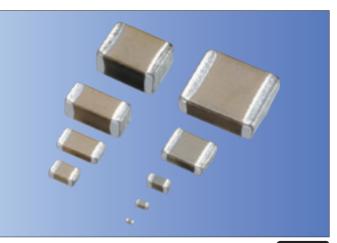
KYOCERa

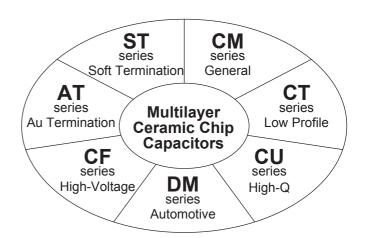
Kyocera's series of Multilayer Ceramic Chip Capacitors are designed to meet a wide variety of needs. We offer a complete range of products for both general and specialized applications, including CM series for generalpurpose, CT series for low profile, CU series for Hi-Q, DM series for automotive, CF series for high-voltage, AT series for Au termination, and ST series for soft termination.

Features

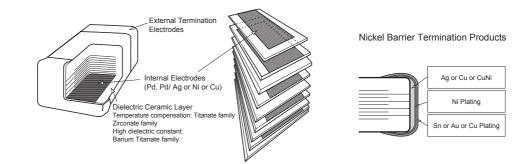
- We have factories worldwide in order to supply our global customer bases quickly and efficiently and to maintain our reputation as one of the highest–volume producers in the industry.
- All our products are highly reliable due to their monolithic structure of high-purity and superfine uniform ceramics and their integral internal electrodes.
- By combining superior manufacturing technology and materials with high dielectric constants, we produce extremely compact components with exceptional specifications.
- Our stringent quality control in every phase of production from material procurement to shipping ensures consistent manufacturing and super quality.
- Kyocera components are available in a wide choice of dimensions, temperature characteristics, rated voltages, and terminations to meet specific configurational requirements.



RoHS Compliant



Structure



Tape and Reel



Bulk Case



Please contact your local AVX, Kyocera sales office or distributor for specifications not covered in this catalog.

Our products are continually being improved. As a result, the capacitance range of each series is subject to change without notice. Please contact an sales representative to confirm compatibility with your application.



Kyocera Ceramic Chip Capacitors are available for different applications as classified below:

Series	Dielectric Options	Typical Applications	Features	Terminations	Available Size
СМ	C0G (NP0) X5R X7R *X6S X7S	General purpose	Wide cap range	Nickel barrier/ Tin	01005, 0201, 0402 0603, 0805, 1206 1210, 1812
СТ	X5R X7R	IC card (Decoupling)	Low profile	Nickel barrier/ Tin	0201, 0402, 0603 0805, 1206, 1210
си	COG (NPO)	Power amplifier	High-Q	Nickel barrier/ Tin	01005
DM	X7R	Automotive	Thermal shock Resistivity High reliability	Nickel barrier/ Tin	0603,0805,1206
CF	C0G (NP0) X7R	High voltage & Power circuits	High voltage 250VDC, 630VDC 1000VDC, 2000VDC 3000VDC, 4000VDC	Nickel barrier/ Tin	0805, 1206, 1210 1812, 2208, 1808 2220
AT	X5R X7R	Optical communications	Au termination	Nickel barrier/ Au	0201,0402
ST	X5R X7R X7S	PCB with severe bending conditions	Soft termination	Nickel barrier/ Tin (Soft Termination)	1206,1210

* Option

* Negative temperature coefficient dielectric types are available on request.



