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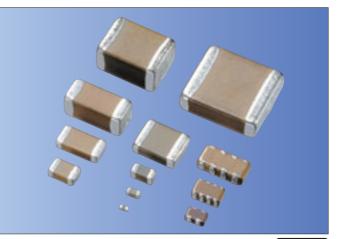
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🔇 КУОСЕРА

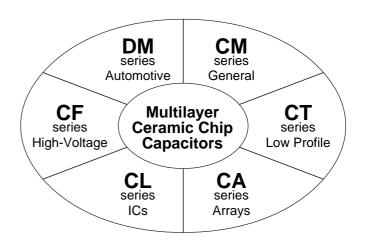
Kyocera's series of Multilayer Ceramic Chip Capacitors are designed to meet a wide variety of needs. We offer a complete range of products for both general and specialized applications, including CM series for generalpurpose, CT series for low profile, CA series for arrays, CL series for ICs, CF series for high-voltage, and DM series for automotive.

Features

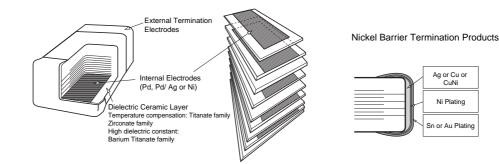
- We have factories worldwide in order to supply our global customer bases quickly and efficiently and to maintain our reputation as one of the highest–volume producers in the industry.
- All our products are highly reliable due to their monolithic structure of high-purity and superfine uniform ceramics 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.

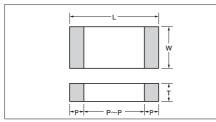
Kyocera Ceramic Chip Capacitors are available for different applications as classified below:

Series	Dielectric Options	Typical Applications	Features	Terminations	Available Size
СМ	C0G (NP0) X5R X7R *X6S *X7S Y5V	General purpose	Wide cap range	Nickel barrier	01005, 0201, 0402 0603, 0805, 1206 1210, 1812
СТ	X5R X7R Y5V	IC card (Decoupling)	Low profile	Nickel barrier	0201, 0402, 0603 0805, 1206, 1210
CA	COG (NP0) X5R, X7R	Digital signal Pass line	Reduction in placing cost	Nickel barrier	0405, 0508
CL	X7S	ICs (Decoupling)	Low inductance	Nickel barrier	0204, 0306
CF	COG (NP0) X7R	High voltage & Power circuits	High voltage 250VDC, 630VDC 1000VDC, 2000VDC 3000VDC, 4000VDC	Nickel barrier	0805, 1206, 1210 1812, 2208, 1808 2220
DM	X7R	Automotive	Thermal shock Resistivity High reliability	Nickel barrier	0603,0805,1206

* Option

* Negative temperature coefficient dielectric types are available on request.

Dimensions



Dimensions and Packaging Quantities

Size	L	de	Dimension			Dimensions (m				Maximum qua			
5120	JIS	EIA	Code	L	W	Т	P min.	P max.	P to P min.	0180 Reel	¢330 Reel		
02	0402	01005	Α	0.4±0.02	0.2±0.02	0.2±0.02	0.07	0.14	0.13	40kp (E4/1) 20kp (P8/2)	-		
			Α			0.22 max.				30kp (P8/1) 15kp (P8/2)	150kp (P8/1) 50kp (P8/2)		
			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)		
03	0603	0201								15kp (P8/2) 30kp (P8/1)	50kp (P8/2) 150kp (P8/1)		
			С	0.6±0.05	0.3±0.05	0.3±0.05	0.13	0.23	0.19	15kp (P8/2)	50kp (P8/2)		
			D E	0.6±0.09	0.3±0.09	0.3±0.09 0.25 max.	0.10	0.20	0.20	15kp (P8/2) 15kp (P8/2)			
			Α			0.25 max.				20kp (P8/1)	100kp (P8/1)		
			В			0.33 max.				10kp (P8/2) 10kp (P8/2)	50kp (P8/2) -		
			С	1.0±0.05	0.5±0.05	0.35 max.				20kp (P8/1) 10kp (P8/2)	100kp (P8/1 50kp (P8/2)		
_			D			0.5±0.05		0.05	0.20	20kp (P8/1)	100kp (P8/1		
5	1005	0402					0.15	0.35	0.30	10kp (P8/2) 20kp (P8/1)	50kp (P8/2) 100kp (P8/1		
			E	1.0±0.10	0.5±0.10	0.35 max.				10kp (P8/2)	50kp (P8/2)		
			F			0.5±0.10				20kp (P8/1) 10kp (P8/2)	50kp (P8/2)		
			G	1.0±0.15	0.5±0.15	0.5±0.15				20kp (P8/1) 10kp (P8/2)	50kp (P8/2)		
			A			0.55 max.				4kp (P8/4)	10kp (P8/4)		
			В	1.6±0.10	0.8±0.10	0.8±0.10				8kp (P8/2) 4kp (P8/4)	20kp (P8/2) 10kp (P8/4)		
			С			0.55 max.	-			8kp (P8/2)	20kp (P8/2)		
05	1608	0603		1.6±0.15	0.8±0.15		0.20	0.60	0.60	0.60	0.50	4kp (P8/4) 8kp (P8/2)	10kp (P8/4 20kp (P8/2
			D			0.8±0.15	-			4kp (P8/4)	10kp (P8/4		
			E	1.6±0.2	0.8±0.2	0.55 max.				8kp (P8/2) 4kp (P8/4)	20kp (P8/2 10kp (P8/4		
			F A			0.8±0.2 0.55 max.				* 4kp (P8/4)	- 10kp (P8/4		
			В			0.95 max.				4kp (P8/4)	10kp (P8/4		
			C D	2.0±0.10	1.25±0.10	1.00 max. 0.60±0.1				4kp (E8/4) 4kp (P8/4)	10kp (E8/4 10kp (P8/4		
			E	E	2.0±0.10	1.25±0.10	0.85±0.10	-			4kp (P8/4)	10kp (P8/4	
1	2012	0805	F G			1.05±0.10 1.25±0.10	0.20	0.75	0.20 0.75	0.70	3kp (E8/4) 3kp (E8/4)	10kp (E8/4 10kp (E8/4	
			H			0.55 max.	-			4kp (P8/4)	10kp (P8/4		
			J	2.0±0.15	1.25±0.15	0.95 max.]			4kp (P8/4)	10kp (P8/4		
			K L		4 95 19 99	1.25±0.15 0.95 max.	-			3kp (E8/4) 4kp (P8/4)	10kp (E8/4 10kp (P8/4		
			М	2.0±0.20	1.25±0.20	1.25±0.20				3kp (E8/4)	10kp (E8/4		
			A B			0.85±0.10 0.95 max.	-			4kp (P8/4) 4kp (P8/4)	10kp (P8/4 10kp (P8/4		
			C	0.010.00	101015	1.00 max.				4kp (E8/4)	10kp (E8/4		
			D	3.2±0.20	1.6±0.15	1.15±0.10				3kp (E8/4)	10kp (E8/4)		
6	3216	1206	<u>Е</u> F			1.25±0.10 1.6±0.15	0.30	0.85	1.40	3kp (E8/4) 2.5kp (E8/4)	10kp (E8/4) 5kp (E8/4)		
			G			0.95 max.				4kp (P8/4)	10kp (P8/4)		
			H	3.2±0.20	1.6±0.20	1.00 max.				4kp (E8/4)	10kp (E8/4		
_			J			1.6±0.20 1.00 max.				2.5kp (E8/4) 4kp (E8/4)	5kp (E8/4) 10kp (E8/4)		
			B			1.40 max.	1			3kp (E8/4)	10kp (E8/4		
~	0005	1010	C	0.010.00	0.5/0.00	1.60 max.	0.00	1.00		2.5kp (E8/4)	5kp (E8/4)		
2	3225	1210	E D	3.2±0.20	2.5±0.20	1.6±0.15 2.20 max.	0.30	1.00	1.40	2.5kp (E8/4) 2kp (E8/4)	<u>5kp (E8/4)</u> 5kp (E8/4)		
			F			2.0±0.2				2kp (E8/4)	5kp (E8/4)		
			G			2.5±0.2	1			1kp (E8/4)	4kp (E8/4)		
2	4520	1808	A B	4.5±0.20	2.0±0.20	1.6 max. 2.2 max.	0.15	0.85	2.60	2kp (E12/4) 2kp (E12/4)	-		
			Α			2.0 max.				1kp (E12/8)	-		
			B C			2.0±0.2 2.5 max.	-			1kp (E12/8) 0.5kp (E12/8)	-		
3	4532	1812	D	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)	-		
			E			2.8 max.]			0.5kp (E12/8)	-		
2	5720	2208	F	5.7±0.40	2.0±0.20	2.8±0.2 2.2 max.	0.15	0.85	4.20	0.5kp (E12/8) 2kp (12/8)			
~	5120	2200	A	0.7±0.40	2.0±0.20	2.2 max. 2.0 max.	0.15	0.00	7.20	1kp (E12/8)	-		
55	5750	2220	В	5.7±0.40	5.0±0.40	2.5 max.	0.30	1.40	2.50	0.5kp (E12/8)	-		
			С			2.8 max.				0.5kp (E12/8)	-		

