

SELECTION OF CERAMIC CHIP CAPACITORS

JARO Multilayer Ceramic Chip Capacitors offer the most complete range of characteristics and configurations available in the industry. We suggest your selection of capacitors based on consideration of the following items:

1. DIELECTRIC TYPE

The choice of dielectric is determined by the required capacitance-temperature stability. We offer COG (1BCG), X7R (2R1), Z5U (2E6), and Y5V (2F4)

2. CAPACITANCE AND TOLERANCE

Capacitance and its tolerance are determined by circuit requirement and cost consideration.

3. RATED VOLTAGE

Rated voltage is determined by circuit requirement.

4. SIZE

Size is determined by the circuit design and cost consideration.

5. PACKAGING

Specify the packaging of capacitors as bulk or tape and reeled.

6. NON-STANDARD REQUIREMENTS

Specify any non-standard requirements which are not stated in catalog.

Dielectric	COG (1BCG)	X7R (2R1)	Z5U (2E6) / Y5V (2F4)
Features	Ultra-stable Low dissipation factor Tight tolerance available Good frequency performance No aging of capacitance	Semi-stable, high K High volumetric efficiency Highly reliable in high temperature application High insulation resistance	High volumetric efficiency Non-polar construction General purpose, High K
Applications	LC and RC tuned circuit Filtering Timing	Blocking Coupling Timing Bypassing Frequency discriminating Filtering	Bypassing De-coupling Filtering

Series: CC

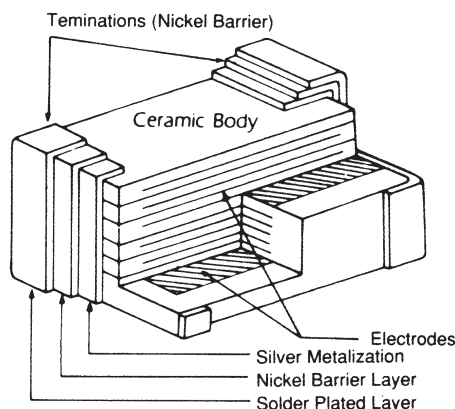
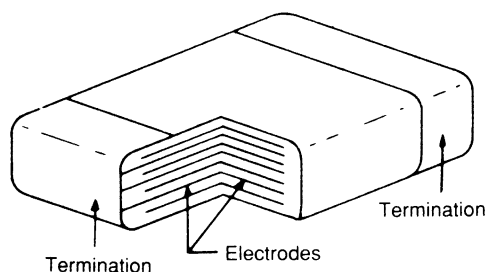
DESCRIPTION:

JARO Multilayer Ceramic Chip Capacitors supplied in bulk or tape & reel package are ideally suitable for thick-film hybrid circuits and automatic surface mounting on any printed circuit boards.

The nickel-barrier terminations consists of a nickel barrier layer over the silver metallization and then finished by electroplated solder layer to ensure the terminations have good solderability. The nickel barrier layer in terminations prevents the dissolution of termination when extended immersion in molten solder at elevated solder temperature.

CONFIGURATION

NICKEL-BARRIER TERMINATIONS



RESISTANCE TO SOLDERING

Termination Material	Code	Test Conditions
Nickel-barrier, Solder plated	N	260°C, 60 Sn/40 Pb solder, 60 secs.

TOLERANCES AVAILABLE

Dielectric		Available Tolerance	Capacitance
EIA	IEC		
COG	1BCG	±0.25 pF	≤ 5 pF
		±0.5 pF	5 pF, CAP., 10 pF
		±1%, ±2%, ±5%, ±10%	≥ 10 pF
X7R	2R1	±5%, ±10%, ±20%	All values
Z5U	2E6	±20%, +80%-20%	All values
Y5V	2F4	±20%, +80%-20%	All values

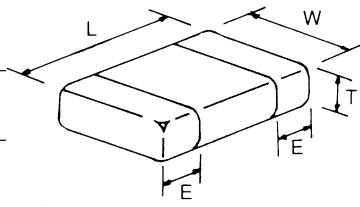
Other tolerances are available upon request.