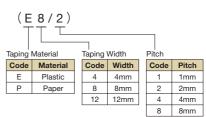


Dimensions

*Packaging Code

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p * P~P - *P*	

Dimensions and Packaging Quantities



Sec def <	Dime	Dimensions and Packaging Quantities											
102 1030 1030 104 0.14 <	Size					14/			Dmov	R to R min			
A 0.6 ¹⁰ 0.3 0.6 ¹⁰ 0.3 0.6 ¹⁰ 0.3 0.2 ¹⁰ 0.3 0.2 ¹⁰											40kp (E4/1)	φ330 Reel**	
A B B	02	0402	01005	A	0.4±0.02	0.2±0.02	0.2±0.02	0.07	0.14	0.13	20kp (P8/2)	- 150km (D9/1)	
B B Control Contro <thcontro< th=""> <thcontrol< th=""></thcontrol<></thcontro<>				A	0.6±0.02	0.2+0.02	0.22 max.	0.10	0.00	0.00	15kp (P8/2)	50kp (P8/2)	
053 051 050 <td></td> <td></td> <td></td> <td>в</td> <td>0.6±0.03</td> <td>0.3±0.03</td> <td>0.3±0.03</td> <td>0.10</td> <td>0.20</td> <td>0.20</td> <td>30kp (P8/1)</td> <td>150kp (P8/1)</td>				в	0.6±0.03	0.3±0.03	0.3±0.03	0.10	0.20	0.20	30kp (P8/1)	150kp (P8/1)	
0 0	03	0603	0201										
i i					0.6±0.05	0.3±0.05		0.13	0.23	0.19	15kp (P8/2)		
96 106 A 3 0.500.05 0.25 max. 0					0.6±0.09	0.3±0.09		0.10	0.20	0.20		-	
96 106 64 8 6 0.580,05 0.580,05 0.33 max, 0.35 max, 0.											20kp (P8/1)		
05 100 0 1000 0.5*0.05 0.33 max. 0.33 max. 0.33 max. 0.33 max. 0.35 max. 0.35 max. 0.5 max. 0													
Alt Alt <td></td> <td></td> <td></td> <td>В</td> <td></td> <td></td> <td>0.25 max.</td> <td></td> <td></td> <td></td> <td>10kp (P8/2)</td> <td>50kp (P8/2)</td>				В			0.25 max.				10kp (P8/2)	50kp (P8/2)	
05 100 0.012 100 0.010 0.010 0.010 0.010 0.000 0.010 0.000<				с	1.0±0.05	0.5±0.05	0.33 max.				20kp (P8/1) 10kp (P8/2)		
96 9402 9402 9402 9402 9402 9402 94044 9404 9404				D			0.35 max				20kp (P8/1)	100kp (P8/1)	
Mod Mode								-			10kp (P8/2) 20kp (P8/1)		
Part Part Part Part Part Part Part Part	05	1005	0402	E			0.5±0.05	0.15	0.35	0.30	10kp (P8/2)	50kp (P8/2)	
100 0.000 0				F			0.35 max.				20kp (P8/1)		
100 100 100 0.500				6	1.0±0.10	0.5±0.10	0.5+0.10	-			20kp (P8/1)		
100 100 100 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.000000 0.000000 0.0000000 0.0000000000000 0.0000000				G			0.5±0.10	-			10kp (P8/2)	30KP (F0/2)	
image: state in the s				н	1.0±0.15	0.5±0.15	0.5±0.15				10kp (P8/2)	50kp (P8/2)	
105 1068 0 1 dec 0.10 0.8±0.10 0.8±0.10 0.8±0.10 0.8±0.10 0.8±0.10 0.8±0.15 0.8±0.16<					1.0±0.20	0.5±0.20]			10kp (P8/2)	-	
105 168 1.650.10 0.850.10 0.850.10 0.850.10 0.850.10 0.850.10 0.850 max. 0.850 max. 0.850 max. 0.850 max. 0.860												- 10kp (P8/4)	
1668 0.663 C 1.6±0.15 0.8±0.15 0.8±0.15 0.20 0.60 0.55 0.840 0.20 0.60 0.840 0.840 0.840 0.840 0.840 0.840 0.840 0.840 0.840 0.840 0.840 0.840 0.860					1.6±0.10	0.8±0.10		1			8kp (P8/2)	20kp (P8/2)	
1608 0603 0 0 0.80 <th0.80< th=""> <th0.80< th=""> <th0.80< td="" th<=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td><td></td><td>4Kp (P8/4) 8kp (P8/2)</td><td></td></th0.80<></th0.80<></th0.80<>								-			4Kp (P8/4) 8kp (P8/2)		
21 2012 0.60 0.820.02 0.820.02 0.650 max. 0.650 max. 0.800.02 0.800	105	1608	0603	C	1 6+0 15	0.8+0.15	0.55 max.	0.20	0.60	0.50	4kp (P8/4)	10kp (P8/4)	
E E 1.6:0.20 F 0.8:0.20 0.8:0.20 0.55 max. 0.55 max. 0.8:0.20 0.55 max. 0.8:0.10 0.05:0.10 0.050 max. 0.8:0.10 0.050 max. 0.			0000	D		0.0_0110	0.8±0.15	0.20	0.00	0.00			
21 2012 0.65 0.00 0.830.20 0.830.20 0.830.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.840.20 0.850.10 0.950 max. 0.950 max. 0.950 max. 0.950 max. 0.950 max. 0.970 440p.(P8/4) 1.90p.(P8/4) 1.90p.(P8/4)<				F			0.55 max			-	8kp (P8/2)	20kp (P8/2)	
21 2012 0805 A B C C F 2.0±0.10 (D C C) 1.25±0.10 (D C) 0.55 max. (1.00 max. 1.050 100 (0.6±0.1) (0.5					1.6±0.20	0.8±0.20		-			4kp (P8/4)	10kp (P8/4)	
21 2012 0805 C 2.0±0.10 1.25±0.10 0.6±0.1 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.6±0.10 0.5±0.10 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±0.15 0.5±50.15 <t< td=""><td></td><td></td><td></td><td>Α</td><td></td><td></td><td>0.55 max.</td><td></td><td></td><td></td><td></td><td></td></t<>				Α			0.55 max.						
21 2012 0805 $ \begin{bmatrix} $								-			4kp (P8/4)		
21 2012 0605 F 0<				D	2.0±0.10	1.25±0.10	0.6±0.1				4kp (P8/4)	10kp (P8/4)	
2012 0603 G				0005					-			4kp (P8/4)	
316 125 1.25 0.35 max 1.15 0.35 max 44p (P8/4) 10kp (P8/4) <td>21</td> <td>2012</td> <td>0805</td> <td>G</td> <td></td> <td></td> <td>1.25±0.10</td> <td>0.20</td> <td>0.75</td> <td>0.70</td> <td>3kp (E8/4)</td> <td>10kp (E8/4)</td>	21	2012	0805	G			1.25±0.10	0.20	0.75	0.70	3kp (E8/4)	10kp (E8/4)	
316 K					2 0+0 15	1.25+0.15		-					
3216 1 1 2 0.00 1.25:0.20 0.05 max. 0.05					2.0±0.15	1.25±0.15	1.25±0.15	-		-	3kp (E8/4)	10kp (E8/4)	
316 3216 A B C D A B C A B C					2.0±0.20	1.25±0.20	0.95 max.]			4kp (P8/4)	10kp (P8/4)	
316 3216 3216 3210 3210.20 1.6±0.15 1.00 max. 1.15±0.10 1.25±0.10 1.6±0.15 0.30 1.6±0.16 0.85 1.40 4kp (P8/4) (P8/4) 3kp (E8/4) 10kp (E8/4) 3kp (E8/4) 3216 F -											4kp (P8/4)		
316 3216 1206 5.2±0.20 1.5±0.10 1.15±0.10 0.30 0.85 1.40 3kp (E8/4) 10kp (E8/4) 316 3.2±0.20 1.6±0.20 1.6±0.20 0.30 0.85 1.40 3kp (E8/4) 5kp (E8/4) 5kp (E8/4) 3kp]			4kp (P8/4)		
316 3216 1206 E					3.2±0.20	1.6±0.15				-	4Kp (E8/4) 3kp (E8/4)	10kp (E8/4) 10kp (E8/4)	
G H 3.2±0.20 1.6±0.20 0.95 max. 1.0±0.20 H 4kp (P8/4) 10kp (P8/4) J 3.2±0.30 1.6±0.20 1.6±0.20 2.5kp (E8/4) 2.5kp (E8/4) - K 3.2±0.30 1.6±0.30 1.6±0.30 0.50 0.70 1.90 2kp (E8/4) - K 3.2±0.35 1.6±0.30 1.6±0.30 0.50 0.70 1.90 2kp (E8/4) - K 3.2±0.35 1.6±0.30 1.6±0.30 0.50 0.70 1.90 2kp (E8/4) - K A 3.2±0.20 2.5±0.20 1.60 max. - <td></td> <td>0010</td> <td>1000</td> <td></td> <td></td> <td></td> <td>1.25±0.10</td> <td>0.30</td> <td>0.85</td> <td>1.40</td> <td>3kp (E8/4)</td> <td>10kp (E8/4)</td>		0010	1000				1.25±0.10	0.30	0.85	1.40	3kp (E8/4)	10kp (E8/4)	
H 3.2±0.20 1.6±0.20 1.00 max. 1.6±0.20 4kp (E8/4) 10kp (E8/4) K 3.2±0.30 1.6±0.30 0.50 0.70 1.90 2ksp (E8/4) K 3.2±0.35 1.6±0.30 0.6±0.30 0.50 0.70 1.90 2kp (E8/4) K A 1.6±0.30 0.50 0.70 1.90 2kp (E8/4) B A A 1.6±0.30 0.50 0.70 1.90 2kp (E8/4) B B A <td>316</td> <td>3216</td> <td>1206</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	316	3216	1206										
K 3.2±0.30 3.2±0.35 1.6±0.30 4 1.6±0.30 1.6±0.30 0.50 0.70 0.70 1.90 2kp (E8/4) 2kp (E8/4)				Н	3.2±0.20	1.6±0.20	1.00 max.	1			4kp (E8/4)	10kp (E8/4)	
A A 1.00.30 1.00.30 0.50 0.70 1.90 2kp (E8/4) 32 3225 1210 B A 1.00 max. 1.40 max. 4kp (E8/4) 10kp (E8/4) 10kp (E8/4) 32 3225 1210 D 3.2±0.20 2.5±0.20 1.60 max. 2.20 max. 2.20 max. 2.5±0.20 1.60 max. 2.5±0.20 1.60 max. 2.0±0.2 1.60 max. 0.15 0.85 2.60 2kp (E8/4) 5kp (E8/4) 5kp (E8/4) 42 4520 1808 A 4.5±0.20 2.0±0.20 1.6 max. 0.15 0.85 2.60 2kp (E12/4) - 43 4532 1812 C A 3.2±0.20 2.0±0.2 0.30 1.10 2.00 2kp (E12/4) - 2.0±0.2 2.5 max. 0.30 1.10 2.05 0.5kp (E12/8) - 1.5b<0.2					3.2±0.30	4.010.00		0.50	0.70	1.00	2.5Kp (E8/4) 2kp (E8/4)	5KP (E8/4) -	
32 3225 1210 B C 1.40 max. 1.60 max. 1.60 max. 3.2±0.20 2.5±0.20 1.6±0.15 0.30 1.00 1.40 2.5kp (E8/4) 5kp (E8/4) <td></td> <td></td> <td></td> <td>L</td> <td></td> <td>1.6±0.30</td> <td></td> <td>0.50</td> <td>0.70</td> <td>1.90</td> <td>2kp (E8/4)</td> <td>-</td>				L		1.6±0.30		0.50	0.70	1.90	2kp (E8/4)	-	
32 325 1210 C 3.2±0.20 2.5±0.20 1.60 max. 1.6±0.15 0.30 1.40 2.5kp (E8/4) 5kp (E8/4)								-					
E E 2.20 max. 2.0±0.2 2.20 max. 2.0±0.2 2.20 max. 2.5±0.2 2.60 max. 2.2 max. 2.60 max. 0.15 2.60 max. 0.85 2.60 max. 2.20 max. 2.60 max. 2.5 max. 2.60 max. 2.0±0.2 2.60 max. 2.5 max. 2.60 max. 0.30 2.60 max. 1.10 2.00 max. 2.5 max. 2.00 max. 0.5kp (E12/8)			10.5	С			1.60 max.	1			2.5kp (E8/4)	5kp (E8/4)	
F C 2.0±0.2 2.5±0.2 2.6±0.2 1kp (E8/4) 5kp (E8/4) 5kp (E8/4) 5kp (E8/4) 5kp (E8/4) 5kp (E8/4) 5kp (E8/4) 4kp (E8/4)	32	3225	1210		3.2±0.20	2.5±0.20		0.30	1.00	1.40			
42 4520 1808 A 4.5±0.20 2.0±0.20 1.6 max. 2.2 max. 0.15 0.85 2.60 2kp (E12/4) - 43 4532 1812 A B - 2.0 max. 0.15 0.85 2.60 2kp (E12/4) - 43 4532 1812 C - - 2.0 max. 2.0 max. - 1kp (E12/8) - 52 5720 2208 A 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/4) - 55 5750 2208 A 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 2.5kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) - 5				F			2.0±0.2	1			2kp (E8/4)	5kp (E8/4)	
42 432 1808 B 4.50.20 2.00.20 2.2 max. 0.13 0.63 2.00 2kp (E12/4) - 43 4532 1812 A A 2.00.20 2.0 max. 0.13 0.63 2.00 2kp (E12/4) - 43 4532 1812 C A A 3.2±0.20 2.0±0.2 2.0±0.2 2.0±0.2 0.30 1.10 2.00 1kp (E12/8) - 50 5750 2208 A 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) - 56 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) - 5750 2220 B												4kp (E8/4)	
A3 4532 1812 B 2.0±0.2 2.0±0.2 2.5 max. 0.30 1.10 1kp (E12/8) - 43 4532 1812 D 4.5±0.30 3.2±0.20 2.5 max. 0.30 1.10 2.00 0.5kp (E12/8) - 52 5720 2208 A 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) - 56 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) -	42	4520	1808	В	4.5±0.20	2.0±0.20	2.2 max.	0.15	0.85	2.60	2kp (E12/4)		
43 4532 1812 C 4.5±0.30 3.2±0.20 2.5 max. 2.5±0.2 0.30 1.10 2.00 0.5kp (E12/8) - 52 5720 2208 A 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) - 56 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) -								-					
B B B B C	43	1520	1810	С	1 5+0 30	3 2+0 20	2.5 max.	0.30	1 10	200	0.5kp (E12/8)		
F 2.8±0.2 0.5kp (E12/8) - 52 5720 2208 A 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/8) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.0 max. 0.30 1.40 2.50 1kp (E12/8) - 56 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) -	43	4002	1012		4.5±0.50	0.2-0.20		0.30	1.10	2.00			
52 5720 2208 A 5.7±0.40 2.0±0.20 2.2 max. 0.15 0.85 4.20 2kp (E12/4) - 55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 1kp (E12/8) - 56 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) -				F			2.8±0.2				0.5kp (E12/8)		
55 5750 2220 B 5.7±0.40 5.0±0.40 2.5 max. 0.30 1.40 2.50 0.5kp (E12/8) - C C 2.8 max. 0.30 1.40 2.5kp (E12/8) -	52	5720	2208		5.7±0.40	2.0±0.20		0.15	0.85	4.20	2kp (E12/4)		
C 2.8 max. 0.5kp (E12/8) -	55	5750	2220		5.7±0.40	5.0±0.40		0.30	1.40	2.50			
Note: Taping denotes the quantity packaged per reel (kn means 1000 nieces) * Please contact us				С			2.8 max.					-	

Note: Taping denotes the quantity packaged per reel (kp means 1000 pieces). * Please contact us.



KYOCERA PART NUMBER	CM	21	<u>X7R</u>	104	K	50	A <u>T</u>	
SERIES CODECM = General PurposeCF = High VoltageCT = Low ProfileAT = Au terminationCU = High-QST = Soft terminationDM = AutomotiveST = Soft termination								
SIZE CODESIZEEIA(JIS)SIZEEIA(JIS) $02 = 01005 (0402)$ $32 = 1210 (3225)$ $03 = 0201 (0603)$ $42 = 1808 (4520)$ $05 = 0402 (1005)$ $43 = 1812 (4532)$ $105 = 0603 (1608)$ $52 = 2208 (5720)$ $21 = 0805 (2012)$ $55 = 2220 (5750)$ $316 = 1206 (3216)$								
DIELECTRIC CODECODE EIA CODECG = C0G (NPO)X7S = X7S (Option)X5R = X5RX6S = X6S (Option)X7R = X7RNegative temperature coefficient dielectric types are available	ble on request.							
CAPACITANCE CODECapacitance expressed in pF.Two significant digits plus number of zeros.For Values < 10pF, Letter R denotes decimal point,								
TOLERANCE CODE $A = \pm 0.05 pF$ (option) $D = \pm 0.5 pF$ $K = \pm 10\%$ $B = \pm 0.1 pF$ $G = \pm 2\%$ (option) $M = \pm 20\%$ $C = \pm 0.25 pF$ $J = \pm 5\%$								
VOLTAGE CODE $04 = 4VDC$ $100 = 100VDC$ $1000 = 1$ $06 = 6.3VDC$ $250 = 250VDC$ $2000 = 2$ $10 = 10VDC$ $400 = 400VDC$ $3000 = 3$ $16 = 16VDC$ $630 = 630VDC$ $4000 = 4$ $25 = 25VDC$ $50 = 50VDC$	2000VDC 3000VDC							
TERMINATION CODE A = Nickel Barrier/ Tin *G = Nickel Barrier/ Au *K = Nickel Barrier/ Au G : AuSn solder and conductiv K : Wire bonding and conductiv		r/ Cu	S =	Nickel (Soft Te				
$\begin{array}{llllllllllllllllllllllllllllllllllll$	H = 7" Reel Tapin N = 13" Reel Tapin W = 13" Reel Tapin P = 7" Reel Tapin Carrier tape width 4 1 Applied for size 43	ng & 2n ng & 1n ng & 1n 4mm.	nm Cavit nm Cavit	y pitch y pitch				
OPTION								

Thickness max. value is indicated in CT series

EX. 125 \rightarrow 1.25mm max.

