers having reverse recovery times as low as 25 ns to complement the Schottky devices for higher voltage requirements in high frequency applications.
- A wide variety of package options to match virtually any potential requirement.

The rectifier selector section that follows has generally been arranged by package and technology. The individual tables have been sorted by voltage and current with the package types for the devices listed shown above each table. The Application Specific Rectifiers are also included in their respective tables.

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RECTIFIER NUMBERING SYSTEM



PREFIX KEY

MUR = ULTRA FAST RECTIFIER
 MBR = (SCHOTTKY) BARRIER RECTIFIER
 MR = STANDARD & FAST RECOVERY
 MSR = ULTRASOFT

SUFFIX KEY

CT = CENTER TAP (DUAL) TO-220, POWERTAP, DPAK, D²PAK
 PT = CENTER TAP (DUAL) TO-218 PACKAGE
 WT = CENTER TAP (DUAL) TO-247
 SF = SOD-123 FLAT LEAD
 PF = POWER FACTOR CORRECTION SPECIFIC

EXAMPLE:

MUR	30	20	WT
ULTRAFAST	30 AMP	200 V	CENTER TAP (DUAL) TO-247

EXAMPLE:

MBR	30	45	WT
SCHOTTKY	30 AMP	45 V	CENTER TAP (DUAL) TO-247

*For available packaging options consult Sales Office or see Data Sheet.

Application Specific Rectifiers

Table 1. Low V_F Schottky Rectifiers

Device	I_O (A)	V_{RRM} (V)	Max V_F @ Rated I_O and $T_C = 25^\circ\text{C}$ (V)	Max I_R @ Rated V_{RRM} and $T_C = 25^\circ\text{C}$ (mA)	Package
MBR0520L	0.5	20	0.385	0.25	SOD-123
MBR120LSF	1.0	20	0.45	0.4	SOD-123 Flat Lead
MBR120VLSF	1.0	20	0.34	0.6	SOD-123 Flat Lead
MBR130LSF	1.0	30	0.38	1.0	SOD-123 Flat Lead
MBRM110L	1.0	10	0.365	0.5	POWERMITE®
MBRA210L	2.0	10	0.35	0.7	SMA
MBRS130L	1.0	30	0.395	1.0	SMB
MBRS230L	2.0	30	0.50	1.0	SMB
MBRS410L	4.0	10	0.33	5.0	SMC
MBRD835L	8.0	35	0.41	1.4	DPAK
MBRD1035CTL	10	35	0.41	6.0	DPAK
MBR2030CTL	20	30	0.48	5.0	TO-220
MBRB2535CTL	25	35	0.41	10	D ² PAK
MBR2535CTL	25	35	0.41	5.0	TO-220
MBRB2515L	25	15	0.42	15	D ² PAK
MBR2515L	25	15	0.42	15	TO-220
MBRB3030CTL	30	30	0.51	5.0	D ² PAK
MBR4015LWT	40	15	0.42	5.0	TO-247
MBR10H100CTG★	10	100	0.85	0.0035	TO-220AB
MBR20H100CTG★	20	100	0.88	0.0045	TO-220AB
MBRF20H100CTG★	20	100	0.88	0.0045	FULL PAK
MBR30H100CTG★	30	100	0.93	0.0045	TO-220AB
MBR40H100WTG★	40	100	0.9	0.01	TO-247
MBR41H100CTG★	40	100	0.9	0.01	TO-220AB
MBRB41H100CT-1G★	40	100	0.9	0.01	I ² PAK
MBR60H100CTG★	60	100	0.98	0.01	TO-220AB
MBRB30H30CT-1G★	30	30	0.6	0.5	I ² PAK
MBR3045ST★	30	45	0.76	0.2	TO-220AB
MBRB3045CT-1G★	30	45	0.76	0.2	I ² PAK
MBRB30H60CT-1G★	30	60	0.82	0.8	I ² PAK

Table 2. Low Leakage Schottky Rectifiers

Device	I_O (A)	V_{RRM} (V)	Max V_F @ Rated I_O and $T_C = 25^\circ\text{C}$ (V)	Max I_R @ Rated V_{RRM} and $T_C = 25^\circ\text{C}$ (mA)	Package
MBR120ESF	1.0	20	0.53	0.01	SOD-123FL
MBRM110E	1.0	10	0.53	0.001	POWERMITE®
MBRM120E	1.0	20	0.53	0.01	POWERMITE®
MBRA120E	1.0	20	0.53	0.01	SMA
MBRA210E	2.0	10	0.5	0.05	SMA
MBRS410E	4.0	10	0.5	0.15	SMC

Table 3. High Voltage Schottky Rectifiers

Device	I_O (A)	V_{RRM} (V)	Max V_F @ Rated I_O and $T_C = 25^\circ\text{C}$ (V)	Max I_R @ Rated V_{RRM} and $T_C = 25^\circ\text{C}$ (mA)	Package
MBRS3200	3.0	200	0.84	0.005	SMB
MBRS3201	3.0	200	0.84	0.005	SMC
MBRS4201	4.0	200	0.86	0.00035	SMC
MBRB20200CT	20	200	1.0	1.0	D ² PAK
MBR20200CT	20	200	1.0	1.0	TO-220AB

★ New Product

All devices listed are ON Semiconductor preferred devices

Application Specific Rectifiers (continued)

Table 3. High Voltage Schottky Rectifiers (continued)

Device	I _O (A)	V _{RRM} (V)	Max V _F @ Rated I _O and T _C = 25°C (V)	Max I _R @ Rated V _{RRM} and T _C = 25°C (mA)	Package
MBRF20200CT	20	200	1.0	1.0	FULL PAK
MBR40250	40	250	0.097	0.03	TO-220AC
MBR40250T	40	250	0.097	0.03	TO-220AB
MBRF40250T	40	250	0.097	0.03	FULL PAK

Table 4. MEGAHERTZ™ Rectifiers

Device	I _O (A)	V _{RRM} (V)	Max V _F @ Rated I _F and T _C = 25°C (V)	Max I _R @ Rated V _{RRM} and T _C = 25°C (mA)	t _{rr} (ns)	Package
MURH840CT	8.0	400	2.2	0.01	28	TO-220AB
MURHB840CT	8.0	400	2.2	0.01	28	TO-220AB
MURHS160	1.0	600	2.4	0.02	35	SMB
MURHD560	5.0	600	2.7	0.01	30	DPAK
MURH860CT	8.0	600	2.8	0.01	35	TO-220AB
MURHB860CT	8.0	600	2.8	0.01	35	TO-220AB
MURHF860CT	8.0	600	2.8	0.01	35	TO-220AB

Table 5. UltraSoft Rectifiers (For High Speed Rectification)

Device	I _O (A)	V _{RRM} (V)	Max V _F @ I _F and T _C = 25°C (V)	Max t _{rr} (ns)	T _J Max (°C)	Package
MSRD620CT	6.0	200	1.35 @ 6.0 A	55	175	DPAK
MSR860	8.0	600	1.7 @ 8.0 A	120	150	TO-220AC
MSR1560	15	600	1.8 @ 15 A	45	150	TO-220AC

Table 6. Energy Rated Rectifiers

Device	I _O (A)	V _{RRM} (V)	Max V _F @ I _F Rated and T _C = 25°C (V)	Max I _R @ Rated V _{RRM} and T _C = 125°C (μA)	Avalanche Energy (mJ)	Package
MUR180E	1.0	800	1.75	10	10	DO-41
MUR1100E	1.0	1000	1.75	10	10	DO-41
MUR480E	4.0	800	1.75	25	20	DO-201AD
MUR4100E	4.0	1000	1.75	25	20	DO-201AD
MUR880E	8.0	800	1.8	25	20	TO-220AC
MUR8100E	8.0	1000	1.8	25	20	TO-220AC

Table 7. Automotive Transient Suppressors

Device	I _O (A)	V _{RRM} (V)	Max V _F @ Rated I _F and T _C = 25°C (V)	I _{RSM} (A)	T _J Max (°C)	Package
MR2535L	6.0	20	1.1 @ 100 A	62 @ 10 mS	175	Axial Lead Button
MR2835SK	32	23	1.1 @ 100 A	62 @ 10 mS	175	Top Can
MR2520L	6.0	23	1.25 @ 100 A	58 @ 10 mS	175	Axial Lead Button
TRA2532	32	23	1.18 @ 100 A	80 @ 10 mS	175	Micro Button

Table 8. DCM PFC Specific Diodes

Device	I _O (A)	V _{RRM} (V)	Max V _F @ Rated I _F and T _C = 25°C (V)	Max t _{rr} (ns)	Package
MUR450PF★	4.0	520	1.15 V	95	Axial Lead
MUR550APF★	5.0	520	1.15 V	95	Axial Lead
MUR550PF★	5.0	520	1.15 V	95	TO-220AC
MURD550PF★	5.0	520	1.15 V	95	DPAK

★ New Product

All devices listed are ON Semiconductor preferred devices

SCHOTTKY Rectifiers

Table 9. Surface Mount Schottky Rectifiers

V_{RRM} (V)	$I_O^{(1)}$ (A)	I_O Rating Condition	Device	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (mA)	Max $I_R^{(3)}$ (mA)	Package
20	0.5	$T_L = 90^\circ\text{C}$	MBR0520L MBR0520L	0.310 @ 0.1 A 0.385 @ 0.5 A	5.0	125	.075 @ 10 V .250 @ 20 V	5.0 @ 10 V 8.0 @ 20 V	CASE 425-04 (SOD-123) Cathode = Band 
30	0.5	$T_L = 100^\circ\text{C}$	MBR0530 MBR0530	0.375 @ 0.1 A 0.430 @ 0.5 A	5.0	125	.020 @ 15 V .130 @ 30 V	-	
40	0.5	$T_L = 110^\circ\text{C}$	MBR0540 MBR0540	0.53 @ 0.5 A	5.0	150	.010 @ 20 V .020 @ 40 V	-	
30	1.0	$T_L = 65^\circ\text{C}$	MBR130 MBR130	0.51 @ 1.0 A	5.5	125	60 μA	-	
20	1.0	$T_L = 140^\circ\text{C}$	MBR120ESF MBR120ESF	0.53 @ 1.0 A	40	150	.010	1.6 @ 100 $^\circ\text{C}$	CASE 498-01 (SOD-123FL) 
20	1.0	$T_L = 115^\circ\text{C}$	MBR120LSF MBR120LSF	0.45 @ 1.0 A	50	125	0.4	25 @ 85 $^\circ\text{C}$	
20	1.0	$T_L = 119^\circ\text{C}$	MBR120VLSF MBR120VLSF	0.340 @ 1.0 A	45	125	0.6	15 @ 85 $^\circ\text{C}$	
30	1.0	$T_L = 117^\circ\text{C}$	MBR130LSF	0.38 @ 1.0 A	40	125	1.0	25 @ 100 $^\circ\text{C}$	
40	1.0	$T_L = 112^\circ\text{C}$	MBR140SF MBR140SF	0.55 @ 1.0 A	30	125	0.5	25 @ 85 $^\circ\text{C}$	
10	1.0	$T_C = 100^\circ\text{C}$	MBRM110E MBRM110E	0.53 @ 1.0 A	50	150	0.001	0.5 @ 100 $^\circ\text{C}$	CASE 457-04 (POWERMITE®) 
10	1.0	$T_C = 115^\circ\text{C}$	MBRM110L MBRM110L	0.365 @ 1.0 A	50	125	0.5	60 @ 100 $^\circ\text{C}$	
20	1.0	$T_C = 130^\circ\text{C}$	MBRM120E MBRM120E	0.530 @ 1.0 A 0.455 @ 0.1 A	50	150	0.010 @ 20 V	1.6 @ 20 V	
20	1.0	$T_{tab} \leq 100^\circ\text{C}$	MBRM120L MBRM120L	0.45 @ 1.0 A 0.36 @ 0.1 A	50	125	0.4 @ 20 V	N/A	
30	1.0	$T_C = 135^\circ\text{C}$	MBRM130L MBRM130L	0.45 @ 1.0 A	50	125	1.0	N/A	
40	1.0	$T_{tab} \leq 100^\circ\text{C}$	MBRM140	0.39 @ 0.1 A 0.55 @ 1.0 A	50	125	0.5 @ 40 V	N/A	CASE 403D-02 (SMA) Cathode = Notch or Polarity Band 
20	1.0	$T_L = 125^\circ\text{C}$	MBRA120E	0.530 @ 1.0 A	40	150	0.010	1.6 @ 100 $^\circ\text{C}$	
30	1.0	$T_C \leq 105^\circ\text{C}$	MBRA130L	0.41 @ 1.0 A 0.47 @ 2.0 A	25	125	1.0 @ 30 V 0.4 @ 15 V	25 @ 30 V	
40	1.0	$T_C \leq 100^\circ\text{C}$	MBRA140	0.60 @ 1.0 A 0.73 @ 2.0 A	25	125	0.5 @ 40 V 0.1 @ 20 V	10 @ 40 V	
60	1.0	$T_L = 105^\circ\text{C}$	MBRA160	0.51 @ 1.0 A	60	125	0.2	10 @ 125 $^\circ\text{C}$	
60	1.0	$T_L = 105^\circ\text{C}$	SS16	0.51 @ 1.0 A	30	125	0.2	10 @ 125 $^\circ\text{C}$	
10	2.0	$T_L = 125^\circ\text{C}$	MBRA210E	0.50 @ 2.0 A	150	150	0.050	0.5 @ 100 $^\circ\text{C}$	
10	2.0	$T_L = 110^\circ\text{C}$	MBRA210L	0.35 @ 2.0 A	230	125	0.70	60 @ 100 $^\circ\text{C}$	
40	3.0	$T_C = 100^\circ\text{C}$	MBRA340	0.45 @ 3.0 A	100	125	0.3	15 @ 40 V	

(1) I_O is total device current capability.(2) At V_{RRM} unless noted(3) At V_{RRM} , $T_J = 100^\circ\text{C}$ unless noted

All devices listed are ON Semiconductor preferred devices

SCHOTTKY Rectifiers (continued)

Table 9. Surface Mount Schottky Rectifiers (continued)

V _{RRM} (V)	I _O ⁽¹⁾ (A)	I _O Rating Condition	Device	Max V _F @ I _F T _C = 25°C (V)	I _{FSM} (A)	T _J Max (°C)	Max I _R ⁽²⁾ T _J = 25°C (mA)	Max I _R ⁽³⁾ (mA)	Package
20	1.0	T _L = 115°C	MBRS120	0.55 @ 1.0 A	40	125	1.0	10	CASE 403A-03 (SMB) Cathode = Notch or Polarity Band 
30	1.0	T _L = 120°C	MBRS130L	0.395 @ 1.0 A	40	125	1.0	10	
30	1.0	T _L = 115°C	MBRS130	0.55 @ 1.0 A	40	125	1.0	10	
40	1.0	T _L = 115°C	MBRS140	0.6 @ 1.0 A	40	125	1.0	10	
40	1.0	T _C = 110°C	MBRS140L	0.5 @ 1.0 A	40	125	0.4	10	
90	1.0	T _L = 120°C	MBRS190	0.75 @ 1.0 A	50	125	0.5	5.0	
100	1.0	T _L = 120°C	MBRS1100	0.75 @ 1.0 A	40	150	0.5	5.0	
40	1.5	T _C = 100°C	MBRS1540	0.46 @ 1.5 A	40	125	0.8	5.7	
30	2.0	T _C = 110°C	MBRS230L	0.5 @ 2.0 A	40	125	1.0	75 @ 125°C	
40	2.0	T _C ≤ 95°C	MBRS240L	0.43 @ 2.0 A 0.53 @ 4.0 A	25	125	2.0 @ 40 V 0.5 @ 20 V	60 @ 40 V 40 @ 20 V	
40	2.0	T _C = 103°C	MBRS2040L	0.43 @ 2.0 A 0.50 @ 4.0 A	70	125	0.80 @ 40 V 0.10 @ 20 V	20 @ 40 V 6.0 @ 20 V	
60	2.0	T _L = 95°C	MBRS260	0.63 @ 2.0 A	60	125	0.2	10 @ 125°C	
40	2.0	T _C = 100°C	SS22	0.5 @ 2.0 A	75	125	0.4	5.7 @ 100°C	
40	2.0	T _C = 100°C	SS24	0.5 @ 2.0 A	75	125	0.4	5.7 @ 100°C	
60	2.0	T _L = 95°C	SS26	0.63 @ 2.0 A	40	125	0.2	10 @ 125°C	
200	3.0	T _L = 120°C	MBRS3200	0.84 @ 3.0 A	100	150	5.0 μA	5.0 @ 200 V	CASE 403-03 (SMC) Cathode = Notch 
20	3.0	T _L = 100°C	MBRS320	0.50 @ 3.0 A	80	125	2.0	20	
30	3.0	T _L = 100°C	MBRS330	0.50 @ 3.0 A	80	125	2.0	20	
40	3.0	T _L = 100°C	MBRS340	0.525 @ 3.0 A	80	125	2.0	20	
60	3.0	T _L = 100°C	MBRS360T3	0.74 @ 3.0 A	80	125	0.5	20	
100	3.0	T _L = 100°C	MBRS3100	0.79 @ 3.0 A	130	150	0.05	5.0 @ 125°C	
200	3.0	T _C = 70°C	MBRS3201	0.840 @ 3.0 A	100	150	0.005	5.0 @ 150°C	
10	4.0	T _L = 130°C	MBRS410E	0.50 @ 4.0 A	250	150	0.15	4.0 @ 100°C	
10	4.0	T _L = 110°C	MBRS410L	0.33 @ 4.0 A	150	125	5.0	200 @ 100°C	
200	4.0	T _L = 70°C	MBRS4201	0.860 @ 4.0 A	100	150	0.00035	500 @ 150°C	
40	5.0	T _C = 105°C	MBRS540	0.5 @ 5.0 A	190	125	0.3	15 @ 40 V	
20	3.0	T _C = 125°C	MBRD320	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
30	3.0	T _C = 125°C	MBRD330	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
40	3.0	T _C = 125°C	MBRD340	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
50	3.0	T _C = 125°C	MBRD350	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
60	3.0	T _C = 125°C	MBRD360	0.60 @ 3.0 A	75	150	0.2	20 @ 125°C	
20	6.0	T _C = 130°C	MBRD620CT	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	CASE 369A-13 (DPAK)   "CT" Suffix  Non-"CT" Suffix
30	6.0	T _C = 130°C	MBRD630CT	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
40	6.0	T _C = 130°C	MBRD640CT	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
50	6.0	T _C = 130°C	MBRD650CT	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
60	6.0	T _C = 130°C	MBRD660CT	0.70 @ 3.0 A	75	150	0.1	15 @ 125°C	
35	8.0	T _C = 100°C	MBRD835L	0.40 @ 3.0 A 0.51 @ 8.0 A	100	125	1.4	35	
35	10	T _C = 90°C	MBRD1035CTL	0.49 @ 10 A	100	125	2.0	130 @ 125°C	
45	10	T _C = 135°C	MBRD1045T4G	0.84 @ 20 A	150	150	0.1	15 @ 125°C	

(1) I_O is total device current capability.(2) At V_{RRM} unless noted(3) At V_{RRM}, T_J = 100°C unless noted

All devices listed are ON Semiconductor preferred devices

SCHOTTKY Rectifiers (continued)

Table 9. Surface Mount Schottky Rectifiers (continued)

V_{RRM} (V)	$I_O^{(1)}$ (A)	I_O Rating Condition	Device	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (mA)	Max $I_R^{(3)}$ (mA)	Package
10	45	$T_C = 135^\circ\text{C}$	MBRB1045	0.84 @ 20 A	150	150	0.1	15 @ 125 $^\circ\text{C}$	CASE 418B-04 (D ² PAK) 
45	15	$T_C = 105^\circ\text{C}$	MBRB1545CT	0.84 @ 15 A	150	150	0.1	15 @ 125 $^\circ\text{C}$	
45	16	$T_C = 125^\circ\text{C}$	MBRM1645CT	0.63 @ 16 A	150	150	0.2	40 @ 125 $^\circ\text{C}$	
60	20	$T_C = 110^\circ\text{C}$	MBRB2060CT	0.95 @ 20 A	150	150	0.15	150 @ 125 $^\circ\text{C}$	
100	20	$T_C = 110^\circ\text{C}$	MBRB20100CT	0.85 @ 10 A 0.95 @ 20 A	150	150	0.1	6.0 @ 125 $^\circ\text{C}$	
200	20	$T_C = 125^\circ\text{C}$	MBRB20200CT	1.0 @ 20 A	150	150	1.0	50 @ 125 $^\circ\text{C}$	
15	25	$T_C = 90^\circ\text{C}$	MBRB2515L	0.45 @ 25 A	150	100	15	200 @ 70 $^\circ\text{C}$	
35	25	$T_C = 110^\circ\text{C}$	MBRB2535CTL	0.47 @ 12.5 A 0.55 @ 25 A	150	125	10	500 @ 125 $^\circ\text{C}$	
45	25	$T_C = 130^\circ\text{C}$	MBRB2545CT	0.82 @ 30 A	150	150	0.2	40 @ 125 $^\circ\text{C}$	
30	30	$T_C = 115^\circ\text{C}$	MBRB3030CT	0.54 @ 15 A 0.67 @ 30 A	300	150	1.2	145 @ 150 $^\circ\text{C}$ 46 @ 10 V, 150 $^\circ\text{C}$	
30	30	$T_C = 95^\circ\text{C}$	MBRB3030CTL	0.45 @ 15 A 0.51 @ 30 A	150	125	2.0	195 @ 125 $^\circ\text{C}$ 75 @ 10 V, 125 $^\circ\text{C}$	
30	40	$T_C = 110^\circ\text{C}$	MBRB4030	0.46 @ 20 A 0.55 @ 40 A	300	150	1.0	150 @ 125 $^\circ\text{C}$	

(1) I_O is total device current capability.(2) At V_{RRM} unless noted(3) At V_{RRM} , $T_J = 100^\circ\text{C}$ unless noted

