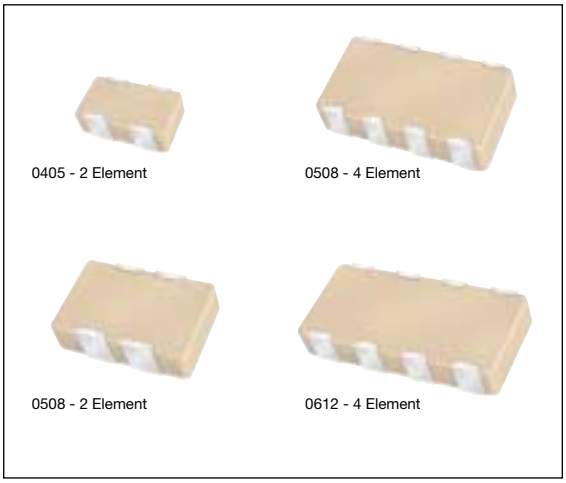
A KYOCERA GROUP COMPANY

AVX
Capacitor Array

Capacitor Array

Capacitor Array (IPC)



GENERAL DESCRIPTION

AVX is the market leader in the development and manufacture of capacitor arrays. The smallest array option available from AVX the 0405 2-element device, has been an enormous success in the Telecommunications market. The array family of products also includes the 0612 4-element device as well as 0508 2-element and 4-element series, all of which have received widespread acceptance in the marketplace.

AVX capacitor arrays are available in X5R, X7R and NP0 (C0G) ceramic dielectrics to cover a broad range of capacitance values. Voltage ratings from 6.3 Volts up to 100 Volts are offered.

Key markets for capacitor arrays are Mobile and Cordless Phones, Digital Set Top Boxes, Computer Motherboards and Peripherals as well as Automotive applications, RF Modems, Networking Products etc.

AVAILABLE CAPACITANCE VALUES

Case Size	Voltage	NP0/C0G		X5R/X7R	
		Min. Cap	Max. Cap.	Min. Cap.	Max. Cap.
0612 *4 element*	16v	100	471	221	104
	25v	100	471	221	473
	50v	100	471	221	473
	100v	100	391	221	103
0508 *4 element*	10v				104
	16v	100	271	221	563
	25v	100	271	221	183
	50v	100	271	221	183
	100v	100	221	221	472
0508 *2 element*	6.3v				105
	16v	100	471	221	104
	25v	100	471	221	333
	50v	100	471	221	333
	100v	100	391	221	822
0405 *2 element*	10v				104
	16v	100	101	121	223
	25v	100	101	121	682
	50v	100	101	121	682

= X5R (Above 103)

HOW TO ORDER

W	2	A	4	3	C	103	M	A	T	2A
Style	**Case Size** 1 = 0405 2 = 0508 3 = 0612	**Array**	**Number of Caps**	**Voltage** 6 = 6.3V Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	**Dielectric** A = NP0 C = X7R D = X5R	**Capacitance Code (In pF)** 2 Sig Digits + Number of Zeros	**Capacitance Tolerance** J = ±5% K = ±10% M = ±20%	**Failure Rate**	**Termination Code** T = Plated Ni and Solder	**Packaging & Quantity Code** 2A = 7" Reel (4000) 4A = 13" Reel (10000) 2F = 7" Reel (1000)

Capacitor Array

Capacitor Array (IPC)

BENEFITS OF USING CAPACITOR ARRAYS

AVX capacitor arrays offer designers the opportunity to lower placement costs, increase assembly line output through lower component count per board and to reduce real estate requirements.

Reduced Costs

Placement costs are greatly reduced by effectively placing one device instead of four or two. This results in increased throughput and translates into savings on machine time. Inventory levels are lowered and further savings are made on solder materials etc.

Space Saving

Space savings can be quite dramatic when compared to the use of discrete chip capacitors. As an example, the 0508 4-element array offers a space reduction of >40% vs. 4 x 0402 discrete capacitors and of >70% vs. 4 x 0603 discrete capacitors. (This calculation is dependent on the spacing of the discrete components.)

Increased Throughput

Assuming that there are 220 passive components placed in a mobile phone:

A reduction in the passive count to 200 (by replacing discrete components with arrays) results in an increase in throughput of approx. 9%.

