THE NEW VALUE FRONTIER

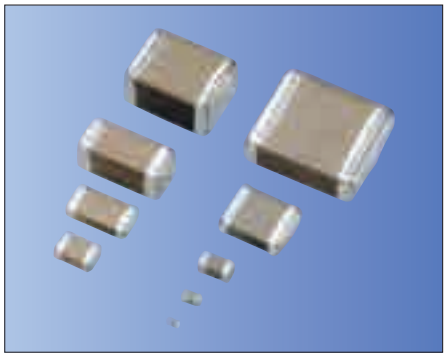
KYOCERA

Capacitors

2018

KYOCERA Corporation

Capacitors



RoHS Compliant

■Features

- ●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.
- ●We have a network 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.

■KYOCERA PART NUMBER

CM	03	X5R	225	M	06	A	H	□□□
①	②	③	④	⑤	⑥	⑦	⑧	OPTION :

Above digits are used to track individual specification or thickness.

(Example)

①Series	: CM Series(General)
②Size	: 0201
③Dielectric	: X5R
④Capacitance	: 2.2μF
⑤Tolerance	: ±20%
⑥Voltage	: 6.3Vdc
⑦Termination	: Sn
⑧Packaging	: Cavity pitch 2mm / Reel Size φ180

①SERIES CODE

CODE	Type
CM	General
CT	Low Profile
CU	High-Q
AT	Au Termination
ST	Soft Termination
CF	High-Voltage
KNH	Three Terminal Capacitors

②Size Code

CODE	EIA	JIS
02	01005	0402
03	0201	0603
05	0402	1005
105	0603	1608
21	0805	2012
316	1206	3216
32	1210	3225
42	1808	4520
43	1812	4532

③DIELECTRIC CODE

Temperature Compensation Type			
CODE	Temperature Range (℃)	ppm/℃	
CG	-55 to 125	0	±30
CH			±60

・All parts of C0G will be marked as "CG" but will conform to the above table.
・Temperature coefficients are determined by calculation based on measurement at 20℃ and 85℃.

High Dielectric Constant Type			
CODE	Temperature Range (℃)	ΔC max. (%)	Standard Temperature (℃)
X5R	-55 to 85	±15	25
X7R	-55 to 125	±15	
X7S		±22	

④CAPACITANCE CODE

Capacitance expressed in pF.
Two significant digits plus number of zeros.
For Values < 10pF, Letter R denotes decimal point,
<1,000pF=1nF、1,000nF=1μF>

(Example)

CODE	Capacitance
R50	0.5pF
1R0	1pF
100	10pF
101	100pF
102	1nF
103	10nF
104	100nF
105	1μF
106	10μF

E STANDARD NUMBER				
E3	E6	E12	E24	
1.0	1.0	1.0	1.0	1.1
		1.2	1.2	1.3
	1.5	1.5	1.5	1.6
		1.8	1.8	2.0
2.2	2.2	2.2	2.2	2.4
		2.7	2.7	3.0
	3.3	3.3	3.3	3.6
		3.9	3.9	4.3
4.7	4.7	4.7	4.7	5.1
		5.6	5.6	6.2
	6.8	6.8	6.8	7.5
		8.2	8.2	9.1

⑤TOLERANCE CODE

Temperature Compensation Type (C0G)	
CODE	Tolerance
A*	±0.05pF
B	±0.1pF
C	±0.25pF
D	±0.5pF
G*	±2%
J	±5%
K	±10%

* : Option

High Dielectric Constant Type(X5R/X7R/X7S)	
CODE	Tolerance
J*	±5%
K	±10%
M	±20%

* : Option

⑥VOLTAGE CODE

CODE	Rated Voltage
04	4Vdc
06	6.3Vdc
10	10Vdc
16	16Vdc
25	25Vdc
35	35Vdc
50	50Vdc
100	100Vdc
250	250Vdc
630	630Vdc
1000	1000Vdc
2000	2000Vdc

⑦TERMINATION CODE

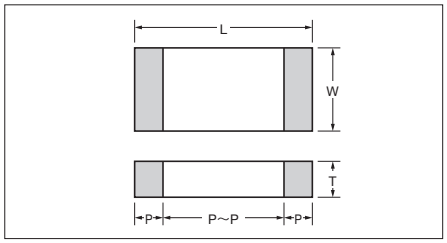
CODE	Termination
A	Nickel Barrier/ Tin
G*1	Nickel Barrier/ Au
K*2	Nickel Barrier/ Au
Y*	Nickel Barrier/ Cu
S	Nickel Barrier/ Tin (Soft Termination)

* : Option
*1: AuSn solder and conductive adhesive.
*2: Wire bonding and conductive adhesive.

⑧PACKAGING CODE

CODE	Size Code	Cavity pitch	Reel size
T	43	8mm	φ180
	105 to 42	4mm	
H	02 to 05	2mm	
Q	03/05	1mm	
P	02	1mm	
L	105 to 32	4mm	φ330
N	02 to 05	2mm	
W	03/05	1mm	

■Dimension



■Packaging Code

20kp (E 8 / 2)

kp means 1000 pieces

Taping Material	
Code	Material
E	Plastic
P	Paper

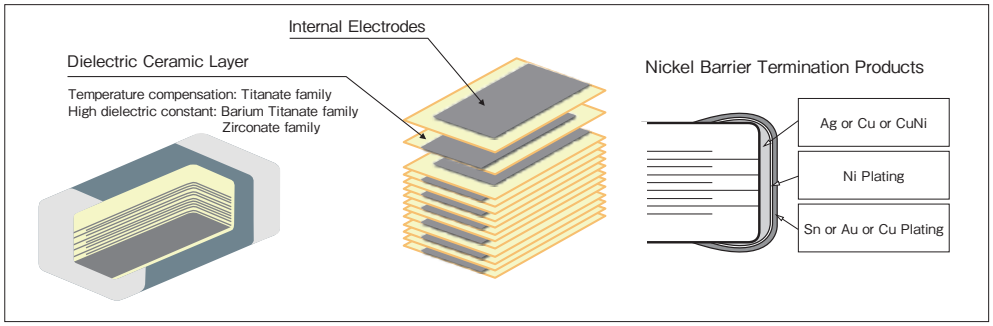
Taping Width	
Code	Width
4	4mm
8	8mm
12	12mm

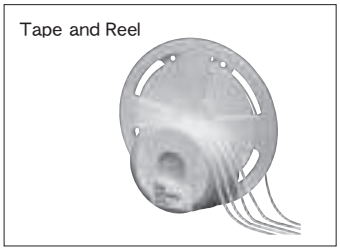
Pitch	
Code	Pitch
1	1mm
2	2mm
4	4mm
8	8mm

Size	Code		Dimension	Dimension (mm)						Maximum quantity per reel	
	EIA	JIS	Code	L	W	T	P min.	P max.	P to P min.	ϕ 180Reel	ϕ 330Reel
02	01005	0402	A	0.4±0.02	0.2±0.02	0.2±0.02	0.07	0.14	0.13	40kp (E4/1) 20kp (P8/2)	— 80kp (P8/2)
03	0201	0603	A	0.6±0.03	0.3±0.03	0.22 max.	0.10	0.20	0.20	30kp (P8/1) 15kp (P8/2)	150kp (P8/1) 50kp (P8/2)
			B			0.3±0.03					
			C	0.6±0.05	0.3±0.05	0.3±0.05	0.13	0.23	0.19	30kp (P8/1) 15kp (P8/2)	150kp (P8/1) 50kp (P8/2)
			D	0.6±0.09	0.3±0.09	0.25 max.	0.13	0.23	0.19	15kp (P8/2)	—
			E			0.3±0.09					
			F	0.6±0.10	0.3±0.10	0.3±0.10					
05	0402	1005	A	1.0±0.05	0.5±0.05	0.22 max.	0.15	0.35	0.30	20kp (P8/1) 10kp (P8/2)	100kp (P8/1) 50kp (P8/2)
			B			0.33 max.					
			C			0.5±0.05					
			D	1.0±0.07	0.5±0.07	0.5±0.07	0.15	0.35	0.30	20kp (P8/1) 10kp (P8/2)	— 50kp (P8/2)
			E	1.0±0.10	0.5±0.10	0.5±0.10					
			F*	1.0±0.10	0.5±0.20	0.50 max	0.05	0.25	—	10kp (P8/2)	—
			G	1.0±0.15	0.5±0.15	0.5±0.15	0.15	0.35	0.30	20kp (P8/1) 10kp (P8/2)	— 50kp (P8/2)
			H	1.0±0.20	0.5±0.20	0.33 max.	0.15	0.35	0.30	10kp (P8/2)	—
			J			0.5±0.20					
			K*				0.05	0.25	—		
105	0603	1608	A	1.6±0.10	0.8±0.10	0.55 max.	0.20	0.60	0.50	4kp (P8/4)	10kp (P8/4)
			B			0.8±0.10					
			C	1.6±0.15	0.8±0.15	0.8±0.15					
21	0805	2012	A	2.0±0.10	1.25±0.10	0.95 max.	0.20	0.75	0.70	4kp (P8/4)	10kp (P8/4)
			B			0.85±0.10					
			C			1.05±0.10				3kp (E8/4)	10kp (E8/4)
			D			1.25±0.10					
			E	2.0±0.15	1.25±0.15	0.95 max.	0.20	0.75	0.70	4kp (P8/4)	10kp (P8/4)
			F			1.25±0.15				3kp (E8/4)	10kp (E8/4)
			G	2.0±0.20	1.25±0.20	0.95 max.				4kp (P8/4)	10kp (P8/4)
			H			1.25±0.20				3kp (E8/4)	10kp (E8/4)
316	1206	3216	A	3.2±0.20	1.6±0.15	1.15±0.10	0.30	0.85	1.40	3kp (E8/4)	10kp (E8/4)
			B			1.25±0.10					
			C			1.6±0.15				2.5kp (E8/4)	5kp (E8/4)
			D	3.2±0.20	1.6±0.20	1.6±0.20	0.30	0.85	1.40	2.5kp (E8/4)	5kp (E8/4)
			F	3.2±0.30	1.6±0.30	1.6±0.30	0.30	0.85	1.90	2kp (E8/4)	—
32	1210	3225	A	3.2±0.30	2.5±0.20	1.6±0.15	0.30	1.00	1.40	2.5kp (E8/4)	5kp (E8/4)
			B			2.0±0.20				2kp (E8/4)	5kp (E8/4)
			C			2.5±0.20				1kp (E8/4)	4kp (E8/4)
42	1808	4520	A	4.5±0.20	2.0±0.20	2.2 max.	0.15	0.85	2.60	2kp (E12/4)	—
43	1812	4532	A	4.5±0.30	3.2±0.20	2.5 max.	0.30	1.10	2.00	0.5kp (E12/8)	—

* : KNH Series

■Structure





・Please contact your local 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.

■Features

We offer a diverse product line ranging from ultra-compact (0.4×0.2mm) to large (3.2×2.5mm) components configured for a variety of temperature characteristics, rated voltages, and packages. We offer the choice and flexibility for almost any applications.

■Applications

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

Temperature Compensation Dielectric

Part Number List : P20

●Capacitance chart

Size (EIA Code)		CM02 (01005)		CM03 (0201)	CM05 (0402)	CM105 (0603)
Rated Voltage (Vdc) / Capacitance (pF)		16	25	50	50	50
1R0	1.0					
1R5	1.5					
	2.0					
	3.0					
	4.0					
	5.0					
	6.0					
	7.0		A			
	8.0					
	9.0					
100	10					
120	12			B		
	15					
	18					
	22					
	27					
	33					
	39					
	47	A				
	56					
	68					
	82					
101	100					
121	120					
	150	A				
	180					
	220				C	
	270					
	330					
	390					
	470					
	560					B
	680					
	820					
102	1000					

〈Standard Capacitance Value〉
・E12 Series
Please contact for capacitance value other than standard.