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

* Please contact us.



KYOCERA PART NUM	BER	<u>CM</u>	<u>21</u> X7F	<u>104</u>	<u>K</u> <u>50</u>	A T	
CM = General Purpose CT = Low Profile CA = Arrays	CL = ICs	9					
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	SIZEEIA(JIS) 32 =1210 (3225) 42 =1808 (4520) 43 =1812 (4532) 52 =2208 (5720) 55 =2220 (5750)	SIZE EIA (JIS) D11 = 0405 (1014)/ F12 = 0508 (1220)/					
DIELECTRIC CODE -							
CODE EIA CODE CG = C0G (NPO) X5R = X5R X7R = X7R Negative temperature coefficie	X7S = X7S (Option) X6S = X6S (Option) Y5V = Y5V ent dielectric types are avai	ilable on request.					
CAPACITANCE CODE							
	notes decimal point, 1.5pF = 1R5						
TOLERANCE CODE -							
$\begin{array}{ll} A=\pm 0.05 pF \mbox{ (option)} & D=\\ B=\pm 0.1 pF & G=\\ C=\pm 0.25 pF & J= \end{array}$	$\pm 2\%$ (option) M = $\pm 20\%$	%					
VOLTAGE CODE							
06 = 6.3VDC 250 = 10 = 10VDC 400 =	250VDC 2000 = 400VDC 3000 =	= 1000VDC = 2000VDC = 3000VDC = 4000VDC					
TERMINATION CODE A = Nickel Barrier/ Tin	K = Nickel Barrier/ Au						
		u					
PACKAGING CODE -							
B = Bulk C = Bulk Cassette (option) T = 7" Reel Taping & 4mm (Q = 7" Reel Taping & 1mm (L = 13" Reel Taping & 4mm (Cavity pitch	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 t	ng & 2mm Ca ng & 1mm Ca ng & 1mm Ca Imm.	vity pitch vity pitch			
OPTION							

OPTION -

Thickness max. value is indicated in CT series

Dielectric Value (pF)	C0G (NPO) 0 ppm/ °C	U∆ (N750) –750 ppm/ °C	SL +350 to -1000ppm/ °C
0.5 to 2.7	СК	UK	SL
3.0 to 3.9	CJ	UJ	SL
4.0 to 9.0	СН	UJ	SL
≥10	CG	UJ	SL

K = ±250ppm/ °C, J = ±120ppm/ °C, H = ±60ppm/ °C, G = ±30ppm/ °C e.g. CG = 0±30ppm/ °C

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

High Dielectric Constant Type

EIA Dielectric	Temperature Range	∆C max.
X5R	−55 to 85°C	±15%
X7R	–55 to 125°C	11370
*X7S	–55 to 125°C	+000/
*X6S	–55 to 105°C	±22%
Y5V	–30 to 85°C	-82 to +22%

* option

Available Tolerances

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

EIA Dielectric	Tolerance	Capacitance
	C=±0.25pF	^{*1} <10pF
	D=±0.50pF	
	*3 A=±0.05pF	<0.5pF
C0G	B=±0.1pF	≤5pF
	*3 G=±2%	>10~F
	J=±5%	≥10pF E12 Series
	K=±10%	E12 Series
*3 X6S X5R	*² K=±10%	*4 E3 Series
*3 X7S X7R	M=±20%	ES Series
Y5V	Z=-20% to +80%	E3 Series
Nete		

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	ption)
	1.0	1.0	1.0	1.1
1.0	1.0	1.2	1.2	1.3
1.0	1.5	1.5	1.5	1.6
	1.5	1.8	1.8	2.0
	2.2	2.2	2.2	2.4
	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
	4.7	4.7	4.7	5.1
4.7	4.7	5.6	5.6	6.2
4.7	6.8	6.8	6.8	7.5
	0.0	8.2	8.2	9.1



KYOCERa

[RoHS Compliant Products]

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

Applications

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

Size (EIA Code)	CM02 (01005)			CM03 (0201)			CN (04	02)	CM105 (0603)	CM21 (0805)				
Temperature	C ∆*1	C	<u>*1</u>	U	<u>*2</u>	SL	C ∆*1	SL	C ∆*1	C ∆*1				
Rated Voltage (VDC) Capacitance (pF)	16	25	50	16	25	25	50	50	50	16	25	50		
R20 0.2 R50 0.5 1R0 1.0 1R5 1.5				в										
1R5 1.5 2.0 3.0 4.0 5.0 6.0														
7.0 8.0 9.0		в			в	в								
100 10 120 12 15 18 22	A		в											
22 27 33 39 47														
47 56 68 82														
101 100 121 120														
150 180 220 270							D	D						
270 330 390 470							_							
560 680 820									в					
102 1000 122 1200 1500 1800												E		
2200 2700 3300											E			
3900 4700 5600 6800											G			
8200 103 10000 123 12000										G				
15000 18000 Standard Capacitar														

<Standard Capacitance Value>

E12 Series

Please contact for capacitance value other than standard.

Optional Spec.