A reduction of 40 placements increases throughput by 18%.

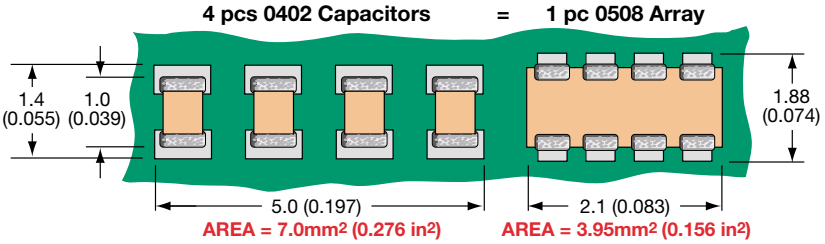
For high volume users of cap arrays using the very latest placement equipment capable of placing 10 components per second, the increase in throughput can be very significant and can have the overall effect of reducing the number of placement machines required to mount components:

If 120 million 2-element arrays or 40 million 4-element arrays were placed in a year the requirement for placement equipment would be reduced by one machine.

During a 20Hr operational day a machine places 720K components. Over a working year of 167 days the machine can place approximately 120 million. If 2-element arrays are mounted instead of discrete components, then the number of placements is reduced by a factor of two and in the scenario where 120 million 2-element arrays are placed there is a saving of one pick and place machine.

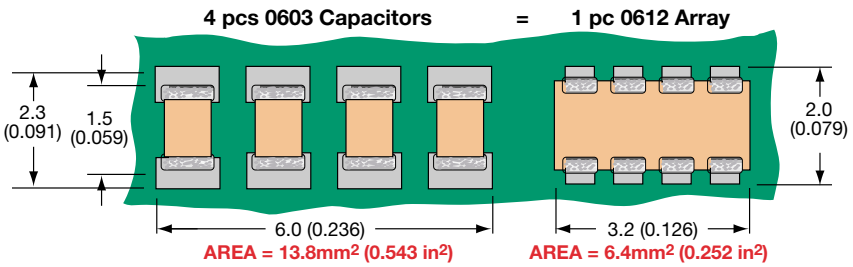
Smaller volume users can also benefit from replacing discrete components with arrays. The total number of placements is reduced thus creating spare capacity on placement machines. This in turn generates the opportunity to increase overall production output without further investment in new equipment.

W2A (0508) Capacitor Arrays



The 0508 4-element capacitor array gives a PCB space saving of over 40% vs four 0402 discretes and over 70% vs four 0603 discrete capacitors.

W3A (0612) Capacitor Arrays



The 0612 4-element capacitor array gives a PCB space saving of over 50% vs four 0603 discretes and over 70% vs four 0805 discrete capacitors.

Capacitor Array

Multi-Value Capacitor Array (IPC)

GENERAL DESCRIPTION

A recent addition to the array product range is the Multi-Value Capacitor Array. These devices combine two different capacitance values in standard 'Cap Array' packages and are available with a maximum ratio between the two capacitance values of 100:1. The multi-value array is currently available in the 0405 and 0508 2-element styles.

Whereas to date AVX capacitor arrays have been suited to applications where multiple capacitors of the same value are used, the multi-value array introduces a new flexibility to the range. The multi-value array can replace discrete capacitors of different values and can be used for broadband decoupling applications. The 0508 x 2 element multi-value array would be particularly recommended in this application. Another application is filtering the 900/1800 or 1900MHz noise in mobile phones. The 0405 2-element, low capacitance value NP0, (C0G) device would be suited to this application, in view of the space saving requirements of mobile phone manufacturers.

ADVANTAGES OF THE MULTI-VALUE CAPACITOR ARRAYS

Enhanced Performance Due to Reduced Parasitic Inductance

When connected in parallel, not only do discrete capacitors of different values give the desired self-resonance, but an additional unwanted parallel resonance also results. This parallel resonance is induced between each capacitor's self-resonant frequencies and produces a peak in impedance response. For decoupling and bypassing applications this peak will result in a frequency band of reduced decoupling and in filtering applications reduced attenuation.

The multi-value capacitor array, combining capacitors in one unit, virtually eliminates the problematic parallel resonance, by minimizing parasitic inductance between the capacitors, thus enhancing the broadband decoupling/filtering performance of the part.