CAPACITANCE RANGE: COG

EIA/IEC Dielectric Code		COG/1BCG					
Size		0402	0603	0805	1206	1210	1812
(L) Length	mm	1.0 ± 0.05	1.60 ± 0.15	2.00 ± 0.20	3.20 ± 0.20	3.20 ± 0.30	4.50 ± 0.30
	(in)	(.039 ± .002)	(.063 ± .006)	(.080 ± .008)	(.126 ± .008)	(.126 ± .012)	(.177 ± .012)
(W) Width	mm	.05 ± 0.05	0.80 ± 0.15	1.20 ± 0.20	1.60 ± 0.20	2.50 ± 0.30	3.20 ± 0.30
	(in)	(.02 ± .002)	(.032 ± .006)	(.050 ± .008)	(.063 ± .008)	(.100 ± .012)	(.126 ± .012)
(T) Thickness	mm	0.5 ± 0.05	0.80 ± 0.15	1.25 max	1.25 max	1.3 max	1.3 max.
	(in)	(.02 ± .002)	(.032 ± .006)	(.049)	(.049)	(.051)	(.051)
(E) Termination	mm	0.10 max	0.40 ± 0.20	0.50 ± 0.20	0.50 ± 0.20	0.50 ± 0.20	0.64 ± 0.38
	(in)	(.004)	(.016 ± .008)	(.020 ± .008)	(.020 ± .008)	(.020 ± .008)	(.025 ± .015)

CONFIGURATION

W. V. D. C.		50		25	50	50	100	50	100	50	100	50	100
Cap. (PF)	0.5	[Shaded]											
	1.0	[Shaded]											
	1.2	[Shaded]											
	1.5	[Shaded]											
	1.8	[Shaded]											
	2.2	[Shaded]											
	2.7	[Shaded]											
	3.3	[Shaded]											
	3.9	[Shaded]											
	4.7	[Shaded]											
	5.6	[Shaded]											
	6.8	[Shaded]											
	8.2	[Shaded]											
	10	[Shaded]											
	12	[Shaded]											
	15	[Shaded]											
	18	[Shaded]											
	22	[Shaded]											
	27	[Shaded]											
	33	[Shaded]											
	39	[Shaded]											
	47	[Shaded]											
	56	[Shaded]											
	68	[Shaded]											
	82	[Shaded]											
	100	[Shaded]											
	120	[Shaded]											
	150	[Shaded]											
	180	[Shaded]											
	220	[Shaded]											
	270	[Shaded]											
	330	[Shaded]											
	390	[Shaded]											
	470	[Shaded]											
	560	[Shaded]											
	680	[Shaded]											
	820	[Shaded]											
	1000	[Shaded]											
	1200	[Shaded]											
	1500	[Shaded]											
	1800	[Shaded]											
	2200	[Shaded]											
	2700	[Shaded]											
	3300	[Shaded]											
	3900	[Shaded]											
	4700	[Shaded]											
	5600	[Shaded]											
	6800	[Shaded]											
	8200	[Shaded]											
	.010	[Shaded]											
Cap. (µF)	.012	[Shaded]											
	.015	[Shaded]											



Dimensions are in millimeters, dimensions in parenthesis are in inches. Other capacitance values and voltages are available upon request.

The thickness of chip capacitors might be changed due to the improvement of the production technology.

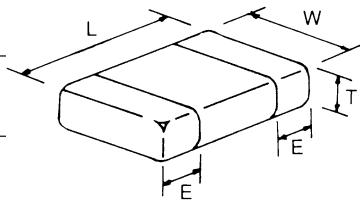
CAPACITANCE RANGE: X7R

EIA/IEC Dielectric Code		X7R/2R1					
Size		0402	0603	0805	1206	1210	1812
(L) Length	mm	1.0 ± 0.05	1.60 ± 0.15	2.0 ± 0.2	3.2 ± 0.2	3.2 ± 0.3	4.5 ± 0.3
	(in)	(.039 ± .002)	(.063 ± .006)	(.080 ± .008)	(.126 ± .008)	(.126 ± .012)	(.177 ± .012)
(W) Width	mm	0.5 ± 0.05	0.80 ± 0.15	1.2 ± 0.2	1.6 ± 0.2	2.5 ± 0.3	3.2 ± 0.3
	(in)	(.02 ± .002)	(.032 ± .006)	(.050 ± .008)	(.063 ± .008)	(.10 ± .012)	(.126 ± .012)
(T) Thickness	mm	0.5 ± 0.05	0.80 ± 0.15	1.25 max	1.25 max	1.3 max	1.3 max.
	(in)	(.02 ± .002)	(.032 ± .006)	(.049)	(.049)	(.051)	(.051)
(E) Termination	mm	0.10 max	0.4 ± 0.20	0.5 ± 0.2	0.5 ± 0.2	0.5 ± 0.2	0.64 ± 0.38
	(in)	(.004)	(.016 ± .008)	(.020 ± .008)	(.020 ± .008)	(.020 ± .008)	(.025 ± .015)

