



## MULTILAYER CERAMIC CHIP CAPACITORS

### HOW TO ORDER

MA 0805 CG 101 J 500 PR

PRO-CAP TYPE: \_\_\_\_\_

SIZE CODE: \_\_\_\_\_

0201	0402	0603	0805	1206	1210	1812	2220	2225
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DIELECTRIC CODE: \_\_\_\_\_

CODE	DIELECTRIC
CG	NPO/COG(1B)
XR / X7R	X7R(2R1)
X5R	X5R
ZU	Z5U(2E6)
YV	Y5V(2F4)

CAPACITANCE CODE: \_\_\_\_\_

Capacitance expressed in pico farads (pF).  
 First two digits are significant figures.  
 Third digit denotes the number of zeros.  
 Use R for decimal point for values less than 10pF.  
 A few examples are shown with codes.

( $\mu$ F)	(nF)	CAPACITANCE (pF)	CODE
		1.0 pF	1R0
		4.7 pF	4R7
		10 pF	100
	0.22 nF	220 pF	221
0.022 $\mu$ F	22 nF	22,000 pF	223
0.10 $\mu$ F	100 nF	100,000 pF	104
1 $\mu$ F	1,000 nF	1,000,000 pF	105

TOLERANCE CODE: \_\_\_\_\_

CODE	TOLERANCE	CODE	TOLERANCE	CODE	TOLERANCE
A	$\pm 0.05\text{pF}$	F	$\pm 1\%$	M	$\pm 20\%$
B	$\pm 0.10\text{pF}$	G	$\pm 2\%$	Z	$\pm 80\%, - 20\%$
C	$\pm 0.25\text{pF}$	J	$\pm 5\%$	P	$\pm 100\%, - 0\%$
D	$\pm 0.50\text{pF}$	K	$\pm 10\%$		

RATED VOLTAGE CODE: \_\_\_\_\_

2 significant digits + number of zeros.

CODE	VOLTAGE	CODE	VOLTAGE	CODE	VOLTAGE	CODE	VOLTAGE
4R0	4.0V DC	500	50V DC	631	630V DC	402	4000V DC
6R3	6.3V DC	101	100V DC	102	1000V DC		
100	10V DC	251	250V DC	152	1500V DC		
160	16V DC	301	300V DC	202	2000V DC		
250	25V DC	501	500V DC	302	3000V DC		

PACKAGING CODE: \_\_\_\_\_

PR: Tape and Reel 7" Reel, Cardboard Tape  
 ER: Tape and Reel 7" Reel, Embossed Tape  
 XP: Tape and Reel 13" Reel, Cardboard Tape

	0201	0402	0603	0805	1206	1210	1812	2220	2225
PR	15000	10000	4000	4000	4000	1000/2000	1000	500/1000	500
ER	-	-	-	2000/3000	2000/3000	1000/2000	1000/1500	500/1000	500
XP	50000	50000	20000	15000	15000	-	-	-	-

**MULTILAYER CERAMIC CHIP CAPACITORS**

**SELECTION OF CERAMIC CHIP CAPACITOR**

Pro-Cap Multilayer Ceramic Chip Capacitor are RoHS Compliant and offer the most complete range fo characteristics and configuration available in the industry. We suggest your selection of capacitors be 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(1B), X5R, 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 & REEL.

**6. NON-STANDARD REQUIREMENTS**

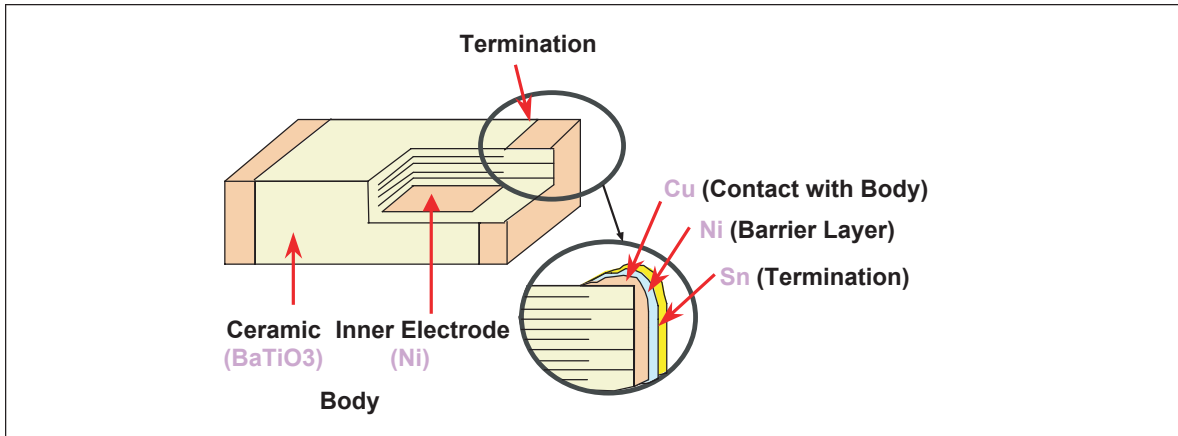
Specify any non-standard requirements which are not stated in the catalogue.

Dielectric	COG(1B)	X5R, X7R(2R1)	Z5U(2E6), Y5V(2F4)
	<ul style="list-style-type: none"> <li>• Ultra-stable</li> <li>• Low dissipation factor</li> <li>• Tight tolerance available</li> <li>• Good frequency performance</li> <li>• No aging of capacitance</li> <li>• Class I Dielectric, temperature compensating</li> <li>• High stability over time, voltage and temperature changes</li> <li>• Nickel barrier termination and excellent mechanical strength</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-stable High K</li> <li>• High volumetric efficiency</li> <li>• Highly relieable in high temperature application</li> <li>• High insulation resistance</li> <li>• Class II Dielectric, temperature stable</li> <li>• Excellent frequency characteristics, non-linear capacitance change</li> <li>• Higher capacitance then COG</li> <li>• Nickel barrier terminations and excellent mechanical strength</li> </ul>	<ul style="list-style-type: none"> <li>• Highest volumetric efficiency</li> <li>• Non-polar construction</li> <li>• General purpose, High K dielectric</li> <li>• High capacitance density</li> <li>• Low ESL, low ESR and excellent frequency response</li> <li>• Nickel barrier terminations and excellent mechanical strength</li> </ul>
Applications	<ul style="list-style-type: none"> <li>• LC and RC tuned circuit</li> <li>• Filtering</li> <li>• Timing</li> </ul>	<ul style="list-style-type: none"> <li>• Blocking</li> <li>• Coupling</li> <li>• Timing</li> <li>• Bypassing</li> <li>• Frequency discriminating</li> <li>• Filtering</li> </ul>	<ul style="list-style-type: none"> <li>• Bypassing</li> <li>• De-coupling</li> <li>• Filtering</li> </ul>

**MULTILAYER CERAMIC CHIP CAPACITORS**

**DESCRIPTION: CHIP SERIES (MA TYPE)**

Pro-Cap offers RoHS compliant Multilayer Ceramic Chip Capacitors that are ideally suitable for thick-film hybrid circuits and automatic surface mounting on any printed circuit boards. The nickel-barrier terminations consist 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 prevent the dissolution of the termination when extended immersion in molten solder at elevated solder temperature. This product meets the Moisture Sensitivity Level 1 (MSL 1) requirements.