095 \rightarrow 0.95mm max.



Temperature Compensation Type

Code	ppm	n∕ °C	Temperature Range
CG	0	±30	–55 to 125°C
CH	0	±60	-55 10 125 0

Note: All parts of COG will be marked as "CG" but will conform to the above table.

Temperature coefficients are determined by calculation based on measurement at 20°C and 85°C.

High Dielectric Constant Type

EIA Dielectric	Temperature Range	∆C max.				
X5R	–55 to 85°C	±15%				
X7R	–55 to 125°C	15%				
X7S	–55 to 125°C	+22%				
*X6S	–55 to 105°C	±22 %				

* option

Available Tolerances

Dielectric materials, capacitance values and tolerances are available in the following combinations only:

EIA Dielectric	Tolerance	Capacitance
	* ³ A=±0.05pF	<0.5pF
	B=±0.1pF	≤5pF
	C=±0.25pF	*1 <10pF
C0G	D=±0.50pF	<10pr
	*3 G=±2%	>10 ~ Γ
	J=±5%	≥10pF
	K=±10%	E12 Series
*3 X6S X5R	*2 K=±10%	*4 E3 Series
X7S X7R	M=±20%	ES Series

Note:

*1 Nominal values below 10pF are available in the standard values of 0.5pF, 1.0pF, 1.5pF, 2.0pF, 3.0pF, 4.0pF, 5.0pF, 6.0pF, 7.0pF, 8.0pF, 9.0pF

*2 J = \pm 5% for X7R (X5R) is available on request.

*3 option

*4 E6 series is available on request.

E Standard Number

E3	E6	E12	E24 (C	Option)					
	1.0	1.0	1.0	1.1					
1.0	1.0	1.2	1.2	1.3					
1.0	1 6	1.5	1.5	1.6					
	1.5	1.8							
	2.2	2.2	2.2	2.4					
0.0	2.2	2.7	2.7 3.0						
2.2	2.2	3.3	3.3	3.6					
	3.3	3.9	3.9	4.3					
	47	4.7	4.7	5.1					
4 7	4.7	5.6	5.6	6.2					
4.7	6.9	6.8	6.8	7.5					
	6.8	8.2	8.2	9.1					



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Features

We offer a diverse product line ranging from ultra-compact (0.4×0.2mm) to large (4.5×3.2mm) components configured for a variety of temperature characteristics, rated voltages, and packages. We offer the choice and flexibility for almost any applications.

Temperature Compensation Dielectric

CM02 **CM03** Size **CM05** CM105 **CM21** (EIA Code) (01005) (0201) (0402) (0603) (0805) **C**∆*1 **C**∆*1 **C**∆*1 **C**∆*1 **C**∆*1 Temperature Rated Voltage (VDC) 16 25 50 50 50 16 25 50 R20 0.2 R50 0.5 1R0 1.0 1R5 1.5 2.0 3.0 4.0 4.0 5.0 6.0 7.0 8.0 9.0 10 12 15 в 100 120 Α в 18 22 27 33 39 47 56 68 82 100 120 150 180 220 270 101 121 Е 330 390 470 560 680 в 820 1000 1200 1500 1800 2200 2700 3300 4700 5600 6800 8200 10000 12000 15000 18000 102 E Е G 103 123

<Standard Capacitance Value>

E12 Series

Please contact for capacitance value other than standard.

*1: CG.CH

Alphabets in capacitance chart denote dimensions. Please refer to the below table for detail.

(Example) In case of "B" fo

case of "B" for CM03;	Size	Size	Dir	nension (m	ım)
L : 0.6±0.03mm W : 0.3±0.03mm	Size	Code	L	W	т
T : 0.3±0.03mm	02	Α	0.4±0.02	0.2±0.02	0.2±0.02
	03	В	0.6±0.03	0.3±0.03	0.3±0.03
	05	E	1.0±0.05	0.5±0.05	0.5±0.05
	105	В	1.6±0.10	0.8±0.10	0.8±0.10
	21	E	2.0±0.10	1.25±0.10	0.85±0.10
	21	G	2.0±0.10	1.25±0.10	1.25±0.10

Applications

This standard type is ideal for use in a wide range of applications, from commercial to industrial equipment.



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X5R Dielectric

(EIA	Size A Code)	(0	CM02	2 5)		CN (02	103 :01)				CM05 (0402	5				CM (06	105 03)					CN (08	/121 805)		
	Voltage (VDC)	6.3	10	16	6.3	10	16	25	4	6.3	10	16	25	4	6.3	10	16	25	50	4	6.3	10	16	25	50
101	acitance (pF)																								
151	150		-																						<u> </u>
101	220 330																								
	470 680																								
102 152	<u>1000</u> 1500		A8	A8			_	B3																	<u> </u>
152	2200 3300						вз																		
103	4700 6800 10000					B4																			
153	15000 22000 33000	A8											=												
104	47000 68000 100000				B7	B7						E3	- E3 -					вз	B1						G1
	220000 470000	A8			B8 C8					E5 [17]	E8 E8	E8				B4	В3	D8						G3	G8
105	1000000 2200000				C8	D9	D10		1001	k///A	E8	E8	G7		DE		80						G3		G8
106	4700000 10000000				1081	1.091			G8 H10	E8 H8		K8			B5 D5 D8	B8 D8	B8				G5 M5	G4 M8	K8 M8	М8	
107	22000000 47000000 100000000																			M7					

Size (EIA Code)				316 06)						132 10)			CN (18	143 (12)
Rated Voltage (VDC) Capacitance (pF)	6.3	10	16	25	50	100	4	6.3	10	16	25	50	6.3	50
220000 470000 105 1000000						J3					B3	F1		
2200000 4700000 106 10000000	F5	F4	F3	F3 J8	[J3]				F4	C3 G3	F3 G3 G8	G3		D1
22000000 47000000 107 100000000	J5	J8	J 8				G5	G5	G4	63	68		F5	

Dimension (mm)

<Standard Capacitance Value>

Two digits alphanumerics in capacitance chart denote dimensions and tan $\delta.$ Please refer to the below table for detail.

(Example)

In case of "B2" for CM03; Size Code

L : 0.6±0.03mm W : 0.3±0.03mm T : 0.3±0.03mm

Tan δ : 3.5% max.

Size	Code	L	W	т
02	Α	0.4±0.02	0.2±0.02	0.2±0.02
	В	0.6±0.03	0.3±0.03	0.3±0.03
03	С	0.6±0.05	0.3±0.05	0.3±0.05
	D	0.6±0.09	0.3±0.09	0.3±0.09
	Е	1.0±0.05	0.5±0.05	0.5±0.05
05	G	1.0±0.10	0.5±0.10	0.5±0.10
05	Н	1.0±0.15	0.5±0.15	0.5±0.15
	К	1.0±0.20	0.5±0.20	0.5±0.20
105	В	1.6±0.10	0.8±0.10	0.8±0.10
105	D	1.6±0.15	0.8±0.15	0.8±0.15
	G	2.0±0.10	1.25±0.10	1.25±0.10
21	К	2.0±0.15	1.25±0.15	1.25±0.15
	М	2.0±0.20	1.25±0.20	1.25±0.20

Size	Size	Dir	nension (m	nm)	Tan δ	Tan δ
Size	Code	L	W	Т	Code	Idii 0
	D	3.2±0.20	1.6±0.15	1.15±0.10	1	2.5% max.
316	F	3.2±0.20	1.6±0.15	1.6±0.15	2	3.5% max.
310	J	3.2±0.20	1.6±0.20	1.6±0.20	3	5.0% max.
	К	3.2±0.30	1.6±0.30	1.6±0.30	4	7.0% max.
	В	3.2±0.20	2.5±0.20	1.40 max.	5	7.5% max.
32	С	3.2±0.20	2.5±0.20	1.60 max.	7	10.0% max.
52	F	3.2±0.20	2.5±0.20	2.0±0.2	8	12.5% max.
	G	3.2±0.20	2.5±0.20	2.5±0.2	9	15.0% max.
40	D	4.5±0.30	3.2±0.20	2.5±0.2	10	20.0% max.
43	F	4.5±0.30	3.2±0.20	2.8±0.2		



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X7R Dielectric

	Size A Code)	CM02 (01005)		CM03 (0201)			105 :02)			CM105 (0603)					CM21 (0805)		
	Voltage (VDC) citance (pF)	16	10	16	25	16	25	6.3	10	16	25	50	6.3	10	16	25	50
101	100																
151	150 220 330			B2	B2												
102	470 680 1000	A8		BZ													
152	1500 2200 3300																
103	4700 6800 10000		B3 —				E3										
153	15000 22000 33000					E2											
104	47000 68000 100000					E8	E8		B3	B2	B2	B1				G2	G1
105	220000 470000 1000000								B8	B8	D8			G3	G2 G8	G8	[M3]
106	2200000 4700000 10000000 22000000							D8					M8	M8 M8	M8	M8	

Size (EIA Cod	le)	CM316 (1206)							CM32 (1210)				143 12)
Rated Voltage (V Capacitance (- 63	10	16	25	50	100	10	16	25	50	100	50	100
	000					<u>D1</u> F1							
	000 000 000		D2	F2					B2	B1 F1	G1	B1	D1
2200 4700 106 10000 22000	000	F3 J8 J5	J8	J8 J3	J3]	<u>J</u> 3	G8	G2 G8	F2 G8	G3		D1	

Optional Spec.

<Standard Capacitance Value> CM21 size and smaller : E6 Series

CM316 size and larger / capacitance value of $0.1 \mu F$ and larger : E3 Series Please contact for capacitance value other than standard.

Two digits alphanumerics in capacitance chart denote dimensions and tan δ . Please refer to the below table for detail.

(Example)

In case of "B3" for CM03; L : 0.6±0.03mm W : 0.3±0.03mm T : 0.3±0.03mm

Tan δ : 5.0% max.