CONFIGURATION

□	□	□	□	□	□
---	---	---	---	---	---

W. V. D. C.	16	25	50	16	25	50	16	25	50	100	16	25	50	100	50	100	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. .010																		
(µF) .012																		
.015																		
.018																		
.022																		
.027																		
.033																		
.039																		
.047																		
.056																		
.068																		
.082																		
.10																		
.12																		
.15																		
.18																		
.22																		
.27																		
.33																		
.39																		
.47																		



Dimensions are in millimeters, dimensions in parenthesis are in inches. Other capacitance values and voltages are available upon request.

The thickness of chip capacitors might be changed due to the improvement of the production technology.

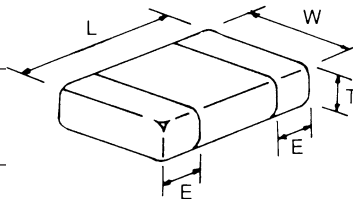
CAPACITANCE RANGE: Z5U

EIA/IEC Dielectric Code		Z5U/2E6			
Size		0805	1206	1210	1812
(L) Length	mm	2.0 ± 0.2	3.2 ± 0.2	3.2 ± 0.3	4.5 ± 0.3
	(in)	(.080 ± .008)	(.126 ± .008)	(.126 ± .012)	(.177 ± .012)
(W) Width	mm	1.2 ± 0.2	1.6 ± 0.2	2.5 ± 0.3	3.2 ± 0.3
	(in)	(.050 ± .008)	(.063 ± .008)	(.10 ± .012)	(.126 ± .012)
(T) Thickness	mm	1.25 max	1.25 max	1.3 max	1.3 max.
	(in)	(.049)	(.049)	(.051)	(.051)
(E) Termination	mm	0.5 ± 0.2	0.5 ± 0.2	0.5 ± 0.2	0.64 ± 0.38
	(in)	(.020 ± .008)	(.020 ± .008)	(.020 ± .008)	(.025 ± .015)

CONFIGURATION



W. V. D. C.	25	50	25	50	25	50	25	50
Cap. 2700								
(PF) 3300								
3900								
4700								
5600								
6800								
8200								
Cap. .010								
(µF) .012								
.015								
.018								
.022								
.027								
.033								
.039								
.047								
.056								
.068								
.082								
.10								
.12								
.15								
.18								
.22								
.27								
.33								
.39								
.47								
.56								
.68								
.82								
1.0								
1.2								
1.5								
1.8								



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

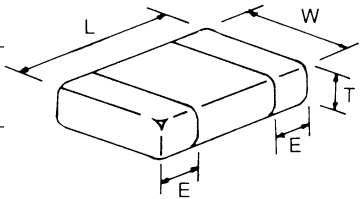
CAPACITANCE RANGE: Y5V

EIA/IEC Dielectric Code		Y5V/2F4					
Size		0402	0603	0805	1206	1210	1812
(L) Length	mm	1.0 ± 0.05	1.60 ± 0.15	2.0 ± 0.2	3.2 ± 0.2	3.2 ± 0.3	4.5 ± 0.3
	(in)	(.039 ± .002)	(.063 ± .006)	(.080 ± .008)	(.126 ± .008)	(.126 ± .012)	(.177 ± .012)
(W) Width	mm	0.5 ± 0.05	0.80 ± 0.15	1.2 ± 0.2	1.6 ± 0.2	2.5 ± 0.3	3.2 ± 0.3
	(in)	(.2 ± .002)	(.032 ± .006)	(.050 ± .008)	(.063 ± .008)	(.10 ± .012)	(.126 ± .012)
(T) Thickness	mm	0.5 ± 0.05	0.80 ± 0.15	1.25 max	1.25 max	1.3 max	1.3 max.
	(in)	(0.2 ± .002)	(.032 ± .006)	(.049)	(.049)	(.051)	(.051)
(E) Termination	mm	0.10 max	0.4 ± 0.20	0.5 ± 0.2	0.5 ± 0.2	0.5 ± 0.2	0.64 ± 0.38
	(in)	(.004)	(.016 ± .008)	(.020 ± .008)	(.020 ± .008)	(.020 ± .008)	(.025 ± .015)