*1: CG,CH,CJ,CK

*2: UJ,UK

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

(Example) In case of "B" for CN

kample) case of "B" for CM03;	Size	Size	Dir	mension (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	D	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

КЧОСЕRа

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X5R Dielectric

(EIA	Size A Code)	CN (010	102 005)		CN (02	103 201)				CM05 (0402	5)				CM (06	105 03)					CN (08	/121 605)		
	Voltage (VDC)	6.3	10	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
	citance (pF)							-					-						-					
101 151	100 150																							
101	220 330																							
	470 680		A8																					
102 152	1000	V///A	A8				B3																	<u> </u>
152	1500 2200 3300					B3																		
103	4700 6800 10000	A8			В4																			
153	15000 22000 33000	Ao										- D3 -												
104	47000 68000 100000			B7	B7]						D3	- D3 -					B3	B1						G1
105	220000 470000 1000000			B8 C8	B8				B5 D7	D8	D8				B4	В3	D8					G3	G3	G8
106	2200000 4700000 10000000			D8				F8 G9	D8 G8					B5 D5 D8	B8 D8	B8				G5 M5	G4 M8	G3 K8 M8	M8	
107	22000000 47000000 100000000																		M7	115		11/0		

	Size A Code)	CM316 e) (1206)							CM32 (1210)						
<u> </u>	Voltage (VDC) icitance (pF)	6.3	10	16	25	50	100	4	6.3	10	16	25	50	6.3	50
105	220000 470000 1000000				D3	D1	J3					B3	B1 F1		
106	2200000 4700000 10000000	F5	F4	F3	F3 J8	[J3]				F4	C3 G3	F3 G3 G8	G3		D1
107	22000000 47000000 100000000	J5	J8	J8				G5	G5	G4	G3	68		F5	

<Standard Capacitance Value>

CM21 size and smaller : E6 Series CM316 size and larger / capacitance value of 0.1μ F and larger : E3 Series Please contact for capacitance value other than standard. Optional Spec.

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;

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

Tan δ : 3.5% max.

Size	Size	Dir	mension (m	ım)		
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			
	D	1.0±0.05	0.5±0.05	0.5±0.05		
05	F	1.0±0.10	0.5±0.10	0.5±0.10		
	G	1.0±0.15	0.5±0.15	0.5±0.15		
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	າm)	Τап δ	Tan δ
Size	Code	L	W	Т	Code	Tan o
	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.
	J	3.2±0.20	1.6±0.20	1.6±0.20	3	5.0% max.
	В	3.2±0.20	2.5±0.20	1.40 max.	4	7.0% max.
32	С	3.2±0.20	2.5±0.20	1.60 max.	5	7.5% max.
32	F	3.2±0.20	2.5±0.20	2.0±0.2	7	10.0% max.
	G	3.2±0.20	2.5±0.20	2.5±0.2	8	12.5% max.
43	D	4.5±0.30	3.2±0.20	2.5±0.2	9	20.0% max.
43	F	4.5±0.30	3.2±0.20	2.8±0.2		

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X7R Dielectric

	Size Code)	CM02 (01005)		CM03 (0201)			105 02)			CM105 (0603)					CM21 (0805)		
	Voltage (VDC) citance (pF)	10	10	16	25	16	25	6.3	10	16	25	50	6.3	10	16	25	50
101 151	100 150 220 330	A8		B2	B2												
102 152	470 680 1000																
152	1500 2200 3300 4700		— вз —														
103 153	6800 10000 15000						D3										
	22000 33000 47000					D2	D8					B1					
104	68000 100000 220000					D8	D8		В3	B2	B2				G2	G2	G1
105	470000 1000000 2200000							D8	B8	B8	D8			G3	G2 G8	G8 M8	[M3]
106	4700000 10000000 22000000												M8	M8 [M8]	M8		

Size (EIA Code)	CM316 (1206)						CM32 (1210)					-	143 12)
Rated Voltage (VDC) Capacitance (pF)	6.3	10	16	25	50	100	10	16	25	50	100	50	100
47000 104 100000					A1	<u>D1</u> F1					B1		
220000 470000 105 1000000			D2	D2 F2	D1				B2	B1 F1	F1 G1	B1	D1
2200000 4700000 106 10000000 22000000	J8	F3 J8 J5	J8	J8 J3	[J3]	J3	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 $\delta.$ 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.

0:	Size	Dir	nension (m	ım)	Tan δ	Tan δ
Size	Code	L	W	т	Code	lan o
02	Α	0.4±0.02	0.2±0.02	0.2±0.02	1	2.5% max.
03	В	0.6±0.03	0.3±0.03	0.3±0.03	2	3.5% max.
05	D	1.0±0.05	0.5±0.05	0.5±0.05	3	5.0% max.
105	В	1.6±0.10	0.8±0.10	0.8±0.10	5	7.5% max.
105	D	1.6±0.15	0.8±0.15	0.8±0.15	8	12.5% max.
21 G		2.0±0.10	1.25±0.10	1.25±0.10		
21	М	2.0±0.20	1.25±0.20	1.25±0.20		
	Α			0.85±0.10		
316	D	3.2±0.20	1.6±0.15	1.15±0.10		
510	F			1.6±0.15		
	J	3.2±0.20	1.6±0.20	1.6±0.20		
	В			1.40 max.		
32	F	3.2±0.20	2.5±0.20	2.0±0.2		
	G			2.5±0.2		
42	43 B	4.5±0.30	3.2±0.20	2.0±0.2		
40	D	4.5±0.30	5.2±0.20	2.5±0.2		

[RoHS Compliant Products]

Y5V Dielectric

	Size A Code)	CM05 (0402)	-	105 603)		CM21 (0805)			CM316 (1206)			CM32 (1210)	
	Voltage (VDC) citance (pF)	10	10	16	10	16	25	10	16	25	10	16	25
102 472	1000 2200 4700												
103 473	10000 22000 47000												
104 474	100000 220000 470000	D8											
105 475	1000000 2200000 4700000		B8	B6	G8	G6	G4		D6	D4			
106 476	1000000 2200000 4700000				G9			F8 F9	F6		F8	C6	C6

<Standard Capacitance Value>

E3 Series Please contact for capacitance value other than standard.

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

(Example)

C8" for CM05; Size Size	Dir	mension (m		Tan δ	Tan δ	
0±0.05mm	L	w	т	Code	Code	lan o
5±0.05mm 05 D	1.0±0.05	0.5±0.05	0.5±0.05		3	5.0% max.
12.5% max. 105 B	1.6±0.10	0.8±0.10	0.8±0.10		4	7.0% max.
21 G	2.0±0.10	1.25±0.10	1.25±0.10		6	9.0% max.
216 D	3.2±0.20	1.6±0.15	1.15±0.10		8	12.5% max
F	3.2±0.20	1.6±0.15	1.6±0.15		9	16.0% max
20 C	3.2±0.20	2.5±0.20	1.60 max.			
F	3.2±0.20	2.5±0.20	2.0±0.2			
12.5% max. 105 B 21 G 316 F 32 C	1.6±0.10 2.0±0.10 3.2±0.20 3.2±0.20 3.2±0.20	0.8±0.10 1.25±0.10 1.6±0.15 1.6±0.15 2.5±0.20	0.8±0.10 1.25±0.10 1.15±0.10 1.6±0.15 1.60 max.		4 6 8	7.0% m 9.0% m 12.5% n