Size	Size	Dimension (mm)							
Size	Code	L	W	т					
02	Α	0.4±0.02	0.2±0.02	0.2±0.02					
03	В	0.6±0.03	0.3±0.03	0.3±0.03					
05	E	1.0±0.05	0.5±0.05	0.5±0.05					
105	В	1.6±0.10	0.8±0.10	0.8±0.10					
105	D	1.6±0.15	0.8±0.15	0.8±0.15					
21	G	2.0±0.10	1.25±0.10	1.25±0.10					
	М	2.0±0.20	1.25±0.20	1.25±0.20					

Size	Size	Din	nension (m	nm)
Size	Code	L	W	т
	Α	3.2±0.20	1.6±0.15	0.85±0.10
316	D	3.2±0.20	1.6±0.15	1.15±0.10
	F	3.2±0.20	1.6±0.15	1.6±0.15
	J	3.2±0.20	1.6±0.20	1.6±0.20
	К	3.2±0.30	1.6±0.30	1.6±0.30
	В	3.2±0.20	2.5±0.20	1.40 max.
32	F	3.2±0.20	2.5±0.20	2.0±0.2
	G	3.2±0.20	2.5±0.20	2.5±0.2
43	В	4.5±0.30	3.2±0.20	2.0±0.2
	D	4.5±0.30	3.2±0.20	2.5±0.2

Tan δ Code	Tan δ
1	2.5% max.
2	3.5% max.
3	5.0% max.
5	7.5% max.
8	12.5% max.

X7S Dielectric

Size CM316		Siz		Size	Dimension (mm)				
(EIA Code)	(1206)	512		Code	I	L	W	Т	
Rated Voltage (VDC)	100	31	6	K	3.2±	0.30	1.6±0.30	1.6±0.30	
Capacitance (pF)									
47000			-						
104 100000		Tar	ıδ	_	0				
220000		Co	da	Tan	0				
470000		00	ue						
105 1000000		3	,	5.0% ו	mov				
2200000		3		J.0 70 I	nax.				
4700000	🛛 кз 🖉								
106 1000000									
22000000									

Two digits alphanumerics in capacitance chart denote dimensions and tan $\delta.$ Please refer to the below table for detail.



Test Conditions and Specifications for Temperature Compensation Type (CA Characteristics) CM/ CT/ CU/ CF Series