Reduced ESR

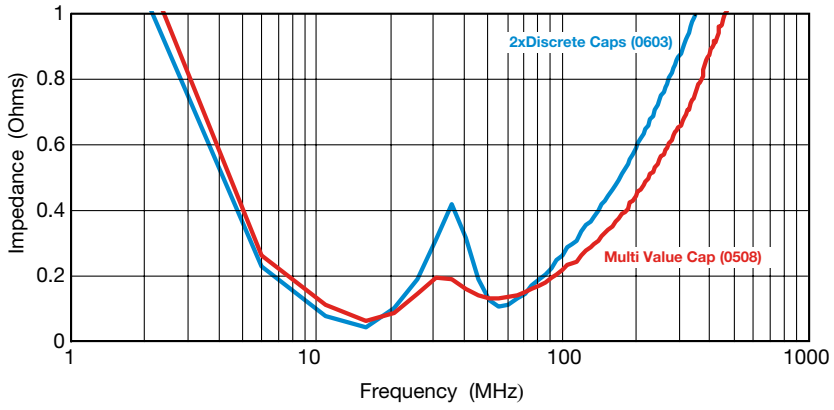
An advantage of connecting two capacitors in parallel is a significant reduction in ESR. However, as stated above, using discrete components brings with it the unwanted side effect of parallel resonance. The multi-value cap array is an excellent alternative as not only does it perform the same function as parallel capacitors but also it reduces the uncertainty of the frequency response.

HOW TO ORDER

W	2	A	2	Y	C	103M	104M	A	T	2A
						1st Value	2nd Value			
Style	**Case Size** 1 = 0405 2 = 0508	**Array**	**Number of Caps**	**Voltage** 6 = 6.3V Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	**Dielectric** A = NP0 C = X7R D = X5R	**Capacitance Code (In pF)** 2 Sig. Digits + Number of Zeros	**Capacitance Tolerance** K = ±10% M = ±20%	**Failure Rate**	**Termination Code** T = Plated Ni and Solder	**Packaging & Quantity Code** 2A = 7" Reel (4000) 4A = 13" Reel (10000) 2F = 7" Reel (1000)

IMPEDANCE vs FREQUENCY
MULTI-VALUE ARRAY COMPARED TO DISCRETE CAPACITORS

10nF / 100nF Capacitor
Impedance vs Frequency



Capacitor Array

NP0/C0G

SIZE	0405	0508	0508	0612
# Elements	2	2	4	4
Soldering	Reflow Only	Reflow/Wave	Reflow/Wave	Reflow/Wave
Packaging	All Paper	All Paper	Paper/Embossed	Paper/Embossed
Length MM (in.)	1.00 ± 0.15 (0.039 ± 0.006)	1.30 ± 0.15 (0.051 ± 0.006)	1.30 ± 0.15 (0.051 ± 0.006)	1.60 ± 0.20 (0.063 ± 0.008)
Width MM (in.)	1.37 ± 0.15 (0.054 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	3.20 ± 0.20 (0.126 ± 0.008)
Max. Thickness MM (in.)	0.66 (0.026)	0.94 (0.037)	0.94 (0.037)	1.35 (0.053)
WVDC	10 16 25 50	6.3 16 25 50 100	10 16 25 50 100	16 25 50 100
CAP 1 pF				
1.2				
1.5				
1.8				
2.2				
2.7				
3.3				
3.9				
4.7				
5.6				
6.8				
8.2				
10				
12				
15				
18				
22				
27				
33				
39				
47				
56				
68				
82				
100				
120				
150				
180				
220				
270				
330				
390				
470				
560				
680				
820				
1000				
1200				
1500				
1800				
2200				
2700				
3300				
3900				
4700				
5600				
6800				
8200				
Cap 0.010 µF				