All devices listed are ON Semiconductor preferred devices

Table 10. Axial Lead Schottky Rectifiers

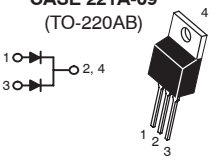
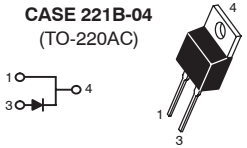
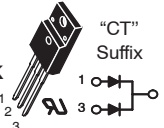
V_{RRM} (V)	I_O (A)	I_O Rating Condition	Device	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_L = 25^\circ\text{C}$ (mA)	Max $I_R^{(3)}$ (mA)	Package
20	1.0	$T_A = 55^\circ\text{C}$ $R_{\theta JA} = 80^\circ\text{C/W}$	1N5817	0.45 @ 1.0 A	25	125	1.0	10	CASE 59-10 (DO-41) Plastic 
30	1.0	$T_A = 55^\circ\text{C}$ $R_{\theta JA} = 80^\circ\text{C/W}$	1N5818	0.55 @ 1.0 A	25	125	1.0	10	
40	1.0	$T_A = 55^\circ\text{C}$ $R_{\theta JA} = 80^\circ\text{C/W}$	1N5819	0.60 @ 1.0 A	25	125	1.0	10	
50	1.0	$T_A = 55^\circ\text{C}$	MBR150	0.75 @ 1.0 A	25	150	0.5	5.0	
60	1.0	$T_A = 55^\circ\text{C}$ $R_{\theta JA} = 80^\circ\text{C/W}$	MBR160	0.75 @ 1.0 A	25	150	0.5	5.0	
100	1.0	$T_A = 120^\circ\text{C}$ $R_{\theta JA} = 50^\circ\text{C/W}$	MBR1100	0.79 @ 1.0 A	50	150	0.5	5.0	
20	3.0	$T_A = 76^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	1N5820	0.457 @ 3.0 A	80	125	2.0	20	CASE 267-05 (DO-201AD) Plastic 
30	3.0	$T_A = 71^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	1N5821	0.500 @ 3.0 A	80	125	2.0	20	
40	3.0	$T_A = 61^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	1N5822	0.525 @ 3.0 A	80	125	2.0	20	
40	3.0	$T_A = 65^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	MBR340	0.600 @ 3.0 A	80	150	0.6	20	
50	3.0	$T_A = 65^\circ\text{C}$	MBR350RL	0.600 @ 3.0 A	80	150	0.6	20	
60	3.0	$T_A = 65^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	MBR360RL	0.740 @ 3.0 A	80	150	0.6	20	
100	3.0	$T_A = 100^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	MBR3100	0.79 @ 3.0 A	150	150	0.6	20	
45	8.0	$T_L = 75^\circ\text{C}$	80SQ045N	0.55 @ 8.0 A	140	125	1.0	50 @ 100 $^\circ\text{C}$	

(2) At V_{RRM} unless noted(3) At V_{RRM} , $T_J = 100^\circ\text{C}$ unless noted

All devices listed are ON Semiconductor preferred devices

SCHOTTKY Rectifiers (continued)

Table 11. TO-220 and I²PAK Thru-Hole Schottky Rectifiers

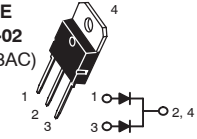
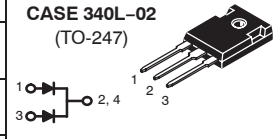
V _{RRM} (V)	I _O (A)	I _O Rating Condition	Device	Max V _F @ I _F T _C = 25°C (V)	I _{FSM} (A)	T _J Max (°C)	Max I _R ⁽²⁾ T _C = 25°C (mA)	Max I _R ⁽³⁾ (mA)	Package
35	15	T _C = 105°C	MBR1535CT	0.84 @ 15 A	150	150	0.1	15 @ 125°C	CASE 221A-09 (TO-220AB) 
45	15	T _C = 105°C	MBR1545CT	0.84 @ 15 A	150	150	0.1	15 @ 125°C	
100	16	T _C = 133°C	MBR16100CT	0.84 @ 16 A	150	175	0.1	5.0 @ 125°C	
30	20	T _C = 137°C	MBR2030CTL	0.52 @ 10 A 0.58 @ 20 A	150	150	5.0	40	
45	20	T _C = 135°C	MBR2045CT	0.84 @ 20 A	150	150	0.1	15 @ 125°C	
60	20	T _C = 133°C	MBR2060CT	0.85 @ 10 A 0.95 @ 20 A	150	150	0.1	6.0 @ 125°C	
80	20	T _C = 133°C	MBR2080CT	0.95 @ 20 A	150	150	0.1	6.0 @ 125°C	
90	20	T _C = 133°C	MBR2090CT	0.95 @ 20 A	150	150	0.1	6.0 @ 125°C	
100	10	T _C = 168°C	MBR10H100CTG	0.85 @ 10 A	180	175	0.0035	4.5 @ 125°C	
100	20	T _C = 162°C	MBR20H100CTG	0.88 @ 20 A	250	175	0.0045	6.0 @ 125°C	
100	30	T _C = 155°C	MBR30H100CTG	0.93 @ 30 A	250	175	0.0045	6.0 @ 125°C	
100	40	T _C = 150°C	MBR41H100CTG	0.9 @ 40 A	350	175	0.01	10 @ 125°C	
100	60	T _C = 133°C	MBR60H100CTG	0.98 @ 60 A	350	175	0.01	10 @ 125°C	
100	20	T _C = 133°C	MBR20100CT	0.85 @ 10 A 0.95 @ 20 A	150	150	0.1	6.0 @ 125°C	
200	20	T _C = 125°C	MBR20200CT	1.0 @ 20 A	150	150	1.0	50 @ 125°C	
35	25	T _C = 95°C	MBR2535CTL	0.55 @ 25 A	150	125	5.0	500 @ 125°C	
45	25	T _C = 130°C	MBR2545CT	0.82 @ 25 A	150	150	0.2	40 @ 125°C	
45	30	T _C = 130°C	MBR3045ST	0.76 @ 30 A	150	175	0.2	40 @ 125°C	
15	40	T _C = 105°C	MBR4015CTL	0.54 @ 25 A	150	125	1.0	400 @ 125°C	
250	40	T _C = 82°C	MBR40250T	0.097 @ 40 A	150	150	0.03	30 mA @ 125°C	
35	7.5	T _C = 105°C	MBR735	0.54 @ 40 A	150	150	0.1	15 @ 125°C	CASE 221B-04 (TO-220AC) 
45	7.5	T _C = 105°C	MBR745	0.84 @ 15 A	150	150	0.1	15 @ 125°C	
35	10	T _C = 135°C	MBR1035	0.84 @ 20 A	150	150	0.1	15 @ 125°C	
45	10	T _C = 135°C	MBR1045	0.84 @ 20 A	150	150	0.1	15 @ 125°C	
60	10	T _C = 133°C	MBR1060	0.80 @ 10 A	150	150	0.1	6.0 @ 125°C	
80	10	T _C = 133°C	MBR1080	0.80 @ 10 A	150	150	0.1	6.0 @ 125°C	
90	10	T _C = 133°C	MBR1090	0.8 @ 10 A	150	150	0.1	6.0 @ 125°C	
100	10	T _C = 133°C	MBR10100	0.80 @ 10 A	150	150	0.1	6.0 @ 125°C	
35	16	T _C = 125°C	MBR1635	0.63 @ 16 A	150	150	0.2	40 @ 125°C	
45	16	T _C = 125°C	MBR1645	0.63 @ 16 A	150	150	0.2	40 @ 125°C	
15	25	T _C = 90°C	MBR2515L	0.45 @ 25 A	150	100	15	200 @ 70°C	
250	40	T _C = 82°C	MBR40250	0.097 @ 40 A	150	150	0.03	30 @ 125°C	
30	30		MBRB30H30CT-1G	0.6 @ 30 A	260	150	0.5	45 @ 125°C	CASE 418D-01 I²PAK (TO-262) 
45	30	T _C = 130°C	MBRB3045CT-1G	0.76 @ 30 A	150	175	0.2	40 @ 125°C	
60	30		MBRB30H60CT-1G	0.82 @ 30 A	260	175	0.8	45 @ 125°C	
100	40	T _C = 150°C	MBRB41H100CT-1G	0.9 @ 40 A	350	175	0.01	10 @ 125°C	
60	20	T _C = 133°C	MBRF2060CT	0.95 @ 20 A	150	150	0.15	15 @ 125°C	CASE 221D-03 FULL PAK 
100	20	T _C = 133°C	MBRF20100CT	0.95 @ 20 A	150	150	0.15	15 @ 125°C	
200	20	T _C = 125°C	MBRF20200CT	1.0 @ 20 A	150	150	1.0	50 @ 125°C	
45	25	T _C = 125°C	MBRF2545CT	0.82 @ 25 A	150	150	0.2	40 @ 125°C	
250	40	T _C = 46°C	MBRF40250T	0.097 @ 40 A	150	150	0.03	30 @ 125°C	

⁽²⁾At V_{RRM} unless noted⁽³⁾At V_{RRM}, T_J = 100°C unless noted

⌚ Indicates UL Recognized – File #E69369

SCHOTTKY Rectifiers (continued)

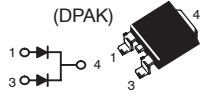
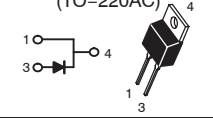
Table 12. TO-218 and TO-247 Schottky Rectifiers

V_{RRM} (V)	I_O (A)	I_O Rating Condition	Device	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max I_R ⁽²⁾ $T_C = 25^\circ\text{C}$ (mA)	Max I_R ⁽³⁾ (mA)	Package
45	30	$T_C = 105^\circ\text{C}$	<i>MBR3045PT</i>	0.76 @ 30 A	200	150	1.0	100 @ 125 $^\circ\text{C}$	CASE 340D-02 (TO-218AC) 
45	40	$T_C = 125^\circ\text{C}$	<i>MBR4045PT</i>	0.70 @ 20 A 0.80 @ 40 A	400	150	1.0	50	
45	60	$T_C = 125^\circ\text{C}$	<i>MBR6045PT</i>	0.62 @ 30 A 0.75 @ 60 A	500	150	1.0	50	
45	30	$T_C = 105^\circ\text{C}$	<i>MBR3045WT</i>	0.76 @ 30 A	200	150	1.0	100 @ 125 $^\circ\text{C}$	CASE 340L-02 (TO-247) 
15	40	$T_C = 125^\circ\text{C}$	<i>MBR4015LWT</i>	0.42 @ 20 A 0.50 @ 40 A	400	100	5.0	150 @ 75 $^\circ\text{C}$	
45	40	$T_C = 125^\circ\text{C}$	<i>MBR4045WT</i>	0.70 @ 20 A 0.80 @ 40 A	400	150	1.0	50	
45	60	$T_C = 125^\circ\text{C}$	<i>MBR6045WT</i>	0.62 @ 30 A 0.75 @ 60 A	500	150	1.0	50	
30	70	$T_C = 100^\circ\text{C}$	<i>MBR7030WT</i>	0.72 @ 70 A	500	150	5.0	250 @ 100 $^\circ\text{C}$	
100	40	$T_C = 150^\circ\text{C}$	<i>MBR40H100WT</i>	0.9 @ 40 A	200	175	0.01	10 @ 125 $^\circ\text{C}$	

⁽²⁾At V_{RRM} unless noted⁽³⁾At V_{RRM} , $T_J = 100^\circ\text{C}$ unless noted

UltraSoft Rectifiers

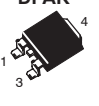
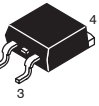
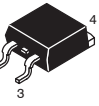
Table 13. UltraSoft Rectifiers (For High Speed Rectification)

V_{RRM} (V)	I_O ⁽¹⁾ (A)	I_O Rating Condition	Device	Max V_F @ I_F $T_C = 29^\circ\text{C}$ (V)	t_{rr} (ns)	T_J Max ($^\circ\text{C}$)	Max I_R ⁽²⁾ $T_C = 25^\circ\text{C}$ (μA)	Max I_R ⁽³⁾ (μA)	Package
200	6.0	$T_C = 145^\circ\text{C}$	<i>MSRD620CT</i>	1.2 @ 6.0 A	55	150	5.0	200	CASE 369A-13 (DPAK) 
600	8.0	$T_C = 125^\circ\text{C}$	<i>MSR860</i>	1.7 @ 8.0 A	120	150	10	1000	CASE 221B-04 (TO-220AC) 
600	15	$T_C = 125^\circ\text{C}$	<i>MSR1560</i>	1.8 @ 15 A	45	150	15	5000	

⁽¹⁾ I_O is total device current capability.⁽²⁾At V_{RRM} unless noted⁽³⁾At V_{RRM} , $T_J = 150^\circ\text{C}$ unless noted

Ultrafast Rectifiers

Table 14. Surface Mount Ultrafast Rectifiers

V_{RRM} (V)	$I_O^{(1)}$ (A)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (μA)	Max $I_R^{(4)}$ (μA)	Package
50	1.0	$T_L = 155^\circ\text{C}$	MURA105	30	0.875 @ 1.0 A	50	175	2.0	50	CASE 403D-02 SMA  Cathode = Polarity Band
100	1.0	$T_L = 155^\circ\text{C}$	MURA110	30	0.875 @ 1.0 A	50	175	2.0	50	
150	1.0	$T_L = 155^\circ\text{C}$	MURA115	35	0.875 @ 1.0 A	40	175	2.0	50	
200	1.0	$T_L = 155^\circ\text{C}$	MURA120	35	0.875 @ 1.0 A	40	175	2.0	50	
300	1.0	$T_L = 150^\circ\text{C}$	MURA130	35	1.1 @ 1.0 A	35	175	5.0	150	
400	1.0	$T_L = 150^\circ\text{C}$	MURA140	35	1.1 @ 1.0 A	35	175	5.0	150	
600	1.0	$T_L = 145^\circ\text{C}$	MURA160	75	1.25 @ 1.0 A	30	175	5.0	150	
600	1.0	$T_L = 145^\circ\text{C}$	MURHS160	35	2.4 @ 1.0 A	15	175	20	200 @ 125 $^\circ\text{C}$	
50	2.0	$T_L = 135^\circ\text{C}$	MURA205	30	0.94 @ 2.0 A	50	175	2.0	50	
100	2.0	$T_L = 135^\circ\text{C}$	MURA210	30	0.94 @ 2.0 A	50	175	2.0	50	
150	2.0	$T_L = 135^\circ\text{C}$	MURA215	35	0.95 @ 2.0 A	40	175	2.0	50	
200	2.0	$T_L = 135^\circ\text{C}$	MURA220	35	0.95 @ 2.0 A	40	175	2.0	50	
300	2.0	$T_L = 125^\circ\text{C}$	MURA230	65	1.3 @ 2.0 A	35	175	5.0	150	
400	2.0	$T_L = 125^\circ\text{C}$	MURA240	65	1.3 @ 2.0 A	35	175	5.0	150	
600	2.0	$T_L = 110^\circ\text{C}$	MURA260	75	1.45 @ 2.0 A	30	175	5.0	150	
50	1.0	$T_L = 155^\circ\text{C}$	MURS105	35	0.875 @ 1.0 A	40	175	2.0	50	CASE 403A-03 SMB  Cathode = Polarity Band
100	1.0	$T_L = 155^\circ\text{C}$	MURS110	35	0.875 @ 1.0 A	40	175	2.0	50	
150	1.0	$T_L = 155^\circ\text{C}$	MURS115	35	0.875 @ 1.0 A	40	175	2.0	50	
200	1.0	$T_L = 155^\circ\text{C}$	MURS120	35	0.875 @ 1.0 A	40	175	2.0	50	
400	1.0	$T_L = 150^\circ\text{C}$	MURS140	75	1.25 @ 1.0 A	35	175	5.0	150	
600	1.0	$T_L = 150^\circ\text{C}$	MURS160	75	1.25 @ 1.0 A	35	175	5.0	150	
50	2.0	$T_L = 125^\circ\text{C}$	MURS205	30	0.94 @ 2.0 A	50	175	2.0	50	
100	2.0	$T_L = 125^\circ\text{C}$	MURS210	30	0.94 @ 2.0 A	50	175	2.0	50	
200	2.0	$T_L = 145^\circ\text{C}$	MURS220	35	0.95 @ 2.0 A	40	175	2.0	50	
300	2.0	$T_L = 125^\circ\text{C}$	MURS230	65	1.3 @ 2.0 A	35	175	5.0	150	
400	2.0	$T_L = 125^\circ\text{C}$	MURS240	65	1.3 @ 2.0 A	35	175	5.0	150	
600	2.0	$T_L = 125^\circ\text{C}$	MURS260	75	1.45 @ 2.0 A	35	175	5.0	150	
200	3.0	$T_L = 140^\circ\text{C}$	MURS320	35	0.875 @ 3.0 A	75	175	5.0	150	CASE 403-03 SMC Cathode = Notch 
400	3.0	$T_L = 130^\circ\text{C}$	MURS340	75	1.25 @ 3.0 A	75	175	10	250	
600	3.0	$T_L = 130^\circ\text{C}$	MURS360	75	1.25 @ 3.0 A	75	175	10	250	
200	6.0	$T_C = 140^\circ\text{C}$	MURD620CT	35	1.0 @ 3.0 A	50	175	5.0	250 @ 125 $^\circ\text{C}$	DDPAK 
200	3.0	$T_C = 158^\circ\text{C}$	MURD320	35	0.95 @ 3.0 A	75	175	5.0	500 @ 125 $^\circ\text{C}$	
300	3.0	$T_C = 140^\circ\text{C}$	MURD330	50	1.15 @ 3.0 A	90	175	5.0	500	
300	3.0	$T_C = 160^\circ\text{C}$	MURD330	50	1.15 @ 3.0 A	75	175	5.0	500	
400	3.0	$T_C = 160^\circ\text{C}$	MURD340	50	1.15 @ 3.0 A	75	175	5.0	500	
600	5.0	$T_C = 159^\circ\text{C}$	MURHD560	30	2.7 @ 5.0 A	50	175	10	70 @ 125 $^\circ\text{C}$	
520	5.0	$T_C = 160^\circ\text{C}$	MURD550PF	95	1.15 @ 5.0 A	75	175	5.0	400	D²PAK CASE 418B-04 
400	8.0	$T_C = 120^\circ\text{C}$	MURHB840CT	28	2.2 @ 4.0 A	100	175	10	500	
600	8.0	$T_C = 120^\circ\text{C}$	MURHB860CT	35	2.8 @ 4.0 A	100	175	10	500	
200	16	$T_C = 150^\circ\text{C}$	MURB1620CT	35	0.975 @ 8.0 A	100	175	5.0	250	
600	16	$T_C = 150^\circ\text{C}$	MURB1660CT	60	1.5 @ 8.0 A	100	175	10	500	

(1) I_O is total device current capability.(2)At V_{RRM} unless noted(4)At V_{RRM} , $T_J = 150^\circ\text{C}$ unless noted

All devices listed are ON Semiconductor preferred devices

Ultrafast Rectifiers (continued)

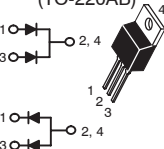
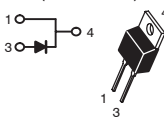
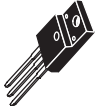
Table 15. Axial Lead Ultrafast Rectifiers

V_{RRM} (V)	I_O (A)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (μA)	Max $I_R^{(4)}$ (μA)	Package
50	1.0	$T_A = 130^\circ\text{C}$	MUR105	35	0.875 @ 1.0 A	35	175	2.0	50	 CASE 59-10 (DO-41) Plastic Cathode = Polarity Band
100	1.0	$T_A = 130^\circ\text{C}$	MUR110	35	0.875 @ 1.0 A	35	175	2.0	50	
150	1.0	$T_A = 130^\circ\text{C}$	MUR115	35	0.875 @ 1.0 A	35	175	2.0	50	
200	1.0	$T_A = 130^\circ\text{C}$ $R_{\theta JA} = 50^\circ\text{C/W}$	MUR120	25	0.875 @ 1.0 A	35	175	2.0	50	
300	1.0	$T_A = 120^\circ\text{C}$	MUR130	75	1.25 @ 1.0 A	35	175	5.0	150	
400	1.0	$T_A = 120^\circ\text{C}$	MUR140	75	1.25 @ 1.0 A	35	175	5.0	150	
600	1.0	$T_A = 120^\circ\text{C}$ $R_{\theta JA} = 50^\circ\text{C/W}$	MUR160	50	1.25 @ 1.0 A	35	175	5.0	150	
800	1.0	$T_A = 95^\circ\text{C}$	MUR180E	75	1.75 @ 1.0 A	35	175	10	600 @ 100 $^\circ\text{C}$	
1000	1.0	$T_A = 95^\circ\text{C}$ $R_{\theta JA} = 50^\circ\text{C/W}$	MUR1100E	75	1.75 @ 1.0 A	35	175	10	600 @ 100 $^\circ\text{C}$	
200	2.0	$T_A = 90^\circ\text{C}$	MUR220	35	0.95 @ 2.0 A	35	175	2.0	50	 CASE 267-05 (DO-201AD) Plastic Cathode = Polarity Band
400	2.0	$T_A = 85^\circ\text{C}$	MUR240	65	1.15 @ 2.0 A	35	175	5.0	150	
600	2.0	$T_A = 60^\circ\text{C}$	MUR260	75	1.35 @ 2.0 A	35	175	5.0	150	
1000	2.0	$T_A = 35^\circ\text{C}$	MUR2100E	100	2.2 @ 2.0 A	35	175	10	600	
50	4.0	$T_A = 80^\circ\text{C}$	MUR405	35	0.89 @ 2.0 A	125	175	5.0	150	
100	4.0	$T_A = 80^\circ\text{C}$	MUR410	35	0.89 @ 2.0 A	125	175	5.0	150	
150	4.0	$T_A = 80^\circ\text{C}$	MUR415	35	0.89 @ 2.0 A	125	175	5.0	150	
200	4.0	$T_A = 80^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	MUR420	25	0.875 @ 3.0 A	125	175	5.0	150	
400	4.0	$T_A = 40^\circ\text{C}$	MUR440	75		75	175	10	250	
520	4.0	$T_C = 65^\circ\text{C}$	MUR450PF	95	1.15 @ 4.0 A	85	175	5.0	400	
600	4.0	$T_A = 40^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	MUR460	50	1.25 @ 3.0 A	70	175	10	250	
800	4.0	$T_A = 35^\circ\text{C}$	MUR480E	75	1.75 @ 3.0 A	70	175	25	900	
1000	4.0	$T_A = 35^\circ\text{C}$ $R_{\theta JA} = 28^\circ\text{C/W}$	MUR4100E	75	1.75 @ 3.0 A	70	175	25	900	
520	5.0	$T_C = 65^\circ\text{C}$	MUR550APF	95	1.15 @ 5.0 A	85	175	5.0	400	

⁽²⁾At V_{RRM} unless noted⁽⁴⁾At V_{RRM} , $T_J = 150^\circ\text{C}$ unless noted

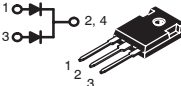
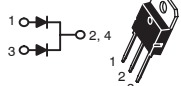
Ultrafast Rectifiers (continued)

