

CPH Series

Multilayer Ceramic Chip Capacitors – High Voltage

TRIGON
COMPONENTS

DESCRIPTION

TRIGON offers the high performance MLCC of high voltage. There are five standard sizes 0805, 1206, 1210, 1808, and 1812 and ranging from 100V to 2KV in NOP/COG and X7R characteristics.

RECOMMENDED APPLICATIONS

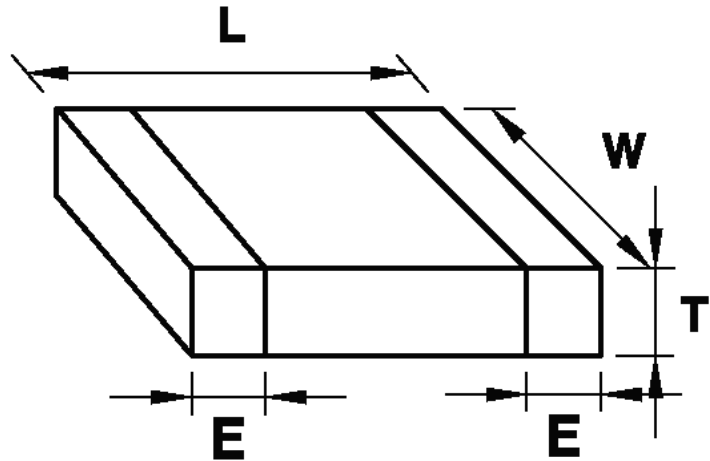
- Modems.
- Telecom Devices.
- LAN / WAN Interface
- Industrial; Controls
- Power Supply.

ORDERING CODE

CPH 05 T 101 J 501 N
(1) (2) (3) (4) (5) (6) (7)

- (1). Chip Capacitor
- (2). Size Code
- (3). Package
- (4). Capacitance Code
- (5). Tolerance Code
- (6). Rated Voltage Code
- (7). Dielectric Code

✘ Please refer to complete Ordering Code (Multilayer Ceramic Chip Capacitor – P. B-184) for more ordering options.



Capacitor Dimensions: (in/mm)

SIZE	0805	1206	1210	1808	1812
(L)Length	.080±.008 (2.00±0.20)	.126±.012 (3.20±0.20)	.126±.012 (3.20±0.30)	.177±.012 (4.50±0.40)	.177±.016 (4.50±0.40)
(W)Width	.050±.008 (1.20±0.20)	.063±.008 (1.60±0.20)	.100±.012 (2.50±0.30)	.080±.008 (2.00±0.20)	.126±.012 (3.2±0.30)
(E)Termination	.020±.008 (0.50±0.20)	.020±.008 (0.50±0.20)	.020±.008 (0.50±0.20)	.025±.015 (0.64±0.38)	.025±.015 (0.64±0.38)

Note: Dimensions are in inches, Dimensions in parenthesis are in millimeters.

