



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.
- 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 superior quality.
- Kyocera components are available in a wide choice of dimensions, temperature characteristics, rated voltages, and terminations to meet specific configurational requirements.

(Example)

- ① Series : CM Series (General)
- ② Size : 0201
- ③ Dielectric : X5R
- ④ Capacitance : 2.2 μ F
- ⑤ Tolerance : \pm 20%
- ⑥ Voltage : 6.3Vdc
- ⑦ Termination : Sn
- ⑧ Packaging : Cavity pitch 2mm / Reel Size ϕ 180

■ 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.

① SERIES CODE

CODE	Type
CM	General
CT	Low Profile
CU	High-Q
KNH	Three Terminal Capacitors

② SIZE 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

③ DIELECTRIC CODE

Temperature Compensation Type			
CODE	Temperature Range (°C)	ppm/°C	
CG	-55 to 125	0	\pm 30
CH			\pm 60

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

High Dielectric Constant Type			
CODE	Temperature Range (°C)	Δ C max. (%)	Standard Temperature (°C)
X5R	-55 to 85	\pm 15	25
X6S	-55 to 105	\pm 22	
X6T		+22/-33	
X7R	-55 to 125	\pm 15	
X7S		\pm 22	
X7T		+22/-33	

④ CAPACITANCE 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 = 1 μ F >

(Example)

CODE	Capacitance	E STANDARD NUMBER			
		E3	E6	E12	E24
R50	0.5pF	1.0	1.0	1.0	1.1
1R0	1pF			1.2	1.3
100	10pF		1.5	1.5	1.6
101	100pF			1.8	2.0
102	1nF	2.2	2.2	2.2	2.4
103	10nF			2.7	3.0
104	100nF		3.3	3.3	3.6
105	1 μ F	3.9		4.3	
106	10 μ F	4.7	4.7	4.7	5.1
				5.6	6.2
			6.8	6.8	7.5
		8.2		9.1	

⑤ TOLERANCE CODE

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

* : Option

⑥ VOLTAGE CODE

CODE	Rated Voltage
04	4Vdc
06	6.3Vdc
10	10Vdc
16	16Vdc
25	25Vdc
35	35Vdc
50	50Vdc
100	100Vdc

⑦ TERMINATION CODE

CODE	Termination
A	Nickel Barrier/ Tin

• Please contact us if Au termination is needed.

⑧ PACKAGING CODE

CODE	Size Code	Cavity pitch	Reel size
T	105 to 32	4mm	ϕ 180
H	02 to 05	2mm	
Q	03/05	1mm	
P	02	1mm	ϕ 330
L	105 to 32	4mm	
N	02 to 05	2mm	
W	03/05	1mm	

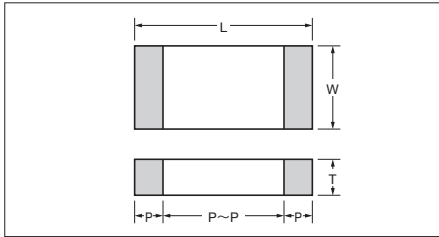
High Dielectric Constant Type (X5R/X6S/X6T/X7R/X7S/X7T)	
CODE	Tolerance
J*	\pm 5%
K	\pm 10%
M	\pm 20%