Table 16. TO-220 Ultrafast and MEGAHERTZ™ Rectifiers

V_{RRM} (V)	$I_O^{(1)}$ (A)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_C = 25^\circ\text{C}$ (μA)	Max $I_R^{(4)}$ (μA)	Package
200	6.0	$T_C = 130^\circ\text{C}$	<i>MUR620CT</i>	35	0.975 @ 3.0 A	75	175	5.0	250	CASE 221A-09 (TO-220AB) 
400	8.0	$T_C = 120^\circ\text{C}$	<i>MURH840CT</i>	28	2.2 @ 4.0 A	100	175	10	500	
600	8.0	$T_C = 120^\circ\text{C}$	<i>MURH860CT</i>	35	2.8 @ 4.0 A	100	175	10	500	
100	16	$T_C = 150^\circ\text{C}$	<i>MUR1610CT</i>	35	0.975 @ 8.0 A	100	175	5.0	250	
150	16	$T_C = 150^\circ\text{C}$	<i>MUR1615CT</i>	35	0.975 @ 8.0 A	100	175	5.0	250	
200	16	$T_C = 150^\circ\text{C}$	<i>MUR1620CT</i>	35	0.975 @ 8.0 A	100	175	5.0	250	
200	16	$T_C = 160^\circ\text{C}$	<i>MUR1620CTR</i>	85	1.2 @ 8.0 A	100	175	5.0	500	
400	16	$T_C = 150^\circ\text{C}$	<i>MUR1640CT</i>	60	1.30 @ 8.0 A	100	175	10	250	
600	16	$T_C = 150^\circ\text{C}$	<i>MUR1660CT</i>	60	1.5 @ 8.0 A	100	175	10	500	
520	5.0	$T_C = 160^\circ\text{C}$	<i>MUR550PF</i>	95	1.15 @ 5.0 A	100	175	5.0	400	
50	8.0	$T_C = 150^\circ\text{C}$	<i>MUR805</i>	35	0.975 @ 8.0 A	100	175	5.0	250	MUR1620CTR Only CASE 221B-04 (TO-220AC) 
100	8.0	$T_C = 150^\circ\text{C}$	<i>MUR810</i>	35	0.975 @ 8.0 A	100	175	5.0	250	
150	8.0	$T_C = 150^\circ\text{C}$	<i>MUR815</i>	35	0.975 @ 8.0 A	100	175	5.0	250	
200	8.0	$T_C = 150^\circ\text{C}$	<i>MUR820</i>	35	0.975 @ 8.0 A	100	175	5.0	250	
400	8.0	$T_C = 150^\circ\text{C}$	<i>MUR840</i>	50	1.30 @ 8.0 A	100	175	10	500	
600	8.0	$T_C = 150^\circ\text{C}$	<i>MUR860</i>	50	1.50 @ 8.0 A	100	175	10	500	
800	8.0	$T_C = 150^\circ\text{C}$	<i>MUR880E</i>	75	1.80 @ 8.0 A	100	175	25	500 @ 100 $^\circ\text{C}$	
1000	8.0	$T_C = 150^\circ\text{C}$	<i>MUR8100E</i>	75	1.80 @ 8.0 A	100	175	25	500 @ 100 $^\circ\text{C}$	
100	15	$T_C = 150^\circ\text{C}$	<i>MUR1510</i>	35	1.05 @ 15 A	200	175	10	500	
150	15	$T_C = 150^\circ\text{C}$	<i>MUR1515</i>	35	1.05 @ 15 A	200	175	10	500	
200	15	$T_C = 150^\circ\text{C}$	<i>MUR1520</i>	35	1.05 @ 15 A	200	175	10	500	
400	15	$T_C = 150^\circ\text{C}$	<i>MUR1540</i>	60	1.25 @ 15 A	150	175	10	500	
600	15	$T_C = 145^\circ\text{C}$	<i>MUR1560</i>	60	1.50 @ 15 A	150	175	10	1000	
200	20	$T_C = 125^\circ\text{C}$	<i>MUR2020R</i>	95	1.10 @ 20 A	250	175	50	1000	
200	16	$T_C = 150^\circ\text{C}$	 <i>MURF1620CT</i>	35	0.975 @ 8.0 A	100	150	5.0	250	
600	16	$T_C = 150^\circ\text{C}$	 <i>MURF1660CT</i>	60	1.5 @ 8.0 A	100	175	10	500	
600	8.0	$T_C \leq 120^\circ\text{C}$	 <i>MURHF860CT</i>	35	2.8 @ 4.0 A	100	150	10	500	CASE 221D-03 (TO-220) FULL PAK 

(1) I_O is total device capability Indicates UL Recognized – File #E69369(2)At V_{RRM} unless noted(4)At V_{RRM} , $T_J = 150^\circ\text{C}$ unless noted

Table 17. TO-218 and TO-247 Ultrafast Rectifiers

V_{RRM} (V)	I_O (A)	I_O Rating Condition	Device	Max t_{rr} (ns)	Max V_F @ I_F $T_C = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (μA)	Max $I_R^{(4)}$ (mA)	Package
200	30	$T_C = 145^\circ\text{C}$	<i>MUR3020WT</i>	35	1.05 @ 15 A	200	175	10	0.5	CASE 340L-02 (TO-247) 
600	30	$T_C = 145^\circ\text{C}$	<i>MUR3060WT</i>	60	1.70 @ 15 A	150	175	10	1.0	
200	30	$T_C = 150^\circ\text{C}$	<i>MUR3020PT</i>	35	1.05 @ 15 A	200	175	10	0.5	CASE 340D-02 (TO-218AC) 
400	30	$T_C = 150^\circ\text{C}$	<i>MUR3040PT</i>	60	1.25 @ 15 A	150	175	10	0.5	
600	30	$T_C = 145^\circ\text{C}$	<i>MUR3060PT</i>	60	1.50 @ 15 A	150	175	10	1.0	

(2)At V_{RRM} unless noted(4)At V_{RRM} , $T_J = 150^\circ\text{C}$ unless noted

Fast Recovery Rectifiers/General Purpose Rectifiers

Table 18. Fast Recovery Rectifiers/General Purpose Rectifiers

V_{RRM} (V)	I_O (A)	I_O Rating Condition	Device	Max V_F @ I_F $T_J = 25^\circ\text{C}$ (V)	Max t_{rr} (ns)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	Max $I_R^{(2)}$ $T_J = 25^\circ\text{C}$ (μA)	Max $I_R^{(3)}$ (μA)	Package
400	1.5	$T_L = 118^\circ\text{C}$	MRS1504	1.04 @ 1.5 A	–	50	150	1.0	340	CASE 403A-03 SMB 
300	1.0	$T_L = 150^\circ\text{C}$	MRA4003	1.1 @ 1.0 A	–	30	175	10	50	CASE 403B-02 SMA  Cathode = Notch
400	1.0	$T_L = 150^\circ\text{C}$	MRA4004	1.1 @ 1.0 A	–	30	175	10	50	
600	1.0	$T_L = 150^\circ\text{C}$	MRA4005	1.1 @ 1.0 A	–	30	175	10	50	
800	1.0	$T_L = 150^\circ\text{C}$	MRA4006	1.1 @ 1.0 A	–	30	175	10	50	
1000	1.0	$T_L = 150^\circ\text{C}$	MRA4007	1.1 @ 1.0 A	–	30	175	10	50	
50	1.0	$T_A = 75^\circ\text{C}$	1N4001RL	1.1 @ 1.0 A	–	30	150	10	50	CASE 59-10⁽⁷⁾ (DO-41) Plastic  Cathode = Polarity Band
100	1.0	$T_A = 75^\circ\text{C}$	1N4002RL	1.1 @ 1.0 A	–	30	150	10	50	
200	1.0	$T_A = 75^\circ\text{C}$	1N4003RL	1.1 @ 1.0 A	–	30	150	10	50	
400	1.0	$T_A = 75^\circ\text{C}$	1N4004RL	1.1 @ 1.0 A	–	30	150	10	50	
600	1.0	$T_A = 75^\circ\text{C}$	1N4005RL	1.1 @ 1.0 A	–	30	150	10	50	
800	1.0	$T_A = 75^\circ\text{C}$	1N4006RL	1.1 @ 1.0 A	–	30	150	10	50	
1000	1.0	$T_A = 75^\circ\text{C}$	1N4007RL	1.1 @ 1.0 A	–	30	150	10	50	
50	1.0	$T_A = 75^\circ\text{C}$	1N4933RL	1.2 @ 1.0 A	200	30	150	5.0	100	
100	1.0	$T_A = 75^\circ\text{C}$	1N4934RL	1.2 @ 1.0 A	200	30	150	5.0	100	
200	1.0	$T_A = 75^\circ\text{C}$	1N4935RL	1.2 @ 1.0 A	200	30	150	5.0	100	
400	1.0	$T_A = 75^\circ\text{C}$	1N4936RL	1.2 @ 1.0 A	200	30	150	5.0	100	
600	1.0	$T_A = 75^\circ\text{C}$	1N4937RL	1.2 @ 1.0 A	200	30	150	5.0	100	
50	3.0	$T_L = 105^\circ\text{C}$	1N5400RL	1.2 @ 9.4 A	–	200	150	10	500 @ 150 $^\circ\text{C}$	CASE 267-05 (DO-201AD) Plastic  Cathode = Polarity Band
100	3.0	$T_L = 105^\circ\text{C}$	1N5401RL	1.2 @ 9.4 A	–	200	150	10	500 @ 150 $^\circ\text{C}$	
200	3.0	$T_L = 105^\circ\text{C}$	1N5402RL	1.2 @ 9.4 A	–	200	150	10	500 @ 150 $^\circ\text{C}$	
400	3.0	$T_L = 105^\circ\text{C}$	1N5404RL	1.2 @ 9.4 A	–	200	150	10	500 @ 150 $^\circ\text{C}$	
600	3.0	$T_L = 105^\circ\text{C}$	1N5406RL	1.2 @ 9.4 A	–	200	150	10	500 @ 150 $^\circ\text{C}$	
800	3.0	$T_L = 105^\circ\text{C}$	1N5407RL	1.2 @ 9.4 A	–	200	150	10	500 @ 150 $^\circ\text{C}$	
1000	3.0	$T_L = 105^\circ\text{C}$	1N5408RL	1.2 @ 9.4 A	–	200	150	10	500 @ 150 $^\circ\text{C}$	
200	3.0	$T_A = 80^\circ\text{C}^{(8)}$	MR852RL	1.25 @ 3.0 A	200	100	150	10	150	
400	3.0	$T_A = 80^\circ\text{C}^{(8)}$	MR854RL	1.25 @ 3.0 A	200	100	150	10	150	
600	3.0	$T_A = 80^\circ\text{C}^{(8)}$	MR856RL	1.25 @ 3.0 A	200	100	150	10	150	
50	6.0	$T_A = 60^\circ\text{C}$ $R_{\theta JA} = 25^\circ\text{C/W}$	MR750RL	1.25 @ 100 A	–	400	175	25	1000	CASE 194-04 Axial Lead Micro Button  Cathode indicated by diode symbol
100	6.0	$T_A = 60^\circ\text{C}$ $R_{\theta JA} = 25^\circ\text{C/W}$	MR751RL	1.25 @ 100 A	–	400	175	25	1000	
200	6.0	$T_A = 60^\circ\text{C}$ $R_{\theta JA} = 25^\circ\text{C/W}$	MR752RL	1.25 @ 100 A	–	400	175	25	1000	
400	6.0	$T_A = 60^\circ\text{C}$ $R_{\theta JA} = 25^\circ\text{C/W}$	MR754RL	1.25 @ 100 A	–	400	175	25	1000	
600	6.0	$T_A = 60^\circ\text{C}$ $R_{\theta JA} = 25^\circ\text{C/W}$	MR756RL	1.25 @ 100 A	–	400	175	25	1000	
200	25	$T_C = 150^\circ\text{C}$	MR2502	1.18 @ 78.5 A	–	400	175	100	500	CASE 193-04 Micro Button  Cathode = Polarity Band
400	25	$T_C = 150^\circ\text{C}$	MR2504	1.18 @ 78.5 A	–	400	175	100	500	
250	32	$T_C = 150^\circ\text{C}$	TRA3225	1.15 @ 100 A	–	500	175	10	250	
250	25	$T_C = 150^\circ\text{C}$	TRA2525	1.18 @ 100 A	–	400	175	10	250	

⁽²⁾At V_{RRM} unless noted⁽³⁾At V_{RRM} , $T_J = 100^\circ\text{C}$ unless noted⁽⁷⁾Package Size: 0.120" max diameter by 0.260" length.⁽⁸⁾Must be derated for reverse power dissipation. See data sheet.⁽⁹⁾Overvoltage Transient Suppressor: 24–32 volts avalanche voltage.

Fast Recovery Rectifiers/General Purpose Rectifiers (continued)

Table 19. Overvoltage Transient Suppressors

V_{RRM} (V)	$V_{BR}^{(1)}$ (V)	V_{BR} (V)	I_O (A)	Device	Max V_F @ I_F $T_J = 25^\circ\text{C}$ (V)	I_{FSM} (A)	T_J Max ($^\circ\text{C}$)	I_{RSM} (A)	Max $I_R^{(6)}$ (μA)	Package
23	24–32	40 ⁽⁴⁾	6.0 $T_L = 125^\circ\text{C}$	MR2520L	1.25 $I_F = 100\text{A}$	400	175	58 ⁽⁵⁾	10	CASE 194–04 Axial Lead Micro Button  Cathode = Diode Symbol
20	24–32	40 ⁽²⁾	6.0 $T_C = 125^\circ\text{C}$	MR2535L	1.1 $I_F = 100\text{A}$	400	175	62 ⁽⁵⁾	0.2	
20	24–32	40 ⁽³⁾	32 $T_C = 150^\circ\text{C}$	TRA2532	1.18 $I_F = 100\text{A}$	500	175	80 ⁽⁵⁾	10	CASE 193–04 Micro Button  Cathode = Polarity Band
23	24–32	40 ⁽³⁾	32 $T_C = 150^\circ\text{C}$	MR2835SK	1.1 $I_F = 100\text{A}$	400	175	62 ⁽⁵⁾	5.0 @ 20 V	CASE 460–02 Top Can  Cathode = Terminal

(1)At $I_r = 100\text{ mA}$, 25°C (2)At $I_r = 90\text{ A}$, $T_c = 150^\circ\text{C}$, $PW = 80\text{ }\mu\text{S}$ (3)At $I_r = 80\text{ A}$, $T_c = 85^\circ\text{C}$, $PW = 80\text{ }\mu\text{S}$ (4)At $I_r = 80\text{ A}$, $T_c = 25^\circ\text{C}$, $PW = 80\text{ }\mu\text{S}$ (5)Time Constant = 10 mS , 25°C (6)At V_{RRM} , $T_J = 25^\circ\text{C}$ unless noted

Thyristors, Triggers and Surge Suppressors

In Brief . . .

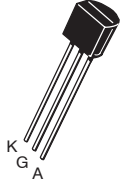
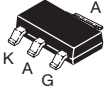
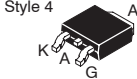
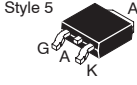
ON Semiconductor's broad line of Thyristors includes . . .

- A full line of Silicon Controlled Rectifiers (SCR's) covering a forward current range of 0.8 to 25 amps and blocking voltages from 30 volts to 800 volts. Available in a choice of six different plastic packages in both through hole and surface mount, for space saving requirements.
- An extensive line of Triacs (bidirectional devices) from 0.6 to 16 amps with blocking voltages from 200 to 800 volts. Like the SCR's, the Triacs are available in a choice of six different plastic packages.
- A new line of Thyristor Surge Suppressors in the surface mount SMB package covering surge currents of 50 and 100 amps, with break over voltages from 80 to 400 volts.
- Trigger devices, including Sidacs and PUT's (Programmable Unijunction Transistors). Trigger devices are available in both the axial lead and TO-92 packages.

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TRIACs	263
Surge Suppressors and Triggers	266

SCRs

Silicon Controlled Rectifiers

					 			
On-State RMS Current IT(RMS) (Amps)	Blocking Voltage VDRM, VRRM (Volts)	TO-92 (Note 1) (TO-226AA) Case 029 Style 10	SOT-223 Case 318E Style 10	TO-225AA (TO-126) Case 077 Style 2	D-PAK Case 369C Style 4 & 5	Surge Current ITSM (Amps) 60 Hz	Max IGT (mA)	Max VGT (Volts)
0.8	30	2N5060				10	0.2	0.8
	60	2N5061						
	100	2N5062						
	200	2N5064						
	100	MCR100-3						
	200	MCR100-4						
	400	MCR100-6						
	600	MCR100-8						
	200		MCR08B			8.0	0.2	0.8
	600		MCR08M					
1.5	400	MCR22-6				15	0.2	0.8
	600	MCR22-8						
4.0	200			C106B		20	0.2	0.8
	400			C106D				
				C106D1				
	600			C106M				
				C106M1				
	400			MCR106-6		25	0.2	1.0
	600			MCR106-8				
	100				MCR703A (Note 2)	25	0.1	0.8
	400				MCR706A (Note 2)			
	600				MCR708A (Note 2)			
	400				MCR716 (Note 3)			
	600				MCR718 (Note 3)			

1. See TO-92 data sheets for complete device suffix packaging ordering options.

RLRA, RLRE, RL, & RL1 suffixes: Radial Tape and Reel

RLRM & ZL1 suffixes: Radial Tape and Ammo Pack

2. Denotes pkg style 5

3. Denotes pkg style 4

Lead Identification

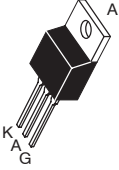
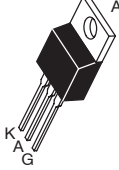
A = Anode

K = Cathode

G = Gate

Shaded devices denote sensitive gate SCR's

SCRs (continued)

		 CASE 369C  CASE 369D	 A K A G	 A K A G			
On-State RMS Current IT(RMS) (Amps)	Blocking Voltage VDRM, VRRM (Volts)	D-PAK Case 369C -001 = Case 369D Style 4	TO-220AB Case 221A-09 Style 3	TO-220AB Case 221A-07 Style 3	Surge Current ITSM (Amps) 60 Hz	Max IGT (mA)	Max VGT (Volts)
8.0	600	MCR8DCM			80	15	1.0
	800	MCR8DCN					
	400		MCR8SD		80	0.2	1.0
	600		MCR8SM				
	800		MCR8SN				
	800		MCR8N		80	15	1.0
	50		C122F		90	25	1.5
	600	MCR8DSM			90	0.2	1.0
	800	MCR8DSN					
	100			MCR72-3	100	0.2	1.5
	400			MCR72-6			
	600			MCR72-8			
	50			MCR218-2	100	25	1.5
	200			MCR218-4			
	400			MCR218-6			
10	400		MCR12LD		100	8.0	0.8
	600		MCR12LM				
	800		MCR12LN				
	800		MCR310-10		100	0.2	1.5
12	600	MCR12DSM			100	0.2	1.0
	800	MCR12DSN					
	800	MCR12DSN-001					
	600	MCR12DCM			100	20	1.0
	800	MCR12DCN					
	400		MCR12D				
	600		MCR12M				
	800		MCR12N				
	50			MCR68-2	100	30	1.5

UL logo indicates UL Recognized File #E69369

Shaded devices denote sensitive gate SCR's

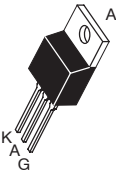
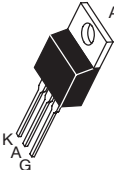
Lead Identification

A = Anode

K = Cathode

G = Gate

SCRs (continued)

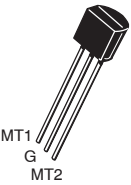
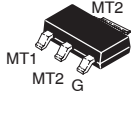
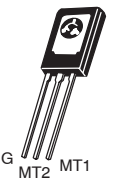
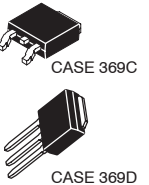
						
On-State RMS Current IT(RMS) (Amps)	Blocking Voltage VDRM, VRRM (Volts)	TO-220AB Case 221A-09 Style 3	TO-220AB Case 221A-07 Style 3	Surge Current ITSM (Amps) 60 Hz	Max IGT (mA)	Max VGT (Volts)
12	50		2N6394	100	30	1.5
	100		2N6395			
	400		2N6397			
	800		2N6399			
16	800	MCR16N		160	20	1.0
	50		2N6400	160	30	1.5
	100		2N6401			
	200		2N6402			
	400		2N6403			
	600		2N6404			
	800		2N6405			
25	400	MCR25D		300	30	1.0
	600	MCR25M				
	800	MCR25N				
	50		2N6504	300	30	1.5
	100		2N6505			
	400		2N6507			
	600		2N6508			
	800		2N6509			
	50		MCR69-2			
	100		MCR69-3			

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Lead Identification

A = Anode
K = Cathode
G = Gate

TRIACs (Bidirectional Devices)

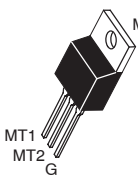
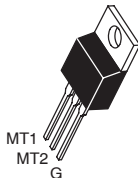
										
							Max IGT (mA)			
On-State RMS Current IT(RMS) (Amps)	Blocking Voltage VDRM, VRRM (Volts)	TO-92 (Note 4) (TO-226AA) Case 029 Style 12	SOT-223 Case 318E Style 11	TO-225AA (TO-126) Case 077 Style 5	D-PAK Case 369C -001 = Case 369D Style 6	Surge Current ITSM (Amps) 60 Hz	Q1	Q2	Q3	Q4
0.6	200	MAC97A4				8.0	5.0	5.0	5.0	7.0
	400	MAC97A6								
	600	MAC97A8								
0.8	400	MAC997A6								
		MAC997B6					3.0	3.0	3.0	5.0
	600	MAC997A8					5.0	5.0	5.0	7.0
		MAC997B8					3.0	3.0	3.0	5.0
	200		MAC08B				10	10	10	10
	600		MAC08M							
2.5	200			T2322B		25	10	10	10	10
4.0	200			2N6071A		30	5.0	5.0	5.0	10
				2N6071B			3.0	3.0	3.0	5.0
	400			2N6073A			5.0	5.0	5.0	10
				2N6073B			3.0	3.0	3.0	5.0
	600			2N6075A			5.0	5.0	5.0	10
				2N6075B			3.0	3.0	3.0	5.0
					MAC4DLM (Note 5)	40	3.0	3.0	3.0	5.0
					MAC4DLM-1 (Note 6)					
					MAC4DHM (Note 5)		5.0	5.0	5.0	10
					MAC4DHM-1 (Note 6)					