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PERFORMANCE SPECIFICATIONS

1. ELECTRICAL

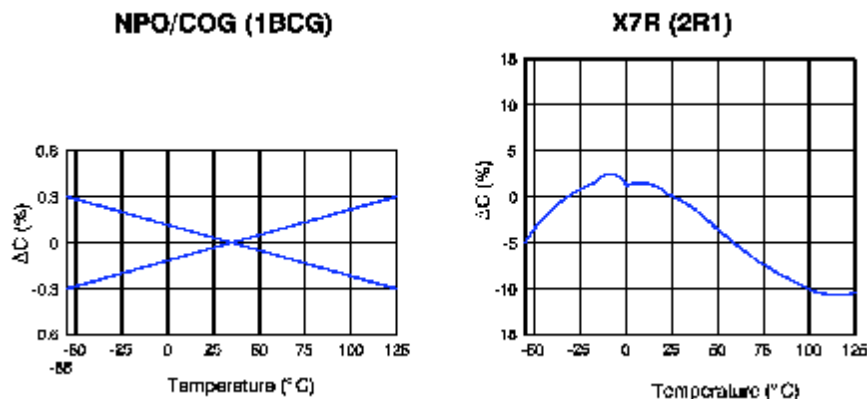
Dielectric Code	EIA	NPO / COG	X7R
	IEC	1BCG	2R1
Temperature Characteristics	*1	0±30 ppm/°C, C > 20pF 0 ⁺¹²⁰ ₋₄₀ ppm/°C, C > 20pF	ΔC ± 15% maximum Over -55°C to +125°C
Operating Temperature Range		-55°C to +125°C	-55°C to +125°C
Measuring Conditions for Capacitance and D.F.	*2	1 MHz, 1 Vrms, C ≤ 1000pF 1 KHz, 1 Vrms, C > 1000pF	1 KHz, 1 Vrms
Dissipation Factor (D.F.) And Tangent of Loss Angle (tan δ)		≤ 0.1% for C ≥ 30pF ≤ $\frac{100\%}{(400+20C)}$ for C < 30pF	Rated voltage ≤ 2.5% ≥ 50V ≤ 3.5% 25V 16V ≤ 5.0% 10V 6.3V
Insulation Resistance (I.R.) after 60 sec. Charging at rated voltage, 25°C, 55% RH max.		≥ 100 Gohms or ≥ 1000 MΩ · μF whichever is less	≥ 10 Gohms or ≥ 100 MΩ · μF whichever is less
Voltage Proof, 25°C, 1-5 sec.		100V 2.5XU 250V 2.0XU 500V 1.5XU ≥1KV 1.2XU	100V 2.5XU 250V 2.0XU 500V 1.5XU ≥1KV 1.2XU
Capacitance Aging		0	≅ 1.5% per decade hour

※ *1. Class I (NOP/COG) capacitors shall be conditioned for 96 ± 4hr by heating in a circulating air oven at a temperature of 55 ± 2°C and a relative humidity not exceeding 20%. The capacitor shall then be allowed to cool in a desiccators' using a suitable desiccant, such as activated alumina or silica gel, and shall be kept therein from the time of removal from the oven to the beginning of the specified tests.

Class II (X7R, Z5U, Y5V) capacitors shall be made a special pre-conditioning before a test or a sequence of tests under the following conditions: Exposure at 150±10°C for 1 hr, followed by setting the capacitor at room temperature for 24±1 hr.

※ *2. Capacitance is within specified tolerance; measured 1000 hours after date of manufacture because of capacitance aging of Class II capacitor.

2. TYPICAL PERFORMANCE CURVES



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ENVIRONMENTAL CHARACTERISTICS