Test Conditions and Specifications for Temperature Compensation Type (C Δ to U Δ • SL Characteristics) CM/ CT/ CF Series

Test	Items	٦	est Condition	S	Specifications			
Capacitance V	/alue (C)	Capacitance	Frequency	Volt	Within tolerance			
Q		C≤1000pF C>1000pF	1MHz±10% 1kHz±10%	0.5 to 5Vrms	C≥30pF : Q≥1000 C<30pF : Q≥400+20C			
Insulation Res	istance (IR)	minute at room a For the rated vol for 1 minute at ro	tage of over 630 ^v oom ambient. discharge curren		Over 10000M\Omega or 500MΩ • $\mu\text{F},$ whichever is less			
Dielectric Resi	istance	Apply 1.5 times w Apply 1.2 times w	nen the rated volta	r 1 to 5 seconds. ge is 250V or over. ge is 630V or over. t of the capacitor	No problem observed			
Appearance		Microscope			No problem observed			
Termination St	trength		d force of 500g (5 a. Apply 2N for 02	,	No problem observed			
Bending Stren	gth	Glass epoxy PCE time 10 seconds.	: Fulcrum spacing	g: 90mm, duration	No significant damage at 1mm bent			
Vibration	Appearance		ncy: 10 to 55 (Hz)	1	No problem observed			
Test	ΔC	Amplitude: 1.5m Sweeping condit		Hz/ 1 minute in X,	Within Tolerance			
	Q	Y and Z	ırs each, 6 hours		C≥30pF : Q≥1000 C<30pF : Q≥400+20C			
Soldering	Appearance		in 260°C±5°C se		No problem observed			
Heat Resistance				ent, and measure	Within $\pm 2.5\%$ or $\pm 0.25pF$, whichever is larger			
liceletanee	Q	after 24±2 hours (Pre-heating con			C≥30pF : Q≥1000			
			Temperature	Time	C<30pF : Q≥400+20C			
	IR		80 to 100°C 150 to 200°C	2 minutes 2 minutes	Over 10000MΩ or 500MΩ • μ F whichever is less			
	Withstanding Voltage	The charge and	discharge curren I 50mA for IR and	t of the capacitor	Resist without problem			
		Soaking condition						
Solderablity		Sn-3Ag-0.50 Sn63 Solder		3±0.5 sec. 2±0.5 sec.	Solder coverage : 90% min.			
Temperature	Appearance	(Cycle)			No problem observed			
Cycle	ΔC	Room temperatu	ıre (3min.)→		Within $\pm 2.5\%$ or $\pm 0.25pF$, whichever is larger			
	Q	Lowest operation Room temperatu	n temperature (30 ıre (3min.)→		C≥30pF : Q≥1000 C<30pF : Q≥400+20C			
	IR	Highest operatio	n temperature(30)min.)	Over 10000M Ω or 500M Ω • $\mu\text{F},$ whichever is less			
	Withstanding Voltage	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.		t of the capacitor	Resist without problem			
Load	Appearance	After applying ra	ted voltage for 5	00+12/ -0 hours	No problem observed			
Humidity Test	ΔC	in pre-condition	at 40°C±2°C, hur	midity 90 to	Within $\pm 7.5\%$ or ± 0.75 pF, whichever is larger			
(Except CF Series)	Q	room temperatu	re before measur	or 24±2 hours, at ement. t of the capacitor	C≥30pF : Q≥200 C<30pF : Q≥100+10C/ 3			
	IR must not exceed 50mA for IR measurement.			Over 500M Ω or 25M $\Omega \cdot \mu$ F, whichever is less				
High-	Appearance	Appearance After applying twice the rated voltage at the		tage at the	No problem observed.			
Temperature with Loading	ΔC	temperature of 1	25±3°C for 1000	+12/ -0 hours,	Within ±3% or ±0.3pF, whichever is larger			
with Loading Q			nple after 24±2 h		C≥30pF : Q≥350 10pF <c<30pf 2<="" :="" q≥275+5c="" td=""></c<30pf>			
	Q	Apply 1.2 times w	nen the rated volta nen the rated volta discharge curren	•				