4. See TO-92 data sheets for complete device suffix packaging ordering options.
 RLRA, RLRE, RL, & RL1 suffixes: Radial Tape and Reel
 RLRM & ZL1 suffixes: Radial Tape and Ammo Pack
 5. Denotes SMT package
 6. Denotes straight lead package

Lead Identification
 MT1 = Main Terminal 1
 MT2 = Main Terminal 2
 G = Gate

Shaded devices denote sensitive gate Triacs

TRIACs (Bidirectional Devices) (continued)

		 CASE 369C  CASE 369D	 MT1 MT2 G	 MT1 MT2 G					
						Max IGT (mA)			
On-State RMS Current IT(RMS) (Amps)	Blocking Voltage VDRM, VRRM (Volts)	D-PAK Case 369C -001 = Case 369D Style 6	TO-220AB Case 221A-09 Style 4	TO-220AB Case 221A-07 Style 4	Surge Current ITSM (Amps) 60 Hz	Q1	Q2	Q3	Q4
4.0	600	MAC4DSM (Note 7)			40	10	10	10	–
		MAC4DSM-1 (Note 8)							
	800	MAC4DSN (Note 7)							
		MAC4DSN-1 (Note 8)							
	600	MAC4DCM (Note 7)			40	35	35	35	–
		MAC4DCM-1 (Note 8)							
	800	MAC4DCN (Note 7)							
		MAC4DCN-1 (Note 8)							
6.0	400			T2500D	60	25	60	25	60
8.0	400		MAC8SD		70	5.0	5.0	5.0	–
	600		MAC8SM						
	800		MAC8SN						
	400		MAC8D		80	35	35	35	–
	600		MAC8M						
	800		MAC8N						
	400		MAC9D			50	50	50	–
	600		MAC9M						
	800		MAC9N						
	200			MAC228A4		5.0	5.0	5.0	10
	400			MAC228A6					
	600			MAC228A8					
	800			MAC228A10					
	600			2N6344	100	50	75	50	75
	400			T2800D					
						25	60	25	60

7. Denotes SMT package

8. Denotes straight lead package

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Shaded devices denote sensitive gate Triacs

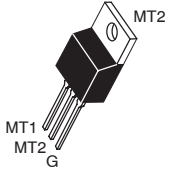
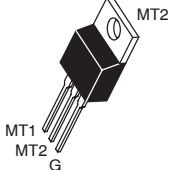
Lead Identification

MT1 = Main Terminal 1

MT2 = Main Terminal 2

G = Gate

TRIACs (Bidirectional Devices) (continued)

								
					Max IGT (mA)			
On-State RMS Current IT(RMS) (Amps)	Blocking Voltage VDRM, VRRM (Volts)	TO-220AB Case 221A-09 Style 4	TO-220AB Case 221A-07 Style 4	Surge Current ITSM (Amps) 60 Hz	Q1	Q2	Q3	Q4
10	600		MAC210A8	100	50	50	50	75
	800		MAC210A10					
12	600	MAC12SM		90	5.0	5.0	5.0	–
	800	MAC12SN						
	400	MAC12HCD		100	50	50	50	–
	600	MAC12HCM						
	800	MAC12HCN						
	400	MAC12D			35	35	35	–
	600	MAC12M						
	800	MAC12N						
	600		MAC212A8		50	50	50	75
	800		MAC212A10					
	600		2N6344A		50	75	50	75
	600		2N6348A					
	800		2N6349A					
15	400	MAC15SD		120	5.0	5.0	5.0	–
	600	MAC15SM						
	800	MAC15SN						
	600	MAC15M		150	35	35	35	–
	800	MAC15N						
	400		MAC15A6		50	50	50	75
	600		MAC15A8					
	800		MAC15A10					
16	400	MAC16D		150	50	50	50	–
	600	MAC16M						
	800	MAC16N						
	600	MAC16CM			35	35	35	–
	800	MAC16CN						

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Shaded devices denote sensitive gate Triacs

Lead Identification

MT1 = Main Terminal 1

MT2 = Main Terminal 2

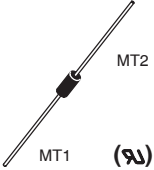
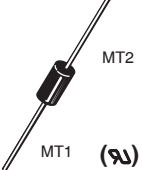
G = Gate

Surge Suppressors and Triggers

Thyristor Surge Suppressors (Bidirectional Devices)

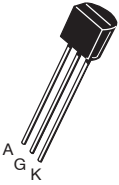
		MT1MT2			
Surge Current IPPS1 10 x 1000 μ sec (Amps)	Maximum Off-State Voltage (Volts)	SMB Case 403C	Maximum Breakover Voltage VBO (Volts)	Minimum Holding Current IH (mA)	General Description
50	170	MMT05B230	265	150	These Thyristor Surge Protector devices help prevent overvoltage damage to sensitive circuits caused by lightening, induction, and power line crossing surges. They are breakover triggered crowbar protectors with turn off occurring when the surge current falls below the holding current value.
	200	MMT05B260	320		
	270	MMT05B310	365		
	300	MMT05B350	400		
80	200	MMT08B260	320	150	
	270	MMT08B310	365		
	300	MMT08B350	400		
100	170	MMT10B230	265	150	
	200	MMT10B260	320		
	270	MMT10B310	365		
	300	MMT10B350	400		

High Voltage Bidirectional Triggers: Sidacs

					
On-State RMS Current IT(RMS) (Amps)	DO-41 Case 059A	Surmetic 50 Case 267 Style 2	Breakover Voltage Range VBO (Volts)	Surge Current ITSM (Amps) 60 Hz	General Description
0.9	MKP1V120		110–130	4.0	High voltage trigger devices similar in operation to triacs. Upon reaching the breakover voltage in either direction, the devices switch to a low voltage on state.
	MKP1V130		120–140		
	MKP1V160		150–170		
	MKP1V240		220–250		
1.0		MKP3V120, MKP3V240	220–250	20	

Surge Suppressors and Triggers (continued)

Thyristor Triggers: Programmable Unijunction Transistors (PUT's)

					
IP			IV		
RG = 10K ohm (μ Amps max.)	RG = 1M ohm (μ Amps max.)	TO-92 (Note 9) (TO-226AA) Case 029 Style 16	RG = 10K ohm (μ Amps min.)	RG = 1M ohm (μ Amps max.)	General Description
5.0	2.0	2N6027	70	50	Similar to unijunction transistors, except that IP, IV, and intrinsic voltage are programmable (adjustable) by means of external voltage divider.
1.0	0.15	2N6028	25	25	

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9. See TO-92 data sheets for complete device suffix packaging ordering options.

RLRA, RLRE, RL, & RL1 suffixes: Radial Tape and Reel

RLRM & ZL1 suffixes: Radial Tape and Ammo Pack

Lead Identification: Suppressor/Sidac

MT1 = Main Terminal 1

MT2 = Main Terminal 2

Lead Identification: PUT

A = Anode

K = Cathode

G = Gate

Power MOSFET Products

Power MOSFET Products

In Brief . . .

Product Summary

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		Through-Hole	279
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What's New For . . .

Computing – ON Semiconductor has introduced a complete portfolio of 30 V Power MOSFET devices for switching and power management applications in Desktop PCs, Notebook Computers, Servers, Graphics Cards, Game Consoles and others. This new suite of products utilizes our latest MOSFET silicon technology, designed for improved efficiency in DC-DC converter applications. These products are available in two packages: DPAK (including IPAK and IPAK with Trimmed Leads) and ON Semiconductor's leading edge SO8 Flat Lead power package.

The new 30 V DPAK devices include the **NTD4804N**, **NTD4805N**, **NTD4806N**, **NTD4808N**, **NTD4809N**, **NTD4810N**, **NTD4813N** and **NTD4815N**.

The new 30 V MOSFET devices in SO8FL include the **NTMFS4833N**, **NTMFS4834N**, **NTMFS4835N**, **NTMFS4836N**, **NTMFS4837N**, **NTMFS4839N**, **NTMFS4841N**, **NTMFS4741N**, **NTMFS4744N** and **NTMFS4747N**.

Portable – (Hand-Held) – Recognizing the industry need for smaller, thinner, faster, cooler and more reliable MOSFET devices for the portable market segment, ON Semiconductor recently released the first six μ Cool™ products. These devices provide designers leading edge performance and flexibility in a small thermally enhanced WDFN6 2x2 mm package. μ Cool brand products will denote leading edge MOSFET products for the portable market place. The first μ Cool products in this portfolio uses exposed drain DFN technology for exceptional thermal resistance (38°C/W) and power ratings (1.9 W) in a 2x2x0.8 mm footprint. Given the same 2x2 mm printed circuit board footprint, the μ Cool portfolio provides up to 190% improvement in steady state power rating over the industry standard SC-88 package and 130% improvement over the SC-70-6 flat lead package.

Automotive

ON Semiconductor has released a line of 40 V, Low $R_{DS(on)}$ parts targeted for the ABS market, but they can be used for any application requiring Low $R_{DS(on)}$. These parts are the **NTB5404NG**, **NTB5405NG**, **NTD5406NG** and the **NTD5407NG**.

*Configuration Codes: S = Single, D = Dual, C = Complementary, F = FETKY, L = Load Switch, Q = Quad

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How To Use This Selector Guide

1. Choose the product type (MOSFET, or Ignition IGBT).
2. Choose the package type (ie., DPAK, ChipFET™).
3. Choose the channel polarity (N, P, or Complementary).
4. Choose a voltage level (V_{DS} – Drain-Source Voltage).
5. View the electrical specifications* and find the device number.

ON Semiconductor Selector Guide – Power MOSFET Products

MOSFET – Surface Mount

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V/1.65 V		I _D (A)	P _D (W)		

SOT-723 – Case 631AA

N-Channel									
20		3.4	4.5	10/15	3.7	0.255	0.44	NTK3043N	S
P-Channel									
-20		4.0	5.3	10	20	0.26	0.4	NTK3143P	S

SC-75 – Case 463

N-Channel									
20		0.23	0.275	0.7	1.82	0.915	0.3	NTA4153N	S
		3	3.5			0.238	0.3	NTA4001N	S
30		7.0	7.5			0.154	0.3	NTA7002N	S
P-Channel									
-20		0.36	0.45	1	2.1	-0.76	0.301	NTA4151P	S

SC-89 – Case 463C

N-Channel									
20		0.23	0.275	0.7	1.82	0.915	0.3	NTE4153N	S
P-Channel									
-20		0.36	0.45	1	2.1	-0.76	0.313	NTE4151P	S

SOT-563 – Case 463A

N-Channel									
20		0.55	0.7	0.9	1.5	0.570	0.280	NTZD3154N	D
P-Channel									
-20		0.15	0.2	0.24	5.6	-0.95	0.21	NTZS3151P	S
		0.9	1.2	2	1.7	-0.455	0.28	NTZD3152P	D
Complementary N/P									
20		0.55/0.9	0.7/1.2	0.9/2.0	1.5/1.7	0.570/ -0.455	0.280	NTZD3155C	C

SC-70 – Case 419

N-Channel									
20	1.0	1.4			1.4	0.3	0.15	MMBF2201N	S
25		0.35	0.40		1.2	0.7	0.28	NTS4409N	S
30		1.5	2		0.9	0.27	0.33	NTS4001N	S
P-Channel									
-8		0.1	0.14	0.21	6.4	-1.4	0.29	NTS2101P	S
-20		0.120	0.16		6.4	-1.37	0.329	NTS4101P	S
	2.2	3.5			2.7*	-0.3	0.15	MMBF2202P	S

SC-88 (SOT-363) – Case 419B

N-Channel									
20		0.060	0.070	0.085	6.9	3.2	1.0	NTJS3157N	S
		0.375	0.445		1.3	0.63	0.27	NTJD4401N	D
25		0.35	0.4*		0.75	1.2	0.63	NTJS4405N	S
30	0.06	0.085			2.75	2.6	0.95	NTJS4160N	S
30		1.5	2.5		0.9	0.25	0.272	NTJD4001N	D

MOSFET – Surface Mount

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

SC-88 (SOT-363) – Case 419B (continued)

P-Channel									
-8		0.3	0.46	0.9	2.2	-0.775	0.27	NTJD2152P	D
-12		0.06	0.09	0.16	8.6	-3.3	0.625	NTJS3151P	S
-20		0.06	0.085	0.205	10	-4.2	1	NTJS4151P	S
		0.26	0.5	1	2.2	-0.88	0.35	NTJD4152P	D
Complementary N/P									
20/-8		0.375/0.3	0.445/0.46	0.90	1.3/2.2	0.63/ -0.775	0.27	NTJD4105C	C
30/-20		1.5/0.260	2.5/0.500			0.25/-0.88	0.27	NTJD4158C	C
Integrated Load Switch P-Channel									
-8		0.175	0.22	0.32		-1.3	0.4	NTJD1155L	L

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V/1.5 V		I _D (A)	P _D (W)		

WDFN6 2x2 mm – Case 506AN

N-Channel									
20		0.07	0.09	0.125/0.250	5.4	4.6	1.5	NTLJD4116N	D
30		0.035	0.045	0.055	12.1	7.8	1.92	NTLJS4159N	S
30		0.035	0.045	0.055	8.5	7.8	1.92	NTLJS4114N	S
P-Channel									
-20		0.1	0.135	0.2	5.5	-4.1	1.5	NTLJD3115P	D
-20		0.04	0.05	0.075/0.2	13	-7.7	1.9	NTLJS3113P	S
FETKY® N-Channel									
20		0.07	0.09	0.125/0.250	5.4	4.6	1.5	NTLJF4156N	F
FETKY® P-Channel									
-20		0.1	0.135	0.2	5.5	-3.3	1.5	NTLJS3117P	F

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

ChipFET™ – Case 1206A

N-Channel									
20		0.030	0.045		12	7.20	1.3	NTHS5404	S
		0.065	0.105		4	4.5	1.13	NTHD5904N	D
		0.075	0.115		2.6	4.1	1.13	NTHD4508N	D
30	0.038	0.05			9.1*	6.7	1.3	NTHS4501N	S
	0.085	0.14			3.6*	3.9	1.13	NTHD4502N	D

ON Semiconductor Selector Guide – Power MOSFET Products

MOSFET – Surface Mount

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

ChipFET™ – Case 1206A (continued)

P-Channel									
-8		0.025	0.036	0.048	15	-7.5	1.3	NTHS2101P	S
		0.058	0.085	0.16	8	-4.6	1.13	NTHD2102P	D
-20		0.034	0.04	0.052	25	-6.7	1.3	NTHS4101P	S
		0.065	0.110		7.5	-4.90	1.3	NTHS5443	S
			0.083		9.7	-5.30	1.3	NTHS5441	S
		0.08	0.11	0.17	7.6	-4.1	1.13	NTHD4102P	D
		0.155	0.24		3	-2.1	1.13	NTHD4401P	D
		0.155	0.260		3.7	-3.0	1.13	NTHD5903	D
Complementary N/P									
20		0.045/0.080	0.050/0.110	0.070/0.15	7.9/8.9	5.5/-4.2	1.13	NTHD3102C	C
		0.08	0.115/0.110		2.3/7.4	3.9/-4.4	1.13	NTHD3100C	C
		0.08/0.115	0.115/0.240		2.6/3.0	3.1/-2.1	1.13	NTHC5513	C
FETKY® N-Channel									
20		0.08	0.115		2.6	2.7	1.13	NTHD4N02F	F
FETKY® P-Channel									
-20		0.08	0.11	0.17	7.4	-4.4	1.13	NTHD3101F	F
		0.155	0.24		3	-4.4	1.13	NTHD4P02F	F

SOT-23 – Case 318

N-Channel									
20		0.08	0.105		2.4	3.2	1.25	NTR4501N	S
	0.090	0.130			6	0.75	0.4	MGSF1N02L	S
	1.000	1.400			1.4	0.3	0.225	MMBF0201NL	S
30	0.100	0.145			6	2.1	0.73	MGSF1N03L	S
	0.11	0.14			3.6*	2.5	0.73	NTR4503N	S
		1.5	2.0		1.15	0.56	0.83	NTR4003N	S
50		3.500*	10*			0.2	0.225	BSS138L	S
60	5.000					0.5	0.225	MMBF170L	S
	7.500	7.5*				0.115	0.225	2N7002L	S
100	6.000					0.17	0.225	BSS123L	S
P-Channel									
-8		0.052	0.072	0.12	12	-3.7	0.96	NTR2101P	S
-20		0.085	0.12	0.21	7.5	-3.2	1.25	NTR4101P	S
		0.20	0.35			-1.3	0.4	NTR1P02L	S
	0.18	0.28			2.5	-1.0	0.400	NTR1P02	S
	0.800	1.100			2.18*	-0.4	0.225	NTR0202PL	S
-30	0.2	0.35			6*	-1.95	1.25	NTR4502P	S
-50		10.000*			6	-0.13	0.225	BSS84L	S

MOSFET – Surface Mount

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

TSOP-6 – Case 318G

N-Channel									
20		0.045	0.055		8	5.1	1.0	NTGS3446	S
30	0.025	0.035			12*	7.0	1.0	NTGS4141N	S
100	0.72	0.82				0.5	1.56	NUD3048M	S
P-Channel									
-12		0.075	0.095		7	-3.30	1.0	NTGS3433	S
-20		0.065	0.100		7.5	-4.40	1.0	NTGS3443	S
		0.090	0.135		6.2	-3.30	1.0	NTGS3441	S
		0.110	0.165		3.25	-3.16	0.98	NTGS3441P	S
-30	0.06	0.11			15.25*	-4.7	1.25	NTGS4111P	S
		0.170	0.280			2.0	0.96	NTGD4161P	D
	0.100	0.170			9*	-3.50	1.0	NTGS3455	S
Complementary									
20		0.08/0.145	0.11/0.20			3.3/2.5	1.1	NTGD3122C	C
FETKY® P-Channel									
-20		0.145	0.200			2.2	0.96	NTGF3123P	F
Integrated Load Switch P-Channel									
-8		0.055	0.070	0.140		-3.3	0.83	NTGD1100L	L

DFN6 3x3 mm – Case 506AG

FETKY® N-Channel									
20		0.09	0.12		2.1	4.6	1.74	NTLGF3501N	F
FETKY® P-Channel									
-20		0.14	0.225		3.8	-3.9	1.6	NTLGF3402P	F

Micro8™ Leadless– Case 846C

N-Channel									
20		0.026	0.031		12	9	3.2	NTLTD7900ZN	D
P-Channel									
-20		0.016	0.021		40	-8.3	3.3	NTLTS3107P	S

Micro8™ – Case 846A

P-Channel									
-20		0.090	0.130*		10	-3.2	1.42	NTTS2P02	S
		0.160	0.250*		5	-1.45	1.0	NTTD1P02	D
-30	0.085	0.135			15	-3.75	1.78	NTTS2P03	S
FETKY® P-Channel									
-20		0.09	0.15		10	-3.3	1.42	NTTD4401F	F

TSSOP-8 – Case 948S

N-Channel									
20		0.022	0.03		12.5	7	1.81	NTQD6968N	D
		0.030	0.038		13	6.9	2.0	NTQD6866	D
P-Channel									
-20		0.020	0.027*		28	-6.8	1.39	NTQS6463	S

ON Semiconductor Selector Guide – Power MOSFET Products

MOSFET – Surface Mount

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

SO–8 (Flat Lead) – Case 488A

N–Channel									
30	0.0022	0.0034			47	35	6.3	NTMFS4108N	S
	0.0035	0.0048			37	30	6.1	NTMFS4119N	S
	0.0045	0.0055			33	31	6.9	NTMFS4120N	S
	0.0053	0.0070			24	29	6.6	NTMFS4121N	S
	0.0060	0.0085			23	23	5.8	NTMFS4122N	S
	0.0080	0.0110			13.1	13	2.3	NTMFS4741N	S
	0.010	0.0140			10	11	2.2	NTMFS4744N	S
	0.0130	0.0170			7.8	9.7	2.2	NTMFS4747N	S

SO–8 (MiniMOS™) – Case 751

N–Channel									
20		0.035	0.048*		12	6.5	2	NTMD6N02	D
		0.040	0.050*		11	5.9	2.5	NTMS4N01	S
	0.090	0.100			12.5*	3.8	2	MMDF3N02HD	D
28	0.008	0.0098			23	14	2.5	NTMS4503N	S
30	0.0045	0.0055			45	18	2.5	NTMS4107N	S
	0.01	0.014			11	12	2.3	NTMS4705N	S
	0.012	0.015			10	10.3	2.2	NTMS4706N	S
	0.023	0.028			26	6.5	2.5	NTMS7N03	S
	0.060	0.080			8*	4	2	NTMD4N03R2	D
80	0.215	0.245			4	2.3	3.1	NTMD3N08L	D
P–Channel									
–16		0.100	0.150		10	–3.85	2.0	NTMD2P01	D
–20		0.014	0.020		48	–10	2.5	NTMS10P02	S
		0.033	0.048		20	–7.0	2.5	NTMS5P02	S
		0.033	0.050		20	–7.8	2	NTMD6P02	D
	0.075	0.095			33*	–5.6	2.5	MMSF3P02HD	S
	0.250	0.400			10*	–2.5	2	MMDF2P02E	D
–30	0.085	0.115			16*	–3.86	2.34	NTMS3P03	S
	0.085	0.125			16*	–3.86	2	NTMD3P03	D
Complementary N/P									
20		0.043/0.100	0.048/0.130		12/10	5.2/–3.4	2	NTMD2C02	C
30	0.070/ 0.200	0.075/ 0.300			11.5/14.2*	4.1	2	MMDF2C03HD	C
FETKY® N–Channel									
30	0.032	0.04			19*	6	2	NTMSD6N303	F
FETKY® P–Channel									
–20		0.090	0.015		16	–3.85	2	NTMSD2P102L	F
	0.085	0.125			16*	–3.86	2	NTMSD3P102	F
–30	0.085	0.125			16*	–3.86	2	NTMSD3P303	F

MOSFET – Surface Mount

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

SOT-223 – Case 318E

N-Channel									
60	0.110				10.6*	3.00	2.10	NTF3055-100	S
		0.120*			7.6	3.00	2.10	NTF3055L108	S
		0.175*			5.1	2.00	2.10	NTF3055L175	S
P-Channel									
-20		0.05	0.07		15	-10	8.3	NTF6P02	S
	0.17				14.3*	-2.6	2.3	NTF2955	S
-30	0.100	0.150			15*	-5.2	3.13	NTF5P03	S

DPAK – Case 369x Family (TO-252)[†]

N-Channel									
24	0.0046	0.0062			23.6	32	110	NTD110N02R	S
	0.005	0.008			21	32	86	NTD95N02R	S
	0.0052				17.7*	32	78.1	NTD85N02R	S
	0.0058	0.009			30	80	75	NTD80N02	S
	0.0105	0.0125			9.5	32	58	NTD60N02R	S
25	0.006	0.0078			25.5	78	64	NTD78N03	S
	0.008	0.013			13.2	32	62.5	NTD70N03R	S
	0.0084	0.0146			12.2	65	50	NTD65N03R	S
	0.014	0.023			6.0	45	50	NTD50N03R	S
	0.0165	0.023			5.78	32	50	NTD40N03R	S
	0.045	0.060			3.76	17.1	22.3	NTD23N03R	S
	0.095	0.130			1.8	14	20.8	NTD14N03R	S
30	0.0040	0.0055			30	117	93.75	NTD4804N	S
	0.0050	0.0074			20.5	88	66	NTD4805N	S
	0.0060	0.0094			15	76	60	NTD4806N	S
	0.0080	0.0124			11.3	63	54.6	NTD4808N	S
	0.0090	0.0140			10.7	58	52	NTD4809N	S
	0.0100	0.0157			9.0	54	50	NTD4810N	S
	0.0130	0.0240			6.9	40	35.3	NTD4813N	S
	0.0150	0.0250			6.0	35	32.6	NTD4815N	S
	0.010	0.013			55*	68	75	NTD4302	S
		0.027*			13.8*	20	74	NTD20N03L27	S
40	10	17			45*	70	100	NTD5406N	S
	26	40			20*	38	75	NTD5407N	S
60		0.028*			23	32	93.75	NTD32N06L	S
	0.042				24*	24	62.5	NTD24N06	S
		0.045*			16	24	62.5	NTD24N06L	S
	0.046				21.2*	20	60	NTD20N06	S
		0.048*			16.6	20	60	NTD20N06L	S
	0.060				15.3*	18	55	NTD18N06	S
	0.062				33*	32	93.75	NTD32N06	S
		0.065*			11	18	55	NTD18N06L	S
	0.094				10.9*	12	48	NTD3055-094	S

[†]Multiple DPAK packages are available. For specific package numbers and dimensions, please see device data sheet.