CONFIGURATION



W. V. D. C.	16	25	50	10	16	25	50	16	25	50	16	25	50	25	50	25	50
Cap. 1000																	
(PF) 1200																	
1500																	
1800																	
2200																	
2700																	
3300																	
3900																	
4700																	
5600																	
6800																	
8200																	
Cap. .010																	
(µF) .012																	
.015																	
.018																	
.022																	
.027																	
.033																	
.039																	
.047																	
.056																	
.068																	
.082																	
.10																	
.12																	
.15																	
.18																	
.22																	
.27																	
.33																	
.39																	
.47																	
.56																	
.68																	
.82																	
1.0																	
1.2																	
1.5																	
1.8																	
2.2																	
2.7																	
3.3																	



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

ELECTRICAL SPECIFICATIONS

Dielectric	EIA	COG	X7R
Code	IEC	1BCG	2R1
Temperature Characteristics *1		0±30 ppm/°C, C>20 PF 0+ ⁺¹²⁰ / ₋₄₀ ppm/°C, C ≤ 20 PF	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 ≤ 1000 PF 1 KHz, 1 Vrms, C > 1000 PF	1 KHz, 1Vrms
Dissipation Factor (D.F.) and Tangent of Loss Angle (tan δ)		≤ 0.1% for C ≥ 30 PF ≤ 100% / (400+20C) for C < 30 pF	rated voltage ≤ 2.5% ≤ 50V ≤ 3.5% 25V 16V ≤ 5.0 10V 6.3V
Insulation Resistance (I.R.) after 60 secs. charging at rated voltage, 25°C, 55% RH max.		≥ 100 Gohms or ≥ 1,000 MΩ • μF whichever is less	≥ 100 Gohms or ≥ 1,000 MΩ • μF whichever is less
Voltage Proof, 25°C, 1-5 secs.			2.5 x Rated Voltage 2.5 x Rated Voltage
Capacitance Aging		0	≈1.5% per decade hour

Dielectric	EIA	Z5U	Y5V
Code	IEC	2E6	2F4
Temperature Characteristics		ΔC + 22%, -56% maximum over + 10°C to +85°C	ΔC + 22%, -82% maximum over -30°C to +85°C
Operating Temperature Range		+10°C to +85°C	-30°C to +85°C
Measuring Conditions for Capacitance and D.F.		1 KHz, 0.5 Vrms	1 KHz, 1.0 Vrms
Dissipation Factor (D.F.) and Tangent of Loss Angle (tan δ)		≤ 4.0%	rated voltage ≤ 5.0% 50V ≤ 7.0% 25V 16V ≤ 10.0 10V 6.3V
Insulation Resistance (I.R.) after 60 secs. charging at rated voltage, 25°C, 55% RH max.		≥ 10 Gohms or ≥ 100 MΩ • μF whichever is less	≥ 10 Gohms or ≥ 100 MΩ • μF whichever is less
Voltage Proof, 25°C, 1-5 secs.			2.5 x Rated Voltage 2.5 x Rated Voltage
Capacitance Aging		≈ 5% per decade hour	≈ 3% per decade hour

* 1, 3 ~ 6: 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.