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



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

Capacitance Value (C) Measure after heat freatment Within tolerance Tanô (%)	Test	Items	Test Conditions	Specifications		
Tanö (%) io C:10µF 1442:1056 C:0:0.2Vm Refer to capacitance chart Insulation Resistance (IR) Measure date the rate voltage is applied to 1 minute at room ambient. The charge and discharge current of the capacitor the rate available current of the capacito	Capacitance \	/alue (C)	Measure after heat treatment	Within tolerance		
Insulation Resistance (IR) minute at nom ambient. The charge and discharge current of the capacitor must not exceed 50m.4.	Tan ∂ (%)		C≤10μF 1kHz±10% 1.0±0.2Vrms C>10μF 120Hz±10% 0.5±0.2Vrms	Refer to capacitance chart		
Dielectric Resistance must not exceed 50mA. The charge and discharge current of the capacitor must not exceed 50mA. No problem observed Appearance must not exceed 50mA. Mo problem observed No problem observed Termination Strempt Appearance intermination Strempt Mo problem observed No problem observed Bending Strempt Gass apox PCR. Future spacing: B0mm, duration intermination strempt No problem observed No problem observed Vibration Terms (%) Appearance must not exceed 50mA (%) target stremmt. No problem observed No problem observed Soldering Heat Appearance must not exceed 50mA (%) target stremmt. No problem observed Within tolerance Soldering Heat Appearance must not exceed 50mA (%) target stremmt. No problem observed Within tolerance Soldering Heat Appearance must not exceed 50mA (%) target stremmt not exceed 50mA (%) target strempt not strempt strempt not str	Insulation Res	istance (IR)	minute at room ambient. The charge and discharge current of the capacitor	Over 10000M Ω or 500M Ω • $\mu F\!$		
Apply a sideward food of 500 [5]N to PCB-monthed sample. note : 2N for 2C01 size in for 10105 size. Exclude CT series with thickness of less than 0.68mm. No problem observed Bending Strength Glass goapy (PCE: Florum spacing: 90mm, duration time 10 seconds. Exclude CT series with thickness of less than 0.68mm. No significant damage at 1mm bent Vibration Test Appearance AC Take the initial value after heat treatment. Vibration (Puepers): 10: 55 (H2) Amplitude: 1.5mm No significant damage at 1mm bent Soldering Heat Resistance Appearance AC Take the initial value after heat treatment. Vibration (Puepers): 10: 55 (H2) Amplitude: 1.5mm No problem observed Withstanding Voltage Techage and glace in room amblent, and measurement. Solder ablity Techage and glace in room amblent, and measurement. Solder 2051/5 C 2 solder for 10:0.5 Solder 2031/5 C 2 minutes The charge and discharge current of the capacitor must not exceed 50m k of Hara withstanding volga measurement. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : Miths talloring Resist without problem Appearance AC Appearance A	Dielectric Res	istance	The charge and discharge current of the capacitor	No problem observed		
Termination Strength note :2N for 0201 size in for 01005 size. Exclude CT series with thickness of less tha 0.66m No problem observed Bending Strength Class epoxy PCE: Fulcrum spacing: 90mm, duration time 10 econds. No problem observed No significant damage at 1mm bent Vibration Test Appearance AC No problem observed No problem observed Soldering Heat Heat Besistance Appearance AC Take the initial value after heat treatment. Solder of the 2412 hours. No problem observed With standing Voltage Tan 0 (%) Tank 0 (%) Tank 0 (%) No problem observed Soldering Heat Heat Pasistance Concention 10-65-01 (M/) rimide in X, Yand Z Directions: 2 hours each, 6 hours total. No problem observed Soldersolutiv Tank 0 (%) Tank 0 (%) Tent observed With standing Voltage Order Time 2 10 to 200°C Z minutes 10 to 200°C No problem observed Soldersolutiv Solder/2 255°C 210.5 sec. Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. No problem observed Solder coverage : 90% min. Solder coverage : 90% min. No problem observed Solder coverage : 90% min. Solder covera	Appearance			No problem observed		
Bending Streenyth time 10 seconds. Exclude CT series with hickness of less than 0.66m. No significant damage at 1mm bent Vibration Test Appearance AC Take the initial value after heat treatment. Vibration frequency: 10 to 56 (H2) Amplitude: 1.5mm No problem observed Within tolerance Soldering Heat Heat Heat Heat Heat Heat Heat Heat	Termination S	trength	note : 2N for 0201 size in for 01005 size.	No problem observed		
Test ΔC Within the sumple in 260 shall be in room ambient, and measure the sample in 260 CHS°C sole of 1010.5 Within tolerance Within tolerance Soldering Heat Resistance Appearance Take the initial value after heat treatment. Soak the sample in 260 CHS°C sole of 1010.5 No problem observed Within 27.5% Within standing Voltage Pre-heating condition: 10-35-10½/1 minute in X, Y and Z No problem observed Within standing Voltage Pre-heating conditions No problem observed Within standing Voltage Pre-heating conditions No problem observed Solderability Soak the sample in 260 to 200°C 2 minutes Resist without problem Solderability Soak the initial value after heat treatment. Soaking condition (hin,)-> Solder coverage : 90% min. Solder coverage in 200 for 200 f	Bending Stren	gth	time 10 seconds.	No significant damage at 1mm bent		
Number of the second						
Tanô (%) Sweeping condition: 10-x50-10H/21 minute in X, Y and Z Directions: 2 hours each, 6 hours total. Within tolerance Soldering Heat Resistance Appearance AC Tanô (%) IR Ake the initial value after heat treatment. Soak the sample in z60°C55°C solder for 10±0.5 soak the sample in z60°C55°C solder for 10±0.5 iz 150 to 200°C ±2 minutes The charge and discharge current of the capacitor must not exceed 50m for H and withstanding voltage measurement. No problem observed Within ±7.5% Solderability Take the initial value after heat treatment. 5 colderability Solder coverage i 90% min. Resist without problem Solderability Solderability Solder coverage i 90% min. Solder coverage i 90% min. Tanô (%) Take the initial value after heat treatment. (%) cold No problem observed Within ±7.5% Solderability Take the initial value after heat treatment. (%) cold No problem observed No problem observed Yotage Take the initial value after heat treatment. (%) cold No problem observed No problem observed Yotage Take the initial value after voltage treatment. High-gearance AC Toke the initial value after voltage treatment. The charge and discharge current of the capacitor must not exceed 50m for IP and withstanding voltage for 500-12/-0 hours, measure and discharge current of the capacitor must not exceed 50m for IP and withstanding voltage for 500-12/-0 hours, measure the sample after Voltage fo	Test			Within tolerance		
Heat Soak the sample in 260°C45°C solder for 10:0.5 Within ±7.5% Resistance Tanô (%) Iff Iff Within ±7.5% Withstanding Tencharge and discharge current of the capacitor must not exceed 50mA for IR and withstanding votage measurement. Over 10000MΩ or 500MΩ • μF, whichever is less Solderability Tencharge and discharge current of the capacitor must not exceed 50mA for IR and withstanding votage measurement. Solder coverage : 90% min. Solderability Solder and the the initial value after heat treatment. (Cycie) Solder coverage : 90% min. AC Room temperature (3min.) → Lowest operation temperature	<u></u>		Sweeping condition: 10→55→10Hz/ 1 minute in X, Y and Z Directions: 2 hours each, 6 hours total.			
Resistance Tanô (%) Tanô (%) seconds and place in room ambient, and measure affect 42± hours. Multiple for the second secon						
IR (Pre-heating conditions) Over 10000MΩ or 500MΩ • μF, whichever is less Withstanding Voltage 1 80 to 100°C 2 minutes 2 150 to 200°C 2 minutes Solderability The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. Solder coverage : 90% min. Resist without problem Solderability Solder 23545°C 24545°C 245.5°C 240.5 sec. Solder coverage : 90% min. Temperature Cycle Appearance ΩC Take the initial value after heat treatment. Cycle) No problem observed No problem observed Notage Take the initial value after voltage treatment. Appearance AC No problem observed No problem observed Within ±12.5% Take the initial value after voltage treatment. Ac ange and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. No problem observed Humidity Test Appearance ΔC Appearance ΔC Appearance ΔC Appearance ΔC No froblem observed High- teamparture before measurement. Appearance ΔC At the initial value after voltage treatment. Must not exceed 50mA for IR measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. Must not exceed 50mA for IR measurement. Must not e			seconds and place in room ambient, and measure			
Withstanding Voltage Order Temperature 1 Time 80 to 100°C 2 minutes 2 minutes Solderablity The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. Solder coverage : 90% min. Resist without problem Solderablity Solder coverage : 90% min. Solder coverage : 90% min. Solder coverage : 90% min. Temperature Cycle Appearance ΔC Tanδ (%) Tanδ (%) No problem observed Within standing Voltage Tanδ (%) Resist without problem No problem observed Within standing Voltage Tanδ (%) Resist without problem No problem observed Within standing Voltage Tanδ (%) Resist without problem No problem observed Within standing Voltage The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. No problem observed Humidity Test Appearance ΔC Appearance ΔC No problem observed IR The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. No problem observed IR Appearance ΔC Appearance ΔC No problem observed IR Appearan						