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MOSFET – Surface Mount

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

DPAK – Case 369x Family (TO–252)[†] (continued)

N–Channel									
60		0.104*			7.4	12	48	NTD3055L104	S
	0.150				7.1*	9	28.8	NTD3055–150	S
		0.170			4.7	9	28.5	NTD3055L170	S
100	0.146				11.3	12	56.6	NTD6600N	S
	0.165				14*	12	53.6	NTD12N10	S
P–Channel									
–30		0.072*			15	–25	75	NTD25P03L	S
–60		0.15*			15*	–15.5	65	NTD20P06L	S
	0.18				15*	–12	55	NTD2955	S

D²PAK – Case 418B (TO–264)

N–Channel									
24	0.0046	0.0062			23.6	125	113.6	NTB125N02R	S
	0.0058	0.009			29	90	85	NTB90N02	S
	0.0105	0.0125			9.5	65	62.5	NTB65N02R	S
25	0.008	0.013			13.2*	75	74.4	NTB75N03R	S
	0.045	0.06			3.76	23	37.5	NTB23N03R	S
28	0.0068				29	85	80	NTB85N03	S
30	0.0065				57	75	125	NTB75N03–006	S
		0.008*			57	75	125	NTB75N03L09	S
	0.0093	0.0125			28	74	80	NTB4302	S
40	4.5	7.0			125*	136	167	NTB5404N	S
	5.8	8.0			88*	116	150	NTB5405N	S
60	0.0095				92*	75	214	NTB75N06	S
	0.014				62*	60	150	NTB60N06	S
		0.016*			43.2	60	150	NTB60N06L	S
	0.026				33*	45	125	NTB45N06	S
		0.028*			23	45	125	NTB45N06L	S
	0.042				23.4*	27	88.2	NTB30N06	S
		0.046*			16	30	88.2	NTB30N06L	S
	0.090				12*	15	48.4	NTB18N06	S
		0.100*			7.3	15	48.4	NTB18N06L	S
100	0.030				72*	52	178	NTB52N10	S
	0.165				14*	13	64.7	NTB13N10	S
150	0.050				70*	37	178	NTB35N15	S
200	0.081				75*	30	214	NTB30N20	S
P–Channel									
–60	0.075				33*	–27.5	120	NTB25P06	S
		0.14*			13	–18.5	88	NTB5605P	S

[†]Multiple DPAK packages are available. For specific package numbers and dimensions, please see device data sheet.

MOSFET – Through-Hole

V _{DSS} (V)	R _{DS(on)} Max (Ω) @ V _{GS} =				Q _T Typ (nC) @ V _{GS} = 4.5 V (5.0 V)/10 V*	Max Rating		Device	Config.
	10 V	4.5 V/5.0 V*	2.5 V/2.7 V*	1.8 V		I _D (A)	P _D (W)		

TO-92 – Case 29-11

N-Channel									
60	7.5					0.15	0.4	VN2222LL	S
	5.0	6.0				0.2	0.35	2N7000	S
	5.0					0.5	0.35	BS170	S
200	14		28			0.25	0.35	BS107	S
			10*			0.25	0.35	BS108	S
	6.0					0.25	0.35	BS107A	S
240	10		10			0.2	0.35	VN2410L	S

TO-220AB – Case 221A (See individual data sheets for specific case number.)

N-Channel									
24	0.0046	0.0062			23.6*	125	113.6	NTP125N02R	S
	0.0058	0.009			29	90	85	NTP90N02	S
	0.0105	0.0125			9.5	65	62.5	NTP65N02R	S
25	0.008	0.013			13	75	74.4	NTP75N03R	S
28	0.0068				29	85	80	NTP85N03	S
30	0.0065				57	75	125	NTP75N03-006	S
		0.008*			57	75	125	NTP75N03L09	S
60	0.0095				92*	75	214	NTP75N06	S
	0.014				62*	60	150	NTP60N06	S
		0.016*			43.2	60	150	NTP60N06L	S
	0.026				33*	45	125	NTP45N06	S
		0.028*			23	45	125	NTP45N06L	S
	0.046				21.2*	27	88.2	NTP27N06	S
	0.090				12*	15	48.4	NTP18N06	S
		0.100			7.3	15	48.4	NTP18N06L	S
150	0.050				70*	37	178	NTP35N15	S
200	0.081				75*	30	214	NTP30N20	S
P-Channel									
-60	0.153				14	-14	55.6	NTP2955	S

TO-264 – Case 340G

N-Channel									
100	0.010				200*	123	313	NTY100N10	S

Ignition IGBT – Insulated Gate Bipolar Transistors

$V_{CE(on)}$ (V)		Min Energy Ratings	Clamp Voltage	Switching Speed	Max Rating		Device	Config.
$V_{GE} = 4.0\text{ V}$ $I_C = 6.0\text{ A}$	$V_{GE} = 4.5\text{ V}$ $I_C = 10\text{ A}$	E_{AS} (mJ)	V_{CES} (V)	Resistive T_{FALL} (μs)	I_D – Cont (A)	P_D (W)		

DPAK – Case 369A (TO–252)

1.35	1.6	250	400	6	20	125	NGD8201N	S
1.35	1.6	250	350	6	20	125	NGD8205N	S
1.6	2	400	400	9	18	115	NGD18N40CLB	S
1.8	2.1	250	410	8	15	107	NGD15N41CL	S

D²PAK – Case 418B (TO–264)

1.35	1.6	250	400	6	20	150	NGB8202N	S
1.6	2.0	400	430	9	18	115	NGB8204N	S
1.35	1.6	250	350	6	20	150	NGB8206N	S
1.6	2	400	400	9	18	115	NGB18N40CLB	S
1.8	2.1	250	410	8	15	107	NGB15N41CL	S
1.6	1.9	300	410	13	15	150	MGB15N40CL	S

TO–220AB – Case 221A

1.8	2.1	250	410	8	15	107	NGP15N41CL	S
1.6	1.9	300	410	13	15	150	MGP15N40CL	S
	1.6	250	400	8	20	150	NGP8203N	S

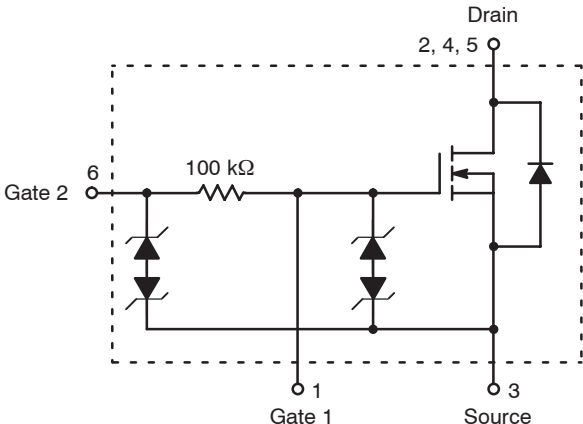
Automotive and Industrial – ON Semiconductor's HDPlus™ platform technology which incorporates various levels of protection features within a MOSFET. The device features can include:

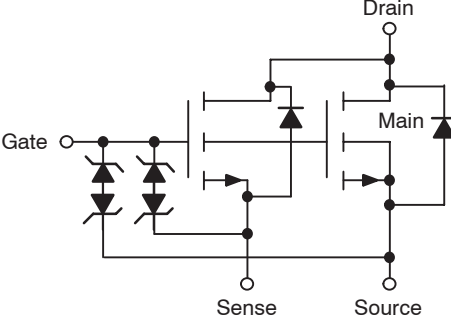
- Short Circuit Protection
- Current Limit
- Thermal Shutdown with Automatic Restart
- Overvoltage Protection
- ESD Protection
- Gate-to-Source Protection
- Current Sense Output
- Pb-free Package

Applications

- Solenoid Driver
- Relay Driver
- Relay Replacement
- Load Switching

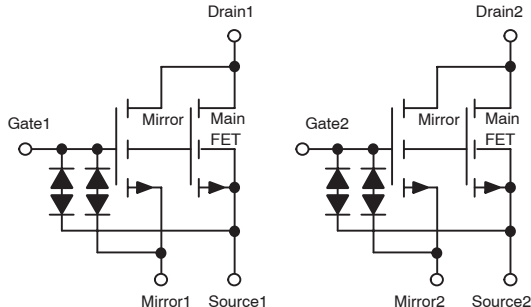
Protected MOSFETs (Automotive/Industrial)

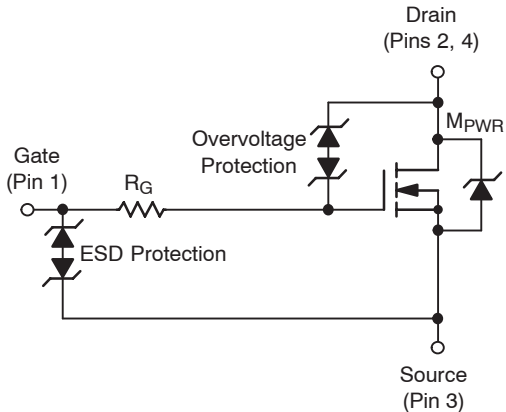
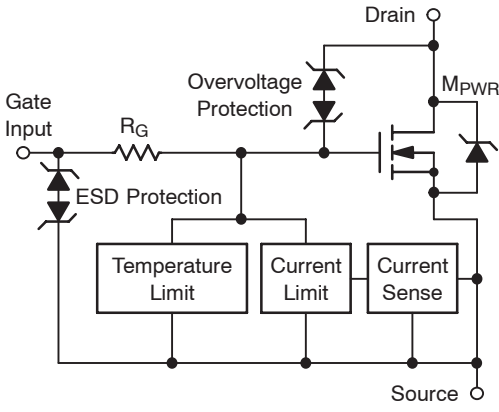
Device	$V_{(BR)DSS}$ (V)	$R_{DS(ON)}$ (Ω) @ $V_{GS} = 10\text{ V}$	Integrated Protection					Max Rating
			Overvoltage	Overcurrent	Overtemperature	ESD	Current Sense Output	P_D (W)
CASE 318G TSOP-6 								
NUD3048M*	100	0.72	—	—	—	X	—	0.66

 CASE 508AA (Leadless) SO-8 								
NILMS4501N*	24	0.013	–	–	–	X	X	2.7

*Not Automotive Qualified.

Protected MOSFETs (Automotive/Industrial) (continued)

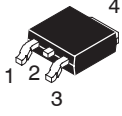
Device	$V_{(BR)DSS}$ (V)	$R_{DS(ON)}$ (Ω) @ $V_{GS} = 10\text{ V}$	Integrated Protection					Max Rating
			Overvoltage	Overcurrent	Overtemperature	ESD	Current Sense Output	P_D (W)
 CASE 751 SO-8 "Dual" 								
NIMD6302R	30	0.05	–	–	–	X	X	1.3

CASE 318E SOT-223   								
NIF9N05CL			NIF62514, NIF5002N, NIF5003N					
NIF9N05CL	55	0.125	X	–	–	X	–	1.69
NIF62514	42	0.1	X	X	X	X	–	1.7
NIF5002N	42	0.2	X	–	–	X	–	1.1
NIF5003N	42	0.068	X	X	X	X	–	1.9

Protected MOSFETs (Automotive/Industrial) (continued)

Device	$V_{(BR)DSS}$ (V)	$R_{DS(ON)}$ (Ω) @ $V_{GS} = 10\text{ V}$	Integrated Protection					Max Rating
			Overvoltage	Overcurrent	Overtemperature	ESD	Current Sense Output	P_D (W)

**CASE 369C
DPAK (TO-252)**



Drain (Pins 2, 4)
Gate (Pin 1)
Source (Pin 3)

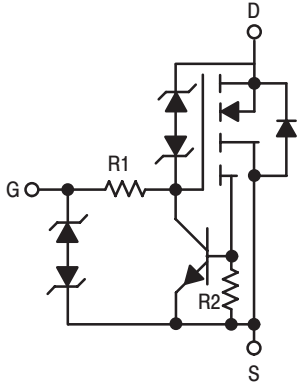
ESD Protection
Overvoltage Protection
MPWR

NID9N05CL

Gate Input
Overvoltage Protection
ESD Protection
Temperature Limit
Current Limit
Current Sense
MPWR

NID5001N, 5003N, 5004N, 6002N

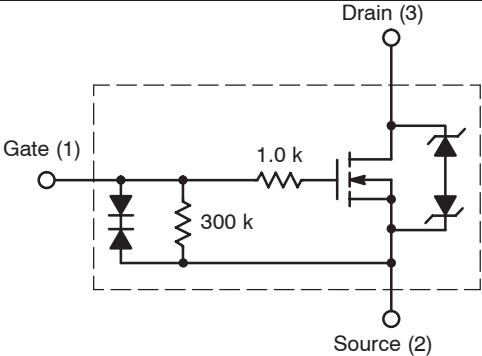
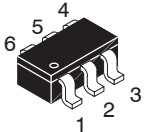
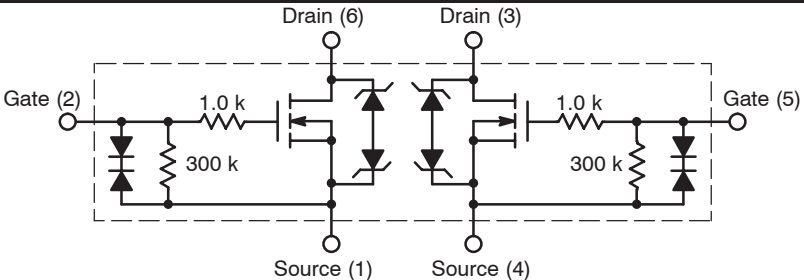
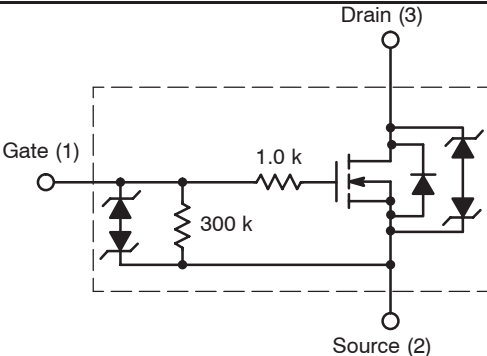
NID9N05CL	55	0.09	X	–	–	X	–	28.8
NID5001N	42	0.029	X	–	–	X	–	64
NID5003N	42	0.05	X	–	–	X	–	1.3
NID6002N	60	0.21	X	–	–	X	–	1.3
NID5004N	40	0.15	X	–	–	X	–	1.3



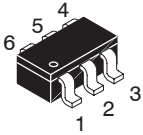
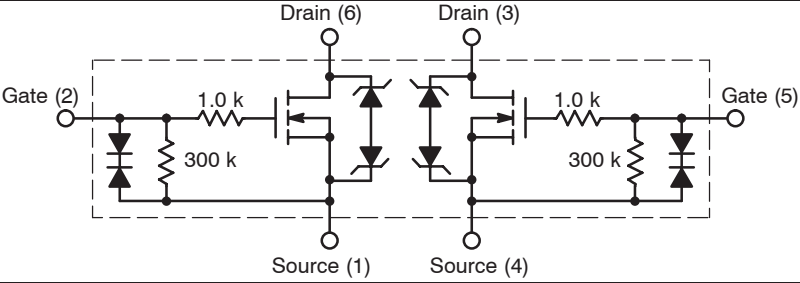
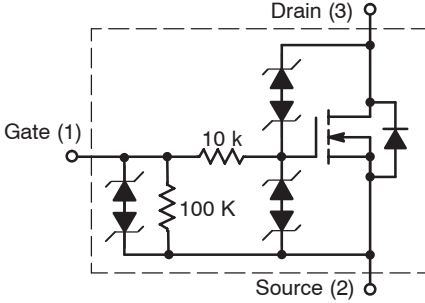
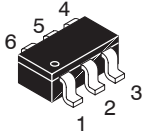
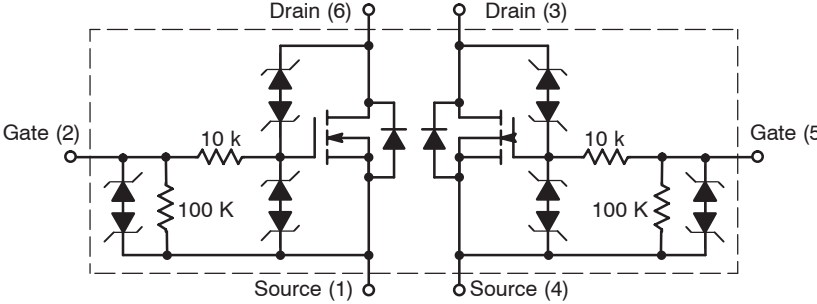
MLD1N06CL, MLD2N06CL

MLD1N06CL	60	0.75 @ $V_{GS} = 5.0\text{ V}$	X	X	–	X	–	40
MLD1N06CL	62	0.4 @ $V_{GS} = 5.0\text{ V}$	X	X	–	X	–	40

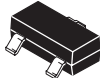
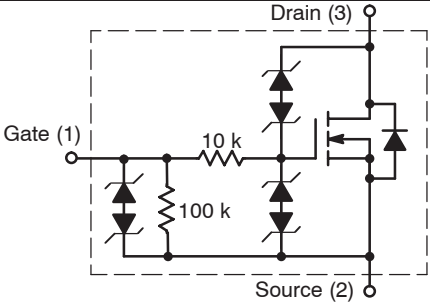
Relay Drivers

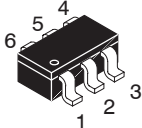
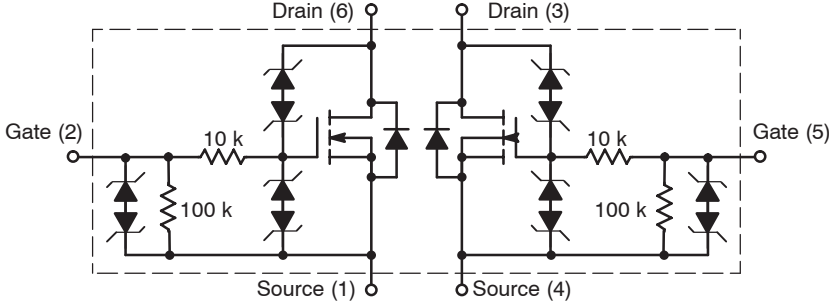
Device	V_{BR} Max (V)	I_D (mA)	E_z (mJ)
 CASE 318 SOT-23 	6.0	500	50
 CASE 318F SC-74 	6.0	500	50
 CASE 318-08 SOT-23 	14	500	50

Relay Drivers (continued)

Device	V_{BR} Max (V)	I_D (mA)	E_z (mJ)
CASE 318F SC-74 	14	500	50
CASE 318 SOT-23 	28	150	250
CASE 318F SC-74 	28	150	250

Relay Drivers (continued)

Device	V_{BR} Max (V)	I_D (mA)	E_z (mJ)
CASE 318 SOT-23			
NUD3160L	60	150	250

CASE 318F SC-74			
NUD3160DM	60	150	250

Product Replacements

Replacement parts are parts that are equivalent to older versions, but built in new technologies. In some cases the

replacement parts have a price advantage. In other cases they have a performance advantage and, in some cases, both.