ENVIRONMENTAL SPECIFICATIONS

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.																				
Resistance to Soldering Heat *3	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 should be covered by solder. <table border="1"> <thead> <tr> <th></th> <th>COG (1BCG)</th> <th>X7R (2R1)</th> <th>Z5U (2E6)</th> <th>Y5V (2F4)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>≤ ±0.5%, or ±0.5 pF whichever is greater</td> <td>≤ ±10% -5%</td> <td>≤ ±20% -10%</td> <td>≤ ±20% -10%</td> </tr> </tbody> </table>		COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)	$\Delta C/C$	≤ ±0.5%, or ±0.5 pF whichever is greater	≤ ±10% -5%	≤ ±20% -10%	≤ ±20% -10%										
	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)																		
$\Delta C/C$	≤ ±0.5%, or ±0.5 pF whichever is greater	≤ ±10% -5%	≤ ±20% -10%	≤ ±20% -10%																		
Rapid Change of Temperature *4	IEC 384-10 4.12 / JIS C 5102 9.3 -55°C to +125°C, 5 cycles (COG, X7R) +10°C to +85°C, 5 cycles (Z5U) -30°C to +85°C, 5 cycles (Y5V) Duration: 30 mins. Recovery: 6 ~ 24 hrs. (COG) 24 ± 2 hrs. (X7R, Z5U, Y5V)	<table border="1"> <thead> <tr> <th></th> <th>COG (1BCG)</th> <th>X7R (2R1)</th> <th>Z5U (2E6)</th> <th>Y5V (2F4)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>±1%, or ±1 pF</td> <td>≤ ±10%</td> <td>≤ ±20%</td> <td>≤ ±20%</td> </tr> <tr> <td>D.F.</td> <td colspan="4">≤ 1.5 x initial requirement</td> </tr> <tr> <td>I.R.</td> <td colspan="4">≥ 0.25 x initial requirement</td> </tr> </tbody> </table>		COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)	$\Delta C/C$	±1%, or ±1 pF	≤ ±10%	≤ ±20%	≤ ±20%	D.F.	≤ 1.5 x initial requirement				I.R.	≥ 0.25 x initial requirement			
	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)																		
$\Delta C/C$	±1%, or ±1 pF	≤ ±10%	≤ ±20%	≤ ±20%																		
D.F.	≤ 1.5 x initial requirement																					
I.R.	≥ 0.25 x initial requirement																					
Endurance *5 (Life Test)	IEC 384-10 4.15 1000 hrs. at maximum temperature with 1.5 x rated voltage applied 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> <th>Z5U (2E6)</th> <th>Y5V (2F4)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>≤ ±2%, or ±1 pF whichever is greater</td> <td>≤ ±20%</td> <td>≤ ±20%</td> <td>≤ ±30%</td> </tr> <tr> <td>D.F.</td> <td colspan="2">≤ 2.0 x initial requirement</td> <td colspan="2">≤ 1.5 x initial requirement</td> </tr> <tr> <td>I.R.</td> <td colspan="4">≥ 0.25 x initial requirement</td> </tr> </tbody> </table>		COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)	$\Delta C/C$	≤ ±2%, or ±1 pF whichever is greater	≤ ±20%	≤ ±20%	≤ ±30%	D.F.	≤ 2.0 x initial requirement		≤ 1.5 x initial requirement		I.R.	≥ 0.25 x initial requirement			
	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)																		
$\Delta C/C$	≤ ±2%, or ±1 pF whichever is greater	≤ ±20%	≤ ±20%	≤ ±30%																		
D.F.	≤ 2.0 x initial requirement		≤ 1.5 x initial requirement																			
I.R.	≥ 0.25 x initial requirement																					
Humidity Test *6	IEC 384-10 4.14 / JIS C5102 9.5 500 hrs. at 40 ±2°C, 90-95% RH Recovery: 6 ~ 24 hrs. (COG) 24 ± 2 hrs. (X7R, Z5U, Y5V)	<table border="1"> <thead> <tr> <th></th> <th>COG (1BCG)</th> <th>X7R (2R1)</th> <th>Z5U (2E6)</th> <th>Y5V (2F4)</th> </tr> </thead> <tbody> <tr> <td>$\Delta C/C$</td> <td>≤ ±2%, or ±1 pF whichever is greater</td> <td>≤ ±10%</td> <td>≤ ±20%</td> <td>≤ ±30%</td> </tr> <tr> <td>D.F.</td> <td colspan="2">≤ 2.0 x initial requirement</td> <td colspan="2">≤ 1.5 x initial requirement</td> </tr> <tr> <td>I.R.</td> <td colspan="4">≥ 0.25 x initial requirement</td> </tr> </tbody> </table>		COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)	$\Delta C/C$	≤ ±2%, or ±1 pF whichever is greater	≤ ±10%	≤ ±20%	≤ ±30%	D.F.	≤ 2.0 x initial requirement		≤ 1.5 x initial requirement		I.R.	≥ 0.25 x initial requirement			
	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)																		
$\Delta C/C$	≤ ±2%, or ±1 pF whichever is greater	≤ ±10%	≤ ±20%	≤ ±30%																		
D.F.	≤ 2.0 x initial requirement		≤ 1.5 x initial requirement																			
I.R.	≥ 0.25 x initial requirement																					
Adhesion	IEC 384-10 4.8 / JIS C5102 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 centre of terminations for 10 ± 1 secs.	No visible damage																				

* 1, 3 ~ 6: 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.