▨ : Optional Spec.

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

(Example)
In case of "B" for CM03;
L : 0.6±0.03mm
W : 0.3±0.03mm
T : 0.3±0.03mm

Size	Size Code	Dimension (mm)		
		L	W	T
02	A	0.4±0.02	0.2±0.02	0.2±0.02
03	B	0.6±0.03	0.3±0.03	0.3±0.03
05	C	1.0±0.05	0.5±0.05	0.5±0.05
105	B	1.6±0.10	0.8±0.10	0.8±0.10

X5R Dielectric

Part Number List : P21-23

●Capacitance chart

Size (EIA Code)	CM02 (01005)		CM03 (0201)					CM05 (0402)						CM105 (0603)			
Rated Voltage (Vdc) / Capacitance (pF)	6.3	16	4	6.3	10	16	25	4	6.3	10	16	25	35	6.3	10	16	25
101 100																	
151 150 220 330																	
470 680 102 1000		A8					B3										
152 1500 2200 3300																	
4700 6800 103 10000																	
153 15000 22000 33000	A8				B7												
47000 68000 104 100000												C3					
220000 470000 105 1000000	A8			B8 C8		E10			C7	C8 C7 C8	C8 C7	C7	C7				C8
2200000 4700000 106 10000000			E8	C8/E8	E9				C8 G8 J8		J8			C5 C8	C8	B8	
15000000 22000000								G8 J8									

Size (EIA Code)	CM21 (0805)					CM316 (1206)						CM32 (1210)				
Rated Voltage (Vdc) / Capacitance (pF)	6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50
105 1000000				D3	D8											
2200000 4700000 106 10000000	H5	D4	D3 F8 H8	H8			C4	C3	C3 D8	D3	D3			C3	C3 C8	C3
22000000 47000000						D5		C3 D8				C5	C4			

〈Standard Capacitance Value〉
Capacitance value of less than 0.1μF: E6 Series
Capacitance value of 0.1μF and larger : E3 Series
Please contact for capacitance value other than standard.

▨ : Optional Spec.

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 Code	Dimension (mm)		
		L	W	T
02	A	0.4±0.02	0.2±0.02	0.2±0.02
03	B	0.6±0.03	0.3±0.03	0.3±0.03
	C	0.6±0.05	0.3±0.05	0.3±0.05
	E	0.6±0.09	0.3±0.09	0.3±0.09
05	C	1.0±0.05	0.5±0.05	0.5±0.05
	G	1.0±0.15	0.5±0.15	0.5±0.15
	J	1.0±0.20	0.5±0.20	0.5±0.20
105	B	1.6±0.10	0.8±0.10	0.8±0.10
	C	1.6±0.15	0.8±0.15	0.8±0.15
21	D	2.0±0.10	1.25±0.10	1.25±0.10
	F	2.0±0.15	1.25±0.15	1.25±0.15
	H	2.0±0.20	1.25±0.20	1.25±0.20
316	C	3.2±0.20	1.6±0.15	1.6±0.15
	D	3.2±0.20	1.6±0.20	1.6±0.20
32	C	3.2±0.30	2.5±0.20	2.5±0.20

Tan δ Code	Tan δ
3	5.0%max.
4	7.0%max.
5	7.5%max.
7	10.0%max.
8	12.5%max.
9	15.0%max.
10	20.0%max.

X7R Dielectric

Part Number List : P21-23

●Capacitance chart

Size (EIA Code)	CM02 (01005)	CM03 (0201)			CM05 (0402)	CM105 (0603)			CM21 (0805)				
Rated Voltage(Vdc) / Capacitance (pF)	16	10	16	25	25	6.3	10	16	6.3	10	16	25	50
101 100	A8												
151 150				B2									
220													
330													
470			B2										
680													
102 1000													
152 1500		B3											
2200													
3300													
4700													
6800													
103 10000													
153 15000													
22000													
33000													
47000													
68000													
104 100000					C8								
220000													
470000													
105 1000000							B8	B8		D3		D8	{H3}
2200000						C8						H8	
4700000									H8	{H8}	H8		
106 10000000													

Size (EIA Code)	CM316 (1206)					CM32 (1210)		
Rated Voltage(Vdc) / Capacitance (pF)	6.3	10	16	25	50	16	25	50
2200000				D8	{D3}	C2		
4700000				{D3}				
106 10000000			D8				C8	C3
22000000	D8	{D5}				C8		

〈Standard Capacitance Value〉
Capacitance value of less than 0.1μF: E6 Series
Capacitance value of 0.1μF and larger : E3 Series
Please contact for capacitance value other than standard.

▨ : Optional Spec.

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 Code	Dimension (mm)		
		L	W	T
02	A	0.4±0.02	0.2±0.02	0.2±0.02
03	B	0.6±0.03	0.3±0.03	0.3±0.03
05	C	1.0±0.05	0.5±0.05	0.5±0.05
105	B	1.6±0.10	0.8±0.10	0.8±0.10
	C	1.6±0.15	0.8±0.15	0.8±0.15
21	D	2.0±0.10	1.25±0.10	1.25±0.10
	H	2.0±0.20	1.25±0.20	1.25±0.20
316	D	3.2±0.20	1.6±0.20	1.6±0.20
32	C	3.2±0.30	2.5±0.20	2.5±0.20

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

X7S Dielectric

Part Number List : P22

●Capacitance chart

Size (EIA Code)	CM316 (1206)
Rated Voltage(Vdc) / Capacitance (pF)	100
105 1000000	
2200000	D3
4700000	E3
106 10000000	

▨ : Optional Spec.

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

(Example)
In case of "D3" for CM316;
L : 3.2±0.20mm
W : 1.6±0.20mm
T : 1.6±0.20mm
Tan δ : 5.0% max.

Size	Size Code	Dimension (mm)		
		L	W	T
316	D	3.2±0.20	1.6±0.20	1.6±0.20
	E	3.2±0.30	1.6±0.30	1.6±0.30

Tan δ Code	Tan δ
3	5.0%max.

Low Profile CT Series 【RoHS Compliant Products】

■Features
This low profile series is ideal where height clearance is limited

■Applications
Circuits requiring a compact, low-profile design, such as module and memory cards.

X5R Dielectric

Part Number List : P23

●Capacitance chart

Size (EIA Code)	CT03 (0201)	CT05 (0402)	CT105 (0603)	CT21 (0805)		
Rated Voltage (Vdc) / Capacitance (pF)	6.3	6.3	16	16	25	50
104 100000	A8					
220000						
470000						
105 1000000	D8	A8/B8	A8		A3	
2200000		B8				G3
4700000		H9		E3		
106 10000000						

▨ : Optional Spec.

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

(Example)
In case of "B8" for CT05;
L : 1.0±0.05mm
W : 0.5±0.05mm
T : 0.33mm max.
Tan δ : 12.5% max.

Size	Size Code	Dimension (mm)		
		L	W	T
03	A	0.6±0.03	0.3±0.03	0.22 max.
	D	0.6±0.09	0.3±0.09	0.25 max.
05	A	1.0±0.05	0.5±0.05	0.22 max.
	B	1.0±0.05	0.5±0.05	0.33 max.
	H	1.0±0.20	0.5±0.20	0.33 max.
105	A	1.6±0.10	0.8±0.10	0.55 max.
21	A	2.0±0.10	1.25±0.10	0.95 max.
	E	2.0±0.15	1.25±0.15	0.95 max.
	G	2.0±0.20	1.25±0.20	0.95 max.

Tan δ Code	Tan δ
3	5.0%max.
8	12.5%max.
9	15.0%max.

High-Q CU Series 【RoHS Compliant Products】

■Features
Ultra-miniature size (0.4x0.2mm)
Low loss characteristics suitable for high frequency

■Applications
●RF power amplifier for mobiles such as impedance matching purpose.

Temperature Compensation Dielectric

Part Number List : P23

●Capacitance chart

Size (EIA Code)	CU02 (01005)
Rated Voltage (Vdc) / Capacitance (pF)	16
R20 0.2	A
R50 0.5	
1R0 1.0	
1R5 1.5	
2.0	
3.0	
4.0	
5.0	
6.0	
7.0	
8.0	
9.0	
100 10	
120 12	
15	
18	
22	

〈Standard Capacitance Value〉
・E12 Series
Please contact for capacitance value other than standard.

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

(Example)
In case of "A" for CU02;
L : 0.4±0.02mm
W : 0.2±0.02mm
T : 0.2±0.02mm

Size	Size Code	Dimension (mm)		
		L	W	T
02	A	0.4±0.02	0.2±0.02	0.2±0.02

Au Termination AT Series

【RoHS Compliant Products】

■Features

Enables wire bonding, AuSn solder and conductive adhesive assembly by Au plated external termination electrodes.

■Applications

●Optical communications
●Inside of IC packages

X5R Dielectric

Part Number List : P24

●Capacitance chart

Size (EIA Code)	AT02 (01005)	AT03 (0201)	AT05 (0402)
Rated Voltage (Vdc) / Capacitance (pF)	6.3	6.3	6.3
104 100000	A8		
220000		B8	C7
470000		C8	
105 1000000		E8	
2200000			

〈Standard Capacitance Value〉
・E3 Series
Please contact for capacitance value other than standard.

▨ : Optional Spec.

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 AT03;
L : 0.6±0.03mm
W : 0.3±0.03mm
T : 0.3±0.03mm
Tan δ : 12.5% max.

Size	Size Code	Dimension (mm) L	W	T
02	A	0.4±0.02	0.2±0.02	0.2±0.02
03	B	0.6±0.03	0.3±0.03	0.3±0.03
	C	0.6±0.05	0.3±0.05	0.3±0.05
	E	0.6±0.09	0.3±0.09	0.3±0.09
05	C	1.0±0.05	0.5±0.05	0.5±0.05

Tan δ Code	Tan δ
7	10.0%max.
8	12.5%max.

Soft Termination ST Series

【RoHS Compliant Products】

■Features

Realizes stress relief effect by soft termination which suppresses cracks in dielectrics.

■Applications

●Electronic equipment for applications such as consumer and industrial uses.

X5R Dielectric

Part Number List : P24

●Capacitance chart

Size (EIA Code)	ST03 (0201)		ST05 (0402)	
Rated Voltage (Vdc) / Capacitance (pF)	4	6.3	6.3	10
105 1000000		C8		
2200000	F8		G8 J8	D8
4700000				
106 10000000				

〈Standard Capacitance Value〉
・E3 Series
Please contact for capacitance value other than standard.

▨ : Optional Spec.

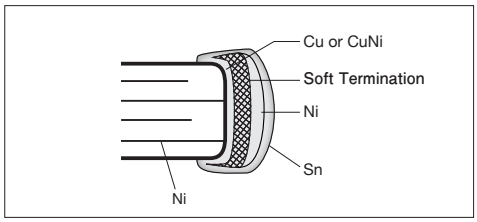
Two digits alphanumerics in capacitance chart denote dimensions and tan δ.
Please refer to the below table for detail.

(Example)
In case of "D8" for ST05;
L : 1.0±0.07mm
W : 0.5±0.07mm
T : 0.5±0.07mm
Tan δ : 12.5% max.

Size	Size Code	Dimension (mm) L	W	T
03	C	0.6±0.05	0.3±0.05	0.3±0.05
	F	0.6±0.10	0.3±0.10	0.3±0.10
05	D	1.0±0.07	0.5±0.07	0.5±0.07
	G	1.0±0.15	0.5±0.15	0.5±0.15
	J	1.0±0.20	0.5±0.20	0.5±0.20

Tan δ Code	Tan δ
8	12.5%max.