Local prime statution Local prime statution Local prime statution Insulation Resistance (III) Measured after the rated voltage is applied for 1 minute at room ambient. The charge and attacharge current of the capacitor must not exceed 30mA. Over 10000M2 or 500M2 - µF, whichever is less Dielectric Resistance Minit of exceed 30mA. No problem observed Appearance Microscope No problem observed Appearance Microscope No problem observed Microscope No problem observed Vibration Gase space yPCB: Fulcrum spacing 90mm, duration in 0 seconds and place in room ambient, and masse size 300 (SN) to a PCB- mounted sample. Apply 2N for 0201, and 1N for Oto Size. Appearance Gase space yPCB: Fulcrum spacing 90mm, duration in 0 seconds and place in room ambient, and measure whith standing Appearance Appearance Acc Appearance Appearance Acc Appearance Coder Appearance Coder Appearance Coder in respective (Smin.) - Packing condition: Solder ability Sider coverage : 90% min. Solder ability Sider coverage : 90% min. Solder ability Sider coverage : 90% min. The charge and discharge current of the capacitor whith act oppearance interperature (Smin.) - Pace and and bace in room ambient, and measurement. Appearance Appearance Appearan	Test	Items		Test Co	ondition	s	Specifications		
Deleter: C=1000pt (1.04±1710%) 0.5 to 50ms (2.00pt) 0:50pt (2.00pt) 0:50pt (2.00pt) 0:50p	Capacitance V	/alue (C)	Capacita	nce Frea	uencv	Volt	Within tolerance		
Insulation Resistance (RR) minute at room ambient. The rade votage of over F30V, apply 500V for 1 minute at room ambient. The rade votage of over F30V, apply 500V for 1 minute at room ambient. The rade votage of over F30V, apply 500V for 1 minute at room ambient. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due made votage for 1 to 5 seconds. Apply 1 5 mem due votage for 1 to 5 seconds. No problem observed No problem observed Residence 1 Company Apply 2 votage for 1 to 55 (Hz) Votation fragework; 10 to 56 (Hz) Votation fragework; 10 to 50 (Hz) Votage for 2000 (Company) Family 2 seconds. No problem observed Soldering Resistance Particity Appearance Votation fragework and place in non ambient, and memory fame 242 hours. (Frage for 2000 (Company) fragework and place in non ambient, and memory fame 242 hours. (Frage for 2000 (Company) fragework and place in non ambient, and memory fame 242 hours. (Frage for 2000 (Company) fragework and place in non ambient, and memory fame 242 hours. (Frage for 2000 (Company) fragework and place in non ambient, and memory fame 242 hours. (Frage for 2000 (Company) fragework and place in non ambient, and memory fame 242 hours.	Q		C≤1000	pF 1MHz	z±10%				
Apperate Apper 1: 3 imme when the rade voltage is 2007 ore. The charge and discharge current of the capacitor in the rade voltage is 2007 ore. The charge and discharge current of the capacitor in the rade voltage is 2007 ore. Apperate No problem observed Apperate Microscope No problem observed Termination Strength Microscope No significant damage at 1mm bent into 10 seconds. No significant damage at 1mm bent into 10 seconds. Vibration frequency: 10 to 55 (Hz) Microscope Mos significant damage at 1mm bent into 10 seconds. No significant damage at 1mm bent into 10 seconds. Vibration frequency: 10 to 55 (Hz) Microscope Mos problem observed No problem observed Soldering Resistence Apperate Soak the sample in 200°C5C colder for 100:5 20 seconds and place in room ambent, at measure atter 244 hours. No problem observed Soldering Resistence Apperate Soak the sample in 200°C5C colder for 100:5 2 to 100°C c 2 minutes 2 to 100°C c 2 455 5°C colder or 100°CM2 + µE whichever is larger Soldering Resist without problem Soaking condition - 2 to 205 for 100°CM2 + µE whichever is larger Soaking condition 2 to exceed Som A for IR and withstanding voltage measurement. No problem observed Soaking condition 3 to exceed Som A for IR and withstanding voltage measurement. No problem obser	Insulation Res	istance (IR)	minute at ro For the rated for 1 minute The charge a	om ambient. d voltage of o at room amb and discharg	over 630' bient.	V, apply 500V	Over 10000M Ω or 500M Ω + μF , whichever is less		
Apply a sideward force of 500g (5k) to a PCB- mounted sample. Apply 2k for 6201, and 1 k for 1005 size. No problem observed Bending Strength Glass epoxy PCE: Fulcrum spacing: 90 mm, duration in to 10 seconds. No significant damage at 1 mm bent Withration Appearance AC Vbration frequency: 10 to 55 (Hz) Amplitude: 1.5mm Sweeping condition: 10→55→10H2/1 minute in X. No significant damage at 1 mm bent Appearance Resistance Appearance AC Vbration frequency: 10 to 55 (Hz) Amplitude: 1.5mm Sweeping condition: 10→55→10H2/1 minute in X. No problem observed Appearance Resistance Appearance AC Soak the sample in 280°C15°C solder for 1020.5 No sociol and place in room ambient, and measure after 24H2 hous: The change and discharge current of the capacitor must not exceed 50mA for IR and withstanding Voltage No problem observed Solderability Soaking condition Solder 230°C 2100°C 2 minutes 2 105 to 200°C 2 minutes 3 100 ta withstanding Voltage No problem observed Solderability Soaking condition Solderability Solder coverage : 90% min. No problem observed Within 12.5% or 10.250F, whichever is larger Cooper : 0.2400+20C No problem observed No problem observed Within 12.5% or 10.250F, whichever is larger Cooper : 0.2400+20C No probl	Dielectric Res	istance	Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor			ge is 250V or over. ge is 630V or over.	No problem observed		
Termination Site mpt mounted sample. Apply 2N for 0201, and 1N for 0000 5ize. No problem observed Bending Structure Glase encoup PCB: Fulcrum spacing: 90mm, duration time 10 acconds. No problem observed Vibration frequency: 10 to 55 (H2) AC Appearance No problem observed AC Appearance No problem observed Vibration frequency: 10 to 55 (H2) AC Appearance No problem observed Appearance Sout be sample in 200° (CS)°C solder for 100.5 AC No problem observed Appearance Sout be sample in 200° (CS)°C solder for 100.5 AC No problem observed Appearance Sout be sample in 200° (CS)°C solder for 100.5 No problem observed No problem observed Appearance Sout bo 100° (C Yminutes 200° (C) No problem observed Solderability The charge and discharge current of the capacity voltage Solder Coverage : 90% min. Solderability Sondag condition: Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Sondag condition temperature (Rmin.)-> Lowest operation t	Appearance		Microscope				No problem observed		
Head and Strength time 10 seconds. No significant damage at timin bent Vibration Appearance Wibration frequency: 10 to 55 (H2) No problem observed AC Mapilude: 1.5mm Sweeping condition: 10 + 55 - 10Hz/1 minute in X, Q No problem observed Soldering Heat Appearance South fes ample in 80°C57C souther for 10Hz/1 seconds and place in room ambient, and measure that P425 hours. No problem observed Resistance Acc Temperature 180 to 100 ^{-C} 2 minutes No problem observed Resistance Souther sample and discharge current voltage measurement. Time to second and place in room ambient, and measure that P425 hours. No problem observed Solderability Socking conditions The charge and discharge current to second and place in room ambient, and withstanding voltage measurement. Solder 2 stricts Solder coverage : 90% min. Solderability Soaking condition Solder 2 stricts Solder 2 stricts Solder 2 stricts Reom temperature (3min) → Room temperature (3min) → Highest operation temperature (30min) → Highest operation temperature (30min) → Highest operation temperature (30min) → Room temperature (3min) → Highest operation temperature (30min) → Highest operation temperature (30min) → Room temperature (3min) → Lowest operation temperature (30min) → Highest operation temperature (30min) → Highest operation temperature (Termination S	trength	mounted sa		. .	,	No problem observed		
Ac Amplitude: 1.5mm Sweeping condition: 10-45610Hz/1 minute in X Y and Z Within Tolerance Soldering Heat Resistance Appearance AC Sold the sample in 260°C:5°C solder for 10:0.5 seconds and place in room amblent, and measure after 24:2 hours. No problem observed Minimized for the sample in 260°C:5°C solder for 10:0.5 marce 34:2 hours. No problem observed Minimized for the sample in 260°C:5°C solder for 10:0.5 seconds and place in room amblent, and measure after 24:2 hours. No problem observed Mithin 32.5% or ±0.25pF, whichever is larger Temperature (3min.)-7 must not exceed 50mA for IR and withstanding voltage measurement. No problem observed Solderability Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Minimized for the sample in the sample at the game. No problem observed Votage Acc Room temperature (3min.)-+ Lowest operation temperature (30min.)- IR No problem observed Mithin 12.5% or ±0.25pF, whichever is larger Ca30pf : C2:1000 C:30pf : C2:100 C:30pf : C2:1000 C:30pf : C2:100 C:30pf : C2:100 C:30pf : C2:100 C:30	Bending Stren	igth			m spacinę	g: 90mm, duration	No significant damage at 1mm bent		
ΔC Sweeping condition: 10→55→10Hz/1 minute in X Within logrance Q Y and Z Decitions: 2 hours each, 6 hours total. C30pf: Q>1000 Soldering Heat Resistance Appearance Sok the sample in 260°C±5°C solder for 10±0.5 No problem observed Q Pro-heating conditions) C30pf: Q>400+20C Within 12.5% or 10.25pf, whichever is larger Q Pro-heating conditions) C30pf: Q>400+20C C30pf: Q>400+20C Vortage Order Temperature Time C30pf: Q>400+20C Vortage Order Temperature Time C30pf: Q>400+20C Vortage The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. Solder coverage : 90% min. Solderability Solder coverage: 500* 12 4515°C 310.5 Sec. Sr63 Solder Solder coverage : 90% min. Temperature Cycle Appearance AC Cycle No problem observed Mithin 12.5% or 10.25pf, whichever is larger Cycle No problem observed Vithin 22.5% or 10.000 C-30pf: Q=2000 C-30pf: Q=200 C-30pf: Q=200 Core Ac After 5 cycles, measurement.	Vibration	Appearance			to 55 (Hz))	No problem observed		
Q Y and Z Directions: 2 hours each, 6 hours total. Directions: 2 hours each, 6 hours total. Soldering Heat Resistance C:30pF: Q:21000 (::Q:40P:Q:QC) AC Solder in room ambient, and measur after 24:2 hours. C:30pF: Q:21000 (::Q:30pF: Q:21000) Q Tere heating conditions) C:30pF: Q:21000 (::Q:30pF: Q:21000) Vithin ±2.5% or ±0.25pF, whichever is larger C:30pF: Q:21000 (::Q:30pF: Q:21000) Vithin ±2.5% or ±0.25pF, whichever is less Tere heating conditions) C:30pF: Q:21000 Vithin ±2.5% or ±0.25pF, whichever is less Tere heating conditions) C:30pF: Q:21000 Vithin ±2.5% or ±0.25pF, whichever is less Tere heating conditions) Period is to ±00°C 2 minutes Solderability Solder orderability Solder 2455°C 3±0.5 sec. Solds or ±0.25pF, whichever is less Period is to ±00°C 2 minutes Solderability Appearance AC Cycle No problem observed Within ±2.5% or ±0.25pF, whichever is larger C:230pF: Q:21000 C:30pF: Q:21000 Could memperature (3min.) → Room temperature (3m	lest	ΔC			→55→10I	Hz/ 1 minute in X.	Within Tolerance		
Act Ac Ac AC Ac ater 24/2 hours. Within ±2.5% or ±0.25pF, whichever is larger Ac Ac Ac Within ±2.5% or ±0.25pF, whichever is larger Ac Ac Ac Within ±2.5% or ±0.25pF, whichever is larger Ac Ac Ac Ac Withstanding The charge and discharge current of the capacitor must not exceed 50m.A for IR and withstanding voltage measurement. Solder coverage : 90% min. Solderabity Solder 23±5°C 3±0.5 sec. Solder coverage Ac Ac Ac Ac Ac Ac Ac		Q	Y and Z						
AC after 242 hours. (Pre-heating conditions) Within 12.5% or 10.25pF, whichever is larger Q If R If	Soldering	Appearance							
Image: Product of the standard of the	Resistance	ΔC			om ambie	ent, and measure	Within $\pm 2.5\%$ or $\pm 0.25pF$, whichever is larger		
IR Differ Propretative Differ Propretative Differ <		Q	(Pre-heating	conditions)					
2 150 to 200°C 2 minutes Withstanding Voltage The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. Resist without problem Solderability Soaking condition Solder 235±5°C 3±0.5 sec. Solder coverage : 90% min. Solderability Appearance Cycle (Cycle) No problem observed Mithestanding Voltage Appearance (Cycle) No problem observed Within ±2.5% or ±0.25pF; whichever is larger C≥30pF : Q≥1000 C<30pF : Q≥1000 Load Humidity Test (Except CF Series) Appearance Apperature Q After applying rated voltage for 500+12/ −0 hours in pre-condition at 40°C42°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. The charge and discharge current of the capacitor measure the sample after 74±2 hours, Apply 1.5 times when the rated voltage is 2500 or over, The charge and discharge current of the capacitor The charge and dischare current of the capacitor The charge and di							· · ·		
Withstanding Voltage The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. Resist without problem Solderability Solder 235±5°C 3±0.5 sec. Sn63 Solder Solder coverage : 90% min. Solderability Solder 235±5°C 2±0.5 sec. Solder coverage : 90% min. Temperature Cycle Appearance AC (Cycle) No problem observed AC Room temperature (3min.)-→ Room temperature (3min.)-→ Room temperature (3min.)> No problem observed Withstanding Voltage After 5 cycles, measure after 24±2 hours. No problem observed IR Highest operation temperature (30min.)> Room temperature of 00000 Ω or 500MΩ • μF, whichever is less Load Humidity Test Appearance After applying rated voltage for 500+12/ - 0 hours in com temperature of 000-220C, humidity 90 to 59%RH, allow parts to stabilize for 24±2 hours, at room temperature of 000-220C, humidity 90 to 59%RH, allow parts to stabilize for 24±2 hours, at room temperature of 125±3°C for 1000+12/ - 0 hours, measure the sample after 24±2 hours, Apply 1.5 times when the rated voltage is 2500 or over, Apply 1.5 times when the		IK					Over Tuuuumsz or Suumsz • µF whichever is less		
Solderability massage 0.5Cu 245±5°C 3±0.5 sec. Solder coverage : 90% min. Temperature Cycle Appearance (Cycle) No problem observed No problem observed AC Room temperature (3min,)-> Lowest operation temperature (30min,)-> Room temperature (30min,)-> Room temperature (30min,)-> No problem observed C≥30pF : Q≥1000 C<30pF : Q≥1000 C<30pF : Q≥1000			The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding				Resist without problem		
ΔC ΔC Boom temperature (3min.)→ Within ±2.5% or ±0.25pF, whichever is larger Q Cowest operation temperature (30min.)→ C≥30pF : Q≥1000 C≥30pF : Q≥400±20C IR Highest operation temperature(30min.)→ After 5 cycles, measure after 24±2 hours. Over 10000MΩ or 500MΩ • μF, whichever is less Withstanding Voltage After 5 cycles, measure after 24±2 hours. Resist without problem Load Appearance After applying rated voltage for 500+12/ -0 hours in pre-condition at 40°C±2°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. No problem observed Vithin ±7.5% or ±0.75pF, whichever is larger C≥30pF : Q≥200 C <stop 3<="" :="" f="" q≥100+10c="" td=""> Over 500MΩ or 25MΩ • μF, whichever is larger C≥30pF : Q≥200 C<30pF : Q≥200</stop>	Solderablity		Soaking condition Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec.			Solder coverage : 90% min.			
ΔC Room temperature (3min.)→ Within ±2.5% or ±0.25pF, Whichever is larger Q Room temperature (3min.)→ C≥30pF : Q≥1000 IR Highest operation temperature (30min.)→ C<30pF : Q≥400+20C IR After 5 cycles, measure after 24±2 hours. Over 10000MΩ or 500MΩ • μF, whichever is less Voltage After 5 cycles, measure after 24±2 hours. Resist without problem Voltage After applying rated voltage for 500+12/ -0 hours, not exceed 50mA for IR and withstanding voltage measurement. No problem observed Humidity ΔC S% RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. No problem observed Within ±7.5% or ±0.75pF, whichever is larger C≥30pF : Q≥200 C<30pF : Q≥200 C The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. No problem observed High- Temperature full After applying twice the rated voltage at the temperature of 125±3°C for 1000-12/ -0 hours, measure the sample after 24±2 hours. No problem observed. Within ±3% or ±0.3pF, whichever is larger C≥30pF : Q≥200 C<30pF : Q≥200 C C C Soff : Q≥100+10C/3 Over 500MΩ or ±0.3pF, whichever is larger C≥30pF : Q≥350 No problem observed. Within ±3% or ±0.3pF, whichever	Temperature	Appearance	(Cycle)				No problem observed		
QLowest operation temperature (30min.) → Room temperature (30min.) → Room temperature (30min.) → Highest operation temperature (30min.) → After 5 cycles, measure after 24±2 hours. The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.C≥30pF : Q≥1000 C<30pF : Q≥400+20CLoad Humidity Test (Except CFF Series)Appearance aAfter applying rated voltage for 500+12/ -0 hours in pre-condition at 40°C±2°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at nom temperature before measurement.No problem observedLoad Humidity Test (Except CFF Series)Appearance aAfter applying twice the rated voltage at the temperature of 125±3°C for 1000+12/ -0 hours, measure the sample after 24±2 hours, Apply 1.5 times when the rated voltage is 630V or over, The charge and discharge current of the capacitor measure the sample after 24±2 hours, Apply 1.5 times when the rated voltage is 630V or over, The charge and discharge current of the capacitor measure the sample after 24±2 hours, Apply 1.5 times when the rated voltage is 630V or over, The charge and discharge current of the capacitor measure the sample after 24±2 hours, Apply 1.5 times when the rated voltage is 630V or over, The charge and discharge current of the capacitor measure the sample after 24±2 hours. Apply 1.5 times when the rated voltage is 630V or over, The charge and discharge current of the capacitor measure the sample after 24±2 hours. Apply 1.5 times when the rated voltage is 630V or over, The charge and discharge current of the capacitor to pre-	Cycle	ΔC	Room tempe	erature (3mir	1.)→		Within $\pm 2.5\%$ or $\pm 0.25pF$, whichever is larger		
In After 5 cycles, measure after 24±2 hours. After 5 cycles, measure after 24±2 hours. Resist without problem Load Appearance Humidity Test (Except CF Series) After applying rated voltage for 500+12/ –0 hours in pre-condition at 40°C±2°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. No problem observed Q The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. No problem observed High- Temperature with Loading After applying twice the rated voltage at the temperature to 125±3°C for 1000+12/ –0 hours, measure the sample after 24±2 hours. No problem observed Q After applying twice the rated voltage at the temperature of 125±3°C for 1000+12/ –0 hours, measure the sample after 24±2 hours. No problem observed. Q After applying twice the rated voltage at the temperature of 125±3°C for 1000+12/ –0 hours, measure the sample after 24±2 hours. No problem observed. Q After applying twice the rated voltage is 250V or over. Apply 1.5 times when the rated voltage is 630V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor No problem observed. C≥30pF : Q≥205 C≥30pF : Q≥205 C≥30pF : Q≥205 10pF <c-30pf :="" q≥200+10c<="" td=""> C<30pF : Q≥200+10C</c-30pf>		Q	Lowest oper Room tempe	ration tempe erature (3mir	erature (30 n.)→				
Withstanding VoltageThe charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.Resist without problemLoad Humidity Test (Except CF Series)Appearance ΔCAfter applying rated voltage for 500+12/ -0 hours in pre-condition at 40°C±2°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. The charge and discharge current of the capacitor or temperature before measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.No problem observedHigh- Temperature with LoadingAppearance ΔCAfter applying twice the rated voltage at the temperature of 125±3°C for 1000+12/ -0 hours. Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor The charge and discharge current of the capacitorNo problem observed.Vithin ±3% or ±0.3pF; Q≥206; C<30pF : Q≥2075+5C/2 C<10pF : Q≥200+10C		IR	Highest ope	ration tempe	erature(30	Omin.)	Over 10000M\Omega or 500M\Omega • $\mu\text{F},$ whichever is less		
Humidity Test (Except CF Series) ΔC in pre-condition at 40°C±2°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. Within ±7.5% or ±0.75pF, whichever is larger C≥30pF : Q≥200 C<30pF : Q≥100+10C/3 C IR Mpearance After applying twice the rated voltage at the temperature of 125±3°C for 1000+12/ -0 hours, measure the sample after 24±2 hours. No problem observed. Within ±3% or ±0.3pF, whichever is larger C≥30pF : Q≥200 C<30pF : Q≥100+10C/3 Over 500MΩ or 25MΩ • μF, whichever is less No problem observed. Within ±3% or ±0.3pF, whichever is larger C≥30pF : Q≥205 C≥30pF : Q≥200 C<30pF : Q≥200 C<30pF : Q≥200 Mithin ±3% or ±0.3pF, whichever is larger C≥30pF : Q≥205 D Q After applying twice the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor Vithin ±3% or ±0.3pF, whichever is larger C≥30pF : Q≥200+10C C C≥30pF : Q≥200+10C		U U U U U U U U U U U U U U U U U U U	The charge a must not exe	and discharg ceed 50mA f	ge curren	t of the capacitor	Resist without problem		
Test (Except CF Series) ΔC 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. $\nabla \ge 30pF : Q \ge 200$ $C < 30pF : Q \ge 100+10C/3$ High- Temperature with LoadingAppearance ΔC After applying twice the rated voltage at the temperature to f 125±3°C for 1000+12/ -0 hours, measure the sample after 24±2 hours. Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitorNo problem observed. $\nabla \ge 30pF : Q \ge 200$ $C < 30pF : Q \ge 200$ $D = 2500$ $D = 2500$ D	Load	Appearance		•	•		No problem observed		
(Except CF Series)QDo Nit, allow platting to compariso to the measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. $C \ge 30pF : Q \ge 200$ $C < 30pF : Q \ge 100+10C/3$ High- Temperature with LoadingAppearance ΔC After applying twice the rated voltage at the temperature to f 125±3°C for 1000+12/ -0 hours, measure the sample after 24±2 hours. Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitorNo problem observed.U $C \ge 30pF : Q \ge 200$ $C < 30pF : Q \ge 200$ $C \ge 200 \pm 10C$	Humidity Test	ΔC					Within ±7.5% or ±0.75pF, whichever is larger		
IR must not exceed 50mA for IR measurement. Over 500MΩ or 25MΩ • μF, whichever is less High- Temperature with Loading Appearance After applying twice the rated voltage at the temperature of 125±3°C for 1000+12/ -0 hours, measure the sample after 24±2 hours. No problem observed. Q After apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor C≥30pF : Q≥275+5C/2 C<10pF : Q≥200+10C	(Except CF Series)	Q	room tempe	rature before	e measur	ement.	C≥30pF : Q≥200		
Temperature with Loading ∆C temperature of 125±3°C for 1000+12/ −0 hours, measure the sample after 24±2 hours. Within ±3% or ±0.3pF, whichever is larger Q Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor C≥30pF : Q≥275+5C/ 2 C<10pF : Q≥200+10C		IR					· · · · · · · · · · · · · · · · · · ·		
with Loading Ac measure the sample after 24±2 hours. Within ±3% of ±0.3pF, whichever is larger Q Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor C≥30pF : Q≥275+5C/ 2 C<10pF : Q≥200+10C	High-	Appearance	After applyir	ng twice the	rated vol	tage at the	No problem observed.		
Q Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor C≥30pF : Q≥350 10pF <c<30pf 2<br="" :="" q≥275+5c="">C<10pF : Q≥200+10C</c<30pf>	Temperature with Loading	ΔC				,			
	that coading	Q	Apply 1.5 times when the rated voltage is 250V or over. Apply 1.2 times when the rated voltage is 630V or over.				10pF <c<30pf 2<="" :="" q≥275+5c="" td=""></c<30pf>		
		IR							