Replacement Table

Part Number	Recommended New Part Numbers		New Part Status
MGSF1P02ELT1/LT3	NTR1P02LT1/T3		Active
MGSF1P02LT1/LT3	NTR1P02LT1/T3		Active
MGSF3433VT1	NTGS3433T1		Active
MGSF3441VT1	NTGS3441T1		Active
MGSF3455VT1	NTGS3455T1		Active
MMBF0202PLT1	NTR0202PLT1		Active
MMDF2C01HDR2	NTMD2C02R2		Active
MMDF2C02ER2	NTMD2C02R2		Active
MMDF2C02HDR2	NTMD2C02R2		Active
MMDF2P01HDR2	NTMD2P01R2		Active
MMDF2P03HDR2	NTMD3P03R2		Active
MMDF3N03HDR2	NTMD4N03R2		Active
MMDF4207R2	NTMD6P02R2		Active
MMDF4N01HDR2	NTMD6N02R2		Active
MMDF4P03HDR2	NTMD3P03R2		Active
MMDF6N02HDR2	NTMD6N02R2		Active
MMDF6N03HDR2	NTMD6N03R2		Active
MMDFS2P102R2	NTMSD3P102R2	NTMSD2P102LR2	Active
MMDFS3P303R2	NTMSD3P303R2		Active
MMDFS6N303R2	NTMSD6N303R2		Active
MMFT2955ET1	NTF2955T1		Active
MMFT3055ELT1	NTF3055L108T1	NTF3055L175T1	Active
MMFT3055ET1	NTF3055-100T1		Active
MMFT3055VLT1	NTF3055L108T1	NTF3055L175T1	Active
MMFT3055VLT1G	NTF3055L108T1G		Active
MMFT3055VLT3	NTF3055L108T3	NTF3055L175T3	Active
MMFT3055VLT3G	NTF3055L108T3G		Active
MMFT3055VLT3-LF	NTF3055L108T3LF		Active
MMFT3055VT1	NTF3055-100T1		Active
MMFT3055VT3	NTF3055-100T3		Active
MMFT5P03HDT1	NTF5P03T3		Active
MMFT5P03HDT3	NTF5P03T3		Active
MMSF3P03HDR2	NTMS3P03R2		Active
MMSF4205R2	NTMS10P02R2		Active
MMSF4N01HDR2	NTMS4N01R2		Active
MMSF5N02HDR2	NTMS4N01R2		Active
MMSF5N03HDR2	NTMS7N03R2		Active
MMSF5P02HDR2	NTMS5P02R2		Active
MMSF7N03HDR2	NTMS7N03R2		Active
MTB1306	NTB75N03L09	NTB75N03-006	Active
MTB1306T4	NTB75N03L09T4	NTB75N03-006T4	Active

Replacement Table

Part Number	Recommended New Part Numbers		New Part Status
MTB15N06V	NTB18N06		Active
MTB20N20E	NTB30N20		Active
MTB20N20ET4	NTB30N20T4		Active
MTB23P06V/VT4	NTB25P06/T4		Active
MTB29N15ET4	NTB35N15T4		Active
MTB30N06VL	NTB30N06L		Active
MTB30N06VLT4	NTB30N06LT4		Active
MTB33N10E	NTB52N10		Active
MTB33N10ET4	NTB52N10T4		Active
MTB36N06V	NTB45N06T4		Active
MTB36N06VT4	NTB45N06T4		Active
MTB40N10E	NTB52N10T4		Active
MTB40N10ET4	NTB52N10T4		Active
MTB50N06V	NTB45N06		Active
MTB50N06VL	NTB45N06L		Active
MTB50N06VLT4	NTB45N06LT4		Active
MTB50N06VT4	NTB45N06T4		Active
MTB52N06V	NTB60N06		Active
MTB52N06VL	NTB60N06L		Active
MTB52N06VLT4	NTB60N06LT4		Active
MTB52N06VT4	NTB60N06T4		Active
MTB60N06HD	NTB60N06		Active
MTB60N06HDT4	NTB60N06T4		Active
MTB75N03HDL	NTB75N03L09		Active
MTB75N03HDLT4	NTB75N03L09T4		Active
MTB75N05HD	NTB75N06		Active
MTB75N05HDT4	NTB75N06T4		Active
MTB75N06HD	NTB75N06		Active
MTB75N06HDT4	NTB75N06T4		Active
MTD14N10ET4	NTD12N10T4		Active
MTD15N06V	NTD18N06		Active
MTD15N06V1	NTD18N06-001		Active
MTD15N06VL	NTD18N06L		Active
MTD15N06VL1	NTD18N06L-001		Active
MTD15N06VLT4	NTD18N06LT4		Active
MTD15N06VT4	NTD18N06T4		Active
MTD20N03HDL	NTD20N03L27		Active
MTD20N03HDL1	NTD20N03L27-001		Active
MTD20N03HDLG	NTD20N03L27G		Active
MTD20N03HDLT4G	NTD20N03L27T4G		Active
MTD20N03HDLT4	NTD20N03L27T4		Active
MTD20N06HD	NTD24N06		Active
MTD20N06HD1	NTD24N06-001		Active
MTD20N06HDL	NTD24N06L		Active

Replacement Table

Part Number	Recommended New Part Numbers		New Part Status
MTD20N06HDLT4	NTD24N06LT4		Active
MTD20N06HDT4	NTD24N06T4		Active
MTD20N06V	NTD20N06		Active
MTD20N06V1	NTD20N06-001		Active
MTD20N06VT4	NTD20N06T4		Active
MTD20P03HDL	NTD25P03L		Active
MTD20P03HDL1	NTD25P03L1		Active
MTD20P03HDLT4	NTD25P03LT4		Active
MTD20P06HDL	NTD20P06L		Active
MTD20P06HDLG	NTD20P06LG		Active
MTD20P06HDLT4	NTD20P06LT4		Active
MTD20P06HDLT4G	NTD20P06LT4G		Active
MTD2955ET4	NTD2955T4		Active
MTD2955V	NTD2955		Active
MTD2955V1	NTD2955		Active
MTD2955VT4	NTD2955T4		Active
MTD3055ELT4	NTD3055L104T4	NTD3055L170T4	Active
MTD3055V	NTD3055-094	NTD3055-150	Active
MTD3055V1	NTD3055-094-001	NTD3055-150-001	Active
MTD3055VL	NTD3055L104	NTD3055L170	Active
MTD3055VL1	NTD3055L104-001	NTD3055L170-001	Active
MTD3055VLT4	NTD3055L104T4	NTD3055L170T4	Active
MTD3055VT4	NTD3055-094T4	NTD3055-150T4	Active
MTD3302	NTD4302		Active
MTD3302T4	NTD4302T4		Active
MTD9N10E	NTD12N10		Active
MTD9N10E1	NTD12N10-001		Active
MTD9N10ET4	NTD12N10T4		Active
MTDF1P02HDR2	NTTD1P02R2		Active
MTP1306	NTP75N03L09	NTP75N03-006	Active
MTP15N06V	NTP18N06		Active
MTP15N06VL	NTP18N06L		Active
MTP20N06V	NTP27N06		Active
MTP20N20E	NTP30N20		Active
MTP3055V	NTP18N06		Active
MTP3055VL	NTP18N06L		Active
MTP36N06V	NTP45N06		Active
MTP50N06V	NTP45N06		Active
MTP50N06VL	NTP45N06L		Active
MTP52N06V	NTP60N06		Active
MTP52N06VL	NTP60N06L		Active
MTP60N06HD	NTP60N06		Active
MTP75N03HDL	NTP75N03L09		Active
MTP75N05HD	NTP75N06		Active

Replacement Table

Part Number	Recommended New Part Numbers		New Part Status
MTP75N06HD	NTP75N06		Active
MTSF2P02HDR2	NTTS2P02R2		Active
MTSF2P03HDR2	NTTS2P03R2		Active
MTW35N15E	NTP35N15	NTB35N15/NTB35N15T4	Active
MTW45N10E	NTB52N10		Active
MTY100N10E	NTY100N10		Active
NMFT3055AVLT1	NTF3055L108T1	NTF3055L175T1	Active
NMFT3055AVLT3-LF	NTF3055L108T3	NTF3055L175T3	Active
NMFT3055AVT1	NTF3055-100T1		Active
NTD3055AVLT4	NTD3055L104	NTD3055L170	Active
NTP3055AV	NTP18N06		Active

Integrated Functions

Integrated Functions

In Brief . . .

Product Summary

Product	Description	Page
Protection Circuits	TVS (Transient Voltage Suppression) arrays which reduce voltage and current spikes from electrostatic discharge (ESD) or lightning to protect electronic circuits.	297
EMI Filter Circuits	ICs which provide isolation from electromagnetic interface (EMI) and also provide protection from electrostatic discharge (ESD).	304
Relay Drivers	ICs which act as switches to interface between relay coils and sensitive logic circuits.	312
Inrush Current Limiter	ICs which limit inrush current and function as resettable circuit breakers.	315
OVP IC w/MOSFET	Overvoltage Protection IC with Integrated P-Channel MOSFET	318

Integrated Functions combine multiple integrated circuits or discrete devices along with passive elements into a single package solution, reducing component count, system size and overall cost while improving parametric performance and stability.

Enhanced Performance

With the increasing demand for enhanced functionality and reduced size, Integrated Functions provide value added flexibility for the customer. ON Semiconductor has the infrastructure to combine many functions into a single package solution.

The demand for this integration is especially strong in computing, wireless, networking and portable applications.

Benefits of Integrated Functions Include:

- Saves Board Space
- Reduced Number of Components
- Board Insertion Cost Saving
- Increased Parametric Stability
- Improved Reliability – Fewer Solder Connections
- Simplified Procurement Activity
- Lower Overall System Cost

How To Use This Selector Guide

1. Choose the product type (Protection, Filter, Drive).
2. Choose the schematic.
3. Choose the package type (ie., SC-74, SO-8).
4. View the electrical specifications and find the device number.

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Integrated Functions	
Protection Circuits	297
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TVS Low Capacitance Surface Mount for USB 2.0 and 1.1	301
TVS Low Capacitance Surface Mount for High Speed Data Lines	303
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Protected MOSFET (Automotive/Industrial)	319

What's New for Integrated Functions

TVS Protection Arrays – ON Semiconductor miniaturizes its TVS array products by introducing the industry's smallest TVS array. The **NUP45V6** series in the ultra small SOT-953 package provides electrostatic discharge (ESD) protection of four data lines in wireless and portable applications. Other recently released products include the **NUP2202** and **NUP4202** low capacitance arrays for USB 2.0 applications.

Better Efficiency Rectification System, BERS™ – ON Semiconductor leads the way with the **NIS6111**, the industry's first self-contained synchronous rectifier. This device contains a high speed comparator and MOSFET driver with a 24 V, N-Channel Power MOSFET that can function as a two terminal replacement for higher power lossy diodes. The **NIS6111** is the first in this family of low loss, hybrid diodes.

Floating Charge Pump – ON Semiconductor has released the **NIS6201** – Floating Charge Pump IC. This device is an economical alternative to higher cost, larger size bias supplies.

(continued on next page)

SMART HotPlug™ – ON Semiconductor extends its integrated Hot Swap Family with the introduction of the **NIS5102** and **NIS5112**. The **NIS5102** and **NIS5112** have the integrated control, high side driver and power SENSEFET™ all combined in one package. These devices feature active current limit and the most robust thermal protection with integrated temperature sensing diodes built into the Power SENSEFET for +12 V applications.

The **NIS5101** has an integrated control, low side driver and power SENSEFET all combined in one package. This device features active current limit and the most robust thermal protection with integrated temperature sensing diodes built into the Power SENSEFET for –48 V applications.

LED Drivers – ON Semiconductor has released the easy to design **NUD4001** Constant Current LED Driver with a 30 V rating. A higher voltage version (200 V) is also available as **NUD4011**. These constant current sources assure uniformity of light output under varying voltage conditions. Other devices being released shortly, in this family are **NUD4301**, which is a linear constant current source for portable applications and the **NUD4021** series switching LED drivers which can efficiently drive 1 W and 3 W LEDs.

EMI Filters – ON Semiconductor is the leading provider of integrated EMI Filter Products designed to suppress EMI radio frequency interference (RFI) noise and provide electrostatic discharge (ESD) Protection for advanced Wireless Cell Phones, Portable electronics and Computing applications. We have released more than 25 new products in miniature DFN/WDFN packages in 2005.

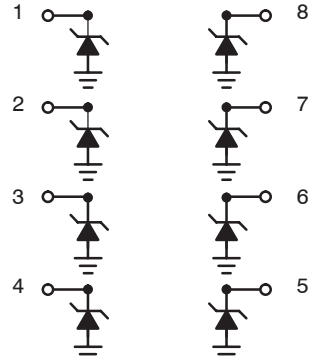
Our next generation EMI filter packages will be available in Low profile (typical 0.5 mm height) miniature μ DFN includes 4-channel (**NUF4001MU**), 6-channel (**NUF6001MU**) and 8-channel (and **NUF8001MU**) provides superior filtering performance over traditional CSP or BGA Package due to low parasitic Inductance and reliability in terms of handling and solderability.

Overvoltage Protection (OVP) IC with Integrated P-Channel MOSFET – Last year, ON Semiconductor joined convenience to practicality by introducing the first overvoltage protection ICs with integrated MOSFET, the **NUS2045** and **NUS3045**. Those devices are used in battery charging circuits to protect sensitive electronics against voltage surges. This year, ON is expanding its portfolio with the **NUS1204** integrating a 12 V FET in a 2 x 2 mm DFN package, the **NUS3046**, a lower threshold version of the **NUS3045**, and the **NUS3055**, a low profile 2.5 x 3.0 mm DFN integrating the functionality of the **NUS3055** in a smaller package.

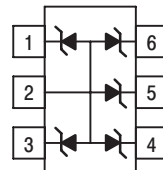
Relay Drivers are ICs which act as switches to interface between microprocessors and electro-mechanical relays and small PCB motors for a variety of applications. The relay driver provides additional current to the relay coil and also protects against ESD. There are two types – bipolar (which uses a transistor) and MOSFET. ON Semiconductor has integrated these components on to one chip.

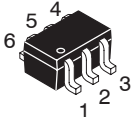
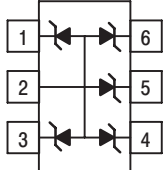
TVS Protection – Arrays in Surface Mount

- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Eight Line Protection

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I _{PP} (Clamping Voltage)	Peak Power Rating (8x20 μsec) (Note 1)
		V _{BR} (V)		@ I _T	I _R	V _{RWM}					
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max	I _{PP} (A)	V _C (V)	Watts
 CASE 506AK DFN8 											
NUP8010MN	5.3	5.6	5.9	1.0	1.0	3.3	13	17	1.6	13	20

- Five Line Protection

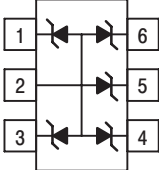
 CASE 318F STYLE 1 SC-74 PLASTIC 											
SMS05C	6.2	–	7.2	1.0	5.0	5.0	260	–	24	14.5	350
SMS12C	13.3	–	15	1.0	1.0	12	120	–	15	23	350
SMS15C	17	–	19	1.0	1.0	15	95	–	12	29	350
SMS24C	26.7	–	32	1.0	1.0	24	60	–	8.0	44	350

 CASE 419B SC-88 (SOT-363) 											
SMF05C	6.2	–	7.2	1.0	5.0	5.0	80	–	8.0	12.5	100
SMF12C	13.3	–	15	1.0	1.0	12	40	–	6.0	23	100
SMF15C	17	–	19	1.0	1.0	15	33	–	5.0	29	100
SMF24C	26.7	–	32	1.0	1.0	24	21	–	2.5	44	100

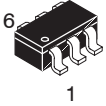
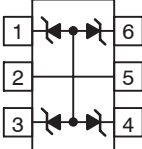
1. Surge waveform 8 x 20 μsec.

TVS Protection – Arrays in Surface Mount (continued)

- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Five Line Protection

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I _{PP} (Clamping Voltage)	Peak Power Rating (8x20 µsec) (Note 2)
		V _{BR} (V)		@ I _T	I _R	V _{RWM}					
	Min	Nom	Max	(mA)	(µA)	(V)	Typ	Max	I _{PP} (A)	V _C (V)	Watts
 CASE 463A SOT-563 											
NUP5120X6	6.2	6.8	7.2	1.0	0.5	3.0	54	–	–	–	90

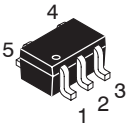
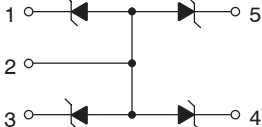
- Four Line Protection

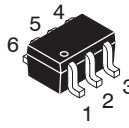
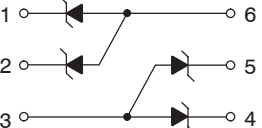
 CASE 318F STYLE 1 SC-74 PLASTIC 											
MMQA5V6	5.32	5.6	5.88	1.0	2.0	3.0	257	–	3.0	8.0	150
MMQA6V2	5.89	6.2	6.51	1.0	0.7	4.0	225	–	2.66	9.0	150
MMQA6V8	6.46	6.8	7.14	1.0	0.5	4.3	210	–	2.45	9.8	150
MMQA12V	11.4	12	12.6	1.0	0.075	9.1	117	–	1.39	17.3	150
MMQA13V	12.4	13	13.7	1.0	0.075	9.8	108	–	1.29	18.6	150
MMQA15V	14.3	15	15.8	1.0	0.075	11	93	–	1.1	21.7	150
MMQA18V	17.1	18	18.9	1.0	0.075	14	77	–	0.923	26	150
MMQA20V	19	20	21	1.0	0.075	15	69	–	0.84	28.6	150
MMQA22V	20.9	22	23.1	1.0	0.075	17	63	–	0.758	31.7	150
MMQA24V	22.8	24	25.2	1.0	0.075	18	58	–	0.694	34.6	150
MMQA27V	25.7	27	28.4	1.0	0.075	21	50	–	0.615	39	150
MMQA30V	28.5	30	31.5	1.0	0.075	23	40	–	0.554	43.3	150
MMQA33V	31.4	33	34.7	1.0	0.075	25	42	–	0.504	48.6	150
SMS05	6.0	–	7.2	1.0	20	5.0	300	400	23	15.5	350
SMS12	13.3	–	15	1.0	1.0	12	120	150	15	23	350
SMS15	16.7	–	18.5	1.0	1.0	15	100	125	12	29	350
SMS24	26.7	–	32	1.0	1.0	24	60	75	8.0	44	350

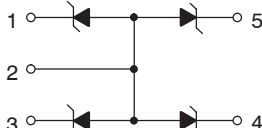
2. Surge waveform 8 x 20 µsec.

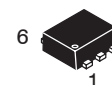
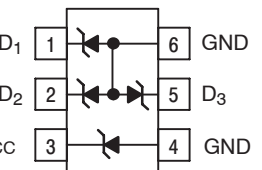
TVS Protection – Arrays in Surface Mount (continued)

- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Four Line Protection

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec) (Note 3)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 419A SC-88A (SOT-353) 											
MSQA6V1W5	6.1	6.6	7.2	1.0	1.0	3.0	90	–	–	–	150
NSQA6V8AW5	6.4	6.8	7.1	1.0	1.0	5.0	12	15	1.6	13	20
NSQA12VAW5	11.4	12	12.7	5.0	0.05	9.0	7.0	15	0.9	23	20
SMF05	6.0	–	7.2	1.0	5.0	5.0	90	–	12	12.5	200

 CASE 419B SC-88 (SOT-363) 											
DF6A6.8FU	6.4	6.8	7.2	1.0	1.0	5.0	40	–	7.0	11.4	75

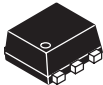
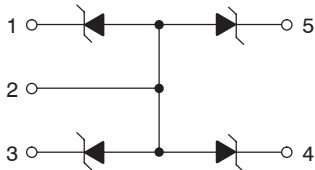
 CASE 463B SOT-553 											
NZQA5V6XV5	5.32	5.6	5.88	1.0	1.0	3.0	90	–	10	10.5	100
NZQA6V2XV5	5.89	6.2	6.51	1.0	0.5	4.0	80	–	9.0	11.5	100
NZQA6V8XV5	6.46	6.8	7.14	1.0	0.1	4.3	70	–	8.0	12.5	100
NZQA5V6AXV5	5.3	5.6	5.9	1.0	1.0	3.0	13	17	1.6	13	20
NZQA6V8AXV5	6.1	6.8	7.2	1.0	1.0	3.0	12	15	1.6	13	20

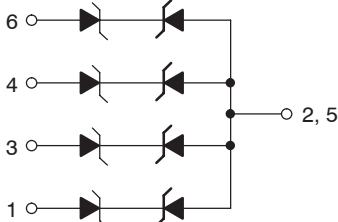
 CASE 463A SOT-563 											
NUP4060AXV6 (D ₁ , D ₂ , and D ₃)	6.2	6.8	7.2	1.0	0.5	3.0	7.0	10	1.6	13	20
NUP4060AXV6 (V _{CC})	15.3	16	17.1	5.0	0.05	11	105	–	–	–	0.200

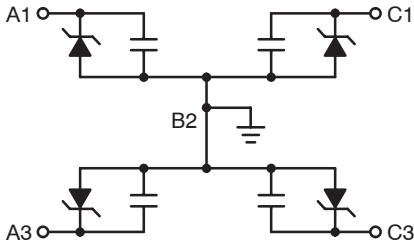
3. Surge waveform 8 x 20 μ sec.

TVS Protection – Arrays in Surface Mount (continued)

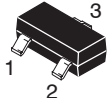
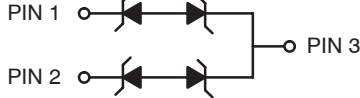
- Human Body Model ESD Rating (> 16 kV)
- IEC 61000-4-2 (ESD) 15 kV (air) 8 kV (contact)
- Four Line Protection

Device	Breakdown Voltage V_{BR} @ 1 mA (V)			Leakage Current I_{RM} @ V_{RM}		Typ Capacitance @ 0 V (pF) (Note 4)		Typ Capacitance @ 3 V Bias (pF) (Note 4)	
	Min	Nom	Max	V_{RWM}	I_{RWM} (μA)	Typ	Max	Typ	Max
 CASE 526AB SOT-953 									
NUP45V6P5	5.3	5.6	5.9	3.0	1.0	13	17	7.0	11.5
NUP46V8P5	6.47	6.8	7.14	4.3	1.0	12	15	6.7	9.5
NUP412VP5	11.4	12	12.7	9.0	1.0	6.5	10	3.5	5.0

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Re- verse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μsec) (Note 4)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μA)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 463A SOT-563 											
NUP4102XV6	13.6	–	17.8	1.0	0.1	12	13	15	3.0	25	75

 CASE 766AB 5 PIN FLIP-CHIP CSP 											
NUP4103FC	6.0	7.0	8.0	1.0	0.1	3.3	47	–	–	–	–

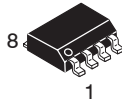
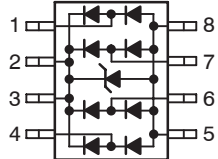
- Two Line Protection

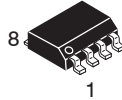
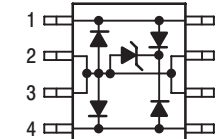
 CASE 318 SOT-23 											
NUP2105L	26.2	–	32	1.0	0.1	24	30	–	8.0	44	350

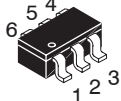
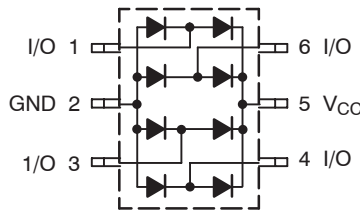
4. Surge waveform 8 x 20 μsec.