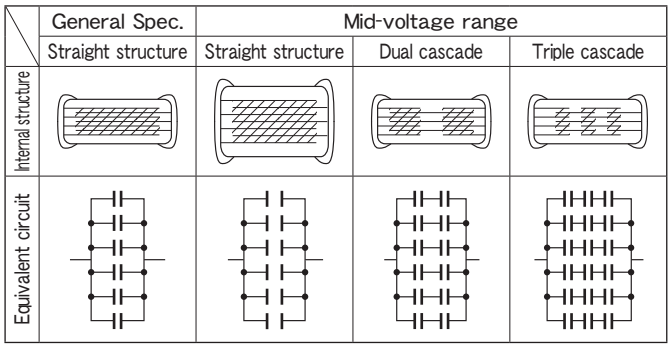
■Structure



High Voltage CF Series 【RoHS Compliant Products】

■Features

Perform less than 1 fit failure ratio by high voltage durability and high reliability which has optimized internal electrode structure based on designing of safety.



・Mid-voltage range (Straight structure)

Secure break-down voltage margin with proper suitable dielectric thickness for each rated voltage.

・Mid-voltage range (Dual cascade structure)

Achieves high rated voltage by series connection of two capacitor units in one MLCC to divide applied voltage into two. Also, it has good protection against transient voltage.

・Mid-voltage range (Triple cascade structure)

Achieves high rated voltage by series connection of three capacitor units in one MLCC to divide applied voltage into three. Excellent safety against high voltage.

The multi cascade design prevents short circuit failure which results in excellent reliability

■Applications

●Camera/ Strobe circuit, Surge killing, Trigger circui
●LCD back light inverter, Ballast capacitor
●Power circuit/ DC-DC converter, Snubber circuit

X7R Dielectric

Part Number List : P24-25

●Capacitance chart

Size (EIA Code)	CF21 (0805)	CF316 (1206)			CF32 (1210)			CF42 (1808)		CF43 (1812)			
Rated Voltage (Vdc) / Capacitance (pF)	250	250	630	1000	250	630	1000	1000	2000	250	630	1000	2000
220	B1			A1 B1									
470									A1				
102 1000	C1			C1									A1
2200			B1				A1	A1					
4700													
103 10000	D1	A1	C1			A1 B1						A1	
22000													
47000		C1			B1						A1		
104 100000										A1			
220000													

〈Standard Capacitance Value〉
・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 "B1" for CF21;
L : 2.0±0.1mm
W : 1.25±0.1mm
T : 0.85±0.1mm
Tan δ : 2.5% max.

Size	Size Code	Dimension (mm)		
		L	W	T
21	B	2.0±0.10	1.25±0.10	0.85±0.10
	C	2.0±0.10	1.25±0.10	1.05±0.10
	D	2.0±0.10	1.25±0.10	1.25±0.10
316	A	3.2±0.20	1.6±0.15	1.15±0.10
	B	3.2±0.20	1.6±0.15	1.25±0.10
	C	3.2±0.20	1.6±0.15	1.6±0.15
32	A	3.2±0.30	2.5±0.20	1.6±0.15
	B	3.2±0.30	2.5±0.20	2.0±0.20
42	A	4.5±0.20	2.0±0.20	2.2 max.
43	A	4.5±0.30	3.2±0.20	2.5 max.

Tan δ Code	Tan δ
1	2.5%max.

Three Terminal Capacitors KNH Series 【RoHS Compliant Products】

■Features

0402 Size. Rated current up to 2A MAX.
With unique circuit structure, this three terminal capacitor enables noise reduction in wide fequency range. With its high capacitance, it is possible to reduce the number of components being used.

■Applications

- ●PCs, Laser Printers, Cellular Phone, Power/ Signal Lines for LCD Display, Office Equipments
- ●V Power Supply/ Signal Line, TV, VCR, etc.
- ●High Current Signal Lines

X5R Dielectric

Part Number List : P25

●Capacitance chart

Size (EIA Code)	KNH05 (0402)
Rated Voltage(Vdc) / Capacitance (pF)	4
105 1000000	
435 4300000	F
106 10000000	K

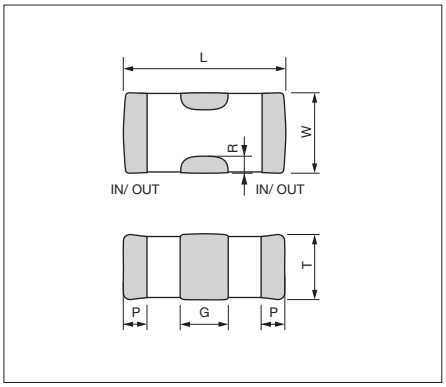
・Storage condition
Temperature: -10 to +45℃
Humidity: 45 to 75%RH
▨ : Optional Spec.

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

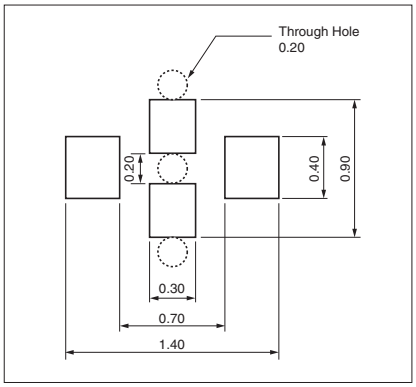
(Example)
In case of "K" for KNH05;
L : 1.0±0.20mm
W : 0.5±0.20mm
T : 0.5±0.20mm

Size Code	Dimension (mm)					
	L	W	T	G	P	R
F	1.0±0.10	0.5±0.20	0.50 max.	0.3±0.10	0.15±0.10	≥0.05
K	1.0±0.20	0.5±0.20	0.5±0.20	0.3±0.10	0.15±0.10	≥0.05

■Dimension (Unit: mm)



■Recommended Land Pattern (Unit: mm)



Test Conditions and Standards

Test Conditions and Specifications for Temperature Compensation Type (C Δ Characteristics) CM / CU Series

Test Items		Test Conditions	Specifications
Capacitance Value (C)		Capacitance: C≤1000pF, C>1000pF; Frequency: 1MHz ± 10%, 1kHz ± 10%; Volt: 0.5 to 5Vrms	Within tolerance
Q			C≥30pF : Q≥1000 C<30pF : Q≥400+20C
Insulation Resistance (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 10000MΩ or 500MΩ・μF, whichever is less
Dielectric Resistance		Apply 3 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 Strength		Apply a sideward force of 500g (5N) to a PCB-mounted sample. Apply 2N for 0201, and 1N for 01005 size.	No problem observed
Bending Strength		Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds.	No significant damage at 1mm bent
Vibration Test	Appearance	Vibration frequency: 10 to 55 (Hz) Amplitude: 1.5mm Sweeping condition: 10 → 55 → 10Hz/ 1 minute in X, Y and Z Directions: 2 hours each, 6 hours total.	No problem observed
	ΔC		Within Tolerance
	Q		C≥30pF : Q≥1000 C<30pF : Q≥400+20C
Soldering Heat Resistance	Appearance	Soak the sample in 260℃ ± 5℃ solder for 10 ± 0.5 seconds and place in room ambient, and measure after 24 ± 2 hours. (Pre-heating conditions) Order 1: 80 to 100℃, 2 minutes; Order 2: 150 to 200℃, 2 minutes The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.	No problem observed
	ΔC		Within ± 2.5% or ± 0.25pF, whichever is larger
	Q		C≥30pF : Q≥1000 C<30pF : Q≥400+20C
	IR		Over 10000MΩ or 500MΩ・μF whichever is less
	Withstanding Voltage		Resist without problem
Solderablity		Soaking condition Sn-3Ag-0.5Cu: 245 ± 5℃, 3 ± 0.5 sec. Sn63 Solder: 235 ± 5℃, 2 ± 0.5 sec.	Solder coverage : 90% min.
Temperature Cycle	Appearance	(Cycle) Room temperature (3min.) → Lowest operation temperature (30min.) → Room temperature (3min.) → 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.	No problem observed
	ΔC		Within ± 2.5% or ± 0.25pF, whichever is larger
	Q		C≥30pF : Q≥1000 C<30pF : Q≥400+20C
	IR		Over 10000MΩ or 500MΩ・μF, whichever is less
	Withstanding Voltage		Resist without problem
Load Humidity Test	Appearance	After applying rated voltage for 500+12/ − 0 hours in pre-condition at 40℃± 2℃ , 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.	No problem observed
	ΔC		Within ± 7.5% or ± 0.75pF, whichever is larger
	Q		C≥30pF : Q≥200 C<30pF : Q≥100+10C/ 3
	IR		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℃ 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.	No problem observed.
	ΔC		Within ± 3% or ± 0.3pF, whichever is larger
	Q		C≥30pF : Q≥350 10pF<C<30pF : Q≥275+5C/ 2 C<10pF : Q≥200+10C
	IR		Over 1000MΩ or 50MΩ・μF, whichever is less

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

Test Conditions and Standards

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

<table>
<tr><th colspan="2">Test Items</th><th>Test Conditions</th><th>Specifications</th></tr>
<tr><td colspan="2">Capacitance Value (C)</td><td>Measure after heat treatment</td><td>Within tolerance</td></tr>
<tr><td colspan="2">Tanδ</td><td><table><tr><th>Capacitance</th><th>Frequency</th><th>Volt</th></tr><tr><td>C≤10μF</td><td>1kHz ± 10%</td><td>1.0 ± 0.2Vrms</td></tr><tr><td>C>10μF</td><td>120Hz ± 10%</td><td>0.5 ± 0.2Vrms</td></tr></table></td><td>Refer to capacitance chart</td></tr>
<tr><td colspan="2">Insulation Resistance (IR)</td><td>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.</td><td>Over 10000MΩ or 500MΩ・μF, whichever is less</td></tr>
<tr><td colspan="2">Dielectric Resistance</td><td>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.</td><td>No problem observed</td></tr>
<tr><td colspan="2">Appearance</td><td>Microscope</td><td>No problem observed</td></tr>
<tr><td colspan="2">Termination Strength</td><td>Apply a sideward force of 500g (5N) to a PCB-mounted sample.
note : 2N for 0201 size, and 1N for 01005 size.
Exclude CT series with thickness of less than 0.66mm.</td><td>No problem observed</td></tr>
<tr><td colspan="2">Bending Strength</td><td>Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds.
Exclude CT series with thickness of less than 0.66mm.</td><td>No significant damage at 1mm bent</td></tr>
<tr><td rowspan="3">Vibration Test</td><td>Appearance</td><td rowspan="3">Take the initial value after heat treatment.
Vibration frequency: 10 to 55 (Hz)
Amplitude: 1.5mm
Sweeping condition: 10→55→10Hz/ 1 minute in X, Y and Z Directions: 2 hours each, 6 hours total, and place in room ambient, and measure the sample after heat treatment.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within tolerance</td></tr>
<tr><td>Tanδ</td><td>Within tolerance</td></tr>
<tr><td rowspan="5">Soldering Heat Resistance</td><td>Appearance</td><td rowspan="5">Take the initial value after heat treatment.
Soak the sample in 260°C ± 5°C solder for 10 ± 0.5 seconds and place in room ambient, and measure after heat treatment.
(Pre-heating conditions)<table><tr><th>Order</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>80 to 100°C</td><td>2 minutes</td></tr><tr><td>2</td><td>150 to 200°C</td><td>2 minutes</td></tr></table>The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ± 7.5%</td></tr>
<tr><td>Tanδ</td><td>Within tolerance</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩ・μF, whichever is less</td></tr>
<tr><td>Withstanding Voltage</td><td>Resist without problem</td></tr>
<tr><td colspan="2">Solderablity</td><td>Soaking condition<table><tr><td>Sn-3Ag-0.5Cu</td><td>245 ± 5°C</td><td>3 ± 0.5 sec.</td></tr><tr><td>Sn63 Solder</td><td>235 ± 5°C</td><td>2 ± 0.5 sec.</td></tr></table></td><td>Solder coverage : 90% min.</td></tr>
<tr><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td rowspan="5">Take the initial value after heat treatment.
(Cycle)
Room temperature (3min.)→
Lowest operation temperature (30min.)→
Room temperature (3min.)→
Highest operation temperature(30min.)
After 5 cycles, measure after heat treatment.
The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ± 7.5%</td></tr>
<tr><td>Tanδ</td><td>Within tolerance</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩ・μF, whichever is less</td></tr>
<tr><td>Withstanding Voltage</td><td>Resist without problem</td></tr>
<tr><td rowspan="4">Load Humidity Test</td><td>Appearance</td><td rowspan="4">Take the initial value after heat treatment.
After applying rated voltage for 500+12/－0 hours in pre-condition at 40°C ± 2°C, humidity 90 to 95%RH, and place in room ambient, and measure the sample after heat treatment.
The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ± 12.5%</td></tr>
<tr><td>Tanδ</td><td>200% max. of initial value</td></tr>
<tr><td>IR</td><td>Over 500MΩ or 25MΩ・μF, whichever is less</td></tr>
<tr><td rowspan="4">High-Temperature with Loading</td><td>Appearance</td><td rowspan="4">Take the initial value after heat treatment.
After applying twice the rated voltage at the highest operation temperature for 1000+12/－0 hours, measure the sample after heat treatment.
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.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ± 12.5%</td></tr>
<tr><td>Tanδ</td><td>200% max. of initial value</td></tr>
<tr><td>IR</td><td>Over 1000MΩ or 50MΩ・μF, whichever is less</td></tr>
</table>

Heat treatment	Keep specimen at 150+0/－10°C for 1 hour, leave specimen at room ambient for 24 ± 2 hours.