Please ask for individual specification for the hatched range in previous chart.





Test Conditions and Specifications for High Dielectric Type (X5R, X7R) CM/ CT Series

Test	Items	Test Conditions	Specifications					
Capacitance \	/alue (C)	Measure after heat treatment	Within tolerance					
Tan δ (%)		Capacitance Frequency Volt C≤10μF 1kHz±10% 1.0±0.2Vrms C>10μF 120Hz±10% 0.5±0.2Vrms	Refer to capacitance chart					
Insulation Res	sistance (IR)	Measured after the rated voltage is applied for 1 minute at room ambient. The charge and discharge current of the capacitor must not exceed 50mA.	Over 10000M\Omega or 500MΩ • $\mu\text{F},$ whichever is less					
Dielectric Resistance		Apply 2.5 times of the rated voltage for 1 to 5 seconds. The charge and discharge current of the capacitor must not exceed 50mA.	No problem observed					
Appearance		Microscope	No problem observed					
Termination S	trength	Apply a sideward force of 500g (5N) to a PCB-mounted sample. note : 2N for 0201 size in for 01005 size. Exclude CT series with thickness of less than 0.66mm.	No problem observed					
Bending Stren	igth	Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds. Exclude CT series with thickness of less than 0.66mm.	No significant damage at 1mm bent					
Vibration	Appearance	Take the initial value after heat treatment.	No problem observed					
Test	ΔC	Vibration frequency: 10 to 55 (Hz) Amplitude: 1.5mm	Within tolerance					
	Tanδ (%)	Sweeping condition: 10→55→10Hz/1 minute in X, Y and Z Directions: 2 hours each, 6 hours total.	Within tolerance					
Soldering Heat	Appearance	Take the initial value after heat treatment. Soak the sample in 260°C±5°C solder for 10±0.5	No problem observed					
Resistance		seconds and place in room ambient, and measure	Within ±7.5% Within tolerance					
	Tanδ (%) IR	after 24±2 hours. (Pre-heating conditions)	Over 10000MΩ or 500MΩ • μ F, whichever is less					
	Withstanding Voltage	Order Temperature Time 1 80 to 100°C 2 minutes 2 150 to 200°C 2 minutes The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.	Resist without problem					
Solderablity		Soaking condition Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec. Sn63 Solder 235±5°C 2±0.5 sec.	Solder coverage : 90% min.					
Temperature	Appearance	Take the initial value after heat treatment.	No problem observed					
Cycle	ΔC	(Cycle) Room temperature (3min.)→	Within ±7.5%					
	Ταn δ (%)	Lowest operation temperature (30min.) \rightarrow	Within tolerance					
	IR	Room temperature (3min.) \rightarrow	Over 10000M Ω or 500M Ω • μ F, whichever is less					
	Withstanding Voltage	Highest operation temperature(30min.) After 5 cycles, measure after 24±2 hours. The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.	Resist without problem					
Load	Appearance	Take the initial value after voltage treatment. After applying rated voltage for 500+12/-0 hours	No problem observed					
Humidity Test		in pre-condition at 40°C±2°C, humidity 90 to	Within ±12.5%					
	Tan δ (%)	95%RH, allow parts to stabilize for 24±2 hours, at	200% max. of initial value					
	IR	room temperature before measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.	Over 500M\Omega or 25MΩ \bullet $\mu\text{F},$ whichever is less					
High-	Appearance	Take the initial value after voltage treatment. After applying twice the rated voltage at the highest	No problem observed					
Temperature with		operation temperature for $1000+12/-0$ hours,	Within ±12.5%					
Loading	Ταη δ (%)	measure the sample after 24±2 hours.	200% max. of initial value					
	IR	The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. Apply 1.5 times when the rated voltage is 10V or less. Applied voltages for respective products are indicated in the below chart.	Over 1000M\Omega or 50MQ + μF whichever is less					
Pre-treat-	Heat	Keep specimen at $150\pm0/-10^{\circ}$ C for 1 bour	leave specimen at room ambient for 24±2 hours.					
ment			1					
ment	ent Voltage Apply the same test condition for 1 hour, then leave the specimen at room ambient for 24±2 hours.							

High-temperature with Loading Applied Voltage (Rated Voltage \times \square)

Rated Voltage	Products
4V	CT03X5R104
6 21/	CM105X5R475, CM316X5R476, CM02X5R153-104
0.3V	CT05X5R104, CT21X5R106, CT03X5R104
16V	CM105X7R474-105, CM21X7R105-475, CM316X7R475-106, CM32X7R106-226, CM05X5R224, CM105X5R225, CM21X5R475-106, CM316X5R226
	CT105X5R105, CT21X5R225-475, CT316X5R106, CM03X5R332-103, CM02X5R101-103
051/	CM105X7R474, CM21X7R105-225, CM316X7R475, CM32X7R106, CM105X5R474-105, CM21X5R225-106, CM316X5R106, CM32X5R106-226
250	CT316X5R225-106, CM03X5R152-103, CM05X7R103-104
FOV	CM21X5R105, CM32X5R106, CM32X7R106
500	CT21X5R225, CT316X5R105-475
100V	CM32X7RK74, CM43X7R105
	4V 6.3V 16V 25V 50V

Please ask for individual specification for the hatched range in previous chart.