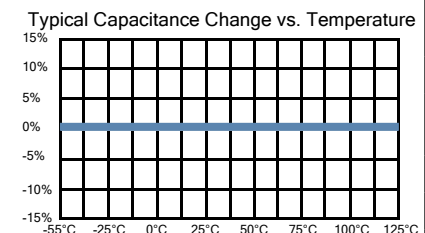


Composition part	Material group	Materials	CAS if applicable
Dielectric body	Ceramic	Barium Titanium Zirconate	66402-68-4
Inner electrode	Ni Paste	Nickel	7440-02-0
		Barium Titanate	12047-27-7
		Ethyl Cellulose	9004-57-3
		n-Paraffin	64771-72-8
		Terpineol	8000-41-7
Terminal electrode	Cu Paste	Copper	7440-50-8
		Glass frit	
		Terpineol	8000-41-7
		Acrylic polymer	
Under plating	Nickel	Ni	7440-02-0
Surface plating	Tin	Sn	7440-31-5

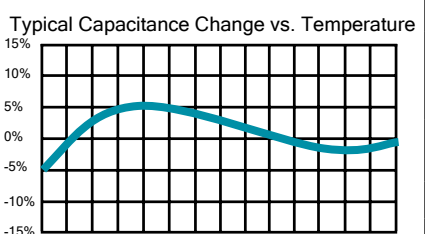
**MULTILAYER CERAMIC CHIP CAPACITORS**

**DIELECTRIC CHARACTERISTICS**

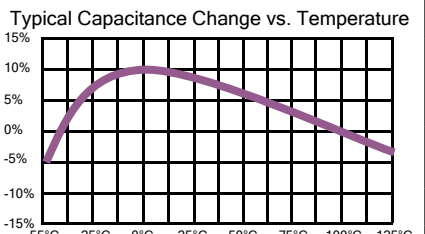
**NPO/COG:**

Operating Temperature Range	-55°C to +125°C	<p>Typical Capacitance Change vs. Temperature</p> 
Temperature Coefficient	0 ± 30ppm / °C	
Temperature Voltage Coefficient	0 ± 30ppm / °C	
Dissipation Factor	0.1% max, (For "U" material, Quality factor is 2500 min.)	
Insulation Resistance	>1000 ohms F for 100 G ohms, whichever is less at 25°C, VDCW (The IR at 125°C is 10% of the value at 25°C)	
Ageing	None	
Withstanding Voltage	>2.5 times VDCW	
Test Parameters	1MHz ± 100KHz at 1.0 ± 2Vrms ≤ 1000pF, 25°C 1KHz ± 100Hz at 1.0 ± 2Vrms > 1000pF, 25°C	
Capacitance Tolerance	P, A, B, C, D, E, F, G, J, K	

**X7R:**

Operating Temperature Range	-55°C to +125°C	<p>Typical Capacitance Change vs. Temperature</p> 
Temperature Coefficient	0 ± 15%Δ°C	
Temperature Voltage Coefficient	Not applicable	
Dissipation Factor	For 50Volts and 100Volts: 2.5% Max.; For 25Volts: 3.0% Max; For 16Volts: 3.5% Max; For 10Volts: 5.0% Max; For 6.3Volts: 10% Max; For values > 10µF and ≤10V, D.F. is 10% Max	
Insulation Resistance	>1000 ohms F for 100 G ohms, whichever is less at 25°C, VDCW (The IR at 125°C is 10% of the value at 25°C)	
Ageing	2.5% per decade hour, typical	
Withstanding Voltage	>2.5 times VDCW	
Test Parameters	1KHz ± 100Hz at 1.0 ± 2Vrms > 100pF, 25°C	
Capacitance Tolerance	F, G, J, K, M	

**X5R:**

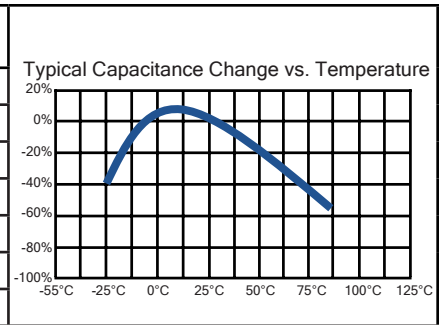
Operating Temperature Range	-55°C to +85°C	<p>Typical Capacitance Change vs. Temperature</p> 
Temperature Coefficient	0 ± 15%Δ°C Max.	
Temperature Voltage Coefficient	Not applicable	
Dissipation Factor	For 50Volts and 100Volts: 2.5% Max.; For 25Volts: 3.0% Max; For 16Volts: 3.5% Max; For 10Volts: 5.0% Max; For 6.3Volts: 10% Max; For values > 10µF and ≤10V, D.F. is 10% Max	
Insulation Resistance	>1000 ohms F for 100 G ohms, whichever is less at 25°C, VDCW (10,000 ohms at 125°C)	
Ageing	2.5% per decade hour, typical	
Withstanding Voltage	>2.5 times VDCW	
Test Parameters	1KHz ± 100Hz at 1.0 ± 2Vrms > 100pF, 25°C	
Capacitance Tolerance	F, G, J, K, M	

**MULTILAYER CERAMIC CHIP CAPACITORS**

**DIELECTRIC CHARACTERISTICS**

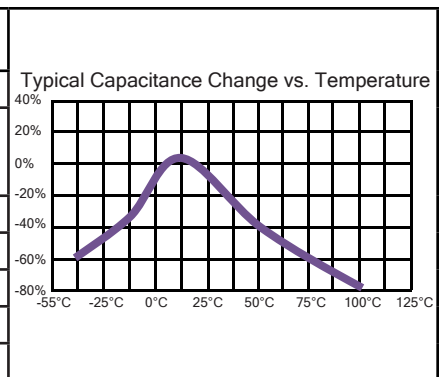
**Z5U:**

Operating Temperature Range	-10°C to +85°C
Temperature Coefficient	+22% -56%Δ°C Max
Dissipation Factor	4.0% Max
Insulation Resistance	>100 ohms F for 10 G ohms, whichever is less at 25°C, VDCW
Ageing	5.0% per decade hour, typical
Withstanding Voltage	>2.5 times VDCW
Test Parameters	1KHz ± 100Hz at 0.5 ± 1Vrms, 25°C
Capacitance Tolerance	K, M, Z