High-temperature with Loading Applied Voltage (Rated Voltage × □)

Applied Voltage	Rated Voltage	Products
×1.3	6.3V	CM105X5R475, CM02X5R153-104
		CT03X5R104
×1.5	16V	CM02X7R101-222, CM105X7R105, CM21X7R475, CM316X7R106, CM32X7R226, CM05X5R224, CM105X5R225, CM21X5R475-106, CM316X5R226
		CT105X5R105, CT21X5R225-475, CM02X5R101-103
	25V	CM21X7R105-225, CM316X7R475, CM32X7R106, CM105X5R105, CM21X5R225-475, CM316X5R106, CM32X5R106-226
		CM03X5R152-103, CM05X7R104
	50V	CM21X5R105, CM32X5R106, CM32X7R106
		CT21X5R225

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

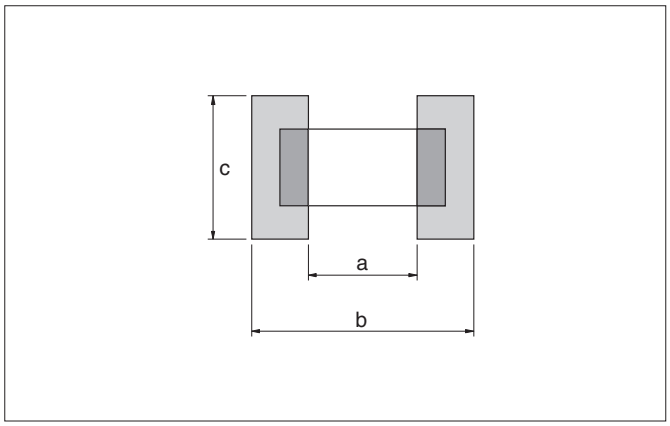
Test Conditions and Standards

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

<table>
<tr><th colspan="2">Test Items</th><th>Test Conditions</th><th>Specifications</th></tr>
<tr><td colspan="2">Capacitance Value (C)</td><td rowspan="2">Measure after heat treatment
<table><tr><th>Capacitance</th><th>Frequency</th><th>Volt</th></tr><tr><td>C≤10μF</td><td>1kHz ± 10%</td><td>1.0 ± 0.2Vrms</td></tr></table></td><td>Within tolerance</td></tr>
<tr><td colspan="2">Tanδ</td><td>Within 2.5%</td></tr>
<tr><td colspan="2">Insulation Resistance (IR)</td><td>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.</td><td>Over 10000MΩ or 500MΩ・μF, whichever is less
Over 100MΩ・μF for CF316X7R104/ 250V</td></tr>
<tr><td colspan="2">Dielectric Resistance</td><td>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.</td><td>No problem observed</td></tr>
<tr><td colspan="2">Appearance</td><td>Microscope</td><td>No problem observed</td></tr>
<tr><td colspan="2">Termination Strength</td><td>Apply a sideward force of 500g (5N) to a PCB-mounted sample.</td><td>No problem observed</td></tr>
<tr><td colspan="2">Bending Strength</td><td>Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds.</td><td>No significant damage at 1mm bent</td></tr>
<tr><td rowspan="3">Vibration Test</td><td>Appearance</td><td rowspan="3">Take the initial value after heat treatment.
Vibration frequency: 10 to 55 (Hz)
Amplitude: 1.5mm
Sweeping condition: 10→55→10Hz/ 1 minute in X, Y and Z
Directions: 2 hours each, 6 hours total.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within tolerance</td></tr>
<tr><td>Tanδ</td><td>Within tolerance</td></tr>
<tr><td rowspan="5">Soldering Heat Resistance</td><td>Appearance</td><td rowspan="5">Take the initial value after heat treatment.
Soak the sample in 260°C ± 5°C solder for 10 ± 0.5 seconds and place in room ambient, and measure after heat treatment.
(Pre-heating conditions)
<table><tr><th>Order</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>80 to 100°C</td><td>2 minutes</td></tr><tr><td>2</td><td>150 to 200°C</td><td>2 minutes</td></tr></table>The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ± 7.5%</td></tr>
<tr><td>Tanδ(%)</td><td>Within tolerance</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩ・μF, whichever is less
Over 100MΩ・μF for CF316X7R104/ 250V and CF55X7R224/ 630V</td></tr>
<tr><td>Withstanding Voltage</td><td>Resist without problem</td></tr>
<tr><td colspan="2">Solderablity</td><td>Soaking condition
<table><tr><td>Sn-3Ag-0.5Cu</td><td>245 ± 5°C</td><td>3 ± 0.5 sec.</td></tr><tr><td>Sn63 Solder</td><td>235 ± 5°C</td><td>2 ± 0.5 sec.</td></tr></table></td><td>Solder coverage : 90% min.</td></tr>
<tr><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td rowspan="5">Take the initial value after heat treatment.
(Cycle)
Room temperature (3min.)→
Lowest operation temperature (30min.)→
Room temperature (3min.)→
Highest operation temperature(30min.)
After 5 cycles, measure after heat treatment.
The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ± 7.5%</td></tr>
<tr><td>Tanδ</td><td>Within tolerance</td></tr>
<tr><td>IR</td><td>Over 10000MΩ or 500MΩ・μF, whichever is less
Over 100MΩ・μF for CF316X7R104/ 250V</td></tr>
<tr><td>Withstanding Voltage</td><td>Resist without problem</td></tr>
<tr><td rowspan="4">High-Temperature with Loading</td><td>Appearance</td><td rowspan="4">Take the initial value after heat treatment.
After applying specified voltage at the highest operation temperature for 1000+12/－0 hours, then measure the sample after heat treatment.
The applied voltage shall be;
1.5 times the rated voltage when the rated voltage is 250V.
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.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ± 12.5%</td></tr>
<tr><td>Tanδ</td><td>200% max. of initial value</td></tr>
<tr><td>IR</td><td>Over 1000MΩ or 50MΩ・μF, whichever is less</td></tr>
<tr><td colspan="2">Heat treatment</td><td colspan="2">Keep specimen at 150+0/－10°C for 1 hour, leave specimen at room ambient for 24 ± 2 hours.</td></tr>
</table>

Test Conditions and Standards

Substrate for Adhesion Strength Test, Vibration Test, Soldering Heat Resistance Test, Temperature Cycle Test, Load Humidity Test, High-Temperature with Loading Test.

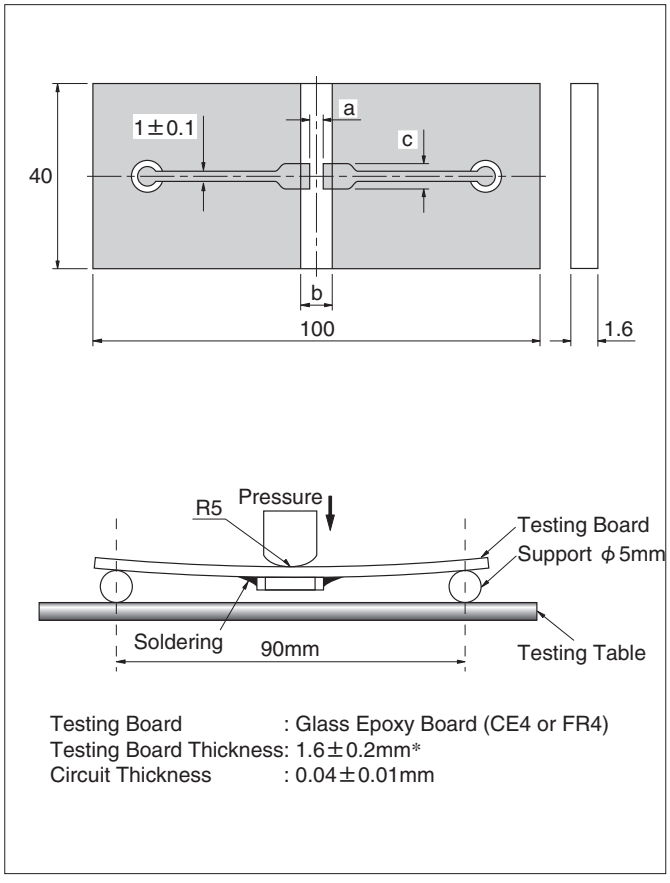


(Unit: mm)

Size (EIA Code)	a	b	c
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

Substrate for Bending Test

(Unit: mm)



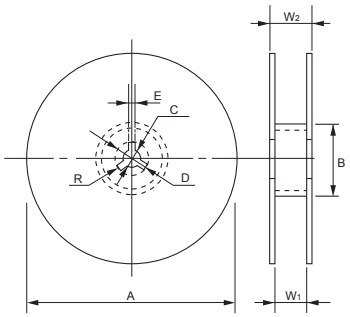
Testing Board : Glass Epoxy Board (CE4 or FR4)
Testing Board Thickness: 1.6±0.2mm*
Circuit Thickness : 0.04±0.01mm

* 02, 03, 05 size 0.8 ± 0.1mm

Packaging Options

Tape and Reel

・Reel



Reel

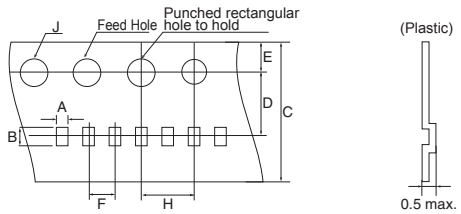
(Unit: mm)

Code / Reel	A	B	C	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.	

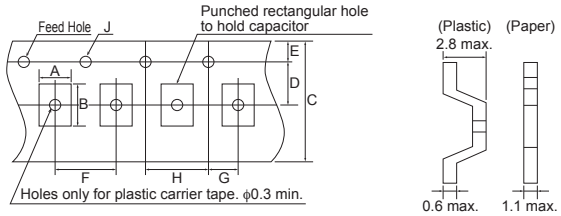
* Carrier tape width 8mm.
For size 42 (1808) or over, Tape width 12mm and W_1: 14 ± 1.5, W_2: 20.5mm max.