Test	Test Conditions	Post-Test Inspection Requirements												
Solderability	IEC 384-10 4.11 / JIS C 5102 8.13 Solder 60 Sn/40 Pb, 235 ± 5°C Immersed for 5 secs.	At least 75% of termination area should be well tinned. No visible damage.												
Resistance to Soldering Heat *1	IEC 384-10 4.10 / JIS C 5102 8.14 Immersed In solder bath at 260 ± 5°C for 10±1 secs. Recovery: 6 ~ 24 hrs. (COG) 24 ± 2 hrs. (X7R, Z5U, Y5V)	At least 75% of termination area should be covered by soldere . No visible damage <table border="1"> <thead> <tr> <th></th> <th>COG(1BCG)</th> <th>X7R(2R1)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>$\leq \pm 1\%$, or $\pm 1\text{pF}$ whichever is greater</td> <td>$\leq +7\%$</td> </tr> </tbody> </table>		COG(1BCG)	X7R(2R1)	$\Delta C/C$	$\leq \pm 1\%$, or $\pm 1\text{pF}$ whichever is greater	$\leq +7\%$						
	COG(1BCG)	X7R(2R1)												
$\Delta C/C$	$\leq \pm 1\%$, or $\pm 1\text{pF}$ whichever is greater	$\leq +7\%$												
Rapid Change of Temperature *2	IEC 384-10 4.12 / JIS C 5102 9.3 -55°C to +125°C, 5 cycles (COG, X7R) Duration: 30 mins. Recovery: 6 ~ 24 hrs. (COG) 24 ± 2 hrs. (X7R)	No visible damage <table border="1"> <thead> <tr> <th></th> <th>COG(1BCG)</th> <th>X7R(2R1)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>$\leq \pm 1\%$, or $\pm 1\text{pF}$ whichever is greater</td> <td>$\leq +15\%$</td> </tr> <tr> <td>D.F.</td> <td>$\leq 2 \text{ X initial requirement}$</td> <td>$\leq 1.5 \text{ X initial requirement}$</td> </tr> <tr> <td>I.R.</td> <td colspan="2">$\geq 0.25 \text{ X initial requirement}$</td> </tr> </tbody> </table>		COG(1BCG)	X7R(2R1)	$\Delta C/C$	$\leq \pm 1\%$, or $\pm 1\text{pF}$ whichever is greater	$\leq +15\%$	D.F.	$\leq 2 \text{ X initial requirement}$	$\leq 1.5 \text{ X initial requirement}$	I.R.	$\geq 0.25 \text{ X initial requirement}$	
	COG(1BCG)	X7R(2R1)												
$\Delta C/C$	$\leq \pm 1\%$, or $\pm 1\text{pF}$ whichever is greater	$\leq +15\%$												
D.F.	$\leq 2 \text{ X initial requirement}$	$\leq 1.5 \text{ X initial requirement}$												
I.R.	$\geq 0.25 \text{ X initial requirement}$													
Endurance (Lift Test) *3	IEC 384-10 4.15 1,000 hrs. at maximum temperature with 2.0 x U ($\leq 250\text{V}$), 1.5xU ($\leq 1\text{KV}$) 1.2xU ($\leq 2\text{KV}$) Recovery: 6 ~ 24 hrs. (COG) 24 ± 2 hrs. (X7R, Z5U, Y5V)	No visible damage <table border="1"> <thead> <tr> <th></th> <th>COG(1BCG)</th> <th>X7R(2R1)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>$\leq \pm 2\%$, or $\pm 2\text{pF}$ whichever is greater</td> <td>$\leq +20\%$</td> </tr> <tr> <td>D.F.</td> <td>$\leq 2.0 \text{ X initial requirement}$</td> <td>$\leq 7 \%$</td> </tr> <tr> <td>I.R.</td> <td colspan="2">$\geq 0.25 \text{ X initial requirement}$</td> </tr> </tbody> </table>		COG(1BCG)	X7R(2R1)	$\Delta C/C$	$\leq \pm 2\%$, or $\pm 2\text{pF}$ whichever is greater	$\leq +20\%$	D.F.	$\leq 2.0 \text{ X initial requirement}$	$\leq 7 \%$	I.R.	$\geq 0.25 \text{ X initial requirement}$	
	COG(1BCG)	X7R(2R1)												
$\Delta C/C$	$\leq \pm 2\%$, or $\pm 2\text{pF}$ whichever is greater	$\leq +20\%$												
D.F.	$\leq 2.0 \text{ X initial requirement}$	$\leq 7 \%$												
I.R.	$\geq 0.25 \text{ X initial requirement}$													
Humidity Test (Damp heat, steady state) *4	IEC 384-10 4.14 / JIS C 5102 9.5 500 HRS. AT 40 ± 2°C, 90-95% RH Recovery: 6 ~ 24 hrs. (COG) 24 ± 2 hrs. (X7R, Z5U, Y5V)	No visible damage <table border="1"> <thead> <tr> <th></th> <th>COG(1BCG)</th> <th>X7R(2R1)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>$\leq \pm 2\%$, or $\pm 2\text{pF}$ whichever is greater</td> <td>$\leq +15\%$</td> </tr> <tr> <td>D.F.</td> <td>$\leq 2.0 \text{ X initial requirement}$</td> <td>$\leq 7 \%$</td> </tr> <tr> <td>I.R.</td> <td colspan="2">$\geq 0.25 \text{ X initial requirement}$</td> </tr> </tbody> </table>		COG(1BCG)	X7R(2R1)	$\Delta C/C$	$\leq \pm 2\%$, or $\pm 2\text{pF}$ whichever is greater	$\leq +15\%$	D.F.	$\leq 2.0 \text{ X initial requirement}$	$\leq 7 \%$	I.R.	$\geq 0.25 \text{ X initial requirement}$	
	COG(1BCG)	X7R(2R1)												
$\Delta C/C$	$\leq \pm 2\%$, or $\pm 2\text{pF}$ whichever is greater	$\leq +15\%$												
D.F.	$\leq 2.0 \text{ X initial requirement}$	$\leq 7 \%$												
I.R.	$\geq 0.25 \text{ X initial requirement}$													
Adhesion	IEC 384-10 4.8 / JIS C 5102 8.11.2 capacitors mounted on a substrate, a force of 5N applied perpendicular to the plane of substrate and parallel the line joining the center of terminations for 10 ± 1 sec.	No visible damage												

※ *1 ~ *4: Class II (X7R, Z5U, Y5V) capacitors shall be made a special pre-conditioning before a test or a sequence of tests under the following conditions: Exposure at 150 ± 10°C for 1 hr., followed by setting the capacitor at room temperature for 24 ± 1 hr..