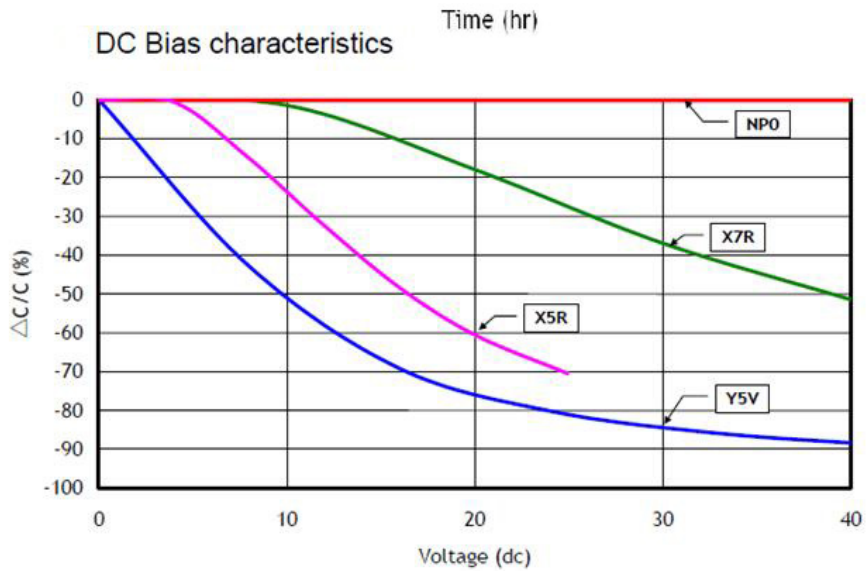


**Y5V:**

Operating Temperature Range	-30°C to +85°C
Temperature Coefficient	+22% -82%Δ°C Max
Dissipation Factor	For 25Volts and 50Volts: 5% Max; For 16Volts: 7.0% Max; For 10Volts: 9.0% Max; For 6.3Volts: 11% Max; For higher Cap values > 10μF and ≤10V, D.F. is 10% Max
Insulation Resistance	>100 ohms F for 10 G ohms, whichever is less at 25°C, VDCW
Ageing	7.0% per decade hour, typical
Withstanding Voltage	>2.5 times VDCW
Test Parameters	1KHz ± 100Hz at 1.0 ± 2Vrms, 25°C
Capacitance Tolerance	K, M, Z



**CAPACITANCE CHANGE VS DC VOLTAGE**



## MULTILAYER CERAMIC CHIP CAPACITORS

### SOLDERING GUIDELINES

Surface mount passive components may be soldered to P.C.B. and substrates using any of these methods:

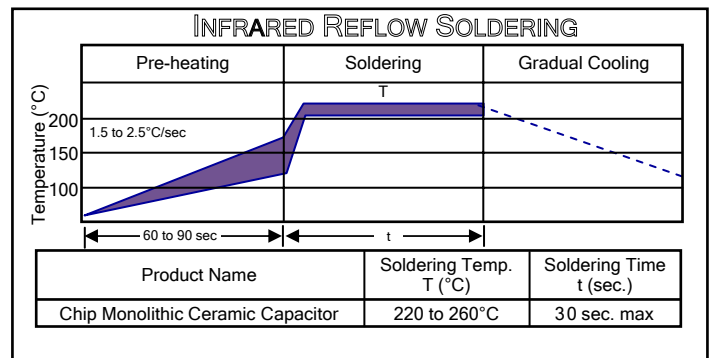
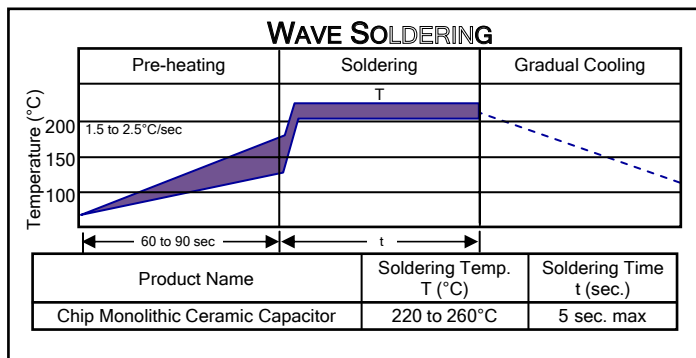
- Wave/dual wave
- Vapor phase reflow
- Bubble solder immersion
- Infrared reflow
- Hot air/convection reflow
- Other(laser, etc.).

Ceramic devices, particularly chip capacitors, generally have poor ability to withstand heat shock. Thermal shock may result during soldering and is a natural material characteristic. Chip capacitor failure mechanisms resulting from excessive thermal shock may include:

- Micro cracks in the ceramic
- Electrical shorts.
- Insulation resistance degradation in accelerated life test conditions.

Users of ceramic chip components can minimize thermal shock by employing a basic process prior to soldering (Recommendation: Preheat the ceramic chip components and board to within 100°C of the soldering temperature.) The time to preheat should be a minimum or one (1) minute.

In addition, the recommended soldering profile process time-temperature profile for components should be followed.

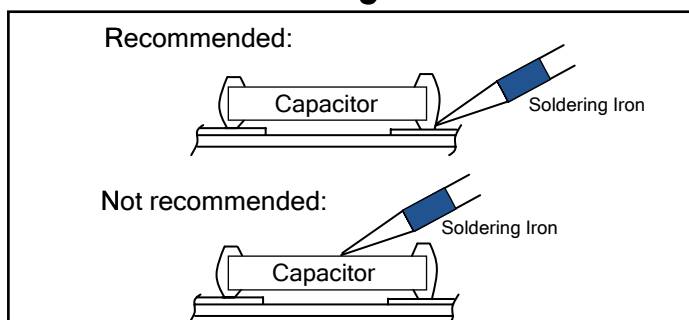


Vapor phase reflow soldering techniques may be used to attach many surface mount components onto a P.C.B. or substrate at one time. Solder temperatures are controlled precisely due to the known boiling point of the liquid.