* : Option

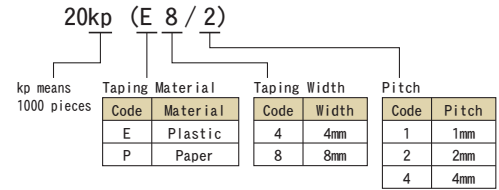


Dimension

■CM/CT/CU Series

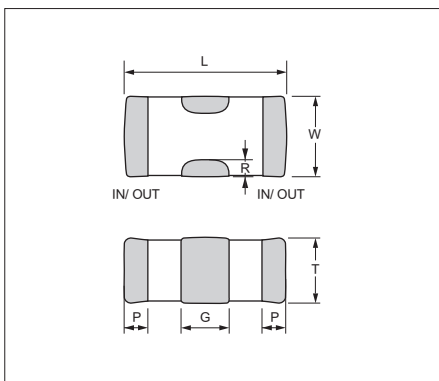


■Packaging Code



Size	Code		Dimension Code	Dimension (mm)						Quantity per reel	
	EIA	JIS		L	W	T	P min.	P max.	P to P min.	φ 180 Reel	φ 330 Reel
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			0.3±0.05					
			D			0.25 max.					
			E			0.3±0.09					
			F			0.3±0.09					
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			0.5±0.15					
			E			0.33 max.					
			F			0.55 max.					
			G			0.5±0.20					
			H			0.80 max.					
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			0.8±0.15					
			D			0.8±0.20					
			E			0.8±0.25					
21	0805	2012	A	2.0±0.10	1.25±0.10	0.95 max.	0.20	0.75	0.70	4kp(P8/4) 3kp(E8/4) 4kp(P8/4) 3kp(E8/4) 4kp(P8/4) 3kp(E8/4)	10kp(P8/4) 10kp(E8/4) 10kp(P8/4) 10kp(E8/4) 10kp(P8/4) 10kp(E8/4)
			B			1.25±0.10					
			C			0.95 max.					
			D			1.25±0.15					
			E			0.95 max.					
			F			1.25±0.20					
			G			1.25±0.20					
316	1206	3216	A	3.2±0.20	1.6±0.15	0.30	0.85	1.40	2.5kp(E8/4)	5kp(E8/4)	
			B		1.6±0.20						
			C		1.6±0.30						
32	1210	3225	A	3.2±0.30	2.5±0.20	2.5±0.20	0.30	1.00	1.40	1kp(E8/4)	4kp(E8/4)

■KNH Series



Size	Code		Dimension Code	Dimension (mm)						Packaging	
	EIA	JIS		L	W	T	G	P	R	φ 180 Reel	φ 330 Reel
KNH 05	0402	1005	A	1.0 ± 0.10	0.5 ± 0.20	0.5 max.	0.3 ± 0.10	0.15 ± 0.10	≥ 0.05	10kp(P8/2)	—
			B	1.0 ± 0.15	0.5 ± 0.15	0.5 ± 0.15					
			C	1.0 ± 0.20	0.5 ± 0.20	0.5 ± 0.20					



■ Features

0402 Size. Rated current up to 2A MAX.

With unique circuit structure, this three terminal capacitor enables noise reduction in wide frequency 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

● Capacitance chart Standard Spec.2

Size (EIA Code)	KNH05 (0402)
Rated Voltage (Vdc)	4
Capacitance	
105	1.0 μ F
435	4.3 μ F
106	10 μ F
156	15 μ F
	A
	C
	B

• Storage condition

Temperature: -10 to +45°C
Humidity: 45 to 75%RH

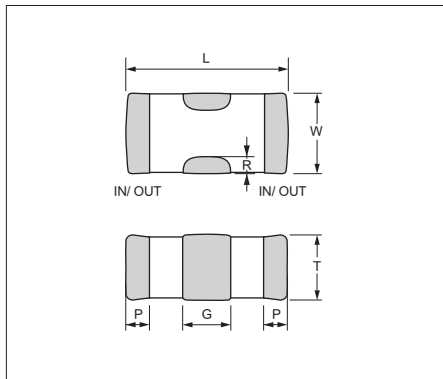
Alphabets in capacitance chart denote dimensions. Please refer to the below table for detail.

(Example) In case of "A" for KNH05:
L: 1.0 \pm 0.10mm, W: 0.5 \pm 0.20mm, T: 0.5mm max.