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COMPONENTS

CAPACITANCE RANGE: NP0/COG

Unit : LxWxE : in(mm), T(Thickness) : mm

EIA Cap. (pF)	NPO/COG														
	100 V					250 V					500 V				
	0603	0805	1206	1210	1812	0805	1206	1210	1812	0805	1206	1210	1808	1812	
10															
12															
15															
18															
22															
27															
33															
39	0.80	0.65	0.85	1.15	1.15	0.65	0.85	1.15	1.15	0.65	0.85	1.15	1.15	1.15	
47	±	±	±	±	±	±	±	±	±	±	±	±	±	±	
56	0.15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
68															
82															
100															
120															
O150															
180															
220															
270															
330															
390															
470															
560															
680															
820															
1000															
1200															
1500		1.25									1.10				
1800		±0.10									±0.10				
2200											1.60				
2700											±0.10				
3300							1.60					1.45±.10	1.45±.10		
3900			1.10				±0.10								
4700			±0.10												
5600															
6800								1.45±.10						1.45±.10	
8200														0	
10000															
12000									1.45±.10						
15000															

Note:

1. Dimension are in millimeters, dimension in parenthesis are in inches.
2. Other capacitance values and voltages are available upon request.
3. The thickness of chip capacitors might be changed due to the improvement of the production technology..

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CAPACITANCE RANGE: NP0/COG

Unit : LxWxE : in(mm), T(Thickness) : mm

EIA Cap. (pF)	NPO/COG											
	1KV				2KV				3KV			
	1206	1210	1808	1812	1206	1210	1808	1812	1206	1210	1808	1812
10												
12												
15												
18												
22												
27												
33	0.85	1.15	1.15	1.15	0.85	1.15	1.15	1.15	0.85±	1.15	1.15	1.15
39	±	±	±	±	±	±	±	±	0.10	±	±	±
47	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10		0.10	0.10	0.10
56												
68												
82												
100												
120												
150					1.10							
180					±					1.45	1.45±.10	
220					0.10					±0.10	1.65	
270					1.60±.10						±	
330											0.10	1.45
390						1.45	1.45					±0.10
470						±0.10	±0.10					2.00±.10
560						1.65±.10	1.65±.10					
680												
820	1.10							1.45				
1000	±0.10							±0.10				
1200	1.10							1.65±.10				
1500	±0.10											
1800												
2200		1.45±.10	1.45±.10									
2700												
3300				1.45								
3900				±								
4700				0.10								
5600												
6800												
8200												
10000												
12000												
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CAPACITANCE RANGE: X7R

Unit : LxWxE : in(mm), T(Thickness) : mm

EIA	X7R													
	100 V					250 V				500 V				
	0603	0805	1206	1210	1812	0805	1206	1210	1812	0805	1206	1210	1808	1812
Cap. (pF)														
100														
120														
150														
180														
220														
270														
330														
390														
470	0.80 ± 0.15	0.65 ± 0.10	0.85 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	0.65 ± 0.10	0.85 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	0.65 ± 0.10	0.85 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.15 ± 0.10
560														
680														
820														
1000														
1200														
1500														
1800														
2200														
2700														
3300														
3900														
4700														
5600						0.85 ± 0.10								
6800														
8200														
Cap.(uF)														
.010		0.85 ± 0.10												
.012														
.015														
.018														
.022														
.027													1.45±.10	
.033														
.039													1.65 ±0.10	
.047														
.056														
.068			1.10 ± 0.10											
.082														
0.10														
0.12														
0.15					1.45±.10									
0.18														
0.22														
0.27														
0.33														
0.39						1.45 ± 0.10								
0.47														

Note:

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CAPACITANCE RANGE: X7R

Unit : LxWxE : in(mm), T(Thickness) : mm

EIA Cap. (pF)	X7R									
	1KV				2KV				3KV	
	1206	1210	1808	1812	1206	1210	1808	1812	1808	1812
100										
120										
150										
180										
220										
270	0.85 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	0.85 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.65±0.10	1.65±0.10
330										
390										
470										
560	1.10 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.10±.10	1.15 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.65±0.10	1.15±0.10
680										
820					1.60 ±0.10					
1000										
1200										
1500	1.60 ±0.10	1.15 ± 0.10	1.15 ± 0.10	1.15 ± 0.10	1.60 ±0.10	1.45±.10	1.65±.10	1.15 ± 0.10	1.65±0.10	1.65±0.10
1800										
2200										
2700										
3300		1.45 ±0.10	1.45±.10					1.45 ±0.10		
3900			1.65±.10					1.65±.10		
4700								2.00±.10		
5600										
6800										
8200				1.45 ±0.10						
Cap.(uF) .010				2.00±.10						
.012										
.015										
.018										
.022										
.027										
.033										
.039										
.047										
.056										
.068										
.082										
0.10										
0.12										
0.15										
0.18										
0.22										
0.27										
0.33										
0.39										
0.47										

Note:

1. Dimension .are in millimeters, dimension in parenthesis are in inches.
2. Other capacitance values and voltages are available upon request.
3. The thickness of chip capacitors might be changed due to the improvement of the production technology..

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CAPACITANCE RANGE: Z5U

Unit : LxWxE : in(mm), T(Thickness) : mm

EIA	Z5U				
W.V.D.C.	100 V				250 V
SIZE	0805	1206	1210	1812	1812
0.033					
0.039					
0.047					
0.056	0.65±0.10				
0.068					
0.082	0.85±0.10				
0.10					1.15±0.10
0.12		0.85±0.10			
0.15					
0.18		1.10±0.10			
0.22					
0.27					
0.33			1.15±0.10		
0.39					
0.47					1.65±0.10
0.56					
0.68				1.15±0.10	
0.82					
1.0					
1.2				1.65±0.10	
1.5					

Note:

1. Dimension .are in millimeters, dimension in parenthesis are in inches.
2. Other capacitance values and voltages are available upon request.
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PACKAGING

1. BULK PACKAGE

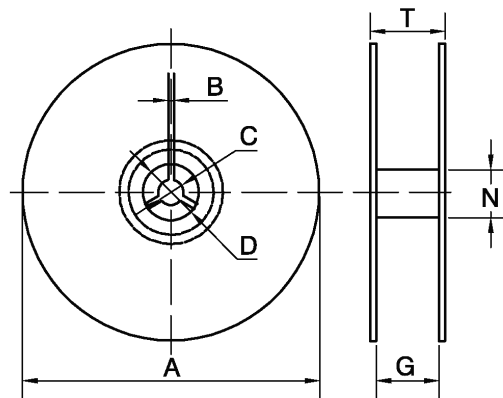
All TRIGON Multilayer Ceramic Chip Capacitors are available in sealed plastic bag. The number of chips per bag depends on size and thickness of chip capacitors.

Chip Sizes	Quantity per Bag
0603, 0805, 1206	10,000
1210, 1808, 1812	4,000

2. TAPE AND REEL PACKAGE

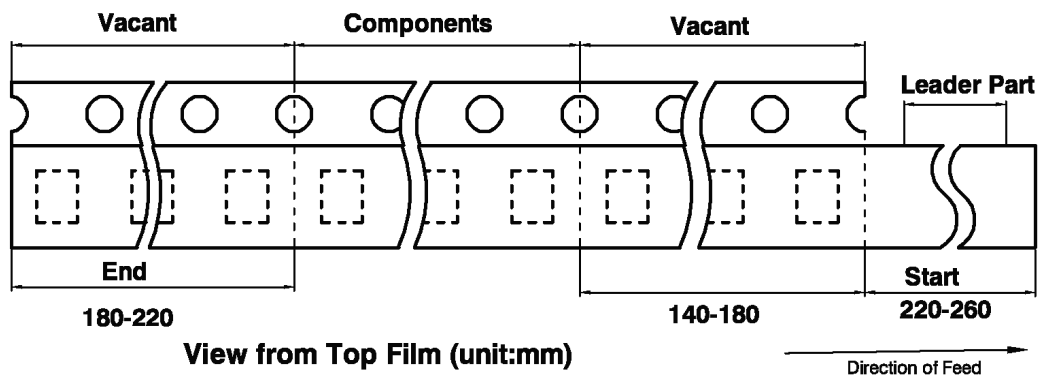
Taping is in accordance with EIA RS-481 or IEC 286-3

REEL FOR TAPING



Unit: mm

Symbol	A	N	C	D	B	G	T
Dimension	178±2.0	50 min.	13.0±0.5	20 min.	2.0±0.5	10.0±1.5	14.9 max.
	178±2.0	50 min.	13.0±0.5	20 min.	2.0±0.5	13.8±1.5	16.7 max.