Solderablity Soaking condition Soaking condition Solderablity Sn-3Ag-0.5Cu 245±5°C 2±0.5 sec. Sn63 Solder 235±5°C 2±0.5 sec. Solder coverage : 90% min. Temperature Cycle Appearance ΔC Tanô (%) Take the initial value after heat treatment. (Cycle) No problem observed Within tanding Voltage Mithestanding Voltage 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. The cond the initial value after voltage for 500+12′ – 0 hours, 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 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 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 capac			1 80 to 100°C 2 minutes 2 150 to 200°C 2 minutes The charge and discharge current of the capacitor must not	Resist without problem		
Cycle ΔC (Cycle) (Cycle) (Cycle) Within ±7.5% Tanô (%) Lowest operation temperature (3min.)→ Highest operation temperature (3min.)→ Within ±17.5% Within ±17.5% Within ±17.5% Within ±17.5% Within ±17.5% Within ±17.5% Over 10000MΩ or 500MΩ • μF, whichever is less Within ±10 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. No problem observed Humidity Test AC Take the initial value after voltage treatment. After applying rated voltage to 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. AC No problem observed High- Temperature with Loading Appearance AC Take the initial value after voltage treatment. AC No problem observed High- Temperature with Loading Take the initial value after voltage treatment. After applying twice the rated voltage at the highest operation temperature for 1000+12/ -0 hours, measure the sample after 24±2 hours. No problem observed Within ±12.5% 200% max. of initial value Over 500MΩ or 25MΩ • μF, whichever is less Within ±12.5% 200% max. of initial value No probl	Solderablity		Soaking condition Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec.	Solder coverage : 90% min.		
AC Room temperature (3min.)→ Within 11/1.37.3% Tanδ (%) Lowest operation temperature (30min.)→ Room temperature (30min.)→ IR Room temperature (3min.)→ Within tolerance Withstanding Voltage Appearance 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. No problem observed 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 High- Temperature with Loading Appearance Tanδ (%) Take the initial value after voltage tro 24±2 hours, at room temperature before measurement. No problem observed High- Temperature with Loading Appearance Tanδ (%) Take the initial value after voltage treatment. Apply 1.5 times when the rated voltage is 10V or less. Applied voltages for respective products are indicated in the below chart. No problem observed Pre- Heat Keep specimen at 150+0/ −10°C for 1 hour, leave specimen at room ambient for 24±2 hours.		Appearance		No problem observed		
Iano (%) Lowest operation temperature (30min.)→ Within tolerance IR Poom temperature (30min.)→ Over 10000MΩ or 500MΩ • μF, whichever is less Withstanding Voltage Over 10000MΩ or 500MΩ • μF, whichever is less Load Appearance Take the initial value after voltage treatment. No problem observed Humidity Take the initial value after voltage for 500+12/ -0 hours in pre-condition at 40°C±2°C, humidity bot op 5%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. No problem observed High-trest Appearance Take the initial value after voltage treatment. No problem observed High-trest Appearance Take the initial value after voltage treatment. No problem observed High-trest Appearance Take the initial value after voltage treatment. No problem observed High-trest Appearance Take the initial value after voltage treatment. No problem observed High-trest Appearance Take the initial value after voltage treatment. No problem observed Take the initial value after voltage treatment. Take the initial value after voltage treatment. No problem observed Uthin ±12.5% 200% max. of initial value Within ±12.5% In No pr	Cycle	-				
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 Humidity Test Appearance AC Take the initial value after voltage treatment. 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. 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. Take the initial value after voltage treatment. AC No problem observed High- Temperature With Loading Appearance Take the initial value after voltage treatment. AC No problem observed No problem observed High- Temperature With Loading Appearance Take the initial value after voltage treatment. AC No problem observed No problem observed High- Temperature With Loading Appearance Take the initial value after 24±2 hours. 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. No problem observed Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.			Lowest operation temperature (30min.) \rightarrow			
Load Humidity Test Appearance ΔC Take the initial value after voltage treatment. 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. IR No problem observed High- Temperature with Loading Appearance ΔC Take the initial value after voltage treatment. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. After applying twice the rated voltage at the highest operation temperature for 1000+12/ -0 hours, measure the sample after 24±2 hours. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. After applying twice the rated voltage at the highest operation temperature for 1000+12/ -0 hours, measure the sample after 24±2 hours. 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. No problem observed Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.		Withstanding	Highest operation temperature(30min.) After 5 cycles, measure after 24±2 hours. The charge and discharge current of the capacitor must not			
Humidity Test ΔC 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. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. Within ±12.5% High- Temperature with Loading Appearance ΔC Take the initial value after voltage treatment. After applying twice the rated voltage at the highest operation temperature for 1000+12/ -0 hours, measure the sample after 24±2 hours. No problem observed No problem observed No problem observed Within ±12.5% 200% max. of initial value 0ver 1000MΩ or 25MΩ • μF, whichever is less Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.	Land					
Test Δ0 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. 200% max. of initial value High- Temperature with Loading Appearance ΔC Take the initial value after voltage treatment. After applying twice the rated voltage at the highest operation temperature for 1000+12/ -0 hours, measure the sample after 24±2 hours. No problem observed No problem observed Vitami ±12.5 // 200% max. of initial value No problem observed Vitami ±12.5 // 200% max. of initial value Vitami ±12.5 // 200% max. of initial value Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.		<u> </u>				
High- Temperature with Loading Appearance AC Tanδ (%) Take the initial value after voltage treatment. After applying twice the rated voltage treatment. After applying twice the rated voltage treatment. After applying twice the rated voltage at the highest operation temperature for 100+12/-0 hours, measure the sample after 24±2 hours. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. After applying twice the rated voltage treatment. After applying twice the rated voltage at the highest operation temperature for 100+12/-0 hours, measure the sample after 24±2 hours. 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. No problem observed Ver 1000MΩ or 50MΩ • μF, whichever is less Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.			in pre-condition at 40°C±2°C, humidity 90 to			
High- Temperature with Loading Appearance ΔC Take the initial value after voltage treatment. After applying twice the rated voltage at the highest operation temperature for 1000+12/ -0 hours. 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. No problem observed Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.		room temperature before measurement. The charge and discharge current of the capacitor				
Temperature with Loading ΔC After applying twice the rated voltage at the highest operation temperature for 1000+12/ –0 hours, measure the sample after 24±2 hours. Within ±12.5% Tanô (%) measure the sample after 24±2 hours. 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. Within ±12.5% Pre- Heat Keep specimen at 150+0/ –10°C for 1 hour, leave specimen at room ambient for 24±2 hours.	High-					
Tano (%) measure the sample after 24±2 hours. In 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. 200% max. of initial value Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.	Temperature	ΔC		Within ±12.5%		
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 1000MΩ or 50MΩ • µF, whichever is less Pre- Heat Keep specimen at 150+0/ -10°C for 1 hour, leave specimen at room ambient for 24±2 hours.	Loading	Ταn δ (%)		200% max. of initial value		
	Loading	IR	must not exceed 50mA for IR measurement. Apply 1.5 times when the rated voltage is 10V or less. Applied	Over 1000M Ω or 50M Ω • $\mu\text{F},$ whichever is less		
	Pro-	Heat	Keen specimen at $150\pm0/-10^{\circ}$ for 1 hour	leave specimen at room ambient for 2/+2 hours		
	treatment	Voltage		•		