Size	Dimension Code	Dimension (mm)						Packaging ϕ 180 Reel				
		L	W	T	G	P	R	Code	Quantity	Taping Material	Taping Width	Cavity Pitch
KNH05	A	1.0 \pm 0.10	0.5 \pm 0.20	0.5 max.	0.3 \pm 0.10	0.15 \pm 0.10	\geq 0.05	H	10,000	Paper	8mm	2mm
	B	1.0 \pm 0.15	0.5 \pm 0.15	0.5 \pm 0.15	0.3 \pm 0.10	0.15 \pm 0.10	\geq 0.05	H	10,000	Paper	8mm	2mm
	C	1.0 \pm 0.20	0.5 \pm 0.20	0.5 \pm 0.20	0.3 \pm 0.10	0.15 \pm 0.10	\geq 0.05	H	10,000	Paper	8mm	2mm

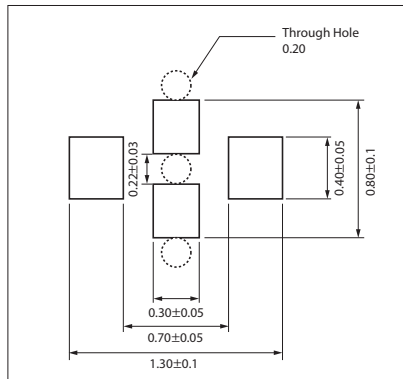
■ Dimension

(Unit: mm)



■ Recommended Land Pattern

(Unit: mm)





Test Conditions and Standards

Test Conditions and Specifications for High Dielectric Type (X5R) KNH Series (Standard Spec.2)

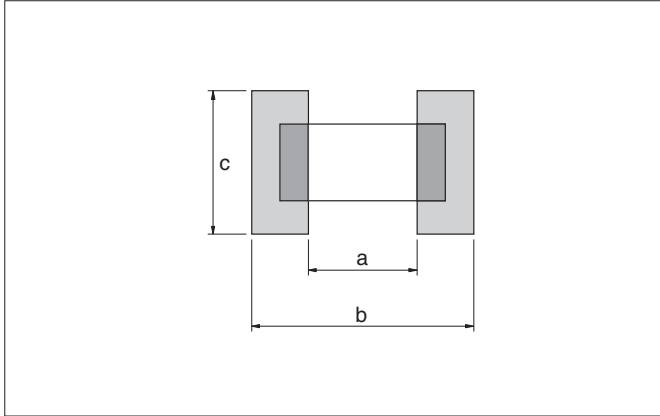
Test Items		Test Conditions	Specifications												
Capacitance Value (C)		Measure after heat treatment <table border="1"> <thead> <tr> <th>Capacitance</th> <th>Frequency</th> <th>Volt</th> </tr> </thead> <tbody> <tr> <td>C≤10μF</td> <td>1kHz ± 10%</td> <td>1.0 ± 0.2Vrms</td> </tr> <tr> <td>C>10μF</td> <td>*1kHz ± 10%</td> <td>0.5 ± 0.2Vrms</td> </tr> <tr> <td></td> <td>120Hz ± 10%</td> <td>0.5 ± 0.2Vrms</td> </tr> </tbody> </table> *KNH05X5R106 The charge and discharge current of the capacitor must not exceed 50mA.	Capacitance	Frequency	Volt	C≤10μF	1kHz ± 10%	1.0 ± 0.2Vrms	C>10μF	*1kHz ± 10%	0.5 ± 0.2Vrms		120Hz ± 10%	0.5 ± 0.2Vrms	Within tolerance
Capacitance	Frequency	Volt													
C≤10μF	1kHz ± 10%	1.0 ± 0.2Vrms													
C>10μF	*1kHz ± 10%	0.5 ± 0.2Vrms													
	120Hz ± 10%	0.5 ± 0.2Vrms													
Insulation Resistance (IR)		Apply the rated voltage for 1minute, and measure it in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA.	Over 50MΩ·μF												
Direct current resistance			0.03Ω max.												
Rated current			2A(DC)												
Dielectric Resistance		Apply 2.5 times of the rated voltage for 1 to 5 seconds. The charge and discharge current of the capacitor must not exceed 50mA.	No problem observed												
Appearance		Microscope	No problem observed												
Bending Strength		Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds. Exclude CT series with thickness of less than 0.66mm.	No significant damage with 1mm bending												
Vibration Test	Appearance	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 in total, and place in normal temperature and humidity, then measure the sample after heat treatment.	No problem observed												
	ΔC		Within tolerance												
	Tan δ		Within tolerance												
Soldering Heat Resistant	Appearance	Take the initial value after heat treatment. Soak the sample in 260°C± 5°C solder for 10 ± 0.5 seconds and place in normal temperature and humidity, and measure after heat treatment. (Pre-heating conditions) <table border="1"> <thead> <tr> <th>Order</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <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> </tbody> </table> The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.	Order	Temperature	Time	1	80 to 100°C	2 minutes	2	150 to 200°C	2 minutes	No problem observed			
	Order		Temperature	Time											
	1		80 to 100°C	2 minutes											
	2		150 to 200°C	2 minutes											
	ΔC		Within ± 30.0%												
Tan δ	Within tolerance														
IR	Over 50MΩ·μF														
Withstanding Voltage	Resist without problem														
Solderability		Soaking condition <table border="1"> <thead> <tr> <th>Sn-3Ag-0.5Cu</th> <th>245 ± 5°C</th> <th>3 ± 0.5 sec.</th> </tr> <tr> <th>Sn63 Solder</th> <th>235 ± 5°C</th> <th>2 ± 0.5 sec.</th> </tr> </thead> </table>	Sn-3Ag-0.5Cu	245 ± 5°C	3 ± 0.5 sec.	Sn63 Solder	235 ± 5°C	2 ± 0.5 sec.	Solder coverage : 90% min.						
Sn-3Ag-0.5Cu	245 ± 5°C	3 ± 0.5 sec.													
Sn63 Solder	235 ± 5°C	2 ± 0.5 sec.													
Temperature Cycle	Appearance	Take the initial value after heat treatment. (Cycle) Room temperature (3 min.) → Lowest operation temperature (30 min.) → Room temperature (3 min.) → Highest operation temperature(30 min.) 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.	No problem observed												
	ΔC		Within ± 30.0%												
	Tan δ		Within tolerance												
	IR		Over 50MΩ·μF												
	Withstanding Voltage		Resist without problem												
Moisture Resistant Load	Appearance	Take the initial value after heat treatment. After applying rated voltage for 500+12/ - 0 hours in the condition of 40°C± 2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.	No problem observed												
	ΔC		Within ± 30.0%												
	Tan δ		200% max. of initial value												
	IR		Over 10MΩ·μF												
High-Temperature Load	Appearance	Take the initial value after heat treatment. After applying 1.0 times the rated voltage at the highest operation temperature for 1000+12/ - 0 hours, and measure the sample after heat treatment in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.	No problem observed												
	ΔC		Within ± 30.0%												
	Tan δ		200% max. of initial value												
	IR		Over 10MΩ·μF												
Heat treatment		Expose sample in the temperature of 150+0/ - 10°C for 1 hour and leave the sample in normal temperature and humidity for 24 ± 2 hours.													