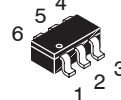
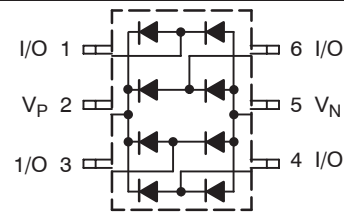
TVS Protection – Low Capacitance Surface Mount for USB 2.0 and 1.1

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 751 SO-8 											
USB 2.0											
NUP4201DR2	6.0	–	–	1.0	10	5.0	2.5	5.0	10	12	500
SRDA05-4R2	6.0	–	–	1.0	10	5.0	4.0	8.0	10	12	500

 CASE 751 SO-8 											
USB 1.1											
LC03-6	6.8	–	–	1.0	20	5.0	8.0	12	50	15	2000

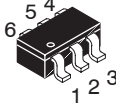
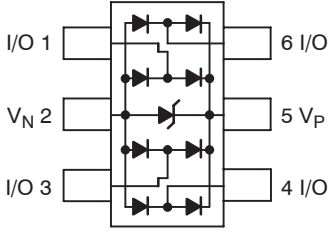
 CASE 318G TSOP-6 											
USB 2.0											
NUP4301MR6	70	–	–	0.1	2.5	–	0.8	1.5	–	–	–
NUP4302MR6	30	–	–	0.1	30	–	–	18	–	–	–

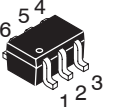
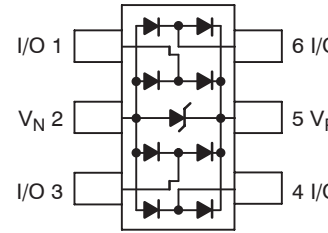
 CASE 318F TSOP-6 											
USB 2.0											
NUP4304MR6	70	–	–	0.1	2.5	–	0.8	1.5	–	–	–

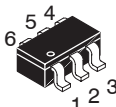
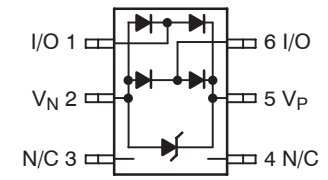
* C_j = Between I/O pins

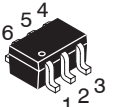
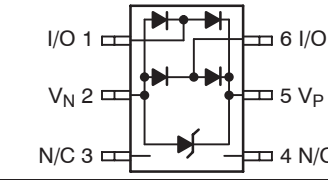
TVS Protection – Low Capacitance Surface Mount for USB 2.0 and 1.1 (continued)

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Re-verse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 318G TSOP-6 											
USB 2.0											
NUP4201MR6	6.0	–	–	1.0	5.0	5.0	3.0	5.0	25	20	500

 CASE 419B SC-88 											
USB 2.0											
NUP4202W1	6.0	–	–	1.0	5.0	5.0	3.0	5.0	28	20	500

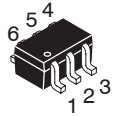
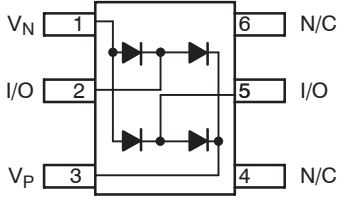
 CASE 318G TSOP-6 											
USB 2.0											
NUP2201MR6	6.0	–	–	1.0	5.0	5.0	3.0	5.0	25	20	500

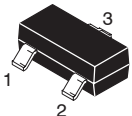
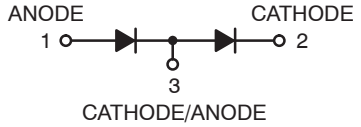
 CASE 419B SC-88 											
USB 2.0											
NUP2202W1	6.0	–	–	1.0	5.0	5.0	3.0	5.0	28	20	500

* C_j = Between I/O pin to ground

TVS Protection – Low Capacitance Surface Mount for USB 2.0 and 1.1 (continued)

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

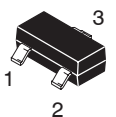
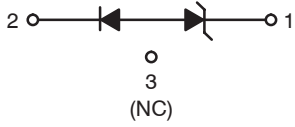
Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance* (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ I_{PP} (Clamping Voltage)	Peak Power Rating (8x20 μ sec)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 419B SC-88 											
USB 2.0											
NUP2301MW6	70	–	–	–	0.1	2.5	0.8	1.5	–	–	–

 CASE 318 SOT-23 											
USB 2.0											
NUP1301ML3	70	–	–	–	0.1	2.5	0.8	1.5	–	–	–

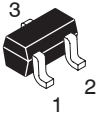
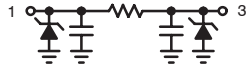
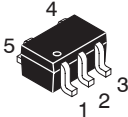
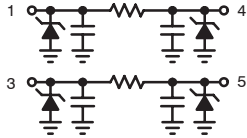
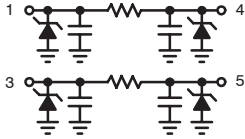
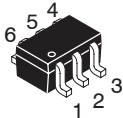
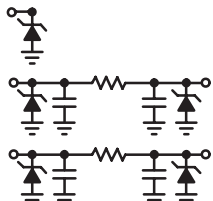
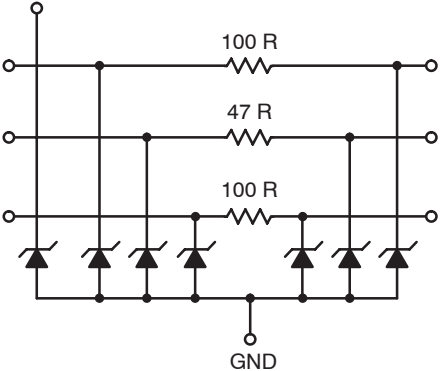
* C_j = Between I/O pins

TVS Protection – Low Capacitance Surface Mount for High Speed Data Lines

- ESD Protection Meeting IEC 61000-4-2, 4-4, 4-5

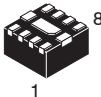
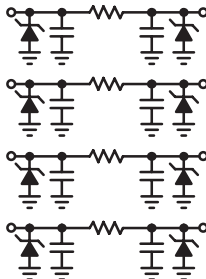
Device	Breakdown Voltage				Max Reverse Leakage Current		Capacitance (pF) @ 0 V, 1.0 MHz		Max Reverse Surge Current	Max Reverse Voltage @ $I_{PP} = 5$ A (Clamping Voltage)	Peak Power Rating (8x20 μ sec)
		V_{BR} (V)		@ I_T	I_R	V_{RWM}					
	Min	Nom	Max	(mA)	(μ A)	(V)	Typ	Max	I_{PP} (A)	V_C (V)	Watts
 CASE 318 STYLE 26 SOT-23 											
SL05	6.0	–	8.0	1.0	20	5.0	3.5	5.0	17	11	300
SL15	16.7	–	18.5	1.0	1.0	15	3.5	5.0	10	30	300
SL24	26.7	–	29	1.0	1.0	24	3.5	5.0	5.0	55	300

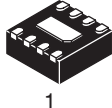
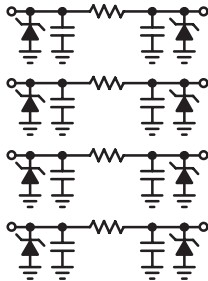
EMI Filter – Data Line Protection

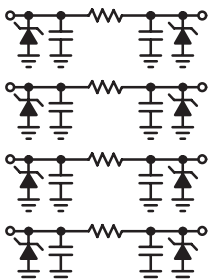
Device	V_{BR} (V)		$I_R(\mu A)$	V_{RWM}	C_{diode} (pF) @ 2.5 V (Note 5)	Resistor		
	Typ	Max	Max		Typ	Typ	Max	
 CASE 463 SC-75 PLASTIC 	NZF220T	7.0	8.0	1.0	3.0	10	100	110
 CASE 419A SC-88A 	NZF220DF	7.0	8.0	1.0	3.0	7.5	100	110
 CASE 463A SOT-563 	NUF2220XV6	7.0	–	1.0	5.0	7.0	100	115
	NUF2230XV6	7.0	–	1.0	5.0	16	100	110
 CASE 419B SC-88 	NUF2240W1	7.0	–	1.0	5.0	17	100	115
 CASE 499AG-01 FLIP-CHIP 	NUF3101FC	7.0	8.0	0.1	3.0	15	100	120

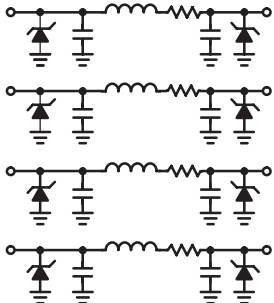
5. Line capacitance is 2x the diode capacitance (C_{diode}).

EMI Filter – Data Line Protection (continued)

Device	V _{BR} (V)		I _R (μA)	@V _{RWM} (V)	C _{diode} (pF) @ 2.5 V (Note 6)	Resistor	
	Typ	Max	Max		Typ	Typ	Max
 CASE 517AK DFN8 (1.6 x 1.6 x 0.85 mm) 							
NUF4402MN	7.0	8.0	0.1	5.0	12	100	115
NUF4403MN	7.0	8.0	0.1	5.0	17	100	115
NUF4210MN	7.0	8.0	0.1	5.0	8.5	100	115

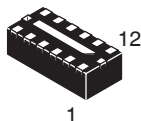
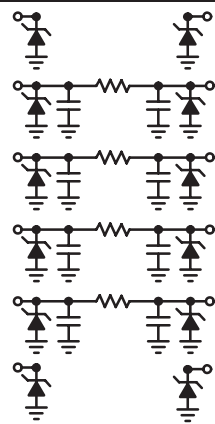
 CASE 506AA DFN8 (2.0 x 2.0 x 0.85 mm) 							
NUF4401MN	7.0	8.0	0.1	5.0	15	200	230

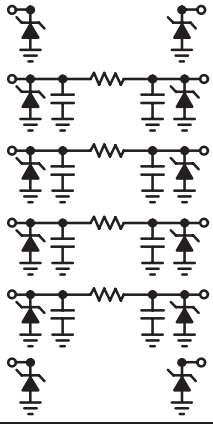
 CASE 517AD UDFN8 (1.2 x 1.8 0.5 mm) 							
NUF4001MU	7.0	8.0	0.1	5.0	12	100	115

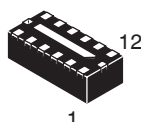
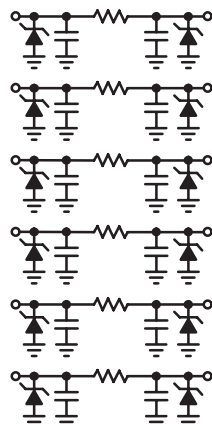
 CASE 517AD UDFN8 (1.2 x 1.8 0.5 mm) 							
NUF4152MU	7.0	8.0	0.1	5.0	20	25	30

6. Line capacitance is 2x the diode capacitance (C_{diode}).

EMI Filter – Data Line Protection (continued)

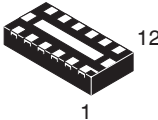
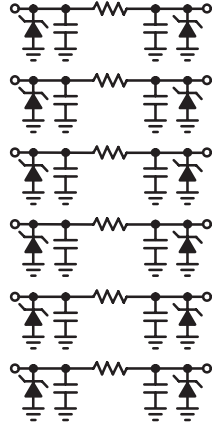
Device	V _{BR} (V)		I _R (μA)	@V _{RWM} (V)	C _{diode} (pF) @ 2.5 V (Note 7)	Resistor	
	Typ	Max	Max		Typ	Typ	Max
 CASE 506AD DFN12 (1.35 x 3.0 x 0.85 mm) 							
NUF6402MN	7.0	8.0	1.0	5.0	17	100	115

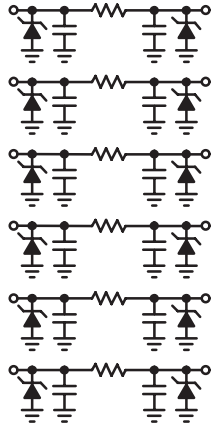
 CASE 499D FLIP-CHIP 300 μm Bumps (1.35 x 3.0 x 0.65 mm) 							
NUF4105FC	7.0	8.0	0.1	3.3	23	100	120

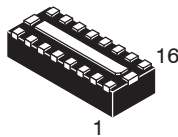
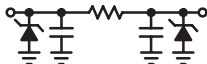
 CASE 506AD DFN12 (1.35 x 3.0 x 0.85 mm) 							
NUF6401MN	7.0	–	1.0	5.0	17	100	115
NUF6406MN	7.0	–	1.0	5.0	12	100	115

7. Line capacitance is 2x the diode capacitance (C_{diode}).

EMI Filter – Data Line Protection (continued)

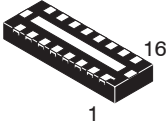
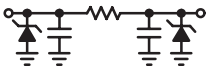
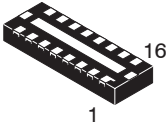
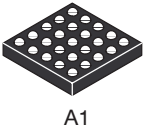
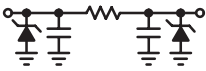
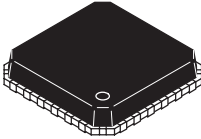
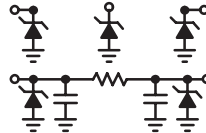
Device	V _{BR} (V)		I _R (μA)	@V _{RWM} (V)	C _{diode} (pF) @ 2.5 V (Note 8)	Resistor	
	Typ	Max	Max		Typ	Typ	Max
 CASE 517AE UDFN12 (1.2 x 2.5 x 0.5 mm) 							
NUF6001MU	7.0	–	1.0	5.0	17	100	115

 CASE 499D FLIP-CHIP 300 μm Bumps (1.35 x 3.0 x 0.65 mm) 							
NUF6106FC	7.0	8.0	0.1	3.3	10	100	120
NUF6105FC	7.0	8.0	0.1	3.3	23	100	120

 CASE 507AC DFN16 (1.6 x 4.0 x 0.85 mm)  1 of 8 Filter Lines							
NUF8401MN	7.0	8.0	0.1	5.0	12	100	115
NUF8402MN	7.0	8.0	0.1	3.3	17	100	115
NUF8410MN	7.0	8.0	0.1	5.0	8.5	100	115

8. Line capacitance is 2x the diode capacitance (C_{diode}).

EMI Filter – Data Line Protection (continued)

Device	V_{BR} (V)		I_R (μA)	@ V_{RWM} (V)	C_{diode} (pF) @ 2.5 V (Note 9)	Resistor	
	Typ	Max	Max		Typ	Typ	Max
 CASE 517AF UDFN16 (1.2 x 3.5 x 0.5 mm)					 1 of 8 Filter Lines		
NUF8001MU	7.0	8.0	0.1	5.0	12	100	115
 CASE 517AF UDFN16 (1.2 x 3.5 x 0.5 mm)					 1 of 8 Filter Lines		
NUF8152MU	7.0	8.0	0.1	5.0	20	25	30
 CASE 499G FLIP-CHIP CSP (2.64 x 2.64 x 0.65 mm)					 1 of 10 Filter Lines		
NUF9001FC	7.0	8.0	0.1	5.0	15	200	230
NUF9002FC	7.0	8.0	0.1	5.0	10	100	115
 CASE 485F 24 PIN MLF					 1 of 9 Filter Lines		
NZMM7V0T4	7.0	8.0	0.1	3.0	10	100	110

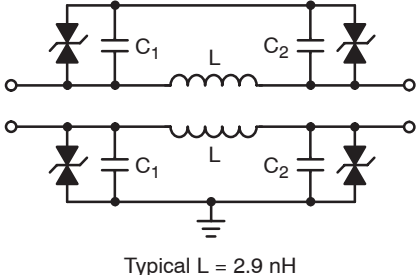
9. Line capacitance is 2x the diode capacitance (C_{diode}).

EMI Filter – Audio Line Protection

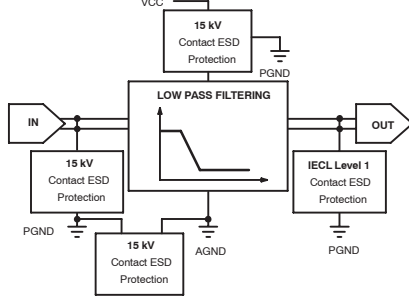
Device	V_{BR} (V)		I_R (μ A)	@ V_{RWM} (V)	C_{diode} (pF) @ 2.5 V (Note 10)	Resistor	
	Typ	Max	Max		Typ	Typ	Max

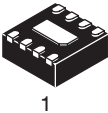
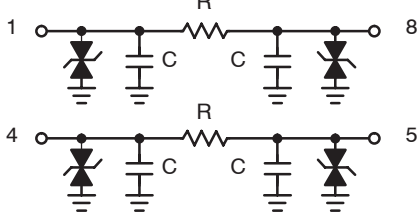


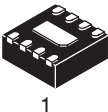
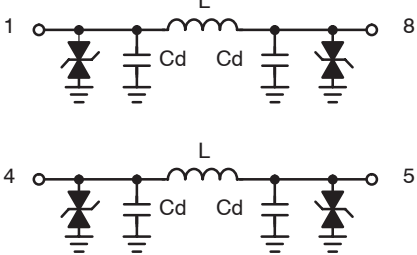
**CASE 499J
FLIP-CHIP**



NUF2441FC	14.5	17.7	0.1	12	100	0.28	0.35
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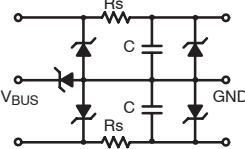
 CASE 499AE FLIP-CHIP 							
NMF3000FC	12	–	0.5	10	500	950	1100

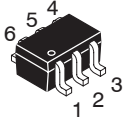
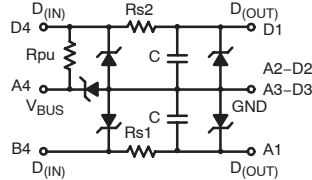
 CASE 506AA DFN8 							
NUF2114MN	15.7	17.7	0.1	12	60	8.4	10
NUF2116MN	15.7	17.7	0.01	12	50	64	75

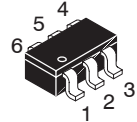
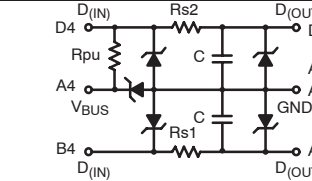
 CASE 506AA DFN8 							
NUF2070MN	15.7	17.7	0.1	12	64	2.4	3.5

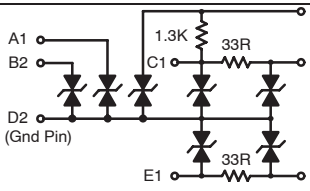
10. Line capacitance is 2x the diode capacitance.

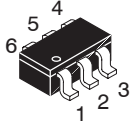
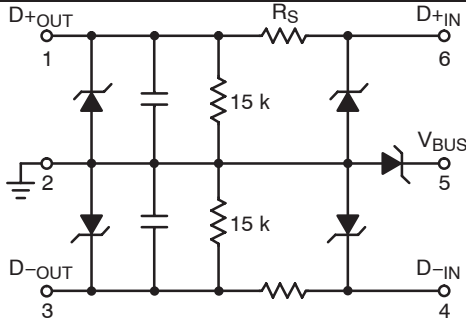
EMI Filter – USB DATA Line Protection

Device	V_{BR} (V)		I_R (μA)	V_{RWM}	C_{line} (pF) @ 2.5 V	Resistor	
	Typ	Max	Max		Typ	Typ	Max
 CASE 463A SOT-563							
NUF2030XV6	6.8	8.0	0.1	5.25	30	22	26.4
NUF2042XV6	6.8	8.0	0.1	5.25	42	22	26.4

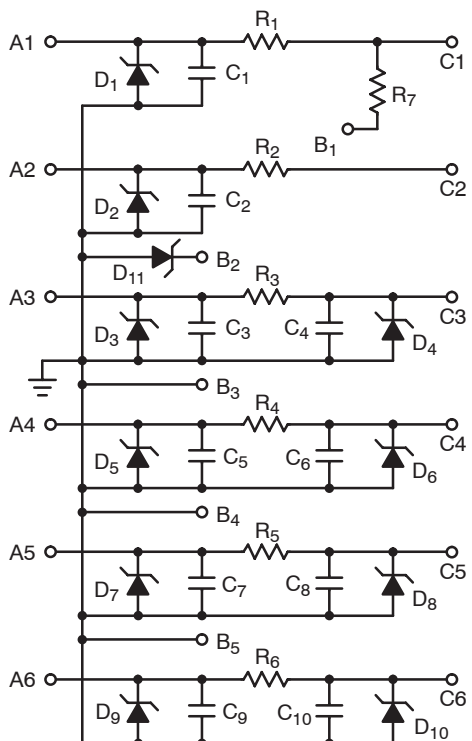
 CASE 419B SC-88 (SOT-363)							
NUF2015W1	6.8	8.0	0.1	5.25	42	15	18
NUF2221W1	6.8	8.0	0.1	5.25	42	22	26.4

 CASE 318G TSOP-6							
STF202-22	7.0	8.0	5.0	5.25	57	22	24

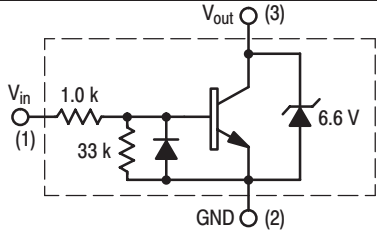
 CASE 499AM FLIP-CHIP							
NUF2222FC	7.8	8.8	0.1	5.0	34	33	38

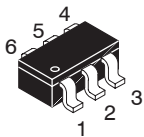
 CASE 318G STYLE 10 TSOP-6							
NUF2101M	7.0	8.0	1.0	5.25	46	30	33.7

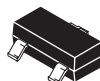
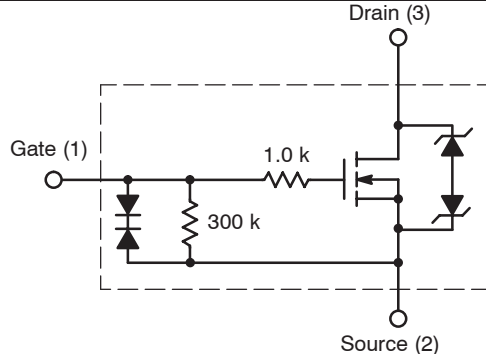
EMI Filter – USB DATA Line Protection (continued)

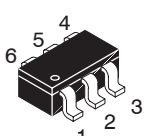
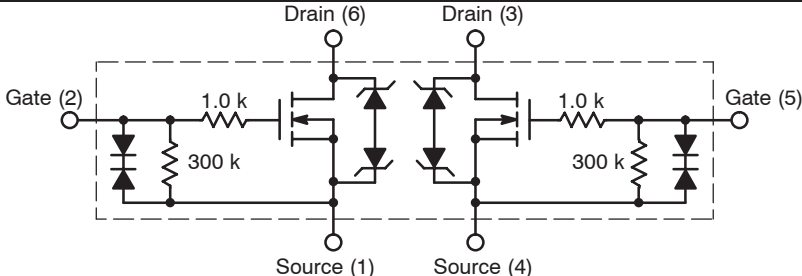
Device	V _{BR} (V)		I _R (μA)	@V _{RWM} (V)	C _{line} (pF) @ 2.5 V	Resistor	
	Typ	Max			Max	Typ	Typ
 A1 CASE 499AD FLIP-CHIP CSP							
NUF4107FC (Pin A1 to C1, Pin A2 to C2)	7.0	8.0	0.1	5.25	36	22	26
NUF4107FC (Pin A3 to C3, Pin A4 to C4, Pin A5 to C5, Pin A6 to C6)	7.0	8.0	0.1	5.25	60	100	120