Carrier Tape

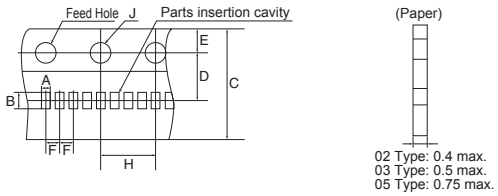
F=1mm (02 Type)



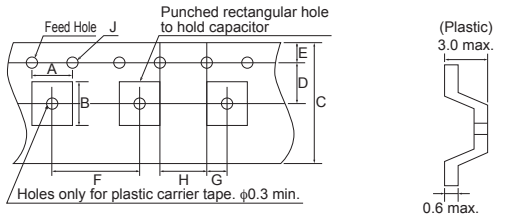
F=4mm (105, 21, 316, 32, 42 Type)



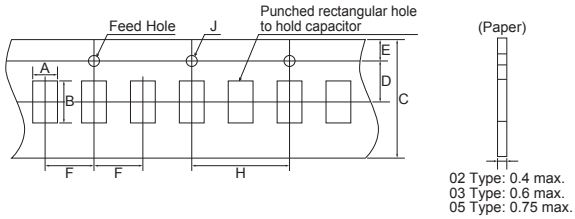
F=1mm (02, 03, 05 Type)



F=8mm (43 Type)



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



Carrier Tape

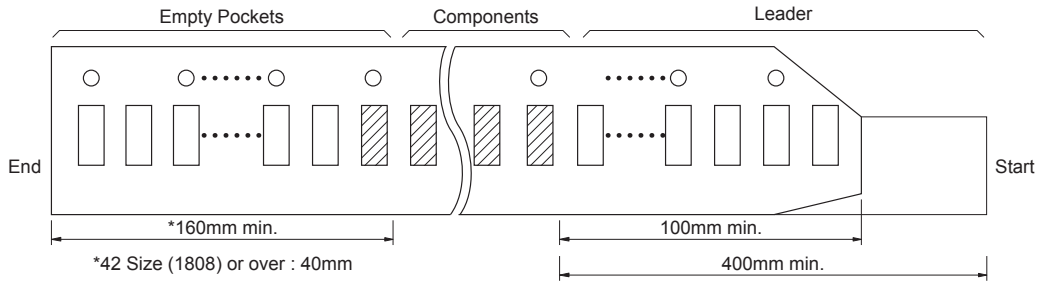
(Unit: mm)

Size (EIA Code)	A	B	C	D	E	F	G	H	J	Carrier Tape Width	Carrier Tape Material
02 (01005)*	0.23±0.02	0.43±0.02	4.0±0.08	1.8±0.02	0.9±0.05	1.0±0.02	—	2.0±0.04	0.8±0.04	4mm	Plastic
	0.25±0.03	0.45±0.03	8.0±0.3	3.5±0.05	1.75±0.1	2.0±0.05		4.0±0.1	1.5+0.1/−0	8mm	Paper
03 (0201)*	0.37±0.03	0.67±0.03	8.0+0.3/−0.1	3.5±0.05	1.75±0.1	1.0±0.05	—	4.0±0.05	1.5+0.1/−0	8mm	Paper
			8.0±0.3			2.0±0.05		4.0±0.1			
05 (0402)*	0.65±0.1	1.15±0.1	8.0+0.3/−0.1	3.5±0.05	1.75±0.1	1.0±0.05	—	4.0±0.05	1.5+0.1/−0	8mm	Paper
	0.75±0.1		8.0±0.3			2.0±0.05	—	4.0±0.1			
105 (0603)	1.0±0.2	1.8±0.2	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	1.5+0.1/−0	8mm	Paper
21 (0805)	1.5±0.2	2.3±0.2	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	1.5+0.1/−0	8mm	Paper
										8mm	Plastic
316 (1206)	2.0±0.2	3.6±0.2	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	1.5+0.1/−0	8mm	Paper
										8mm	Plastic
32 (1210)	2.9±0.2	3.6±0.2	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	1.5+0.1/−0	8mm	Plastic
42 (1808)	2.4±0.2	4.9±0.2	12.0±0.3	5.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	1.5+0.1/−0	12mm	Plastic
43 (1812)	3.6±0.2	4.9±0.2	12.0±0.3	5.5±0.05	1.75±0.1	8.0±0.1	2.0±0.05	4.0±0.1	1.5+0.1/−0	12mm	Plastic

* Option

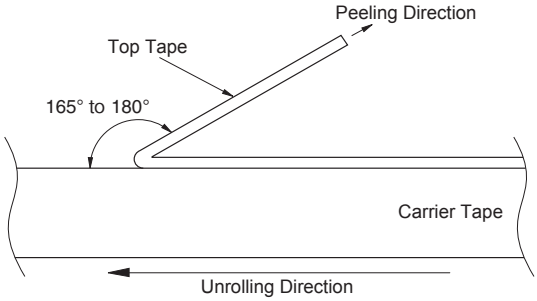
Packaging Options

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 thermal adhesive tape.



Exfoliating angle: 165 to 180 degrees to the carrier tape.
Exfoliating speed: 300 mm/min.

Carrier tape

1) Chip will not fall off from carrier tape or carrier tape will not be damaged by bending than within a radius of 25mm.
2) The chip are inserted continuously without any empty pocket.
3) Chip will not be mis-mounted because of too big clearance between components and cavity. Also the waste of carrier tape will not fill a nozzle hole of mounting machine.

Packaging quantity

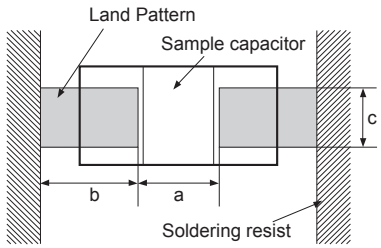
Please refer to Page 2.

Surface Mounting Information

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.

(General, High-Voltage)



General, High-Voltage

(Unit: mm)

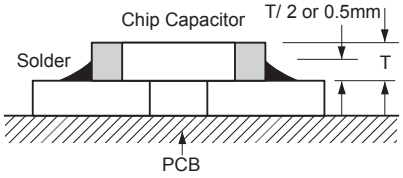
Size (EIA Code)	L×W	a	b	c
02 (01005)	0.4×0.2	0.13 to 0.20	0.12 to 0.18	0.20 to 0.23
03 (0201)	0.6×0.3	0.20 to 0.30	0.25 to 0.35	0.30 to 0.40
05 (0402)	1.0×0.5	0.30 to 0.50	0.35 to 0.45	0.40 to 0.60
105 (0603)	1.6×0.8	0.70 to 1.00	0.80 to 1.00	0.60 to 0.80
21 (0805)	2.0×1.25	1.00 to 1.30	1.00 to 1.20	0.80 to 1.10
316 (1206)	3.2×1.6	2.10 to 2.50	1.10 to 1.30	1.00 to 1.90
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	3.00 to 3.50	1.80 to 2.30	1.50 to 1.80
43 (1812)	4.5×3.2	3.00 to 3.50	1.80 to 2.30	2.60 to 3.00

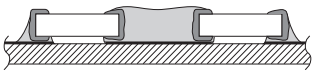
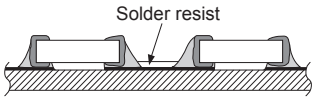
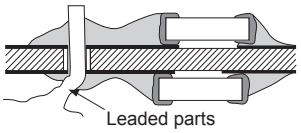
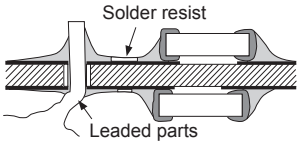
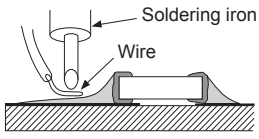
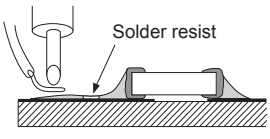
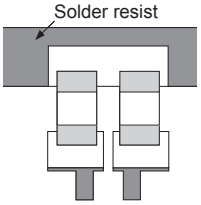
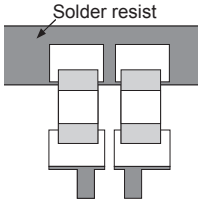
* Recommended land dimensions may differ depending on dimensional tolerance.

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.

Ideal Solder Height



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

Surface Mounting Information

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 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.

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.

Surface Mounting Information

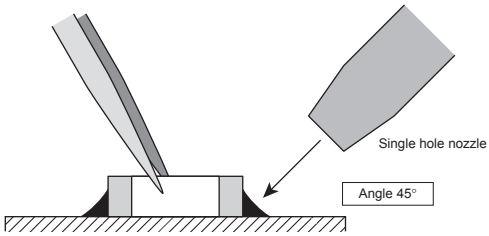
Soldering Method

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

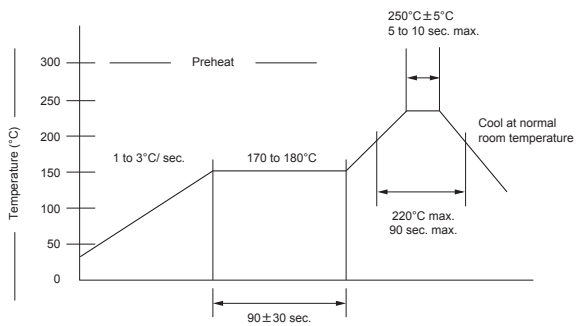
Item	Condition
Distance	5mm min.
Angle	45°
Projection Temp.	400°C max.
Flow rate	Set at the minimum
Nozzle diameter	2φ to 4φ (Single hole type)
Application time	10 sec. max. (1206 and smaller) 30 sec.max. (1210 and larger)

How to point spot heater



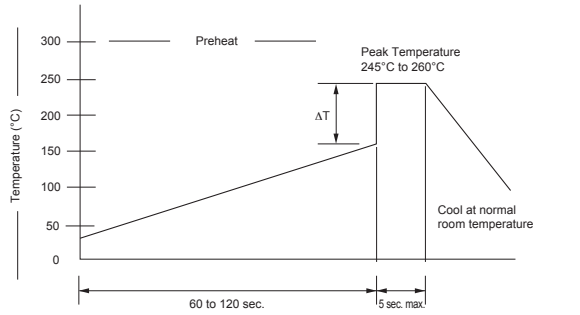
Recommended Temperature Profile (Sn-3Ag-0.5Cu)

Reflow



① Minimize soldering time.
② Ensure that allowable temperature difference does not exceed 150°C.
③ Ensure that allowable temperature difference does not exceed 130°C for 3.2×2.5mm size or larger.

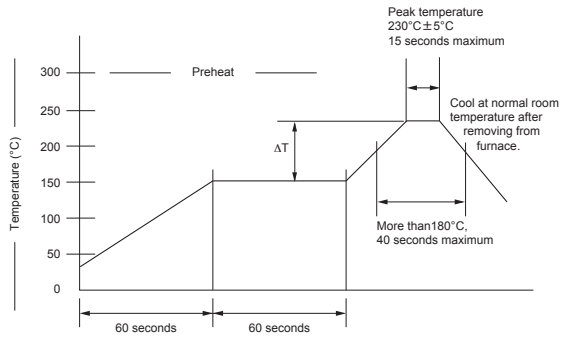
Wave



① Ensure that the chip capacitor is preheated adequately.
② Ensure that the temperature difference (ΔT) does not exceed 150°C.
③ Cool naturally after soldering.
④ Wave soldering is not applicable for chips with size of 3.2×2.5mm or larger of 1.0×0.5mm or smaller and capacitor arrays.

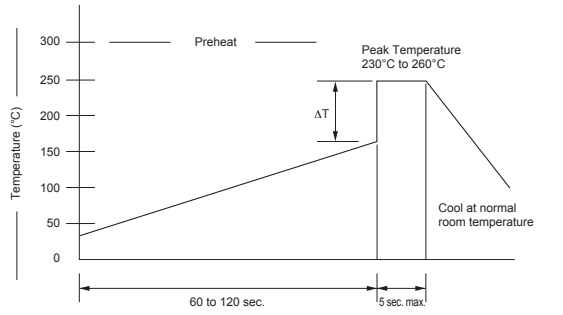
Recommended Temperature Profile (62Sn Solder)

Reflow



① Minimize soldering time.
② Ensure that the temperature difference (ΔT) does not exceed 150°C.
③ Ensure that the temperature difference (ΔT) does not exceed 130°C for 3.2×2.5mm size or larger.
④ MLCC can withstand the above reflow conditions up to 3 times.