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.

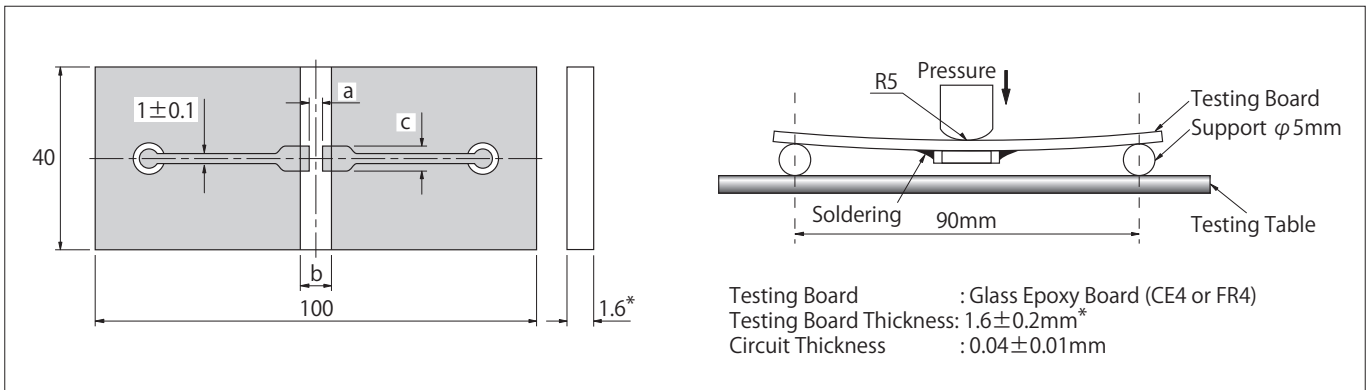
(Unit: mm)