X7R/X5R

SIZE	0405	0508	0508	0612
# Elements	2	2	4	4
Soldering	Reflow Only	Reflow/Wave	Reflow/Wave	Reflow/Wave
Packaging	All Paper	All Paper	Paper/Embossed	Paper/Embossed
Length MM (in.)	1.00 ± 0.15 (0.039 ± 0.006)	1.30 ± 0.15 (0.051 ± 0.006)	1.30 ± 0.15 (0.051 ± 0.006)	1.60 ± 0.20 (0.063 ± 0.008)
Width MM (in.)	1.37 ± 0.15 (0.054 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	3.20 ± 0.20 (0.126 ± 0.008)
Max. Thickness MM (in.)	0.66 (0.026)	0.94 (0.037)	0.94 (0.037)	1.35 (0.053)
WVDC	10 16 25 50	6.3 16 25 50 100	10 16 25 50 100	16 25 50 100
CAP 100 pF				
120				
150				
180				
220				
270				
330				
390				
470				
560				
680				
820				
1000				
1200				
1500				
1800				
2200				
2700				
3300				
3900				
4700				
5600				
6800				
8200				
Cap 0.010 µF				
0.012				
0.015				
0.018				
0.022				
0.027				
0.033				
0.039				
0.047				
0.056				
0.068				
0.082				
0.10				
0.12				
0.15				
0.18				
0.22				
0.27				
0.33				
0.47				
0.56				
0.68				
0.82				
1.0				
1.2				
1.5				
1.8				
2.2				
3.3				
4.7				
10				
22				
47				
100				

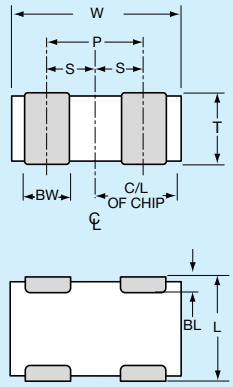
= NP0/C0G

= X7R = X5R

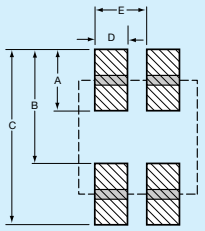
PART & PAD LAYOUT DIMENSIONS

millimeters (inches)

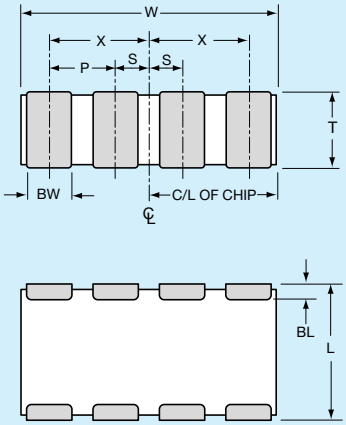
0405 - 2 Element



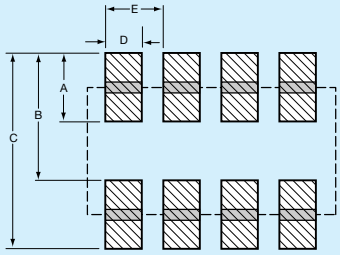
PAD LAYOUT



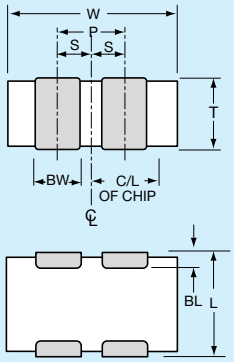
0612 - 4 Element



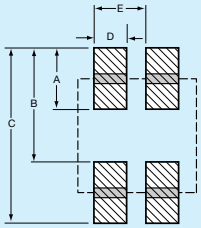
PAD LAYOUT



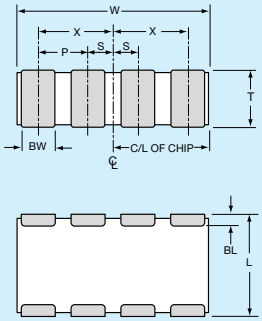
0508 - 2 Element



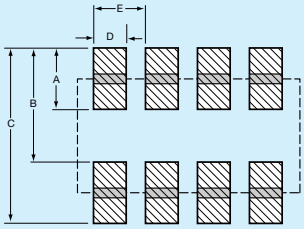
PAD LAYOUT



0508 - 4 Element



PAD LAYOUT



PART DIMENSIONS

0405 - 2 Element

L	W	T	BW	BL	P	S
1.00±0.15 (0.039±0.006)	1.37±0.15 (0.054±0.006)	0.66 MAX (0.026 MAX)	0.36±0.10 (0.014±0.004)	0.20±0.10 (0.008±0.004)	0.64 REF (0.025 REF)	0.32±0.10 (0.013±0.004)