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

Rated Voltage	Products
4V	CT03X5R104
6.21/	CM105X5R475, CM316X5R476
0.57	CT05X5R104, CT21X5R106, CT03X5R104
16\/	CM105X7R474-105, CM21X7R105-475, CM316X7R475-106, CM32X7R106-226, CM05X5R224, CM105X5R225, CM21X5R475-106, CM316X5R226
100	CT105X5R105, CT21X5R225-475, CT316X5R106, CM03X5R332-103
251/	CM105X7R474, CM21X7R105-225, CM316X7R475, CM32X7R106, CM105X5R474-105, CM21X5R225-106, CM316X5R106, CM32X5R106-226
250	CT316X5R225-106, CM03X5R152-103
501/	CM21X5R105, CM32X5R106, CM32X7R106
500	CT21X5R225, CT316X5R105-475
100V	CM32X7RK74, CM43X7R105
	6.3V 16V 25V 50V

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

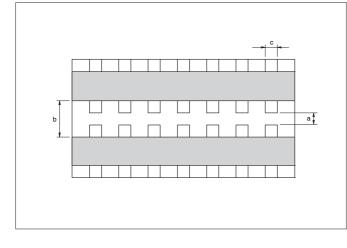
Test Conditions and Specifications for High Dielectric Type (Y5V) CM/ CT/ CA Series

Test	Items		Test Co	onditions		Specifications			
Capacitance \	/alue (C)	Measure afte	r heat treat	ment		Within tolerance			
Tan δ (%)			u ency ±10%		Volt 0.2Vrms	Refer to capacitance chart			
Insulation Res	sistance (IR)	Measured after minute at room		voltage is ap	oplied for 1	Over 10000M Ω or 500M Ω • $\mu\text{F},$ whichever is less			
Dielectric Res	istance		nd discharg	•	1 to 5 seconds. f the capacitor	No problem observed			
Appearance		Microscope				No problem observed			
Termination S	trength	mounted san	nple.	0 (5N) to a PCB- s than 0.66mm.	No problem observed			
Bending Strength		time 10 seco	nds.		90mm, duration s than 0.66mm.	No significant damage at 1mm bent			
Vibration Appearance		Take the initia			ment.	No problem observed			
Test	ΔC	Vibration free Amplitude: 1	. ,	:o 55 (Hz)		Within tolerance			
	Tan δ (%)	Sweeping co Y and Z Directions: 2			/ 1 minute in X, tal.	Within tolerance			
Soldering	Appearance	Take the initia				No problem observed			
Heat Resistance	ΔC	Soak the sample in 260°C±5°C solder for 10±0.5 seconds and place in room ambient, and measure							
1	Tan ∂ (%)	after 24±2 hc (Pre-heating		-		Within tolerance			
	IR	Order	Tempe	rature	Time	Over 10000M\Omega or 500M\Omega \bullet $\mu\text{F},$ whichever is less			
	Withstanding Voltage		ceed 50mA	200°C ge current d	2 minutes 2 minutes of the capacitor d withstanding	Resist without problem			
Solderablity		Soaking con Sn-3Ag-0 Sn63 Sol).5Cu 24	45±5°C 35±5°C	3±0.5 sec. 2±0.5 sec.	Solder coverage : 90% min.			
Temperature	Appearance	Take the initia	al value afte	er heat treat	ment.	No problem observed			
Cycle	ΔC	(Cycle) Room tempe	rature (3mir	ו.)→		Within ±20%			
	Tan ∂ (%)	Lowest opera			in.)→	Within tolerance			
	IR	Room tempe Highest oper	ation tempe	erature(30m	,	Over 10000M\Omega or 500M\Omega ${\scriptstyle \bullet}\mu\text{F},$ whichever is less			
	Withstanding Voltage	After 5 cycles The charge a must not exc voltage meas	nd discharg eed 50mA f	ge current o	f the capacitor	Resist without problem			
Load	Appearance	Take the initia		0		No problem observed			
Humidity Test	ΔC	in pre-condit	ion at 40°C:	±2°C, humi	,	Within ±30%			
	Ταn δ (%)	95%RH, allo room temper			24±2 hours, at nent.	150% max. of initial value			
IR The charge and discharge current of the capar must not exceed 50mA for IR measurement.		f the capacitor	Over 500M or 25M $\bullet \mu F\!\!\!$, whichever is less						
High-	Appearance	After applying twice the rated voltage at the highest		eatment.	No problem observed				
Temperature with	ΔC			•	Within ±30%				
Loading	Τan δ (%)	measure the	sample afte	r 24±2 hour	S.	150% max. of initial value			
	IR				f the capacitor urement.	or $Over 1000M\Omega \text{ or } 50M\Omega \cdot \mu\text{F}$, whichever is less			
Pre-	Heat			E010/ 40		leave specimen at room ambient for 24±2 hours.			

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

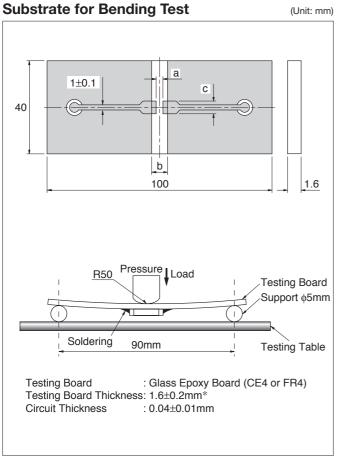
Test	Items	Test Conditions	Specifications			
Capacitance V	alue (C)	Measure after heat treatment	Within tolerance			
Tan δ (%)		CapacitanceFrequencyVoltC≤10μF1kHz±10%1.0±0.2Vrms	Within ±2.5%			
Insulation Res	istance (IR)	Measured after the rated voltage is applied for 1 minute at room ambient. Measured 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 10000MΩ or 500MΩ • μF, whichever is less Over 100MΩ • μF 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 Strength		Apply a sideward force of 500g (5N) to a PCB-mounted sample.	No problem observed			
Bending Stren	gth	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.	No problem observed			
Test	ΔC	Vibration frequency: 10 to 55 (Hz) 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 Heat		Take the initial value after heat treatment. Soak the sample in 260°C±5°C solder for	No problem observed			
Resistance	$\Delta \mathbf{C}$	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	OrderTemperatureTime180 to 100°C2 minutes2150 to 200°C2 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.				
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)	Within ±7.5%			
	Tan δ (%)	Room temperature (3min.) \rightarrow 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\Omega or 500M $\Omega \cdot \mu$ F, whichever is less Over 100M $\Omega \cdot \mu$ F for CF316X7R104/ 250V and CF43X7R474/ 250V CF55X7R105/ 250V and CF55X7R224/ 630V			
	Withstanding Voltage		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%			
⊢	Τan 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 shall be, 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\Omega or 50MΩ • μ F, whichever is less			
Pre-	Heat	Keep specimen at $150+0/-100$ for 1 hour	leave specimen at room ambient for 24±2 hours.			

Substrate for Electrical Tests

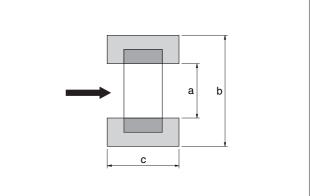


			(Unit: mm)
Size (EIA Code)	а	b	с
02 (01005)	0.15	0.50	0.20
03 (0201)	0.26	0.92	0.32
05 (0402)	0.4	1.4	0.5
105 (0603)	1.0	3.0	1.2
21 (0805)	1.2	4.0	1.65
316 (1206)	2.2	5.0	2.0
32 (1210)	2.2	5.0	2.9
42 (1808)	3.5	7.0	3.7
43 (1812)	3.5	7.0	3.7
52 (2208)	4.5	8.0	5.6
55 (2220)	4.5	8.0	5.6

Substrate for Adhesion Strength Test



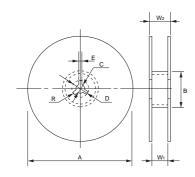
* 02, 03, 05 and array: 0.8±0.1mm



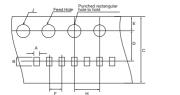
KYOCERa

Tape and Reel

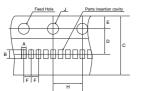
• Reel



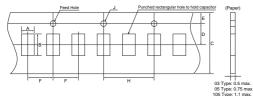
F=1mm (02 Type)