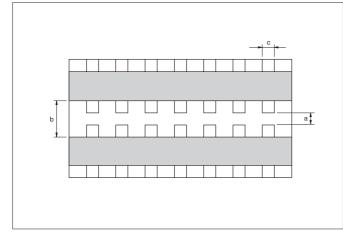


Test Conditions and Specifications for High Dielectric Type (X7R) **CF Series**

Test	Items	Test Conditions	Specifications		
Capacitance \	/alue (C)	Measure after heat treatment	Within tolerance		
Tan δ (%)		CapacitanceFrequencyVoltC≤10µF1kHz±10%1.0±0.2Vrms	Within ±2.5%		
Insulation Resistance (IR)		Measured after the rated voltage is applied for 1 minute at room ambient. Measured after the 500V is applied for 1 minute at room ambient for the rated voltage over 630V. The charge and discharge current of the capacitor must not exceed 50mA.	Over 10000M Ω or 500M Ω • μ F, whichever is less Over 100M Ω • μ F for CF316X7R104/ 250V and CF43X7R474/ 250V CF55X7R105/ 250V and CF55X7R224/ 630V		
Dielectric Resistance		Apply 1.5 times when the rated voltage is 250V or over, apply 1.2 times when the rated voltage is 630V or over for 1 to 5 seconds. The charge and discharge current of the capacitor must not exceed 50mA.	No problem observed		
Appearance		Microscope	No problem observed		
Termination S	trength	Apply a sideward force of 500g (5N) to a PCB-mounted sample.	No problem observed		
Bending Stren	igth	Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds.	No significant damage at 1mm bent		
Vibration Appearance		Take the initial value after heat treatment. Vibration frequency: 10 to 55 (Hz)	No problem observed		
Test	ΔC	Amplitude: 1.5mm	Within tolerance		
	Tan δ (%)Sweeping condition: $10 \rightarrow 55 \rightarrow 10$ Hz/1 minute in X, Y and Z Directions: 2 hours each, 6 hours total.		Within tolerance		
Soldering	Appearance	Take the initial value after heat treatment.	No problem observed		
	ΔC	Soak the sample in $260^{\circ}C\pm 5^{\circ}C$ solder for 10 ± 0.5 seconds and place in room ambient,	Within ±7.5%		
	Tan δ (%)	and measure after 24±2 hours. (Pre-heating conditions)	Within tolerance		
	IR	Order Temperature Time 1 80 to 100°C 2 minutes 2 150 to 200°C 2 minutes	Over 10000M\Omega or 500M Ω • µF, whichever is less Over 100M Ω • µF for CF316X7R104/ 250V and CF43X7R474/ 250V CF55X7R105/ 250V and CF55X7R224/ 630V		
	Withstanding Voltage	The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.	Resist without problem		
Solderablity		Soaking condition Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec. Sn63 Solder 235±5°C 2±0.5 sec.	Solder coverage : 90% min.		
Temperature	Appearance	Take the initial value after heat treatment.	No problem observed		
Cycle	ΔC	(Cycle) Room temperature (3min.)→	Within ±7.5%		
	Tan δ (%)	Lowest operation temperature (30min.) \rightarrow	Within tolerance		
	IR	Room temperature (3min.) \rightarrow Highest operation temperature(30min.) After 5 cycles, measure after 24 \pm 2 hours. The charge and discharge current of the	Over 10000M Ω or 500M Ω • μF , whichever is less Over 100M Ω • μF for CF316X7R104/ 250V and CF43X7R474/ 250V CF55X7R105/ 250V and CF55X7R224/ 630V		
	Withstanding Voltage	capacitor must not exceed 50mA for IR and withstanding voltage measurement.	Resist without problem		
High-	Appearance	Take the initial value after voltage treatment.	No problem observed		
Temperature with	ΔC	After applying specified voltage at the highest operation temperature for 1000+12/ -0 hours,	Within ±12.5%		
Loading	Tan δ (%)	then measure the sample after 24±2 hours. The applied voltage shall be;	200% max. of initial value		
	IR	 1.5 times the rated voltage when the rated voltage is 250V or over. 1.2 times when the rated voltage is 630V or over. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. 	Over 1000M Ω or 50M Ω • $\mu\text{F},$ whichever is less		
Pre-treat-	Heat	Keep specimen at 150+0/-10°C for 1 hour l	eave specimen at room ambient for 24±2 hours.		
o trout	Voltage	· · · · · · · · · · · · · · · · · · ·	In leave the specimen at room ambient for 24 ± 2 hours.		

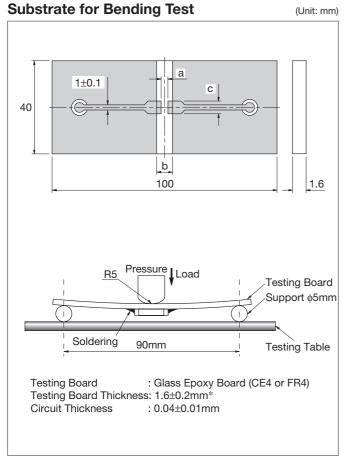


Substrate for Electrical Tests

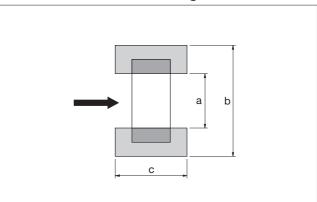


			(Unit: mm)
Size (EIA Code)	а	b	с
02 (01005)	0.15	0.50	0.20
03 (0201)	0.26	0.92	0.32
05 (0402)	0.4	1.4	0.5
105 (0603)	1.0	3.0	1.2
21 (0805)	1.2	4.0	1.65
316 (1206)	2.2	5.0	2.0
32 (1210)	2.2	5.0	2.9
42 (1808)	3.5	7.0	3.7
43 (1812)	3.5	7.0	3.7
52 (2208)	4.5	8.0	5.6
55 (2220)	4.5	8.0	5.6

Substrate for Adhesion Strength Test



* 02, 03, 05 and array: 0.8±0.1mm



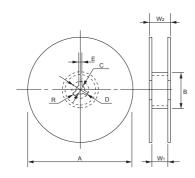


Multilayer Ceramic Chip Capacitors Packaging Options

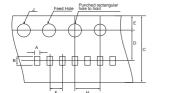


Tape and Reel

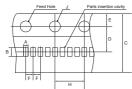
• Reel



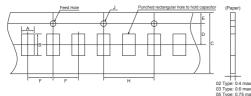
F=1mm (02 Type)



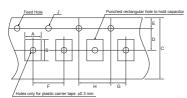
F=1mm (02, 03, 05 Type)



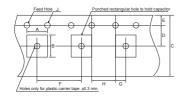
F=2mm (02, 03, 05, 105 Type)



F=4mm (105, 21, 316, 32, 42, 52 Type)



F=8mm (43, 55 Type)





02 Type: 0.4 max. 03 Type: 0.5 max. 05 Type: 0.75 max

Reel				(Unit: mm)
Code Reel	А	В	с	D
7-inch Reel (CODE: T, H, Q)	180 ⁺⁰ -2.0			
7-inch Reel (CODE: P)	178±2.0	φ60 min.	13±0.5	21±0.8
13-inch Reel (CODE: L, N, W)	330±2.0			
Code Reel	E	W 1	W 2	R
7-inch Reel (CODE: T, H, Q)		10.5±1.5	16.5 max.	
7-inch Reel (CODE: P)	2.0±0.5	4.35±0.3	6.95±1.0	1.0
13-inch Reel (CODE: L, N, W)		9.5±1.0	16.5 max.	

* Carrier tape width 8mm.

For size 42 (1808) or over, Tape width 12mm and W1: 14 \pm 1.5, W2: 18.4mm max.

Carrier Tape

Carrier Tape (Unit: m				
Size (EIA Code)	А	В	F	
02 (01005) [*]	0.23±0.02	0.43±0.02	1.0±0.02	
02 (01005)	0.25±0.03	0.45±0.03	2.0±0.05	
03 (0201)*	0.37±0.03	0.67±0.03	1.0±0.05	
03 (0201)	0.37±0.03		2.0±0.05	
05 (0402)*	0.65±0.1	1.15±0.1	1.0±0.05	
05 (0402)			2.0±0.05	
105 (0603)	1.0±0.2	1.8±0.2	4.0±0.1	
21 (0805)	1.5±0.2	2.3±0.2	4.0±0.1	
316 (1206)	2.0±0.2	3.6±0.2	4.0±0.1	
32 (1210)	2.9±0.2	3.6±0.2	4.0±0.1	
42 (1808)	2.4±0.2	4.9±0.2	4.0±0.1	
43 (1812)	3.6±0.2	4.9±0.2	8.0±0.1	
52 (2208)	2.4±0.2	6.0±0.2	4.0±0.1	
55 (2220)	5.3±0.2	6.0±0.2	8.0±0.1	
* Option				

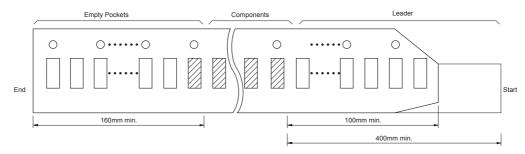
* Option

						(I	Jnit: mm)
F	Carrier Tape	С	D	E	G	Н	J
1.0 ±0.02	4mm Plastic	4.0 +0.08	1.8 ±0.02	0.9 ±0.05	-	2.0 ±0.04	0.8 ±0.04
1.0 ±0.05		8.0 +0.3/ -0.1				4.0 ±0.05	
2.0 ±0.05	8mm Paper	8.0 ±0.3	3.5 ±0.05	1.75	2.0		1.5
4.0 ±0.1	8mm Plastic			±0.1	±0.05	4.0 ±0.1	+0.1/ -0
8.0	12mm	12.0	5.5				
8.0 ±0.1	Plastic	±0.3	±0.05				



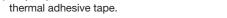


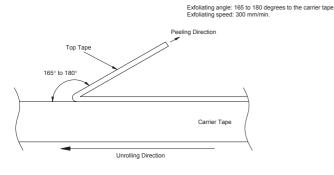
Detail of leader and trailer

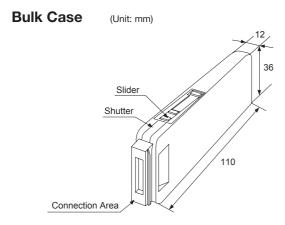


Adhesive tape

- 1) The exfoliative strength when peeling off the top tape from the carrier tape by the method of the following figure shall be *0.1 to 0.7N. *02 Size: 0.1 to 0.5N
- 2) When the top tape is peeled off, the adhesive stays on the top tape.3) Chip capacitors will be in a state free without being stuck on the







• Please contact Kyocera for details.

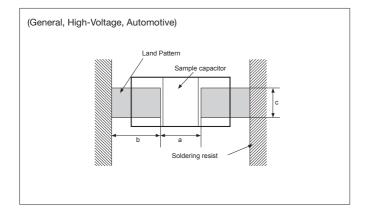


(Unit: mm)

Dimensions for recommended typical land

Since the amount of solder (size of fillet) to be used has direct influence on the capacitor after mounting, the sufficient consideration is necessary.

When the amounts of solder is too much, the stress that a capacitor receives becomes larger. It may become the cause of a crack in the capacitor. When the land design of printed wiring board is considered, it is necessary to set up the form and size of land pattern so that the amount of solder is suitable.