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

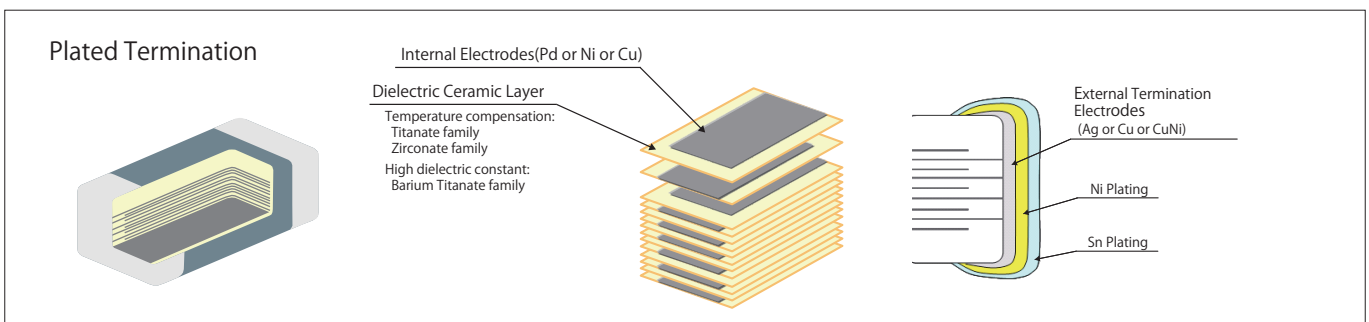
Substrate for Bending Test

(Unit: mm)



* 02, 03, 05 size $0.8 \pm 0.1 \text{ mm}$

Structure



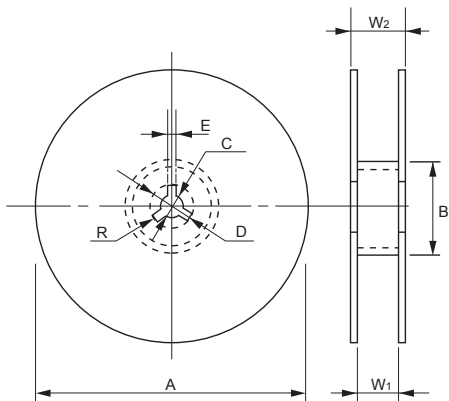
- Please contact your local kyocera sales office or distributor for specifications not covered in this catalog.
- Our products are continually being improved. As a result, the capacitance range of each series is subject to change without notice. Please contact sales representative to confirm compatibility with your application.



Packaging Options Tape and Reel

Reel

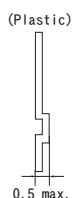
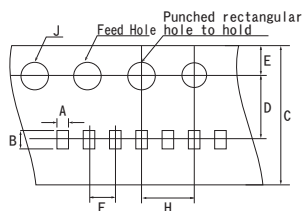
(Unit: mm)



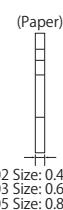
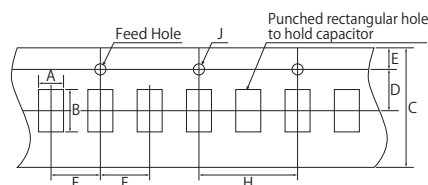
Code Reel	A	B	C	D
7-inch Reel (CODE: T, H, Q)	180 ⁺⁰ _{-2.0}	φ 60 min.	13±0.5	21±0.8
7-inch Reel (CODE: P)	178±2.0			
13-inch Reel (CODE: L, N, W)	330±2.0			
Code Reel	E	W ₁	W ₂	R
7-inch Reel (CODE: T, H, Q)	2.0±0.5	10.5±1.5	16.5 max.	1.0
7-inch Reel (CODE: P)		4.35±0.3	6.95±1.0	
13-inch Reel (CODE: L, N, W)		9.5±1.0	16.5 max.	