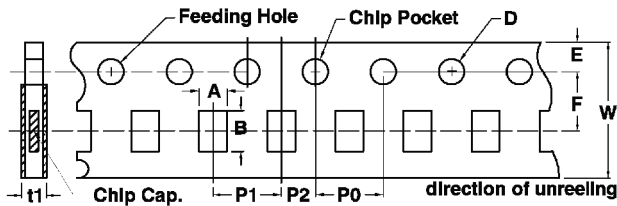


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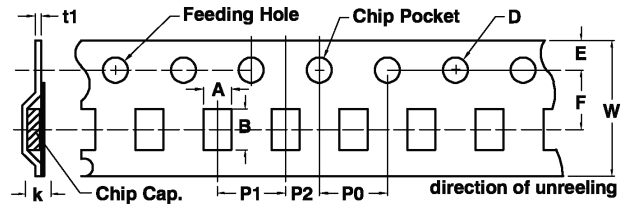
Multilayer Ceramic Chip Capacitors

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3. CARDBOARD TAPE DIMENSIONS



4. EMBOSSED TAPE DIMENSIONS



CARDBOARD TAPE: unit : mm

Code	A	B	W	F	E	P1	P2	P0	D	t1
0603	1.25±0.2	2.05±0.2	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	15 ^{+0.1} ₋₀	1.1 max.
0805	1.65±0.2	2.4±0.2								
1206	2.0±0.2	3.6±0.2								

EMBOSSSED TAPE: unit: mm

CODE	A	B	W	F	E	P1	P2	P0	D	t1	K
0805	1.6±0.2	2.4±0.2	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	15 ^{+0.1} ₋₀	0.3 max	2.0 max.
1206	1.95±0.2	3.6±0.2									2.5 max
1210	2.8±0.2	3.7±0.2									2.85 max
1808	2.4±0.2	4.9±0.2	1.2±0.3	5.5±0.1	1.75±0.1	8.0±0.1	2.0±0.1	4.0±0.1			
1812	3.6±0.2	4.9±0.2	1.2±0.3	5.5±0.1	1.75±0.1	8.0±0.1	2.0±0.1	4.0±0.1			

STANDARD PACKING per Reel

Chip Size	Final Chip Thickness	Max Carrier Thickness	Qty of Cardboard Tape (In 7" Reel)	Qty of Embossed Tape (In 7" Reel)
0603	0.85±0.15mm	0.95mm	4,000	-
0805	0.65±0.10mm	0.75mm	4,000	-
	0.85±0.10mm	0.90mm	4,000	-
1206	1.25±0.10mm	1.25mm	-	3,000
	0.85±0.10mm	0.90mm	4,000	-
	1.10±0.10mm	1.25mm	-	3,000
1210	1.60±0.10mm	1.80mm	-	2,000
	1.15±0.10mm	1.25mm	-	3,000
	1.45±0.10mm	1.55mm	-	2,000
1808	1.65±0.10mm	1.80mm	-	2,000
	1.15±0.10mm	1.35mm	-	3,000
	1.45±0.10mm	1.55mm	-	2,000
	1.65±0.10mm	1.80mm	-	2,000
1812	2.00±0.10mm	2.10mm	-	2,000
	1.15±0.10mm	1.35mm	-	1,000
	1.45±0.10mm	1.80mm	-	1,000
	1.65±0.10mm	1.80mm	-	1,000
	2.00±0.10mm	2.15mm	-	1,000
	2.50±0.10mm	2.85mm	-	500

CUSTOM MADE (13in per Reel)

Chip Size	Chip Thickness, max.	13in per Reel
0603	0.95mm	10K or 15K
0805	0.95mm	10K or 15K
1206	0.95mm	10K or 15K

CPH Series

Multilayer Ceramic Chip Capacitors

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APPLICATION NOTES

Storage:

To prevent the damage of solderability of terminations, the following storage conditions are recommended:

Ambient temperature less than 40°C.