Design of printed circuit and Soldering

The recommended fillet height shall be 1/2 of the thickness of capacitors or 0.5mm. When mounting two or more capacitors in the common land, it is necessary to separate the land with the solder resist strike so that it may become the exclusive land of each capacitor.

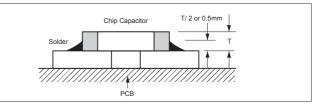
General, High-Voltage

Size (EIA Code)	L×W	а	b	с
02 (01005)	0.4×0.2	0.13 to 0.20	0.12 to 0.18	0.20 to 0.23
03 (0201)	0.6×0.3	0.20 to 0.30	0.25 to 0.35	0.30 to 0.40
05 (0402)	1.0×0.5	0.30 to 0.50	0.35 to 0.45	0.40 to 0.60
105 (0603)	1.6×0.8	0.70 to 1.00	0.80 to 1.00	0.60 to 0.80
21 (0805)	2.0×1.25	1.00 to 1.30	1.00 to 1.20	0.80 to 1.10
316 (1206)	3.2×1.6	2.10 to 2.50	1.10 to 1.30	1.00 to 1.30
32 (1210)	3.2×2.5	2.10 to 2.50	1.10 to 1.30	1.90 to 2.30
42 (1808)	4.5×2.0	2.50 to 3.20	1.80 to 2.30	1.50 to 1.80
43 (1812)	4.5×3.2	2.50 to 3.20	1.80 to 2.30	2.60 to 3.00
52 (2208)	5.7×2.0	4.20 to 4.70	2.00 to 2.50	1.50 to 1.80
55 (2220)	5.7×5.0	4.20 to 4.70	2.00 to 2.50	4.20 to 4.70

Automotive

Automotive (Unit: mm				
Size (EIA Code)	L×W	а	b	с
105 (0603)	1.6×0.8	0.60 to 0.90	0.80 to 1.00	0.70 to 1.00
21 (0805)	2.0×1.25	0.90 to 1.20	0.80 to 1.20	0.90 to 1.40
316 (1206)	3.2×1.6	1.40 to 1.90	1.00 to 1.30	1.30 to 1.80

Ideal Solder Height



Item	Not recommended example	Recommended example/ Separated by solder
Multiple parts mount		Solder resist
Mount with leaded parts	Leaded parts	Solder resist Leaded parts
Wire soldering after mounting	Soldering iron Wire	Solder resist
Overview	Solder resist	Solder resist



Mounting Design

The chip could crack if the PCB warps during processing after the chip has been soldered.

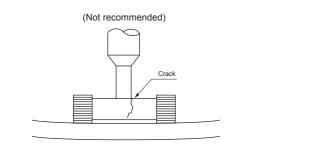
Recommended chip position on PCB to minimize stress from PCB warpage

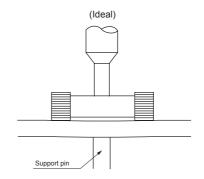


Actual Mounting

1) If the position of the vacuum nozzle is too low, a large force may be applied to the chip capacitor during mounting, resulting in cracking.

- 2) During mounting, set the nozzle pressure to a static load of 1 to 3 $\ensuremath{\mathsf{N}}.$
- 3) To minimize the shock of the vaccum nozzle, provide a support pin on the back of the PCB to minimize PCB flexture.





- 4) Bottom position of pick up nozzle should be adjusted to the top surface of a substrate which camber is corrected.
- 5) To reduce the possibility of chipping and cracks, minimize vibration to chips stored in a bulk case.
- 6) The discharge pressure must be adjusted to the part size. Verify the pressure during setup to avoid fracturing or cracking the chips capacitors.

Resin Mold

- 1) If a large amount of resin is used for molding the chip, cracks may occur due to contraction stress during curing. To avoid such cracks, use a low shrinkage resin.
- 2) The insulation resistance of the chip will degrade due to moisture absorption. Use a low moisture absorption resin.
- 3) Check carefully that the resin does not generate a decomposition gas or reaction gas during the curing process or during normal storage. Such gases may crack the chip capacitor or damage the device itself.

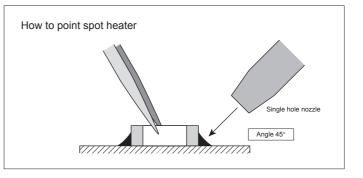


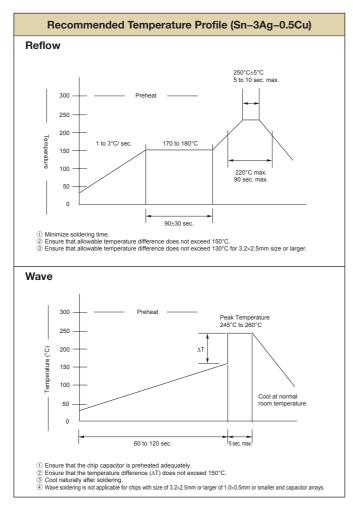
Soldering Method

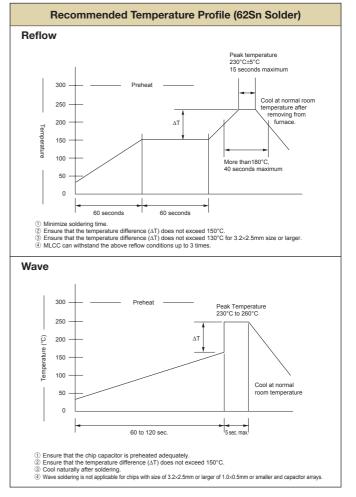
- 1) Ceramic is easily damaged by rapid heating or cooling. If some heat shock is unavoidable, preheat enough to limit the temperature difference (Delta T) to within 150 degree Celsius.
- 2) The product size 1.6×0.8mm to 3.2×1.6mm can be used in reflow and wave soldering, and the product size of bigger than 3.2×1.6mm, or smaller than 1.6×0.8mm can be used in reflow.
- Circuit shortage and smoking can be created by using capacitors which are used neglecting the above caution.
- 3) Please see our recommended soldering conditions.
- 4) In case of using Sn-Zn Solder, please contact us in advance.
- 5) The following condition is recommended for spot heater application.

· Recommended spot heater condition

Item	Condition	
Distance	5mm min.	
Angle	45°	
Projection Temp.	400°C max.	
Flow rate	Set at the minimum	
Nozzle diameter	2φ to 4φ (Single hole type)	
Application time	10 sec. max. (1206 and smaller) 30 sec.max. (1210 and larger)	







Soldering iron

1) Temperature of iron chip

- 2) Wattage
- 3) Tip shape of soldering iron
- 4) Soldering Time
- 1210 and larger 280°C max. 80W max. φ3.0mm max. 3 sec. max.

1206 and smaller 350°C max. 5) Cautions

a) Pre-heating is necessary rapid heating must be avoided.

- Delta T \leq 150°C (product size of bigger than 3.2×1.6mm. Delta T \leq 130°C) b) Avoid direct touching to capacitors.
- c) Avoid rapid cooling after soldering. Natural cooling is recommended.
- *Consult as if it is difficult to keep the temperature 280°C max. for 1210 and larger MLCC'S.



Circuit Design

- 1. Once application and assembly environments have been checked, the capacitor may be used in conformance with the rating and performance which are provided in both the catalog and the specifications. Use exceeding that which is specified may result in inferior performance or cause a short, open, smoking, or flaming to occur, etc.
- 2. Please consult the manufacturer in advance when the capacitor is used in devices such as: devices which deal with human life, i.e. medical devices; devices which are highly public orientated; and devices which demand a high standard of liability. Accident or malfunction of devices such as medical devices, space equipment and devices having to do with atomic power could generate grave consequence with respect to human lives or, possibly, a portion of the public. Capacitors used in these devices may require high reliability design different from that of general purpose capacitors.
- 3. Please use the capacitors in conformance with the operating temperature provided in both the catalog and the specifications. Be especially cautious not to exceed the maximum temperature. In the situation the maximum temperature set forth in both the catalog and specifications is exceeded, the capacitor's insulation resistance may deteriorate, power may suddenly surge and short-circuit may occur. The capacitor has a loss, and may self-heat due to equivalent series resistance when alternating electric current is passed therethrough. As this effect becomes especially pronounced in high frequency circuits, please exercise caution. When using the capacitor in a (self-heating) circuit, please make sure the surface of the capacitor remains under the maximum temperature for usage. Also, please make certain temperature rises remain below 20°C.
- 4. Please keep voltage under the rated voltage which is applied to the capacitor. Also, please make certain the peak voltage remains below the rated voltage when AC voltage is super-imposed to the DC voltage.
 In the situation where AC or pulse voltage is employed, ensure average peak voltage does not exceed the rated voltage.
 Exceeding the rated voltage provided in both catalog and specifications may lead to defective withstanding voltage or, in worst case situations, may cause the capacitor to smoke or flame.
- 5. When the capacitor is to be employed in a circuit in which there is continuous application of a high frequency voltage or a steep pulse voltage, even though it is within the rated voltage, please inquire to the manufacturer. In the situation the capacitor is to be employed using a high frequency AC voltage or a extremely fast rising pulse voltage, even though it is within the rated voltage, it is possible capacitor reliability will deteriorate.
- 6. It is a common phenomenon of high-dielectric products to have a deteriorated amount of static electricity due to the application of DC voltage. Due caution is necessary as the degree of deterioration varies depending on the quality of capacitor materials, capacity, as well as the load voltage at the time of operation.
- 7. Do not use the capacitor in an environment where it might easily exceed the respective provisions concerning shock and vibration specified in the catalog and specifications.

In addition, it is a common piezo phenomenon of high dielectric products to have some voltage due to vibration or to have noise due to voltage change. Please contact sales in such case.

- 8. If the electrostatic capacity value of the delivered capacitor is within the specified tolerance, please consider this when designing the respective product in order that the assembled product function appropriately.
- 9. Please contact us upon using conductive adhesives.

Storage

- 1. If the component is stored in minimal packaging (a heat-sealed or zippered plastic bag), the bag should be kept closed. Once the bag has been opened, reseal it or store it in a desiccator.
- 2. Keep storage place temperature +5 to +40 degree C, humidity 20 to 70% RH. See JIS C 60721-3-1, class 1K2 for other climatic conditions.
- 3. The storage atmosphere must be free of corrosive gas such as sulfur dioxide and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminals will oxidize and solderability will be effected.
- 4. Precautions 1) to 3) apply to chip capacitors packaged in carrier tapes and bulk cases.
- 5. The solderability is assured for 12 months from our shipping date if the above storage precautions are followed.
- 6. Chip capacitors may crack if exposed to hydrogen (H₂) gas while sealed or if coated with silicon, which generates hydrogen gas.

Safety application guideline and detailed information of electrical properties are also provided in Kyocera home page; URL: http://www.kyocera.co.jp/electronic/