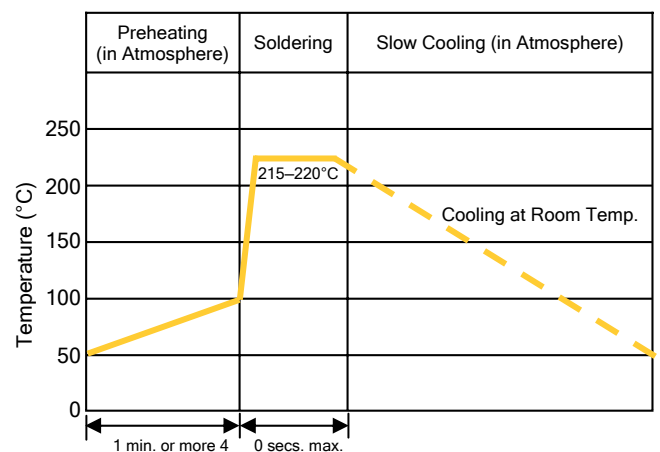
Vapor phase soldering involves condensation heating, whereby the latent heat of the vaporized liquid is released as the vapor condenses on metallization of the parts to be soldered. The phase change from liquid to vapor is rapid and occurs on all exposed surfaces of the part, resulting in uniform heating.

Pro-Cap surface mount capacitors can be successfully attached to a P.C.B. or substrate using the vapor phase reflow technique. Due to the lower soldering temperature, the effect of heat on the components is not severe.

### Soldering Iron



The soldering iron method is used primarily for rework or bread boarding. It is important that the solder iron tip *not touch* the ceramic body. The iron should be applied only to the termination-solder fillet. (Recommendation: The soldering iron shall be of the nichrome wire heater type with a maximum diameter of 3.0mm.)



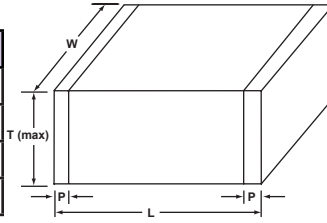
Product Name	Soldering Iron Tip Temp.	Soldering Time	Iron Output
Chip Monolithic Ceramic Capacitor	280°C 5	sec. max	30W max.



### MULTILAYER CERAMIC CHIP CAPACITORS

# 0201

RoHS Compliant



SIZE	6.3V ~50V	
(L) Length mm		0.6 ± 0.03
(W) Width mm		0.3 ± 0.03
(T) Thickness mm		0.3 ± 0.03 max
(P) Termination mm		0.15 ± 0.05

VOLTAGE		4.0					6.3					10					16					
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
CAP	1.0	1R0																				
(pF)	1.5	1R5																				
	2.2	2R2																				
	3.3	3R3																				
	4.7	4R7																				
	6.8	6R8																				
	8.2	8R2																				
	10	100																				
	15	150																				
	18	180																				
	20	200																				
	22	220																				
	27	270																				
	33	330																				
	39	390																				
	47	470																				
	56	560																				
	68	680																				
	82	820																				
	100	101																				
	120	121																				
	150	151																				
	180	181																				
	220	221																				
	270	271																				
	330	331																				
	390	391																				
	470	471																				
	560	561																				
	680	681																				
	820	821																				
	1000	102																				
	1200	122																				
	1500	152																				
	1800	182																				
	2200	222																				
	2700	272																				
	3300	332																				
	3900	392																				
	4700	472																				
	5600	562																				
	6800	682																				
	8200	822																				
(μF)	0.010	103																				
	0.015	153																				
	0.018	183																				
	0.022	223																				
	0.027	273																				
	0.033	333																				
	0.039	393																				
	0.047	473																				
	0.056	563																				
	0.068	683																				
	0.082	823																				
	0.1	104																				
	0.12	124																				
	0.15	154																				
	0.18	184																				
	0.22	224																				
	0.27	274																				
	0.33	334																				
	0.39	394																				
	0.47	474																				
	0.56	564																				
	0.68	684																				
	0.82	824																				
	1.0	105																				
	1.2	125																				
	1.5	155																				
	1.8	185																				

For additional capacitance values and working voltages, please contact us.

VOLTAGE		25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP	0.1	0R1									
(pF)	0.2	0R2									
	0.3	0R3									
	0.4	0R4									
	0.5	0R5									
	1.0	1R0									
	1.5	1R5									
	2.2	2R2									
	3.3	3R3									
	4.7	4R7									
	6.8	6R8									
	8.2	8R2									
	10	100									
	15	150									
	18	180									
	20	200									
	22	220									
	27	270									
	33	330									
	36	360									
	39	390									
	47	470									
	56	560									
	68	680									
	82	820									
	100	101									
	120	121									
	150	151									
	180	181									
	220	221									
	270	271									
	330	331									
	390	391									
	470	471									
	560	561									
	680	681									
	820	821									
	1000	102									
	1200	122									
	1500	152									
	1800	182									
	2200	222									
	2700	272									
	3300	332									
	3900	392									
	4700	472									
	5600	562									
	6800	682									
	8200	822									
(μF)	0.010	103									
	0.015	153									
	0.018	183									
	0.022	223									
	0.027	273									
	0.033	333									
	0.039	393									
	0.047	473									
	0.056	563									
	0.068	683									
	0.082	823									
	0.1	104									
	0.12	124									
	0.15	154									
	0.18	184									
	0.22	224									
	0.27	274									
	0.33	334									
	0.39	394									
	0.47	474									
	0.56	564									
	0.68	684									
	0.82	824									
	1.0	105									
	1.2	125									
	1.5	155									
	1.8	185									

For voltages over 50V  
 please see  
 the MA high voltage series

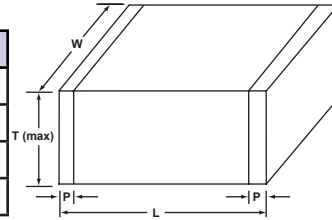


### MULTILAYER CERAMIC CHIP CAPACITORS

# 0402

RoHS Compliant

SIZE	6.3V ~50V	
(L) Length mm	1.0 ± 0.05	
(W) Width mm	0.5 ± 0.05	
(T) Thickness mm	0.6 max	
(P) Termination mm	0.2 ± 0.1 (X5R = 0.10 ~ 0.40)	



VOLTAGE		4.0					6.3					10					16					
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
CAP	4.7	4R7																				
(pF)	6.8	6R8																				
	8.2	8R2																				
	10	100																				
	15	150																				
	18	180																				
	20	200																				
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	0.68	684																				
	0.82	824																				
	1.0	105																				
	1.2	125																				
	1.5	155																				
	1.8	185																				
	2.2	225																				
	3.3	335																				
	4.7	475																				