Wave



① Ensure that the chip capacitor is preheated adequately.
② Ensure that the temperature difference (ΔT) does not exceed 150°C.
③ Cool naturally after soldering.
④ Wave soldering is not applicable for chips with size of 3.2×2.5mm or larger of 1.0×0.5mm or smaller and capacitor arrays.

Soldering iron

1) Temperature of iron chip — 1206 and smaller 350°C max. / 1210 and larger 280°C max.
2) Wattage — 80W max.
3) Tip shape of soldering iron — φ 3.0mm max.
4) Soldering Time — 3 sec. max.

5) Cautions
   a) Pre-heating is necessary rapid heating must be avoided.
      Delta T≤150°C (product size of bigger than 3.2×1.6mm. Delta T≤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.

Precautions

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℃ .

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.
5. The solderability is assured for 6 months from our shipping date if the above storage precautions are followed.

Safety application guideline and detailed information of electrical properties are also provided in Kyocera web site;
URL: https://global.kyocera.com/prdct/electro/

General CM02 Series Size (JIS Code) : 01005(0402) # Packaging Code (Packaging quantity) : H(20,000pcs.) / N(80,000pcs.) / P(40,000pcs.)

Dielectric code CΔ	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Q
CG/CH	CM02CΔ1R0□25A#	1pF	B:±0.1pF / C:±0.25pF	25	0.4±0.02	0.2±0.02	0.2±0.02	420
	CM02CΔ1R5□25A#	1.5pF	B:±0.1pF / C:±0.25pF					430
	CM02CΔ2R0□25A#	2pF	B:±0.1pF / C:±0.25pF					440
	CM02CΔ3R0□25A#	3pF	B:±0.1pF / C:±0.25pF					460
	CM02CΔ4R0□25A#	4pF	B:±0.1pF / C:±0.25pF					480
	CM02CΔ5R0□25A#	5pF	B:±0.1pF / C:±0.25pF					500
	CM02CΔ6R0□25A#	6pF	C:±0.25pF / D:±0.5pF					520
	CM02CΔ7R0□25A#	7pF	C:±0.25pF / D:±0.5pF					540
	CM02CΔ8R0□25A#	8pF	C:±0.25pF / D:±0.5pF					560
	CM02CΔ9R0□25A#	9pF	C:±0.25pF / D:±0.5pF					580
	CM02CΔ100□25A#	10pF	J:±5% / K:±10%					600
	CM02CΔ120□25A#	12pF	J:±5% / K:±10%					640
	CM02CΔ150□25A#	15pF	J:±5% / K:±10%					700
	CM02CΔ180□25A#	18pF	J:±5% / K:±10%					760
	CM02CΔ220□25A#	22pF	J:±5% / K:±10%					840
	CM02CΔ270□16A#	27pF	J:±5% / K:±10%	16	0.4±0.02	0.2±0.02	0.2±0.02	940
	CM02CΔ330□16A#	33pF	J:±5% / K:±10%					1000
	CM02CΔ390□16A#	39pF	J:±5% / K:±10%					
	CM02CΔ470□16A#	47pF	J:±5% / K:±10%					
	CM02CΔ560□16A#	56pF	J:±5% / K:±10%					
	CM02CΔ680□16A#	68pF	J:±5% / K:±10%					
	CM02CΔ820□16A#	82pF	J:±5% / K:±10%					
	CM02CΔ101□16A#	100pF	J:±5% / K:±10%					
	CM02CΔ121□16A#	120pF	J:±5% / K:±10%					
	CM02CΔ151□16A#	150pF	J:±5% / K:±10%					
	CM02CΔ181□16A#	180pF	J:±5% / K:±10%					
	CM02CΔ221□16A#	220pF	J:±5% / K:±10%					

General CM03 Series Size (JIS Code) : 0201(0603) # Packaging Code (Packaging quantity) : H(15,000pcs.) / N(50,000pcs.) / Q(30,000pcs.) / W(150,000pcs.)

Dielectric code CΔ	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Q
CG/CH	CM03CΔ1R0□50A#	1pF	B:±0.1pF / C:±0.25pF	50	0.6±0.03	0.3±0.03	0.3±0.03	420
	CM03CΔ1R5□50A#	1.5pF	B:±0.1pF / C:±0.25pF					430
	CM03CΔ2R0□50A#	2pF	B:±0.1pF / C:±0.25pF					440
	CM03CΔ3R0□50A#	3pF	B:±0.1pF / C:±0.25pF					460
	CM03CΔ4R0□50A#	4pF	B:±0.1pF / C:±0.25pF					480
	CM03CΔ5R0□50A#	5pF	B:±0.1pF / C:±0.25pF					500
	CM03CΔ6R0□50A#	6pF	C:±0.25pF / D:±0.5pF					520
	CM03CΔ7R0□50A#	7pF	C:±0.25pF / D:±0.5pF					540
	CM03CΔ8R0□50A#	8pF	C:±0.25pF / D:±0.5pF					560
	CM03CΔ9R0□50A#	9pF	C:±0.25pF / D:±0.5pF					580
	CM03CΔ100□50A#	10pF	J:±5% / K:±10%					600
	CM03CΔ120□50A#	12pF	J:±5% / K:±10%					640
	CM03CΔ150□50A#	15pF	J:±5% / K:±10%					700
	CM03CΔ180□50A#	18pF	J:±5% / K:±10%					760
	CM03CΔ220□50A#	22pF	J:±5% / K:±10%					840
	CM03CΔ270□50A#	27pF	J:±5% / K:±10%					940
	CM03CΔ330□50A#	33pF	J:±5% / K:±10%					1000
	CM03CΔ390□50A#	39pF	J:±5% / K:±10%					
	CM03CΔ470□50A#	47pF	J:±5% / K:±10%					
	CM03CΔ560□50A#	56pF	J:±5% / K:±10%					
	CM03CΔ680□50A#	68pF	J:±5% / K:±10%					
	CM03CΔ820□50A#	82pF	J:±5% / K:±10%					
	CM03CΔ101□50A#	100pF	J:±5% / K:±10%					

General CM05 Series Size (JIS Code) : 0402(1005) # Packaging Code (Packaging quantity) : H(10,000pcs.) / N(50,000pcs.) / Q(20,000pcs.) / W(100,000pcs.)

Dielectric code CΔ	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Q
CG/CH	CM05CΔ121□50A#	120pF	J:±5% / K:±10%	50	1.0±0.05	0.5±0.05	0.5±0.05	1000
	CM05CΔ151□50A#	150pF	J:±5% / K:±10%					
	CM05CΔ181□50A#	180pF	J:±5% / K:±10%					
	CM05CΔ221□50A#	220pF	J:±5% / K:±10%					
	CM05CΔ271□50A#	270pF	J:±5% / K:±10%					
	CM05CΔ331□50A#	330pF	J:±5% / K:±10%					
	CM05CΔ391□50A#	390pF	J:±5% / K:±10%					
	CM05CΔ471□50A#	470pF	J:±5% / K:±10%					

General CM105 Series Size (JIS Code) : 0603(1608) # Packaging Code (Packaging quantity) : T(4,000pcs.) / L(10,000pcs.)

Dielectric code CΔ	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Q
CG/CH	CM105CΔ561□50A#	560pF	J:±5% / K:±10%	50	1.6±0.10	0.8±0.10	0.8±0.10	1000
	CM105CΔ681□50A#	680pF	J:±5% / K:±10%					
	CM105CΔ821□50A#	820pF	J:±5% / K:±10%					
	CM105CΔ102□50A#	1nF	J:±5% / K:±10%					

General CM02 Series　Size (JIS Code) : 01005(0402)　# Packaging Code (Packaging quantity) : H(20,000pcs.) / N(80,000pcs.) / P(40,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CM02X5R101□16A#	100pF	K:±10% / M:±20%	16	0.4±0.02	0.2±0.02	0.2±0.02	12.5
	CM02X5R151□16A#	150pF	K:±10% / M:±20%					
	CM02X5R221□16A#	220pF	K:±10% / M:±20%					
	CM02X5R331□16A#	330pF	K:±10% / M:±20%					
	CM02X5R471□16A#	470pF	K:±10% / M:±20%					
	CM02X5R681□16A#	680pF	K:±10% / M:±20%					
	CM02X5R102□16A#	1nF	K:±10% / M:±20%					
	CM02X5R152□16A#	1.5nF	K:±10% / M:±20%					
	CM02X5R222□16A#	2.2nF	K:±10% / M:±20%					
	CM02X5R332□16A#	3.3nF	K:±10% / M:±20%					
	CM02X5R472□16A#	4.7nF	K:±10% / M:±20%					
	CM02X5R682□16A#	6.8nF	K:±10% / M:±20%					
	CM02X5R103□16A#	10nF	K:±10% / M:±20%					
	CM02X5R153□06A#	15nF	K:±10% / M:±20%	6.3				
	CM02X5R223□06A#	22nF	K:±10% / M:±20%					
	CM02X5R333□06A#	33nF	K:±10% / M:±20%					
	CM02X5R473□06A#	47nF	K:±10% / M:±20%					
	CM02X5R683□06A#	68nF	K:±10% / M:±20%					
	CM02X5R104□06A#	100nF	K:±10% / M:±20%					
	CM02X5R224M06A#	220nF	M:±20%					
	CM02X5R474M06A#	470nF	M:±20%					
X7R	CM02X7R101□16A#	100pF	K:±10% / M:±20%	16				
	CM02X7R151□16A#	150pF	K:±10% / M:±20%					
	CM02X7R221□16A#	220pF	K:±10% / M:±20%					
	CM02X7R331□16A#	330pF	K:±10% / M:±20%					
	CM02X7R471□16A#	470pF	K:±10% / M:±20%					
	CM02X7R681□16A#	680pF	K:±10% / M:±20%					
	CM02X7R102□16A#	1nF	K:±10% / M:±20%					
	CM02X7R152□16A#	1.5nF	K:±10% / M:±20%					
	CM02X7R222□16A#	2.2nF	K:±10% / M:±20%					