Relative humidity less than 70% RH.

No harmful gases containing sulfur or chlorine.

In the case of bulk packaging do not unpack the minimum package. In case of unpacking seal again or store in a desiccator containing drying agent.

Handling:

Chip Capacitors should be handled with care to avoid contamination or damage. The use of vacuum pickup or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

Preheat:

In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 4°C per second and the final preheat temperature should be within 100°C of the soldering temperature for small chips such as 0603, 0805 and 1206, within 50°C of the soldering temperature for bigger chips such as 1210, 1808 and 1812 etc..

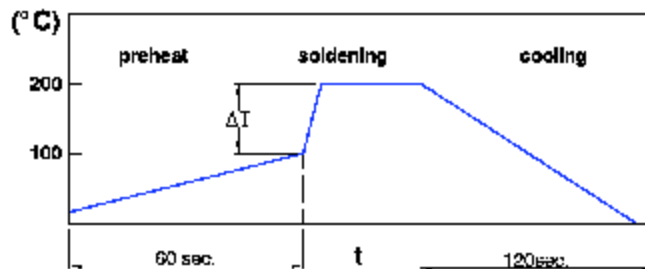
Soldering:

Use mildly activated rosin RA and RMA fluxes, do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips and substrate.

Hand soldering with temperature-controlled iron not exceeding 30 watts and diameter of tip less than 1.2mm is recommended, tip of iron should not contact the ceramic body directly, and the temperature of iron should be set to not more than 260°C.

For bigger chips such as 1210, 1808 and 1812 etc. wave soldering and hand soldering are not recommended.

Recommended soldering profiles as following:



Soldering	Solder Temp.(T)	Soldering Time(t)
Reflow	220-240°C	<15 sec.
Wave	230-250°C	< 5 sec.

Chip Size	ΔT
0603, 0805, 1206	100°C
1210, 1808, 1812	50°C

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APPLICATION NOTES

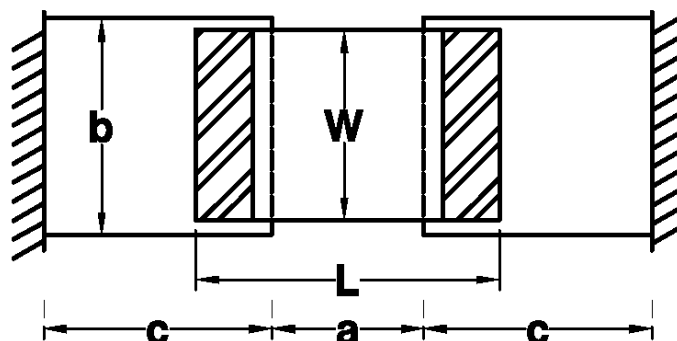
Cooling:

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint. A cooling rate not exceeding 4°C per second should be used when cooling is necessary.

Cleaning

All flux residue must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contaminations that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is dependent upon many factors such as component mix, flux, solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.

Recommended Pad Dimensions:



Unit: inches (mm)

Chip Size	L	W	a	b	c	Accuracy
0603	0.063	0.320	0.028	0.036	0.032	±0.006
	(1.6)	(0.8)	(0.7)	(0.9)	(0.8)	(±0.15)
0805	0.080	0.050	0.036	0.055	0.040	±0.01
	(2.0)	(1.2)	(0.9)	(1.4)	(1.0)	(±0.25)
1206	0.126	0.063	0.087	0.070	0.041	±0.01
	(3.2)	(1.6)	(2.0)	(1.8)	(1.04)	(±0.25)
1210	0.126	0.100	0.080	0.105	0.040	±0.01
	(3.2)	(2.5)	(2.0)	(2.7)	(1.0)	(±0.25)
1808	0.177	0.080	0.132	0.090	0.043	±0.01
	(4.5)	(2.0)	(3.3)	(2.3)	(1.1)	(±0.25)
1812	0.177	0.126	0.132	0.137	0.043	±0.01
	(4.5)	(3.2)	(3.3)	(3.5)	(1.1)	(±0.25)

CPH Series

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TYPICAL PERFORMANCE CURVES