0508 - 2 Element

L	W	T	BW	BL	P	S
1.30±0.15 (0.051±0.006)	2.10±0.15 (0.083±0.006)	0.94 MAX (0.037 MAX)	0.43±0.10 (0.017±0.004)	0.33±0.08 (0.013±0.003)	1.00 REF (0.039 REF)	0.50±0.10 (0.020±0.004)

0508 - 4 Element

L	W	T	BW	BL	P	X	S
1.30±0.15 (0.051±0.006)	2.10±0.15 (0.083±0.006)	0.94 MAX (0.037 MAX)	0.25±0.06 (0.010±0.003)	0.20±0.08 (0.008±0.003)	0.50 REF (0.020 REF)	0.75±0.10 (0.030±0.004)	0.25±0.10 (0.010±0.004)

0612 - 4 Element

L	W	T	BW	BL	P	X	S
1.60±0.20 (0.063±0.008)	3.20±0.20 (0.126±0.008)	1.35 MAX (0.053 MAX)	0.41±0.10 (0.016±0.004)	$0.18^{+0.25}_{-0.08}$ ($0.007^{+0.010}_{-0.003}$)	0.76 REF (0.030 REF)	1.14±0.10 (0.045±0.004)	0.38±0.10 (0.015±0.004)

PAD LAYOUT DIMENSIONS

0405 - 2 Element

A	B	C	D	E
0.46 (0.018)	0.74 (0.029)	1.20 (0.047)	0.30 (0.012)	0.64 (0.025)

0508 - 2 Element

A	B	C	D	E
0.68 (0.027)	1.32 (0.052)	2.00 (0.079)	0.46 (0.018)	1.00 (0.039)

0508 - 4 Element

A	B	C	D	E
0.56 (0.022)	1.32 (0.052)	1.88 (0.074)	0.30 (0.012)	0.50 (0.020)

0612 - 4 Element

A	B	C	D	E
0.89 (0.035)	1.65 (0.065)	2.54 (0.100)	0.46 (0.018)	0.79 (0.031)

PERFORMANCE CHARACTERISTICS

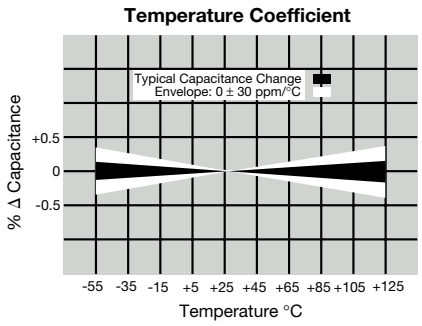
Standard Tolerance	NP0/C0G ±10%	X5R/X7R ±20%
Dissipation Factor	0.1% Max.	50&100V = 2.5% Max. 25V = 3.0% Max. 16V = 3.5% Max. 10V = 5.0% Max.
Insulation Resistance (@+25°C, RVDC)	100,000 MΩ min, or 1,000 MΩ per µF min.,whichever is less	100,000 MΩ min, or 1,000 MΩ per µF min.,whichever is less

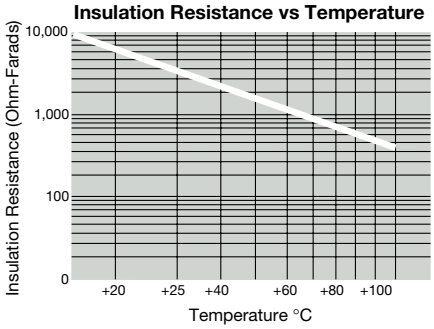
MECHANICAL SPECIFICATIONS

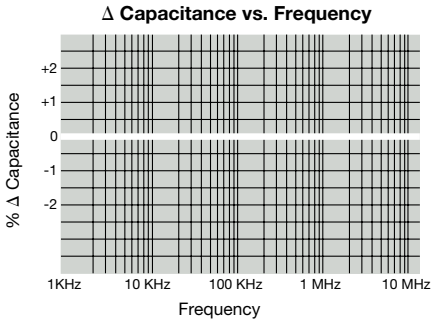
CTE (PPM / °C)	**NP0/C0G:** 10.5; **X7R/X5R:** 12.0
Thermal Conductivity	All Bodies 4 to 5 W/M ° K
Terminations	Plated Nickel and Solder
Thickness	0.94mm Max. / 0.037" Max. (Based on Cap and Dielectric)