Relay Drivers

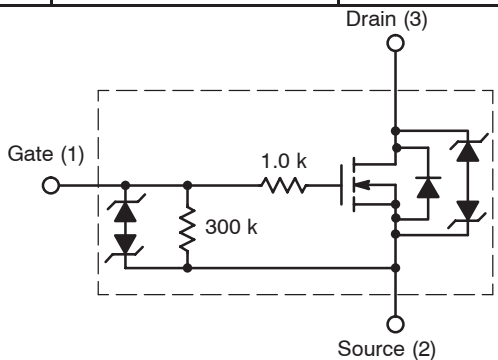
Device	V_{BR} Max (V)	I_D (mA)	E_z (mJ)
 CASE 318 SOT-23			
MDC3105L	6.0	500	50

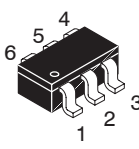
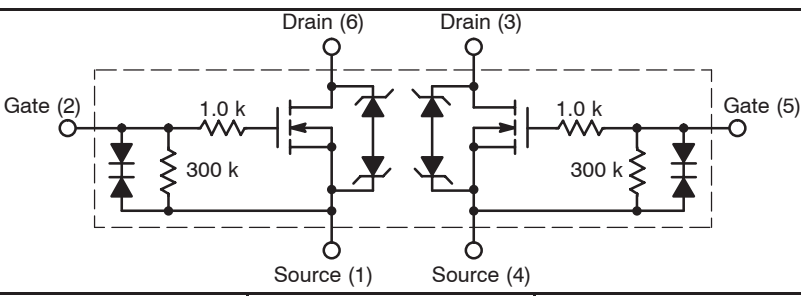
 CASE 318F SC-74			
MDC3105DM	6.0	500	50

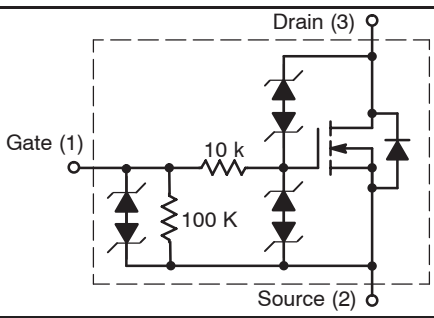
	CASE 318 SOT-23		
NUD3105L	6.0	500	50

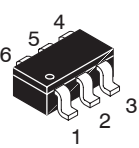
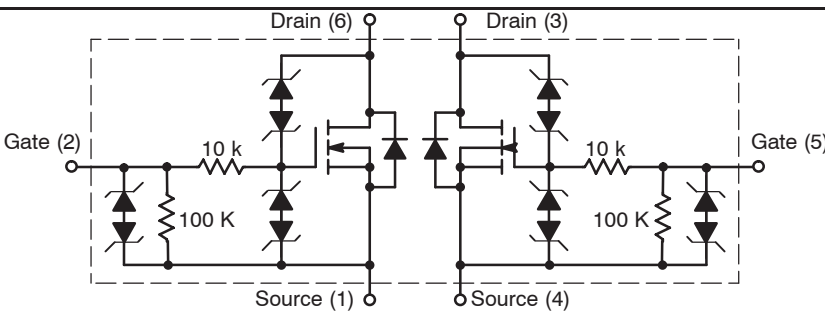
 CASE 318F SC-74			
NUD3105DM	6.0	500	50

Relay Drivers (continued)

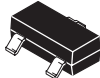
Device	V_{DS} Max (V)	I_D (mA)	E_z (mJ)
 CASE 318 SOT-23			
NUD3112L	14	500	50

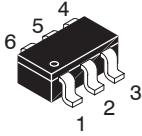
 CASE 318F SC-74			
NUD3112DM	14	500	50

 CASE 318 SOT-23			
NUD3124L	28	150	250

 CASE 318F SC-74			
NUD3124DM	28	150	250

Relay Drivers (continued)

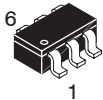
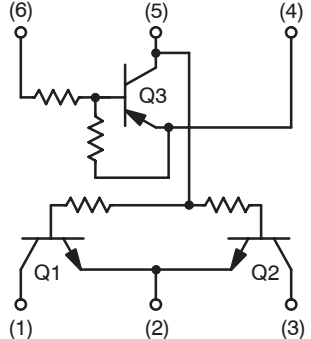
Device	V_{DS} Max (V)	I_D (mA)	E_z (mJ)
 CASE 318 SOT-23			
NUD3160L	60	150	250

 CASE 318F SC-74			
NUD3160DM	60	150	250

LED Drivers

Device	V_{Max} (V)	I_{Max} (mA)	P (Watts)
 CASE 751 SO-8			
NUD4001DR2	30	500	1.13
NUD4011DR2	200	70	1.13

Integrated PNP/NPN Digital Transistor Array

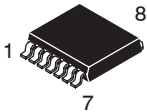
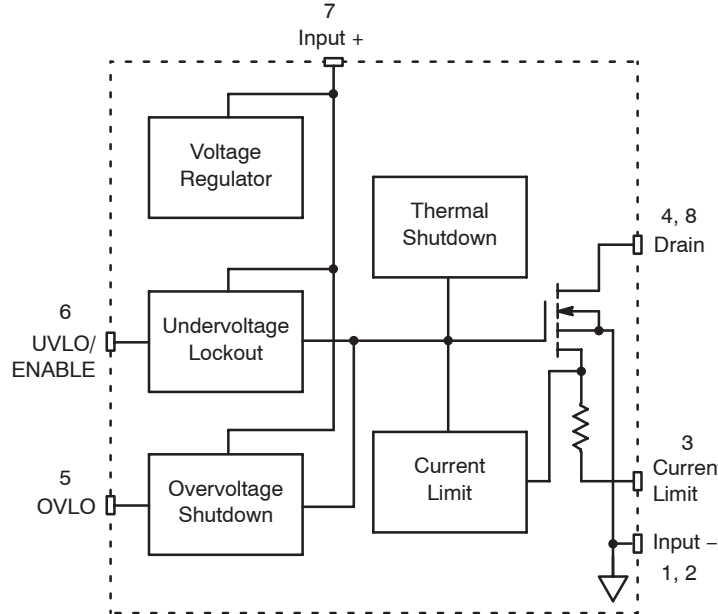
Device	V_{CE} (V)	h_{fe}	V_{BR} (V)	P_D (mW)
 CASE 318F SC-74				
NUS2401SN	0.25	60 & 350	50	350

Devices listed in ***bold italic*** are ON Semiconductor preferred devices.

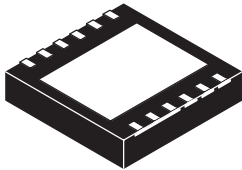
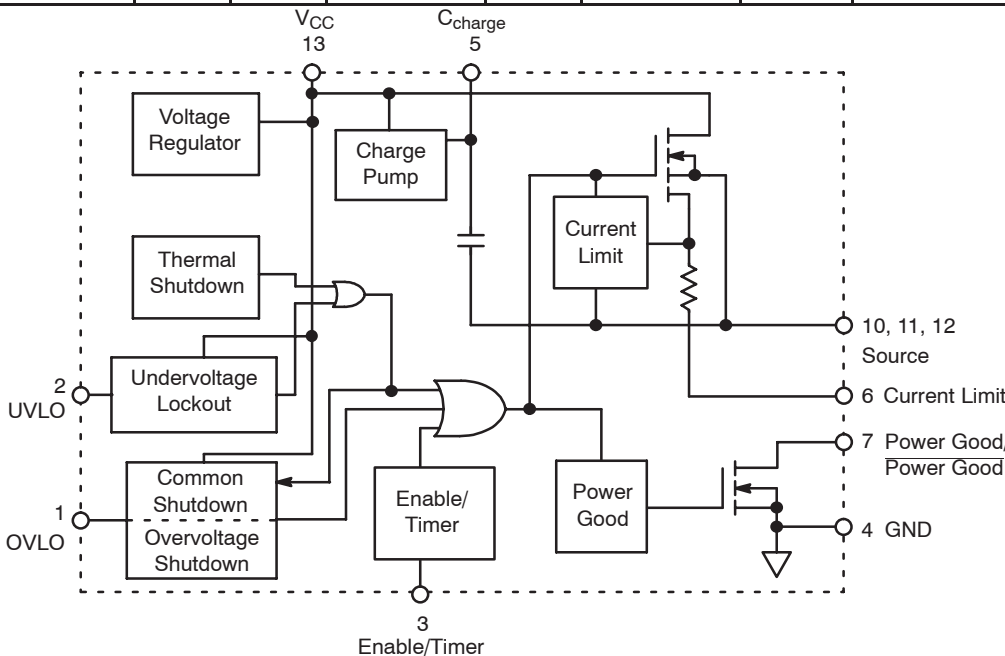
Inrush Current Limiter

SMART HotPlug™ – Low Side

- Integrated Power Device
- Temperature Sensing Diode in Power MOSFET
- Adjustable Current Limit
- Adjustable UVLO and OVLO

Package	Device	V _{in} (V)		R _{DS(on)} (mΩ)	I _D Avg (A)	Thermal Option	Thermal Limit	Thermal Limit Hysteresis
		Min	Max	Typ	Max		Typ °C	Typ °C
 CASE 553AA S-PAK EX SUFFIX 								
SPAK	NIS5101E1T1	18	110	43	6.5	Latch Off	135	40
SPAK	NIS5101E2T1	18	110	43	6.5	Auto-Retry	135	40
SPAK	NIS5101E1T1G	18	110	43	6.5	Latch Off	135	40
SPAK	NIS5101E2T1G	18	110	43	6.5	Auto-Retry	135	40

SMART HotPlug™ – High Side

Package	Device	V _{in} (V)		R _{DS(on)} (mΩ)	I _D Avg (A)	Thermal Option	Thermal Limit	Thermal Limit Hysteresis	
		Min	Max	Typ	Max		Typ °C	Typ °C	
 CASE 488AB 9x9 MM, 12 PIN PLLP									
	QFN 9x9	NIS5102QP1HG	9	18	10	10	Latch Off	135	40
	QFN 9x9	NIS5102QP2HG	9	18	10	10	Auto-Retry	135	40

CASE 751
SOIC-8 NB

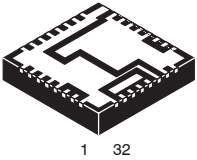
SO-8	NIS5112D1R2G	9.0	18	30	3.0	Latch Off	135	40
SO-8	NIS5112D2R2G	9.0	18	30	3.0	Auto-Retry	135	40

Hybrid Diode IC

Better Efficiency Rectification System, BERS™ IC

- Integrated Power Device
- Low Forward Drop
- Can be used in High Side and Low Side Configurations
- Gate Drive Available to Parallel Additional MOSFETs

Device	V_{in} (V)		IFAV Avg (A) Max	$R_{DS(on)}$ $V_{GS} = 5.0$ V $I_D = 10$ A (m Ω)	Fet Turn-On Time $I_{max} = 3.0$ A, $I_{rev} = 1.0$ A, $V_{rev} = 5.0$ V Typ (nsec)	Turnoff Propagation Delay Time $V_{DS} = V_{offset}$ to $I_D = 0$ A Typ (nsec)
	Typ	Max				



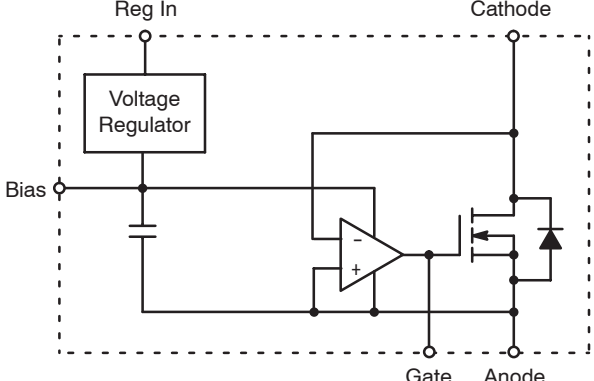
**CASE 488AC
PLLP32**

**MARKING
DIAGRAM**

1 ○

NIS6111
AWLYYYWW

NIS6111= Specific Device Code
A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week



NIS6111QP	0.8	24	30	3.7	45	35
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Floating, Regulated Charge Pump

Device	V_{CC} (V)	I_{davg} , Drive Current Max (A)	Oscillator Frequency f_{osc} Typ (MHz)	$R_{DS(on)}$ High Side FET (Typ) Ω	$R_{DS(on)}$ Low Side FET (Typ) Ω
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**CASE 751
SOIC-8 NB**

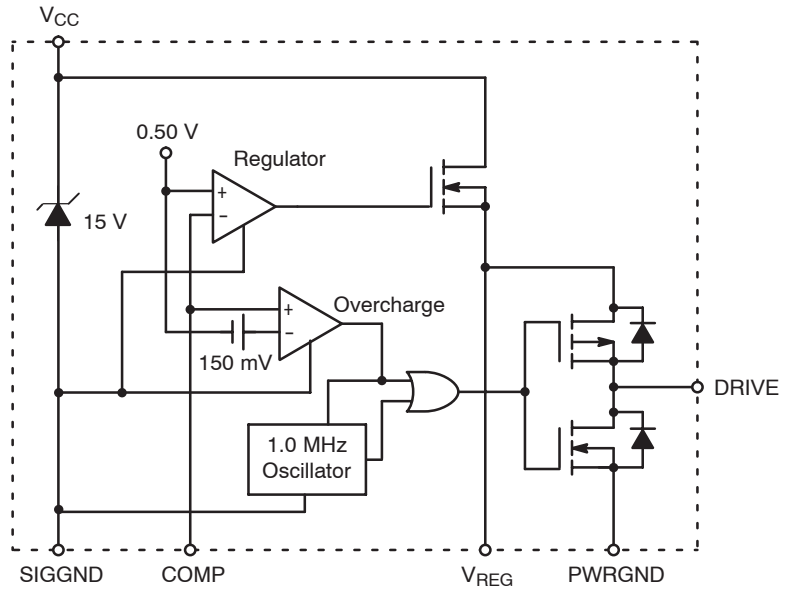
**MARKING
DIAGRAM**

8 □ □ □ □

NIS6201
ALYWX

1 □ □ □ □

A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week



NIS6201	-0.3 to 18	0.05	1.0	20	20
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Overvoltage Protection IC with Integrated P-Channel MOSFET

Device	V _{CC} (V)	V _{DSS} (V) Max	I _D (A), Steady State	R _{DS(on)} (mΩ) Typ V _{GS} = -4.5 V I _D (Note 11)	V _{th} (V) Typ	Package and Dimensions
Diagram illustrating the Overvoltage Protection (OVP) circuit. The input Vin is connected to the OVP/CIRCUIT block and the gate of the P-CH MOSFET. The OVP/CIRCUIT block is connected to VCC and GND. The P-CH MOSFET's source is connected to VCC, its gate is connected to the OVP/CIRCUIT block's Vgate output, and its drain is connected to the load through a diode. The load is connected to GND.				 1 8 CASE 506AL DFN8  1 8 CASE 517AH UDFN8  1 8 CASE 506AN WDFN6		
(Package Drawings Not to Scale)						
NUS2045MN	2.8 to 20	20	-1.0	71	6.85	DFN8 3.3x3.3x0.85 mm
NUS3045MN	2.8 to 30	30	-1.0	66	6.85	DFN8 3.3x3.3x0.85 mm
NUS3046MN	2.5 to 30	30	-1.0	66	5.5	DFN8 3.3x3.3x0.85 mm
NUS3055MN	2.8 to 30	30	-1.0	66	6.85	TLLGA 2.5x3.0x0.55 mm
NUS1204MN	12	12	-0.6	75	4.725	WDFN6 2.0x2.0x0.85 mm

11. I_D = -1.0 A

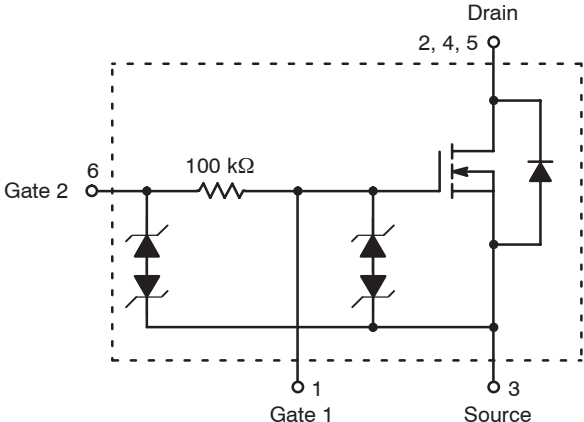
Automotive and Industrial – ON Semiconductor's HDPlus™ platform technology which incorporates various levels of protection features within a MOSFET. The device features can include:

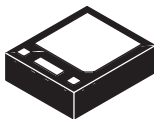
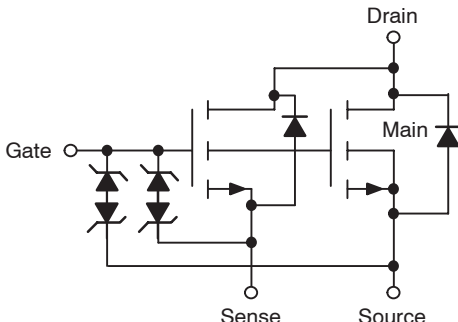
- Short Circuit Protection
- Current Limit
- Thermal Shutdown with Automatic Restart
- Overvoltage Protection
- ESD Protection
- Gate-to-Source Protection
- Current Sense Output
- Pb-free Package

Applications

- Solenoid Driver
- Relay Driver
- Relay Replacement
- Load Switching

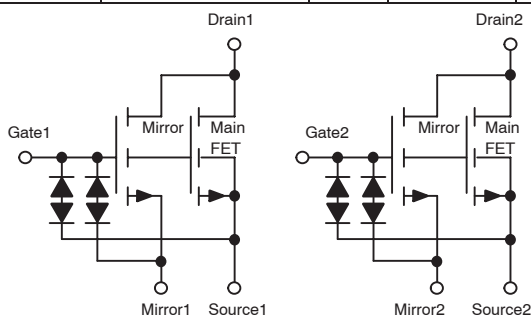
Protected MOSFETs (Automotive/Industrial)

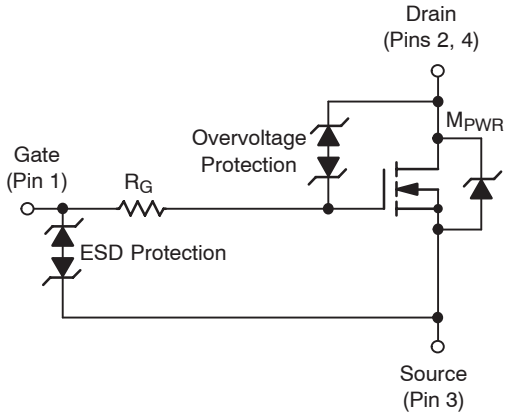
Device	$V_{(BR)DSS}$ (V) $V_{(BR)DSS}$ (V)	$R_{DS(ON)} (\Omega)$ @ $V_{GS} = 10\text{ V}$	Integrated Protection					Max Rating
		$R_{DS(ON)} (\Omega)$ @ $V_{GS} = 10\text{ V}$	Overvoltage	Overcurrent	Overtemperature	ESD	Current Sense Output	P_D (W)
 1		CASE 318G TSOP-6						
NUD3048M*	100	0.72	–	–	–	X	–	0.66

	CASE 508AA (Leadless) SO-8							
NILMS4501N*	24	0.013	–	–	–	X	X	2.7

*Not Automotive Qualified.

Protected MOSFETs (Automotive/Industrial) (continued)

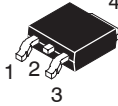
Device	$V_{(BR)DSS}$ (V)	$R_{DS(ON)}$ (Ω) @ $V_{GS} = 10\text{ V}$	Integrated Protection					Max Rating
			Overvoltage	Overcurrent	Overtemperature	ESD	Current Sense Output	P_D (W)
 8 1 CASE 751 SO-8 "Dual" 								
NIMD6302R	30	0.05	–	–	–	X	X	1.3

CASE 318E SOT-223   NIF9N05CL NIF62514, NIF5002N, NIF5003N								
NIF9N05CL	55	0.125	X	–	–	X	–	1.69
NIF62514	42	0.1	X	X	X	X	–	1.7
NIF5002N	42	0.2	X	–	–	X	–	1.1
NIF5003N	42	0.068	X	X	X	X	–	1.9

Protected MOSFETs (Automotive/Industrial) (continued)

Device	$V_{(BR)DSS}$ (V)	$R_{DS(ON)}$ (Ω) @ $V_{GS} = 10$ V	Integrated Protection					Max Rating
			Overvoltage	Overcurrent	Overtemperature	ESD	Current Sense Output	PD (W)

**CASE 369C
DPAK (TO-252)**



Gate (Pin 1) R_G Drain (Pins 2, 4) M_{PWR} Source (Pin 3)

ESD Protection, Overvoltage Protection

NID9N05CL

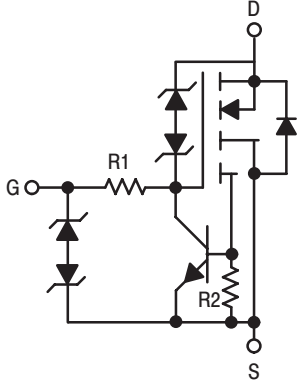
Gate Input R_G Drain M_{PWR} Source

ESD Protection, Overvoltage Protection

Temperature Limit, Current Limit, Current Sense

NID5001N, 5003N, 5004N, 6002N

NID9N05CL	55	0.09	X	–	–	X	–	28.8
NID5001N	42	0.029	X	–	–	X	–	64
NID5003N	42	0.05	X	–	–	X	–	1.3
NID6002N	60	0.21	X	–	–	X	–	1.3
NID5004N	40	0.15	X	–	–	X	–	1.3

 MLD1N06CL, MLD2N06CL								
MLD1N06CL	60	0.75 @ $V_{GS} = 5.0$ V	X	X	–	X	–	40
MLD1N06CL	62	0.4 @ $V_{GS} = 5.0$ V	X	X	–	X	–	40

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