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

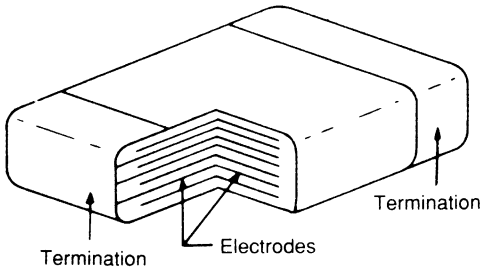
Series: CC

DESCRIPTION:

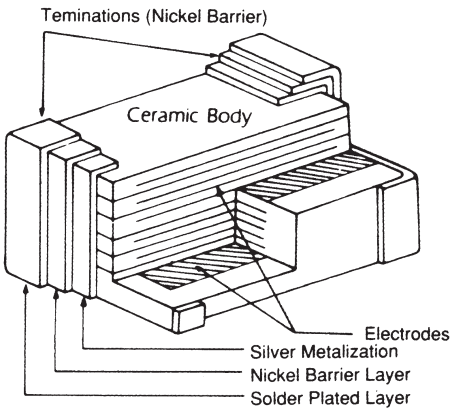
JARO Multilayer Ceramic Chip Capacitors supplied in bulk or tape & reel package are ideally suitable for thick-film hybrid circuits and automatic surface mounting on any printed circuit boards.

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

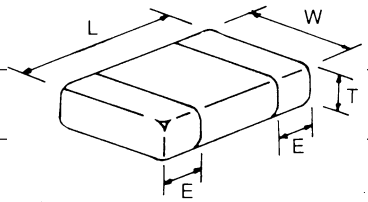
Dielectric				
EIA	IEC	**Available Tolerance**	**Capacitance**	
COG	1BCG	±0.25 pF	≤ 5 pF	
		±0.5 pF	5 pF , CAP. , 10 pF	
		±1%, ±2%, ±5%, ±10%	≥ 10 pF	
X7R	2R1	±5%, ±10%, ±20%	All values	
Z5U	2E6	±20%, +80%-20%	All values	
Y5V	2F4	±20%, +80%-20%	All values	

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 (in)	1.0 ± 0.05 (.039 ± .002)	1.60 ± 0.15 (.063 ± .006)	2.00 ± 0.20 (.080 ± .008)	3.20 ± 0.20 (.126 ± .008)	3.20 ± 0.30 (.126 ± .012)	4.50 ± 0.30 (.177 ± .012)
(W) Width	mm (in)	.05 ± 0.05 (.02 ± .002)	0.80 ± 0.15 (.032 ± .006)	1.20 ± 0.20 (.050 ± .008)	1.60 ± 0.20 (.063 ± .008)	2.50 ± 0.30 (.100 ± .012)	3.20 ± 0.30 (.126 ± .012)
(T) Thickness	mm (in)	0.5 ± 0.05 (.02 ± .002)	0.80 ± 0.15 (.032 ± .006)	1.25 max (.049)	1.25 max (.049)	1.3 max (.051)	1.3 max. (.051)
(E) Termination	mm (in)	0.10 max (.004)	0.40 ± 0.20 (.016 ± .008)	0.50 ± 0.20 (.020 ± .008)	0.50 ± 0.20 (.020 ± .008)	0.50 ± 0.20 (.020 ± .008)	0.64 ± 0.38 (.025 ± .015)
CONFIGURATION							

W. V. D. C.		50	25	50	50	100	50	100	50	100	50	100
Cap.	0.5											
(PF)	1.0											
	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											
	.010											
Cap.	.012											
(µF)	.015											



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 (in)	1.0 ± 0.05 (.039 ± .002)	1.60 ± 0.15 (.063 ± .006)	2.0 ± 0.2 (.080 ± .008)	3.2 ± 0.2 (.126 ± .008)	3.2 ± 0.3 (.126 ± .012)	4.5 ± 0.3 (.177 ± .012)
(W) Width	mm (in)	0.5 ± 0.05 (.02 ± .002)	0.80 ± 0.15 (.032 ± .006)	1.2 ± 0.2 (.050 ± .008)	1.6 ± 0.2 (.063 ± .008)	2.5 ± 0.3 (.10 ± .012)	3.2 ± 0.3 (.126 ± .012)
(T) Thickness	mm (in)	0.5 ± 0.05 (.02 ± .002)	0.80 ± 0.15 (.032 ± .006)	1.25 max (.049)	1.25 max (.049)	1.3 max (.051)	1.3 max. (.051)
(E) Termination	mm (in)	0.10 max (.004)	0.4 ± 0.20 (.016 ± .008)	0.5 ± 0.2 (.020 ± .008)	0.5 ± 0.2 (.020 ± .008)	0.5 ± 0.2 (.020 ± .008)	0.64 ± 0.38 (.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																		
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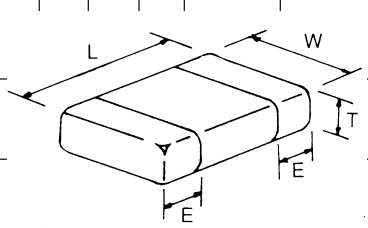
	2200																		
	2700																		
	3300																		
	3900																		
	4700																		
	5600																		
	6800																		
	8200																		
Cap.	.010																		
(µF)	.012																		
	.015																		
	.018																		
	.022																		
	.027																		
	.033																		
	.039																		
	.047																		
	.056																		
	.068																		
	.082																		
	.10																		
	.12																		
	.15																		
	.18																		
	.22																		
	.27																		
	.33																		
	.39																		
	.47																		



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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								
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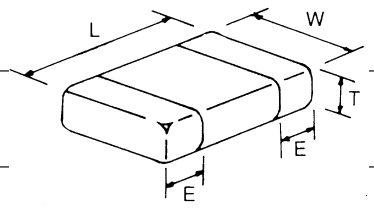
.47								
.56								
.68								
.82								
1.0								
1.2								
1.5								
1.8								



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																	
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	.12																	
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	.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 Characterisics *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 (tand)	≤ 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 votage, 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.

	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)
ΔC/C	≤ ±0.5%, or ±0.5 pF whichever is greater	≤ ±10% -5%	≤ ±20% -10%	≤ ±20% -10%

Test	Test Conditions	Post-Test Inspection Requirements
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)	

	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)
ΔC/C	±1%, or ±1 pF	≤ ±10%	≤ ±20%	≤ ±20%
D.F.	≤ 1.5 x initial requirement			
I.R.	≥ 0.25 x initial requirement			

Test	Test Conditions	Post-Test Inspection Requirements
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

	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)
ΔC/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			

Test	Test Conditions	Post-Test Inspection Requirements
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)	

	COG (1BCG)	X7R (2R1)	Z5U (2E6)	Y5V (2F4)
ΔC/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			

Test	Test Conditions	Post-Test Inspection Requirements
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.