TYPICAL CHARACTERISTIC CURVES

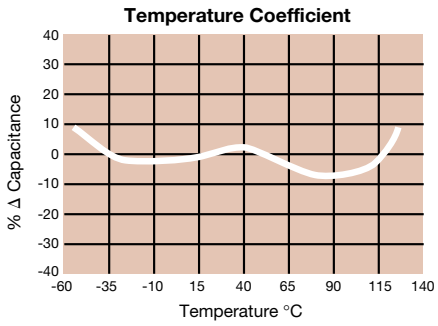
NP0 / C0G DIELECTRIC

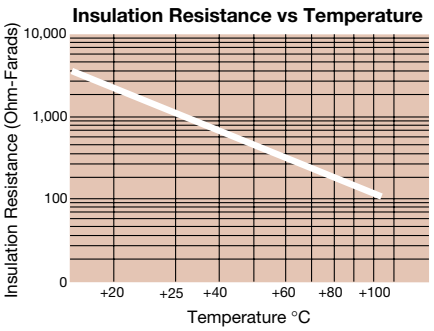


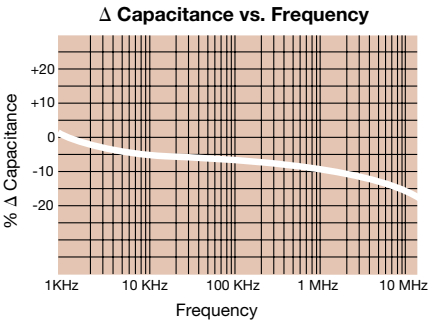




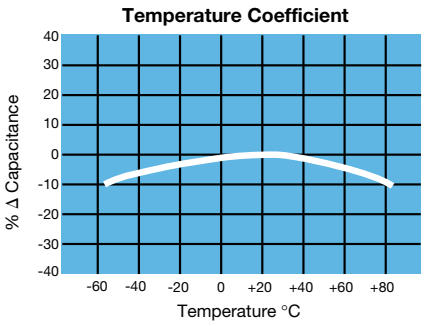
X7R DIELECTRIC

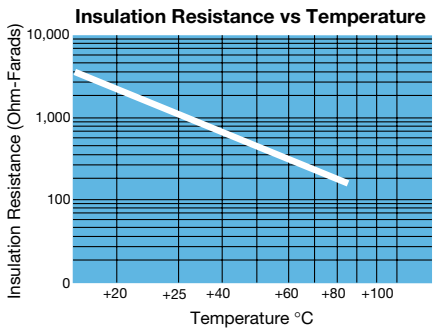


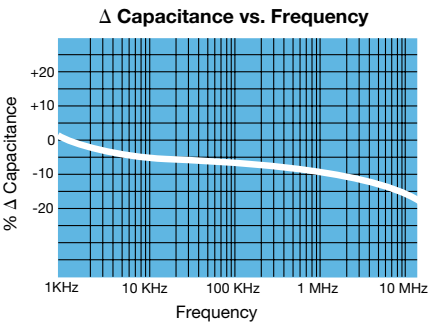




X5R DIELECTRIC







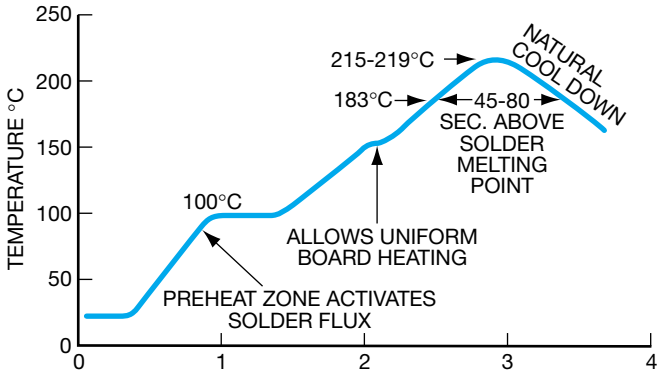
Capacitor Array

SMT Applications

The following solderability profiles are suggested for the different soldering techniques.