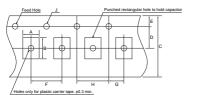
F=1mm (02, 03, 05 Type)



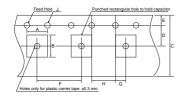
F=2mm (03, 05, 105 Type)



F=4mm (105, D11, F12, 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

(Unit: mm) Size Α В F (EIA Code) 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 1.0±0.05 03 (0201)* 0.37±0.03 0.67±0.03 2.0±0.05 1.0±0.05 05 (0402)* 0.65±0.1 1.15±0.1 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 2.0±0.2 3.6±0.2 4.0±0.1 316 (1206) 32 (1210) 3.6±0.2 4.0±0.1 2.9±0.2 4.9±0.2 42 (1808) 2.4±0.2 4.0±0.1 4.9±0.2 43 (1812) 3.6±0.2 8.0±0.1 6.0±0.2 52 (2208) 2.4±0.2 4.0±0.1 55 (2220) 5.3±0.2 6.0±0.2 8.0±0.1 D11 (0405) 1.15±0.2 1.55±0.2 4.0±0.1 F12 (0508) 1.5±0.2 2.3±0.2 4.0±0.1

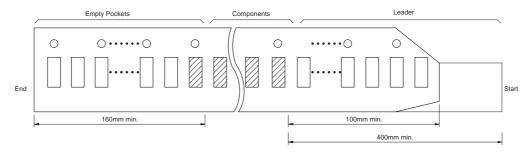
* Option

(Unit: 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	1mm Paper	8.0 +0.3/ -0.1				4.0 ±0.05	
2.0 ±0.05	8mm Paper	8.0 ±0.3 3.5 ±0.05					
			±0.05	1.75 ±0.1	2.0 ±0.05	4.0	1.5 +0.1/ –0
4.0 ±0.1	8mm Plastic		±0.1	±0.05	4.0 ±0.1	+0.1/ -0	
	12mm	12.0	5.5				
8.0 ±0.1	Plastic	±0.3	±0.05				



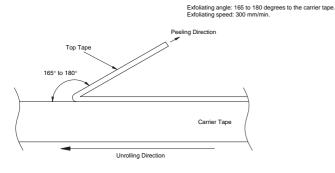
Detail of leader and trailer

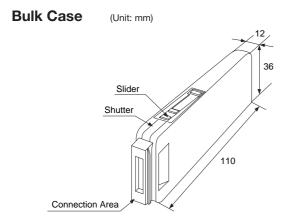


Adhesive tape

- 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





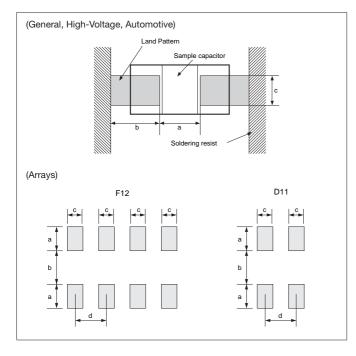


• Please contact Kyocera for details.

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

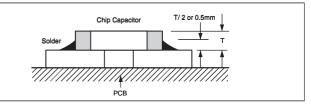
The recommended fillet height shall be 1/2 of the thickness of capacitors or 0.5mm. When mounting two or more capacitors in the common land, it is necessary to separate the land with the solder resist strike so that it may become the exclusive land of each capacitor.

General, I	High-Volta		(Unit: mm)	
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 (Unit: mn				
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
Arrays				(Unit: mm)

(ond in				(onic min)
	а	b	С	d
F12 (0508)	0.5	0.5	0.3	0.5
D11 (0405)	0.69	0.28	0.3	0.64
IC				(Unit: mm)
Size (EIA Code)	L×W	а	b	с
05 (0402)	0.5×1.0	0.15 to 0.20	0.20 to 0.30	0.90 to 1.20
105 (0603)	0.8×1.6	0.20 to 0.30	0.30 to 0.50	1.40 to 1.60

Ideal Solder Height

Comercal Link Veltone



Item	Not recommended example	Recommended example/ Separated by solder
Multiple parts mount		Solder resist
Mount with leaded parts	Leaded parts	Solder resist
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.

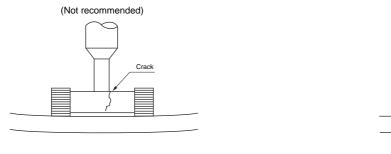
Recommended chip position on PCB to minimize stress from PCB warpage

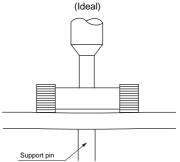


Actual Mounting

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 100 to 300 gf.
- 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

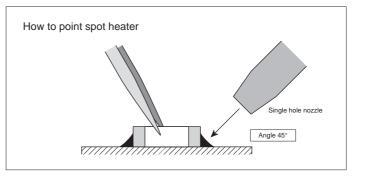
- 1) Ceramic is easily damaged by rapid heating or cooling. If some heat shock is unavoidable, preheat enough to limit the temperature difference (Delta T) to within 130 degree Celsius.
- 2) The product size 1.6×0.8mm to 3.2×1.6mm can be used in reflow and wave soldering, and the product size of bigger than 3.2×1.6mm, or smaller than 1.6×0.8mm, and capacitor arrays can be used in reflow.

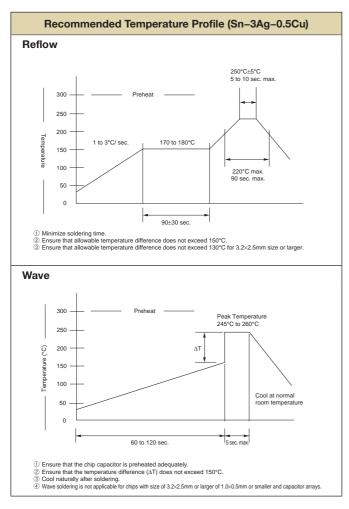
Circuit shortage and smoking can be created by using capacitors which are used neglecting the above caution.

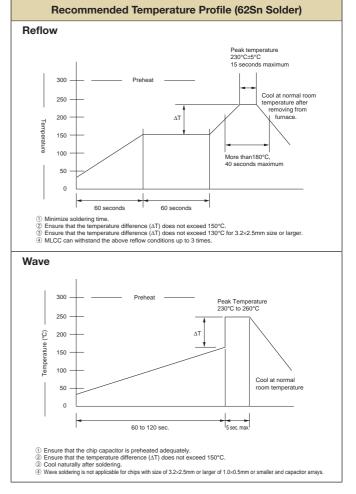
- 3) Please see our recommended soldering conditions.
- 4) In case of using Sn-Zn Solder, please contact us in advance.
- 5) The following condition is recommended for spot heater application.

Recommended spot heater condition

Item	Condition
Distance	5mm min.
Angle	45°
Projection Temp.	400°C max.
Flow rate	Set at the minimum
Nozzle diameter	2¢ to 4¢ (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≤150°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.
- 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 chuck-type 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.
- 3. The storage atmosphere must be free of gas containing sulfur 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 (six months for silver palladium) 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/