General CM03 Series　Size (JIS Code) : 0201(0603)　# Packaging Code (Packaging quantity) : H(15,000pcs.) / N(50,000pcs.) / Q(30,000pcs.) / W(150,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CM03X5R151□25A#	150pF	K:±10% / M:±20%	25	0.6±0.03	0.3±0.03	0.3±0.03	5.0
	CM03X5R221□25A#	220pF	K:±10% / M:±20%					
	CM03X5R331□25A#	330pF	K:±10% / M:±20%					
	CM03X5R471□25A#	470pF	K:±10% / M:±20%					
	CM03X5R681□25A#	680pF	K:±10% / M:±20%					
	CM03X5R102□25A#	1nF	K:±10% / M:±20%					
	CM03X5R152□25A#	1.5nF	K:±10% / M:±20%					
	CM03X5R222□25A#	2.2nF	K:±10% / M:±20%					
	CM03X5R332□25A#	3.3nF	K:±10% / M:±20%					
	CM03X5R472□25A#	4.7nF	K:±10% / M:±20%					
	CM03X5R682□25A#	6.8nF	K:±10% / M:±20%					
	CM03X5R103□25A#	10nF	K:±10% / M:±20%					
	CM03X5R153□10A#	15nF	K:±10% / M:±20%	10	0.6±0.03	0.3±0.03	0.3±0.03	10.0
	CM03X5R223□10A#	22nF	K:±10% / M:±20%					
	CM03X5R333□10A#	33nF	K:±10% / M:±20%					
	CM03X5R473□10A#	47nF	K:±10% / M:±20%					
	CM03X5R683□10A#	68nF	K:±10% / M:±20%					
	CM03X5R104□10A#	100nF	K:±10% / M:±20%					
	CM03X5R224□10A#	220nF	K:±10% / M:±20%					
	CM03X5R474□06A#	470nF	K:±10% / M:±20%	6.3	0.6±0.03	0.3±0.03	0.3±0.03	12.5
	CM03X5R105M16A#	1μF	M:±20%	16	0.6±0.09	0.3±0.09	0.3±0.09	20.0
	CM03X5R105M06A#			6.3	0.6±0.05	0.3±0.05	0.3±0.05	12.5
	CM03X5R225M10AH	2.2μF	M:±20%	10	0.6±0.09	0.3±0.09	0.3±0.09	15.0
	CM03X5R225M06AH			6.3	0.6±0.09	0.3±0.09	0.3±0.09	12.5
	CM03X5R225M06A#035				0.6±0.05	0.3±0.05	0.3±0.05	
	CM03X5R475M04AH	4.7μF	M:±20%	4	0.6±0.09	0.3±0.09	0.3±0.09	12.5
X7R	CM03X7R151□25A#	150pF	K:±10% / M:±20%	25	0.6±0.03	0.3±0.03	0.3±0.03	3.5
	CM03X7R221□25A#	220pF	K:±10% / M:±20%					
	CM03X7R331□25A#	330pF	K:±10% / M:±20%					
	CM03X7R471□16A#	470pF	K:±10% / M:±20%	16	0.6±0.03	0.3±0.03	0.3±0.03	3.5
	CM03X7R681□16A#	680pF	K:±10% / M:±20%					
	CM03X7R102□16A#	1nF	K:±10% / M:±20%					
	CM03X7R152□10A#	1.5nF	K:±10% / M:±20%	10	0.6±0.03	0.3±0.03	0.3±0.03	5.0
	CM03X7R222□10A#	2.2nF	K:±10% / M:±20%					
	CM03X7R332□10A#	3.3nF	K:±10% / M:±20%					
	CM03X7R472□10A#	4.7nF	K:±10% / M:±20%					
	CM03X7R682□10A#	6.8nF	K:±10% / M:±20%					
	CM03X7R103□10A#	10nF	K:±10% / M:±20%					

General CM05 Series　Size (JIS Code) : 0402(1005)　# Packaging Code (Packaging quantity) : H(10,000pcs.) / N(50,000pcs.) / Q(20,000pcs.) / W(100,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CM05X5R104□25A#	100nF	K:±10% / M:±20%	25	1.0±0.05	0.5±0.05	0.5±0.05	5.0
	CM05X5R224□16A#	220nF	K:±10% / M:±20%	16	1.0±0.05	0.5±0.05	0.5±0.05	12.5
	CM05X5R474□10A#	470nF	K:±10% / M:±20%	10	1.0±0.05	0.5±0.05	0.5±0.05	12.5
	CM05X5R474□06A#			6.3	1.0±0.05	0.5±0.05	0.5±0.05	10.0
	CM05X5R105□35A#	1μF	K:±10% / M:±20%	35	1.0±0.05	0.5±0.05	0.5±0.05	10.0
	CM05X5R105□25A#			25				
	CM05X5R105□16A#			16				
	CM05X5R105□10A#			10				
	CM05X5R105□06A#			6.3				
	CM05X5R225□10A#	2.2μF	K:±10% / M:±20%	10	1.0±0.05	0.5±0.05	0.5±0.05	12.5
	CM05X5R225□06A#			6.3				
	CM05X5R475M16A#	4.7μF	M:±20%	16	1.0±0.20	0.5±0.20	0.5±0.20	12.5
	CM05X5R475M06A#			6.3	1.0±0.15	0.5±0.15	0.5±0.15	12.5
	CM05X5R106M06A#	10μF	M:±20%	6.3	1.0±0.20	0.5±0.20	0.5±0.20	12.5
	CM05X5R156M04A#	15μF	M:±20%	4	1.0±0.15	0.5±0.15	0.5±0.15	12.5
	CM05X5R226M04A#	22μF			1.0±0.20	0.5±0.20	0.5±0.20	
X7R	CM05X7R104□25A#	100nF	K:±10% / M:±20%	25	1.0±0.05	0.5±0.05	0.5±0.05	12.5

General CM105 Series　Size (JIS Code) : 0603(1608)　# Packaging Code (Packaging quantity) : T(4,000pcs.) / L(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CM105X5R105□25A#	1μF	K:±10% / M:±20%	25	1.6±0.15	0.8±0.15	0.8±0.15	12.5
	CM105X5R225□16A#	2.2μF	K:±10% / M:±20%	16	1.6±0.10	0.8±0.10	0.8±0.10	12.5
	CM105X5R475□10A#	4.7μF	K:±10% / M:±20%	10	1.6±0.15	0.8±0.15	0.8±0.15	12.5
	CM105X5R475□06A#			6.3	1.6±0.15	0.8±0.15	0.8±0.15	7.5
	CM105X5R106M06A#	10μF	M:±20%	6.3	1.6±0.15	0.8±0.15	0.8±0.15	12.5
X7R	CM105X7R105□16A#	1μF	K:±10% / M:±20%	16	1.6±0.10	0.8±0.10	0.8±0.10	12.5
	CM105X7R105□10A#			10				
	CM105X7R225□06A#	2.2μF	K:±10% / M:±20%	6.3	1.6±0.15	0.8±0.15	0.8±0.15	12.5

General CM21 Series　Size (JIS Code) : 0805(2012)　# Packaging Code (Packaging quantity) : T(3,000pcs.) / L(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CM21X5R105□50A#	1μF	K:±10% / M:±20%	50	2.0±0.10	1.25±0.10	1.25±0.10	12.5
	CM21X5R105□25A#			25	2.0±0.10	1.25±0.10	1.25±0.10	5.0
	CM21X5R225□25A#	2.2μF	K:±10% / M:±20%	25	2.0±0.20	1.25±0.20	1.25±0.20	12.5
	CM21X5R225□16A#			16	2.0±0.10	1.25±0.10	1.25±0.10	5.0
	CM21X5R475□25A#	4.7μF	K:±10% / M:±20%	25	2.0±0.20	1.25±0.20	1.25±0.20	12.5
	CM21X5R475□16A#			16	2.0±0.15	1.25±0.15	1.25±0.15	12.5
	CM21X5R475□10A#			10	2.0±0.10	1.25±0.10	1.25±0.10	7.0
	CM21X5R106□16A#	10μF	K:±10% / M:±20%	16	2.0±0.20	1.25±0.20	1.25±0.20	12.5
	CM21X5R106□06A#			6.3	2.0±0.20	1.25±0.20	1.25±0.20	7.5
X7R	CM21X7R105□50A#	1μF	K:±10% / M:±20%	50	2.0±0.20	1.25±0.20	1.25±0.20	5.0
	CM21X7R105□25A#			25	2.0±0.10	1.25±0.10	1.25±0.10	12.5
	CM21X7R105□10A#			10	2.0±0.10	1.25±0.10	1.25±0.10	5.0
	CM21X7R225□25A#	2.2μF	K:±10% / M:±20%	25	2.0±0.20	1.25±0.20	1.25±0.20	12.5
	CM21X7R475□16A#	4.7μF	K:±10% / M:±20%	16	2.0±0.20	1.25±0.20	1.25±0.20	12.5
	CM21X7R106□10A#	10μF	K:±10% / M:±20%	10	2.0±0.20	1.25±0.20	1.25±0.20	12.5
	CM21X7R106□06A#			6.3				

General CM316 Series　Size (JIS Code) : 1206(3216)　# Packaging Code (Packaging quantity) : T(2,500pcs.) / L(5,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CM316X5R225□100A#	2.2μF	K:±10% / M:±20%	100	3.2±0.20	1.6±0.20	1.6±0.20	5.0
	CM316X5R225□25A#			25	3.2±0.20	1.6±0.15	1.6±0.15	5.0
	CM316X5R475□50A#	4.7μF	K:±10% / M:±20%	50	3.2±0.20	1.6±0.20	1.6±0.20	5.0
	CM316X5R475□25A#			25	3.2±0.20	1.6±0.15	1.6±0.15	5.0
	CM316X5R106□25A#	10μF	K:±10% / M:±20%	25	3.2±0.20	1.6±0.20	1.6±0.20	12.5
	CM316X5R106□16A#			16	3.2±0.20	1.6±0.15	1.6±0.15	5.0
	CM316X5R106□10A#			10	3.2±0.20	1.6±0.15	1.6±0.15	7.0
	CM316X5R226□16A#	22μF	K:±10% / M:±20%	16	3.2±0.20	1.6±0.20	1.6±0.20	12.5
	CM316X5R226□06A#			6.3	3.2±0.20	1.6±0.20	1.6±0.20	7.5
X7R	CM316X7R475□50A#	4.7μF	K:±10% / M:±20%	50	3.2±0.20	1.6±0.20	1.6±0.20	5.0
	CM316X7R475□25A#			25	3.2±0.20	1.6±0.20	1.6±0.20	12.5
	CM316X7R106□25A#	10μF	K:±10% / M:±20%	25	3.2±0.20	1.6±0.20	1.6±0.20	5.0
	CM316X7R106□16A#			16	3.2±0.20	1.6±0.20	1.6±0.20	12.5
	CM316X7R226□10A#	22μF	K:±10% / M:±20%	10	3.2±0.20	1.6±0.20	1.6±0.20	7.5
	CM316X7R226□06A#			6.3	3.2±0.20	1.6±0.20	1.6±0.20	12.5
X7S	CM316X7S225□100A#	2.2μF	K:±10% / M:±20%	100	3.2±0.20	1.6±0.20	1.6±0.20	5.0

General CM316 Series　Size (JIS Code) : 1206(3216)　# Packaging Code (Packaging quantity) : T(2,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X7S	CM316X7S475□100AT	4.7μF	K:±10% / M:±20%	100	3.2±0.30	1.6±0.30	1.6±0.30	5.0

General CM32 Series　Size (JIS Code) : 1210(3225)　# Packaging Code (Packaging quantity) : T(1,000pcs.) / L(4,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CM32X5R475□25A#	4.7μF	K:±10% / M:±20%	25	3.2±0.30	2.5±0.20	2.5±0.20	5.0
	CM32X5R106□50A#	10μF	K:±10% / M:±20%	50	3.2±0.30	2.5±0.20	2.5±0.20	5.0
	CM32X5R106□25A#			25	3.2±0.30	2.5±0.20	2.5±0.20	12.5
	CM32X5R106□16A#			16	3.2±0.30	2.5±0.20	2.5±0.20	5.0
	CM32X5R226□25A#	22μF	K:±10% / M:±20%	25	3.2±0.30	2.5±0.20	2.5±0.20	12.5
	CM32X5R226□16A#			16	3.2±0.30	2.5±0.20	2.5±0.20	5.0
	CM32X5R226□10A#			10	3.2±0.30	2.5±0.20	2.5±0.20	7.0
	CM32X5R476□06A#	47μF	K:±10% / M:±20%	6.3	3.2±0.30	2.5±0.20	2.5±0.20	7.5
X7R	CM32X7R475□16A#	4.7μF	K:±10% / M:±20%	16	3.2±0.30	2.5±0.20	2.5±0.20	2.5
	CM32X7R106□50A#	10μF	K:±10% / M:±20%	50	3.2±0.30	2.5±0.20	2.5±0.20	5.0
	CM32X7R106□25A#			25	3.2±0.30	2.5±0.20	2.5±0.20	12.5
	CM32X7R226□16A#	22μF	K:±10% / M:±20%	16	3.2±0.30	2.5±0.20	2.5±0.20	12.5

Low Profile CT03 Series　Size (JIS Code) : 0201(0603)　# Packaging Code (Packaging quantity) : H(15,000pcs.) / N(50,000pcs.) / Q(30,000pcs.) / N(150,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CT03X5R104□06A#022	100nF	K:±10% / M:±20%	6.3	0.6±0.03	0.3±0.03	0.22max	12.5
	CT03X5R105M06AH025	1μF	M:±20%	6.3	0.6±0.09	0.3±0.09	0.25max	12.5