INFRARED REFLOW SOLDERING (IR)

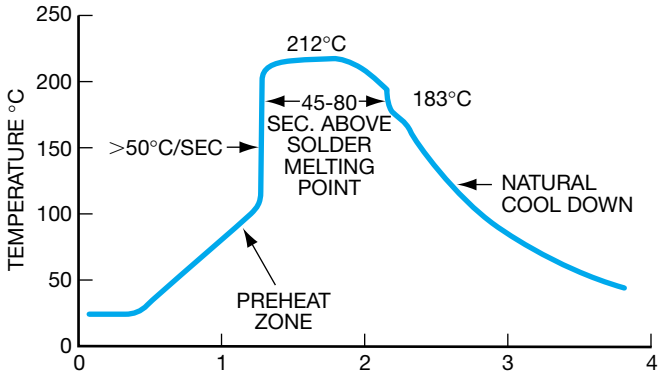
Soldering IR has the highest yields due to controlled heating rates and solder liquidus times. Only the dwell time and peak temperature limitations of resin-molded components need to be considered. Typical recommended solder past wet laydown is approximately 8 mils.



IR Reflow Solder Profile

VAPOR PHASE REFLOW SOLDERING

Vapor phase soldering has the second highest heat transfer rate so care must be used. Preheating the assembly and minimizing the dwell time above the solder liquidus temperature is required to help reduce defects.



Vapor Phase Profile

ASSEMBLY NOTES

AVX recommends a minimum spacing of 0.020" between parts when placing them end to end on assembly boards. The purpose of this spacing is to facilitate post assembly board cleaning and inaccuracies in pick and placement, due to machine placement tolerances.

USA

AVX Myrtle Beach, SC Corporate Offices
Tel: 843-448-9411
FAX: 843-626-5292

AVX Northwest, WA
Tel: 360-669-8746
FAX: 360-699-8751

AVX North Central, IN
Tel: 317-848-7153
FAX: 317-844-9314

AVX Mid/Pacific, MN
Tel: 952-974-9155
FAX: 952-974-9179

AVX Southwest, AZ
Tel: 480-539-1496
FAX: 480-539-1501

AVX South Central, TX
Tel: 972-669-1223
FAX: 972-669-2090

AVX Southeast, NC
Tel: 919-878-6357
FAX: 919-878-6462

AVX Canada
Tel: 905-564-8959
FAX: 905-564-9728

EUROPE

AVX Limited, England European Headquarters
Tel: ++44 (0)1252 770000
FAX: ++44 (0)1252 770001

AVX S.A., France
Tel: ++33 (1) 69.18.46.00
FAX: ++33 (1) 69.28.73.87

AVX GmbH, Germany - AVX
Tel: ++49 (0) 8131 9004-0
FAX: ++49 (0) 8131 9004-44

AVX GmbH, Germany - Elco
Tel: ++49 (0) 2741 2990
FAX: ++49 (0) 2741 299133

AVX srl, Italy
Tel: ++390 (0)2 614571
FAX: ++390 (0)2 614 2576

AVX Czech Republic, s.r.o.
Tel: ++420 (0)467 558340
FAX: ++420 (0)467 558345

ASIA-PACIFIC

AVX/Kyocera, Singapore Asia-Pacific Headquarters
Tel: (65) 258-2833
FAX: (65) 350-4880

AVX/Kyocera, Hong Kong
Tel: (852) 2-363-3303
FAX: (852) 2-765-8185

AVX/Kyocera, Korea
Tel: (82) 2-785-6504
FAX: (82) 2-784-5411

AVX/Kyocera, Taiwan
Tel: (886) 2-2696-4636
FAX: (886) 2-2696-4237

AVX/Kyocera, China
Tel: (86) 21-6249-0314-16
FAX: (86) 21-6249-0313

AVX/Kyocera, Malaysia
Tel: (60) 4-228-1190
FAX: (60) 4-228-1196

Elco, Japan
Tel: 045-943-2906/7
FAX: 045-943-2910

Kyocera, Japan - AVX
Tel: (81) 75-604-3426
FAX: (81) 75-604-3425

Kyocera, Japan - KDP
Tel: (81) 75-604-3424
FAX: (81) 75-604-3425

A KYOCERA GROUP COMPANY

http://www.avxcorp.com

S-CAPA10M0901-N