VOLTAGE		25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
(pF)											
0.47	R47										
0.50	R50										
0.56	R56										
0.60	R60										
0.68	R68										
0.70	R70										
0.75	R75										
0.80	R80										
0.82	R82										
0.90	R90										
1.0	1R0										
1.5	1R5										
2.2	2R2										
3.3	3R3										
4.7	4R7										
5.0	5R0										
5.6	5R6										
6.0	6R0										
6.2	6R2										
6.8	6R8										
7.0	7R0										
7.5	7R5										
8.0	8R0										
8.2	8R2										
9.0	9R0										
10	100										
12	120										
13	130										
15	150										
16	160										
18	180										
20	200										
22	220										
24	240										
27	270										
30	300										
33	330										
36	360										
39	390										
43	430										
47	470										
56	560										
68	680										
82	820										
100	101										
120	121										
130	131										
150	151										
160	161										
180	181										
200	201										
220	221										
270	271										
330	331										
390	391										
470	471										
560	561										
680	681										
820	821										
1000	102										
1200	122										
1500	152										
1800	182										
2200	222										
2700	272										
3300	332										
3900	392										
4700	472										
5600	562										
6800	682										
8200	822										
(µF)											
0.010	103										
0.015	153										
0.018	183										
0.022	223										

For voltages over 50V  
please see  
the MA high voltage series



VOLTAGE		25					35	50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	X5R	COG	X5R	X7R	Z5U	Y5V
CAP 0.027	273											
(pF) 0.033	333											
0.039	393											
0.047	473											
0.056	563											
0.068	683											
0.082	823											
0.10	104											
0.12	124											
0.15	154											
0.18	184											
0.22	224											
0.27	274											
0.33	334											
0.39	394											
0.47	474											
0.56	564											
0.68	684											
0.82	824											
1.0	105											

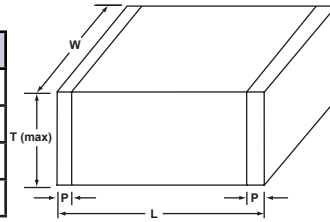
For voltages over 50V  
please see  
the MA high voltage series



### MULTILAYER CERAMIC CHIP CAPACITORS

# 0603

RoHs Compliant



SIZE	4.0V ~50V	2.2μF ~ 22μF
(L) Length mm	1.6 ± 0.15	1.6 ± 0.20
(W) Width mm	0.8 ± 0.15	0.8 ± 0.20
(T) Thickness mm	1.0max (X5R = 0.9 max)	0.8 ± 0.20
(P) Termination mm	0.12 ~ 0.51 (X5R = 0.10 ~ 0.60)	0.20 ~ 0.60

VOLTAGE		4.0					6.3					10					16					
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
CAP 8.2	8R2																					
(pF) 10	100																					
15	150																					
18	180																					
20	200																					
22	220																					
27	270																					
33	330																					
39	390																					
47	470																					
56	560																					
68	680																					
82	820																					
100	101																					
120	121																					
150	151																					
180	181																					
220	221																					
270	271																					
330	331																					
390	391																					
470	471																					
560	561																					
680	681																					
820	821																					
1000	102																					
1200	122																					
1500	152																					
1800	182																					
2200	222																					
2700	272																					
3300	332																					
3900	392																					
4700	472																					
5600	562																					
6800	682																					
8200	822																					
(μF) 0.010	103																					
0.015	153																					
0.018	183																					
0.022	223																					
0.027	273																					
0.033	333																					
0.039	393																					
0.047	473																					
0.056	563																					
0.068	683																					
0.082	823																					
0.10	104																					
0.12	124																					
0.15	154																					
0.18	184																					
0.22	224																					
0.27	274																					
0.33	334																					
0.39	394																					
0.47	474																					
0.56	564																					
0.68	684																					
0.82	824																					
1.0	105																					
1.2	125																					
1.5	155																					
1.8	185																					
2.2	225																					
4.7	475																					
5.6	565																					
6.8	685																					
10.0	106																					
22.0	226																					

For additional capacitance values and working voltages, please contact us.

VOLTAGE			25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
(pF)	0.47	R47										
	0.50	R50										
	0.68	R68										
	0.80	R80										
	0.82	R82										
	1.0	1R0										
	1.2	1R2										
	1.5	1R5										
	1.8	1R8										
	2.0	2R0										
	2.2	2R2										
	2.7	2R7										
	3.0	3R0										
	3.3	3R3										
	3.9	3R9										
	4.0	4R0										
	4.3	4R3										
	4.7	4R7										
	5.0	5R0										
	5.1	5R1										
	5.6	5R6										
	6.0	6R0										
	6.2	6R2										
	6.8	6R8										
	7.0	7R0										
	8.0	8R0										
	8.2	8R2										
	9.0	9R0										
	9.1	9R1										
	10	100										
	15	150										
	18	180										
	20	200										
	22	220										
	27	270										
	33	330										
	36	360										
	39	390										
	47	470										
	56	560										
	68	680										
	82	820										
	100	101										
	120	121										
	150	151										
	180	181										
	220	221										
	270	271										
	330	331										
	390	391										
	470	471										
	560	561										
	680	681										
	820	821										
	1000	102										
	1200	122										
	1500	152										
	1800	182										
	2200	222										
	2700	272										
	3300	332										
	3900	392										
	4700	472										
	5600	562										
	6800	682										
	8200	822										
(μF)	0.010	103										
	0.015	153										
	0.018	183										
	0.022	223										
	0.027	273										
	0.033	333										
	0.039	393										
	0.047	473										
	0.056	563										
	0.068	683										
	0.082	823										

For voltages over 50V  
 please see  
 the MA high voltage series



VOLTAGE		25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP 0.10	104										
(µF) 0.12	124										
0.15	154										
0.18	184										
0.22	224										
0.27	274										
0.33	334										
0.39	394										
0.47	474										
0.56	564										
0.68	684										
0.82	824										
1.0	105										
2.2	225										
4.7	475										
10.0	106										

For voltages over 50V  
please see  
the MA high voltage series

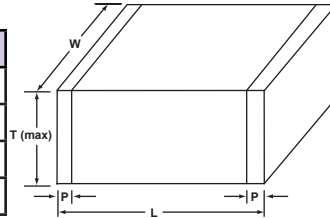


### MULTILAYER CERAMIC CHIP CAPACITORS

# 0805

RoHS Compliant

SIZE	6.3V ~50V	
(L) Length mm	2.0 ± 0.2	
(W) Width mm	1.25 ± 0.2	
(T) Thickness mm	1.30 max (X5R = 1.4 max)	
(P) Termination mm	0.25 ~ 0.71 (X5R = 0.25 ~ 0.75)	