Low Profile CT05 Series　Size (JIS Code) : 0402(1005)　# Packaging Code (Packaging quantity) : H(10,000pcs.) / N(50,000pcs.) / Q(20,000pcs.) / N(100,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CT05X5R105M06A#022	1μF	M:±20%	6.3	1.0±0.05	0.5±0.05	0.22max	12.5
	CT05X5R105□06A#033		K:±10% / M:±20%				0.33max	
	CT05X5R225M06A#033	2.2μF	M:±20%	6.3	1.0±0.05	0.5±0.05	0.33max	12.5
	CT05X5R475M06AH033	4.7μF	M:±20%	6.3	1.0±0.20	0.5±0.20	0.33max	15.0

Low Profile CT105 Series　Size (JIS Code) : 0603(1608)　# Packaging Code (Packaging quantity) : H(4,000pcs.) / N(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CT105X5R105□16A#055	1μF	K:±10%/M:±20%	16	1.6±0.10	0.8±0.10	0.55max	12.5

Low Profile CT21 Series　Size (JIS Code) : 0805(2012)　# Packaging Code (Packaging quantity) : H(4,000pcs.) / N(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	CT21X5R105□25A#095	1μF	K:±10% / M:±20%	25	2.0±0.10	1.25±0.10	0.95max	5.0
	CT21X5R225□50A#095	2.2μF	K:±10% / M:±20%	50	2.0±0.20	1.25±0.20	0.95max	5.0
	CT21X5R475□16A#095	4.7μF	K:±10% / M:±20%	16	2.0±0.15	1.25±0.15	0.95max	12.5

High-Q CU02 Series　Size (JIS Code) : 01005(0402)　# Packaging Code (Packaging quantity) : H(20,000pcs.) / N(80,000pcs.) / P(40,000pcs.)

Dielectric code CΔ	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Q
CG/CH	CU02CΔR20□16A#	0.2pF	B:±0.1pF / C:±0.25pF	16	0.4±0.02	0.2±0.02	0.2±0.02	404
	CU02CΔR50□16A#	0.5pF	B:±0.1pF / C:±0.25pF					410
	CU02CΔ1R0□16A#	1pF	B:±0.1pF / C:±0.25pF					420
	CU02CΔ1R5□16A#	1.5pF	B:±0.1pF / C:±0.25pF					430
	CU02CΔ2R0□16A#	2pF	B:±0.1pF / C:±0.25pF					440
	CU02CΔ3R0□16A#	3pF	B:±0.1pF / C:±0.25pF					460
	CU02CΔ4R0□16A#	4pF	B:±0.1pF / C:±0.25pF					480
	CU02CΔ5R0□16A#	5pF	B:±0.1pF / C:±0.25pF					500
	CU02CΔ6R0□16A#	6pF	C:±0.25pF / D:±0.5pF					520
	CU02CΔ7R0□16A#	7pF	C:±0.25pF / D:±0.5pF					540
	CU02CΔ8R0□16A#	8pF	C:±0.25pF / D:±0.5pF					560
	CU02CΔ9R0□16A#	9pF	C:±0.25pF / D:±0.5pF					580
	CU02CΔ100□16A#	10pF	J:±5% / K:±10%					600
	CU02CΔ120□16A#	12pF	J:±5% / K:±10%					640
	CU02CΔ150□16A#	15pF	J:±5% / K:±10%					700
	CU02CΔ180□16A#	18pF	J:±5% / K:±10%					760
	CU02CΔ220□16A#	22pF	J:±5% / K:±10%					840

Au TerminationAT02 Series Size (JIS Code) : 01005(0402) Packaging Code (Packaging quantity) : H(20,000pcs.)
◇ Termination Code : G(AuSn solder and conductive adhesive.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	AT02X5R104□06GH	100nF	K:±10% / M:±20%	6.3	0.4±0.02	0.2±0.02	0.2±0.02	12.5

Au TerminationAT03 Series Size (JIS Code) : 0201(0603) Packaging Code (Packaging quantity) : H(15,000pcs.)
◇ Termination Code : G (AuSn solder and conductive adhesive.) / K (Wire bonding and conductive adhesive.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	AT03X5R474□06◇H	470nF	K:±10% / M:±20%	6.3	0.6±0.03	0.3±0.03	0.3±0.03	12.5
	AT03X5R105□06◇H	1μF	K:±10% / M:±20%		0.6±0.05	0.3±0.05	0.3±0.05	
	AT03X5R225□06◇H	2.2μF	K:±10% / M:±20%		0.6±0.09	0.3±0.09	0.3±0.09	

Au TerminationAT05 Series Size (JIS Code) : 0402(1005) Packaging Code (Packaging quantity) : H(10,000pcs.)
◇ Termination Code: G (AuSn solder and conductive adhesive.) / K (Wire bonding and conductive adhesive.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	AT05X5R474□06◇H	470nF	K:±10% / M:±20%	6.3	1.0±0.05	0.5±0.05	0.5±0.05	10.0
	AT05X5R105□06◇H	1μF	K:±10% / M:±20%					

Soft Termination ST03 Series Size (JIS Code) : 0201(0603) # Packaging Code (Packaging quantity) : H(15,000pcs.) / N(50,000pcs.) / Q(30,000pcs.) / W(150,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	ST03X5R105M06S#	1μF	M:±20%	6.3	0.6±0.05	0.3±0.05	0.3±0.05	12.5
	ST03X5R225M04SH	2.2μF	M:±20%	4	0.6±0.10	0.3±0.10	0.3±0.10	12.5

Soft Termination ST05 Series Size (JIS Code) : 0402(1005) # Packaging Code (Packaging quantity) : H(10,000pcs.) / N(50,000pcs.) / Q(20,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X5R	ST05X5R225□10S#	2.2μF	K:±10% / M:±20%	10	1.0±0.07	0.5±0.07	0.5±0.07	12.5
	ST05X5R475M06S#	4.7μF	M:±20%	6.3	1.0±0.15	0.5±0.15	0.5±0.15	12.5
	ST05X5R106M06SH	10μF			1.0±0.20	0.5±0.20	0.5±0.20	

High Voltage CF21 Series Size (JIS Code) : 0805(2012) # Packaging Code (Packaging quantity) : T(4,000pcs.) / L(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X7R	CF21X7R221□250A#	220pF	K:±10% / M:±20%	250	2.0±0.10	1.25±0.10	0.85±0.10	2.5
	CF21X7R471□250A#	470pF	K:±10% / M:±20%					

High Voltage CF21 Series Size (JIS Code) : 0805(2012) # Packaging Code (Packaging quantity) : T(3,000pcs.) / L(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X7R	CF21X7R102□250A#	1nF	K:±10% / M:±20%	250	2.0±0.10	1.25±0.10	1.05±0.10	2.5
	CF21X7R222□250A#	2.2nF	K:±10% / M:±20%					
	CF21X7R472□250A#	4.7nF	K:±10% / M:±20%					
	CF21X7R103□250A#	10nF	K:±10% / M:±20%	250	2.0±0.10	1.25±0.10	1.25±0.10	2.5
	CF21X7R223□250A#	22nF	K:±10% / M:±20%					

High Voltage CF316 Series Size (JIS Code) : 1206(3216) # Packaging Code (Packaging quantity) : T(3,000pcs.) / L(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension L[mm]	Dimension W[mm]	Dimension T[mm]	Tan δ [%]
X7R	CF316X7R221□1000A#	220pF	K:±10% / M:±20%	1000	3.2±0.20	1.6±0.15	1.15±0.10	2.5
	CF316X7R471□1000A#	470pF						
	CF316X7R102□1000A#	1nF					1.25±0.10	
	CF316X7R222□630A#	2.2nF	K:±10% / M:±20%	630	3.2±0.20	1.6±0.15	1.25±0.10	2.5
	CF316X7R472□630A#	4.7nF						
	CF316X7R103□630A#	10nF						
	CF316X7R103□250A#	10nF	K:±10% / M:±20%	250	3.2±0.20	1.6±0.15	1.15±0.10	2.5
	CF316X7R223□250A#	22nF						

High Voltage CF316 Series　Size (JIS Code) : 1206(3216)　# Packaging Code (Packaging quantity) : T(2,500pcs.) / L(5,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension			Tan δ [%]
					L[mm]	W[mm]	T[mm]	
X7R	CF316X7R222□1000A#	2.2nF	K:±10% / M:±20%	1000	3.2±0.20	1.6±0.15	1.6±0.15	2.5
	CF316X7R223□630A#	22nF		630	3.2±0.20	1.6±0.15	1.6±0.15	2.5
	CF316X7R473□250A#	47nF	K:±10% / M:±20%	250	3.2±0.20	1.6±0.15	1.6±0.15	2.5
	CF316X7R104□250A#	100nF						

High Voltage CF32 Series　Size (JIS Code) : 1210(3225)　# Packaging Code (Packaging quantity) : T(2,500pcs.) / L(5,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension			Tan δ [%]
					L[mm]	W[mm]	T[mm]	
X7R	CF32X7R472□1000A#	4.7nF	K:±10% / M:±20%	1000	3.2±0.30	2.5±0.20	1.6±0.15	2.5
	CF32X7R223□630A#	22nF		630	3.2±0.30	2.5±0.20	1.6±0.15	2.5

High Voltage CF32 Series　Size (JIS Code) : 1210(3225)　# Packaging Code (Packaging quantity) : T(2,000pcs.) / L(5,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension			Tan δ [%]
					L[mm]	W[mm]	T[mm]	
X7R	CF32X7R473□630A#	47nF	K:±10% / M:±20%	630	3.2±0.30	2.5±0.20	2.0±0.20	2.5
	CF32X7R104□250A#	100nF		250	3.2±0.30	2.5±0.20	2.0±0.20	2.5

High Voltage CF42 Series　Size (JIS Code) : 1808(4520)　Packaging Code (Packaging quantity) : T(2,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension			Tan δ [%]
					L[mm]	W[mm]	T[mm]	
X7R	CF42X7R102□2000AT	1nF	K:±10% / M:±20%	2000	4.5±0.20	2.0±0.20	2.2 max	2.5
	CF42X7R222□1000AT	2.2nF	K:±10% / M:±20%	1000	4.5±0.20	2.0±0.20	2.2 max	2.5
	CF42X7R472□1000AT	4.7nF	K:±10% / M:±20%					
	CF42X7R103□1000AT	10nF	K:±10% / M:±20%					

High Voltage CF43 Series　Size (JIS Code) : 1812(4532)　Packaging Code (Packaging quantity) : T(500pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension			Tan δ [%]
					L[mm]	W[mm]	T[mm]	
X7R	CF43X7R222□2000AT	2.2nF	K:±10% / M:±20%	2000	4.5±0.30	3.2±0.20	2.5 max	2.5
	CF43X7R223□1000AT	22nF	K:±10% / M:±20%	1000	4.5±0.30	3.2±0.20	2.5 max	2.5
	CF43X7R104□630AT	100nF	K:±10% / M:±20%	630	4.5±0.30	3.2±0.20	2.5 max	2.5
	CF43X7R224□250AT	220nF	K:±10% / M:±20%	250	4.5±0.30	3.2±0.20	2.5 max	2.5

Three Terminal Capacitors KNH05 Series　Size (JIS Code) : 0402(1005)　Packaging Code (Packaging quantity) : H(10,000pcs.)

Dielectric code	Part Number	Capacitance	□:Tolerance	Voltage [V]	Dimension			Tan δ [%]
					L[mm]	W[mm]	T[mm]	
X5R	KNH05X5R435M04AH	4.3μF	M:±20%	4	1.0±0.10	0.5±0.20	0.50 max	—
	KNH05X5R106M04AH	10μF	M:±20%		1.0±0.20	0.5±0.20	0.5±0.20	

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