VOLTAGE		6.3					10					16				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP 8.2	8R2															
(pF) 10	100															
15	150															
18	180															
20	200															
22	220															
27	270															
33	330															
39	390															
47	470															
56	560															
68	680															
82	820															
100	101															
120	121															
150	151															
180	181															
220	221															
270	271															
330	331															
390	391															
470	471															
560	561															
680	681															
820	821															
1000	102															
1200	122															
1500	152															
1800	182															
2200	222															
2700	272															
3300	332															
3900	392															
4700	472															
5600	562															
6800	682															
8200	822															
(µF) 0.010	103															
0.015	153															
0.018	183															
0.022	223															
0.027	273															
0.033	333															
0.039	393															
0.047	473															
0.056	563															
0.068	683															
0.082	823															
0.1	104															
0.12	124															
0.15	154															
0.18	184															
0.22	224															
0.27	274															
0.33	334															
0.39	394															
0.47	474															
0.56	564															
0.68	684															
0.82	824															
1.0	105															
1.2	125															
1.5	155															
1.8	185															
2.2	225															
4.7	475															
5.6	565															
6.8	685															
10	106															
22	226															

For additional capacitance values and working voltages, please contact us.



VOLTAGE		25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP 0.10	R10										
(pF) 0.22	R22										
0.33	R33										
0.47	R47										
0.5	R50										
0.56	R56										
0.68	R68										
0.82	R82										
1.0	1R0										
1.5	1R5										
2.2	2R2										
3.3	3R3										
4.7	4R7										
5.1	5R1										
5.6	5R6										
6.8	6R8										
8.2	8R2										
9.1	9R1										
10	100										
15	150										
18	180										
20	200										
22	220										
27	270										
33	330										
36	360										
39	390										
47	470										
56	560										
68	680										
82	820										
100	101										
120	121										
150	151										
180	181										
220	221										
270	271										
330	331										
390	391										
470	471										
560	561										
680	681										
820	821										
1000	102										
1200	122										
1500	152										
1800	182										
2200	222										
2700	272										
3300	332										
3900	392										
4700	472										
5600	562										
6800	682										
8200	822										

For voltages over 50V  
please see  
the MA high voltage series

Continues on next page...

VOLTAGE		25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
Cap 0.010	103										
(µF) 0.015	153										
0.018	183										
0.022	223										
0.027	273										
0.033	333										
0.039	393										
0.047	473										
0.056	563										
0.068	683										
0.082	823										
0.10	104										
0.12	124										
0.15	154										
0.18	184										
0.22	224										
0.27	274										
0.33	334										
0.39	394										
0.47	474										
0.56	564										
0.68	684										
0.82	824										
1.0	105										
1.2	125										
1.5	155										
1.8	185										
2.2	225										
3.3	335										
4.7	475										

For voltages over 50V  
please see  
the MA high voltage series

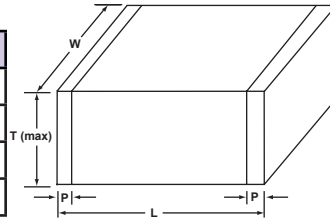


### MULTILAYER CERAMIC CHIP CAPACITORS

# 1206

RoHs Compliant

SIZE	6.3V ~50V	
(L) Length mm	3.2 ± 0.2	
(W) Width mm	1.6 ± 0.2	
(T) Thickness mm	1.80 max	
(P) Termination mm	0.25 ~ 0.85	



VOLTAGE		6.3					10					16				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP 220	221															
(pF) 270	271															
330	331															
390	391															
470	471															
560	561															
680	681															
820	821															
1000	102															
1200	122															
1500	152															
1800	182															
2200	222															
2700	272															
3300	332															
3900	392															
4700	472															
5600	562															
6800	682															
8200	822															
(µF) 0.010	103															
0.015	153															
0.018	183															
0.022	223															
0.027	273															
0.033	333															
0.039	393															
0.047	473															
0.056	563															
0.068	683															
0.082	823															
0.10	104															
0.12	124															
0.15	154															
0.18	184															
0.22	224															
0.27	274															
0.33	334															
0.39	394															
0.47	474															
0.56	564															
0.68	684															
0.82	824															
1.0	105															
1.2	125															
1.5	155															
1.8	185															
2.2	225															
3.3	335															
4.7	475															
5.6	565															
6.8	685															
10	106															
22	226															
33	336															
47	476															
56	566															
68	686															
82	826															
100	107															

For additional capacitance values and working voltages, please contact us.

VOLTAGE			25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
CAP	0.10	R10										
(pF)	0.22	R22										
	0.33	R33										
	0.47	R47										
	0.5	R50										
	5.6	R56										
	6.8	R68										
	8.2	R82										
	1.0	1R0										
	1.5	1R5										
	2.2	2R2										
	3.3	3R3										
	4.7	4R7										
	6.8	6R8										
	8.2	8R2										
	10	100										
	15	150										
	18	180										
	20	200										
	22	220										
	27	270										
	33	330										
	36	360										
	39	390										
	47	470										
	56	560										
	68	680										
	82	820										
	100	101										
	120	121										
	150	151										
	180	181										
	220	221										
	270	271										
	330	331										
	390	391										
	470	471										
	560	561										
	680	681										
	820	821										
	1000	102										
	1200	122										
	1500	152										
	1800	182										
	2200	222										
	2700	272										
	3300	332										
	3900	392										
	4700	472										
	5600	562										
	6800	682										
	8200	822										
(µF)	0.010	103										
	0.012	123										
	0.015	153										
	0.018	183										
	0.022	223										
	0.027	273										
	0.033	333										
	0.039	393										
	0.047	473										
	0.056	563										
	0.068	683										
	0.082	823										
	0.10	104										
	0.12	124										
	0.15	154										
	0.18	184										
	0.22	224										
	0.27	274										
	0.33	334										
	0.39	394										
	0.47	474										
	0.56	564										
	0.68	684										
	0.82	824										

For voltages over 50V  
 please see  
 the MA high voltage series

Continues on next page...

For additional capacitance values and working voltages, please contact us.



VOLTAGE		25				50					
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
Cap 1.0	105										
(µF) 1.2	125										
1.5	155										
1.8	185										
2.2	225										
3.3	335										
4.7	475										
6.8	685										
10	106										

For voltages over 50V  
please see  
the MA high voltage series

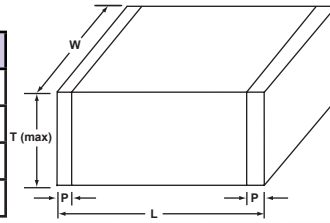


### MULTILAYER CERAMIC CHIP CAPACITORS

# 1210

RoHS Compliant

SIZE	6.3V ~50V	
(L) Length mm	3.2 ± 0.3	
(W) Width mm	2.5 ± 0.3	
(T) Thickness mm	2.70 max (X5R = 2.8 max)	
(P) Termination mm	0.6 ± 0.3	



VOLTAGE		6.3					10					16				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP	10	100														
	12	120														
	15	150														
	18	180														
	22	220														
	27	270														
	33	330														
	39	390														
	47	470														
	56	560														
	68	680														
	82	820														
	100	101														
	150	151														
	180	181														
	220	221														
	270	271														
	330	331														
	390	391														
	470	471														
	560	561														
	680	681														
	820	821														
	1000	102														
	1200	122														
	1500	152														
	1800	182														
	2200	222														
	2700	272														
	3300	332														
	3900	392														
	4700	472														
	5600	562														
	6800	682														
	8200	822														
(µF)	0.010	103														
	0.015	153														
	0.018	183														
	0.022	223														
	0.027	273														
	0.033	333														
	0.039	393														
	0.047	473														
	0.056	563														
	0.068	683														
	0.082	823														
	0.1	104														
	0.12	124														
	0.15	154														
	0.18	184														
	0.22	224														
	0.27	274														
	0.33	334														
	0.39	394														
	0.47	474														
	0.56	564														
	0.68	684														
	0.82	824														
	1.0	105														
	1.2	125														
	1.5	155														
	1.8	185														
	2.2	225														
	3.3	335														
	4.7	475														
	6.8	685														
	10	106														
	22	226														
	33	336														
	47	476														
	100	107														

For additional capacitance values and working voltages, please contact us.



VOLTAGE		25					35					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
(pF)	10	100														
	12	120														
	15	150														
	18	180														
	22	220														
	27	270														
	33	330														
	36	360														
	39	390														
	47	470														
	56	560														
	68	680														
	82	820														
	100	101														
	150	151														
	180	181														
	220	221														
	270	271														
	330	331														
	390	391														
	470	471														
	560	561														
	680	681														
	820	821														
	1000	102														
	1200	122														
	1500	152														
	1800	182														
	2200	222														
	2700	272														
	3300	332														
	3900	392														
	4700	472														
	5600	562														
	6800	682														
	8200	822														
(μF)	0.010	103														
	0.015	153														
	0.018	183														
	0.022	223														
	0.027	273														
	0.033	333														
	0.039	393														
	0.047	473														
	0.056	563														
	0.068	683														
	0.082	823														
	0.10	104														
	0.12	124														
	0.15	154														
	0.18	184														
	0.22	224														
	0.27	274														
	0.33	334														
	0.39	394														
	0.47	474														
	0.56	564														
	0.68	684														
	0.82	824														
	1.0	105														
	1.2	125														
	1.5	155														
	1.8	185														
	2.0	205														
	2.2	225														
	3.3	335														
	4.7	475														
	5.6	565														
	6.8	685														
	10	106														
	22	226														
	33	336														
	47	476														

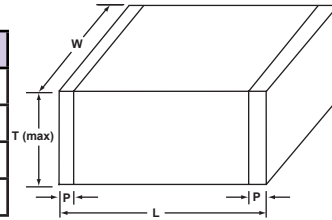


### MULTILAYER CERAMIC CHIP CAPACITORS

# 1812

RoHS Compliant

SIZE	6.3V ~50V	
(L) Length mm	4.5 ± 0.3	
(W) Width mm	3.2 ± 0.25	
(T) Thickness mm	1.80 max (X5R = 3.3 max)	
(P) Termination mm	0.25 ~ 0.76 (X5R = 0.25 ~ 1.50)	



VOLTAGE		6.3					10					16				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP	20	200														
(pF)	22	220														
	27	270														
	33	330														
	39	390														
	47	470														
	56	560														
	68	680														
	82	820														
	100	101														
	120	121														
	150	151														
	180	181														
	220	221														
	270	271														
	330	331														
	390	391														
	470	471														
	560	561														
	680	681														
	820	821														
	1000	102														
	1200	122														
	1500	152														
	1800	182														
	2200	222														
	2700	272														
	3300	332														
	3900	392														
	4700	472														
	5600	562														
	6800	682														
	8200	822														
(µF)	0.010	103														
	0.015	153														
	0.018	183														
	0.022	223														
	0.027	273														
	0.033	333														
	0.039	393														
	0.047	473														
	0.056	563														
	0.068	683														
	0.082	823														
	0.10	104														
	0.12	124														
	0.15	154														
	0.18	184														
	0.22	224														
	0.27	274														
	0.33	334														
	0.39	394														
	0.47	474														
	0.56	564														
	0.68	684														
	0.82	824														
	1.0	105														
	1.2	125														
	1.5	155														
	1.8	185														
	2.2	225														
	3.3	335														
	4.7	475														
	5.6	565														
	6.8	685														
	10	106														
	12	126														
	15	156														
	22	226														

For additional capacitance values and working voltages, please contact us.

VOLTAGE			25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
CAP	0.5											
(pF)	1.0	1R0										
	1.5	1R5										
	2.2	2R2										
	3.3	3R3										
	4.7	4R7										
	6.8	6R8										
	8.2	8R2										
	10	100										
	15	150										
	18	180										
	20	200										
	22	220										
	27	270										
	33	330										
	36	360										
	39	390										
	47	470										
	56	560										
	68	680										
	82	820										
	100	101										
	120	121										
	150	151										
	180	181										
	220	221										
	270	271										
	330	331										
	390	391										
	470	471										
	560	561										
	680	681										
	820	821										
	1000	102										
	1200	122										
	1500	152										
	1800	182										
	2200	222										
	2700	272										
	3300	332										
	3900	392										
	4700	472										
	5600	562										
	6800	682										
	8200	822										
(μF)	0.010	103										
	0.015	153										
	0.018	183										
	0.022	223										
	0.027	273										
	0.033	333										
	0.039	393										
	0.047	473										
	0.056	563										
	0.068	683										
	0.082	823										
	0.1	104										
	0.12	124										
	0.15	154										
	0.18	184										
	0.22	224										
	0.27	274										
	0.33	334										
	0.39	394										
	0.47	474										
	0.56	564										
	0.68	684										
	0.82	824										
	1.0	105										
	1.2	125										
	1.5	155										
	1.8	185										
	2.2	225										
	3.3	335										
	4.7	475										
	5.6	565										
	6.8	685										

For voltages over 50V  
 please see  
 the MA high voltage series

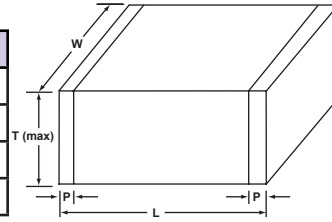


### MULTILAYER CERAMIC CHIP CAPACITORS

# 2220

RoHs Compliant

SIZE	6.3V ~50V	
(L) Length mm	5.7 ± 0.4	
(W) Width mm	5.0 ± 0.4	
(T) Thickness mm	COG, X7R, Z5U, Y5V = X5R = 2.8 max	
(P) Termination mm	COG, X7R, Z5U, Y5V = X5R = 0.25 ~1.03	



VOLTAGE		6.3					10					16				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP	100	101														
(pF)	120	121														
	150	151														
	180	181														
	220	221														
	270	271														
	330	331														
	390	391														
	470	471														
	560	561														
	680	681														
	820	821														
	1000	102														
	1200	122														
	1500	152														
	1800	182														
	2200	222														
	2700	272														
	3300	332														
	3900	392														
	4700	472														
	5600	562														
	6800	682														
	8200	822														
(µF)	0.010	103														
	0.015	153														
	0.018	183														
	0.022	223														
	0.027	273														
	0.033	333														
	0.039	393														
	0.047	473														
	0.056	563														
	0.068	683														
	0.082	823														
	0.10	104														
	0.12	124														
	0.15	154														
	0.18	184														
	0.22	224														
	0.27	274														
	0.33	334														
	0.39	394														
	0.47	474														
	0.56	564														
	0.68	684														
	0.82	824														
	1.0	105														
	1.2	125														
	1.5	155														
	1.8	185														
	2.2	225														
	3.3	335														
	4.7	475														
	5.6	565														
	6.8	685														
	10	106														
	18	186														
	22	226														
	27	276														
	33	336														
	39	396														
	47	476														

VOLTAGE			25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
(pF)	0.5	0R5										
	1.0	1R0										
	1.5	1R5										
	2.2	2R2										
	3.3	3R3										
	4.7	4R7										
	6.8	6R8										
	8.2	8R2										
	10	100										
	15	150										
	18	180										
	20	200										
	22	220										
	27	270										
	33	330										
	36	360										
	39	390										
	47	470										
	56	560										
	68	680										
82	820											
100	101											
120	121											
150	151											
180	181											
220	221											
270	271											
330	331											
390	391											
470	471											
560	561											
680	681											
820	821											
1000	102											
1200	122											
1500	152											
1800	182											
2200	222											
2700	272											
3300	332											
3900	392											
4700	472											
5600	562											
6800	682											
8200	822											
(µF)	0.010	103										
	0.015	153										
	0.018	183										
	0.022	223										
	0.027	273										
	0.033	333										
	0.039	393										
	0.047	473										
	0.056	563										
	0.068	683										
	0.082	823										
	0.10	104										
	0.12	124										
	0.15	154										
	0.18	184										
	0.22	224										
	0.27	274										
	0.33	334										
	0.39	394										
	0.47	474										
0.56	564											
0.68	684											
0.82	824											
1.0	105											
1.2	125											
1.5	155											
1.8	185											

For voltages over 50V  
 please see  
 the MA high voltage series

VOLTAGE		25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP	2.0	205									
(µF)	2.2	225									
	2.7	275									
	3.3	335									
	3.9	395									
	4.7	475									
	5.6	565									
	6.8	685									
	8.2	825									
	10	106									
	12	126									
	15	156									
	18	186									
	20	206									
	22	226									
	27	276									
	33	336									
	39	396									
	47	476									
	56	566									
	62	626									
	82	826									
	100	107									

For voltages over 50V  
 please see  
 the MA high voltage series

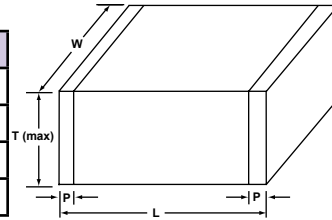


### MULTILAYER CERAMIC CHIP CAPACITORS

# 2225

RoHs Compliant

SIZE	6.3V ~50V	
(L) Length mm	5.7 ± 0.4	
(W) Width mm	6.35 ± 0.25	
(T) Thickness mm	1.80 max	
(P) Termination mm	0.25 ~ 1.02	



VOLTAGE		6.3					10					16				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V
CAP	100	101														
(pF)	120	121														
	150	151														
	180	181														
	220	221														
	270	271														
	330	331														
	390	391														
	470	471														
	560	561														
	680	681														
	820	821														
	1000	102														
	1200	122														
	1500	152														
	1800	182														
	2200	222														
	2700	272														
	3300	332														
	3900	392														
	4700	472														
	5600	562														
	6800	682														
	8200	822														
(µF)	0.010	103														
	0.015	153														
	0.018	183														
	0.022	223														
	0.027	273														
	0.033	333														
	0.039	393														
	0.047	473														
	0.056	563														
	0.068	683														
	0.082	823														
	0.1	104														
	0.12	124														
	0.15	154														
	0.18	184														
	0.22	224														
	0.27	274														
	0.33	334														
	0.39	394														
	0.47	474														
	0.56	564														
	0.68	684														
	0.82	824														
	1.0	105														
	1.2	125														
	1.5	155														
	1.8	185														
	2.2	225														
	3.3	335														
	3.9	395														
	4.7	475														
	5.6	565														
	6.8	685														
	8.2	825														
	10	106														
	12	126														
	15	156														
	18	186														
	22	226														
	33	336														
	39	396														

VOLTAGE			25					50				
Capacitance	CODE	COG	X5R	X7R	Z5U	Y5V	COG	X5R	X7R	Z5U	Y5V	
<b>CAP</b>	100	101										
<b>(pF)</b>	120	121										
	150	151										
	180	181										
	220	221										
	270	271										
	330	331										
	390	391										
	470	471										
	560	561										
	680	681										
	820	821										
	1000	102										
	1200	122										
	1500	152										
	1800	182										
	2200	222										
	2700	272										
	3300	332										
	3900	392										
	4700	472										
	5600	562										
	6800	682										
	8200	822										
<b>(µF)</b>	0.010	103										
	0.015	153										
	0.018	183										
	0.022	223										
	0.027	273										
	0.033	333										
	0.039	393										
	0.047	473										
	0.056	563										
	0.068	683										
	0.082	823										
	0.10	104										
	0.12	124										
	0.15	154										
	0.18	184										
	0.22	224										
	0.27	274										
	0.33	334										
	0.39	394										
	0.47	474										
	0.56	564										
	0.68	684										
	0.82	824										
	1.0	105										
	1.2	125										
	1.5	155										
	1.8	185										
	2.2	225										
	3.3	335										
	3.9	395										
	4.7	475										
	5.6	565										
	6.8	685										
	8.2	825										
	10	106										
	12	126										
	15	156										
	18	186										
	22	226										
	33	336										
	39	396										

For voltages over 50V  
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