Carrier Tape

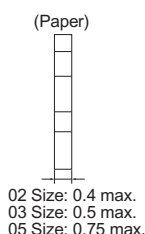
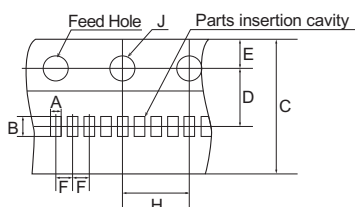
F=1mm (02 Size)



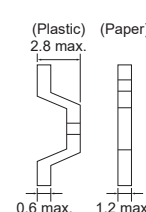
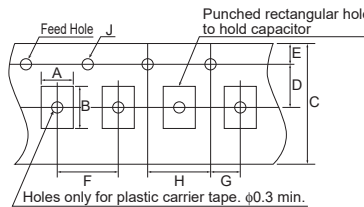
F=2mm (02, 03, 05 Size)



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



F=4mm (105, 21, 316, 32 Size)



Carrier Tape

(Unit: mm)

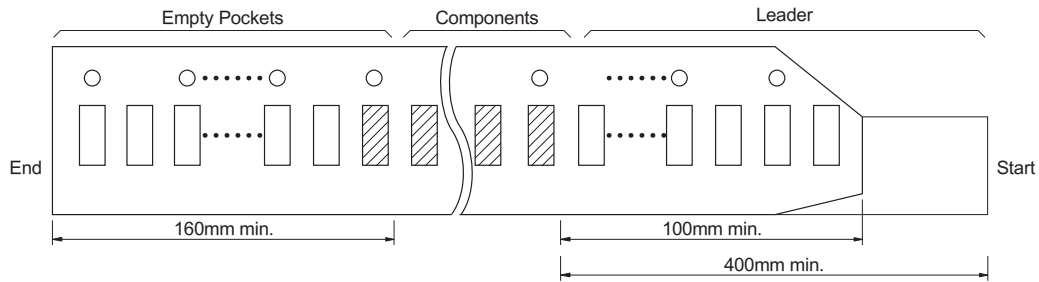
Size (EIA Code)	A	B	C	D	E	F	G	H	J	Carrier Tape	
										Width	Material
02 (01005)*	0.23±0.02	0.43±0.02	4.0±0.08	1.8±0.02	0.9±0.05	1.0±0.02	—	2.0±0.04	0.8±0.04	4mm	Plastic
	0.25±0.03	0.45±0.03	8.0±0.3	3.5±0.05	1.75±0.1	2.0±0.05		4.0±0.1	1.5+0.1/-0	8mm	Paper
03 (0201)*	0.37±0.03	0.67±0.03	8.0+0.3/-0.1	3.5±0.05	1.75±0.1	1.0±0.05	—	4.0±0.05	1.5+0.1/-0	8mm	Paper
	0.39±0.03	0.69±0.03	8.0±0.3	3.5±0.05	1.75±0.1	2.0±0.05		4.0±0.1			
	0.42±0.03	0.72±0.03	8.0±0.3	3.5±0.05	1.75±0.1	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	3.5±0.05	1.75±0.1	2.0±0.05		4.0±0.1			
	0.8±0.1	1.3±0.1	8.0±0.3	3.5±0.05	1.75±0.1	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
	1.1±0.2	1.9±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		
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

* Option



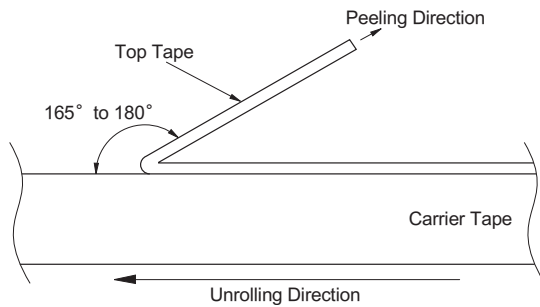
Packaging Options

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.

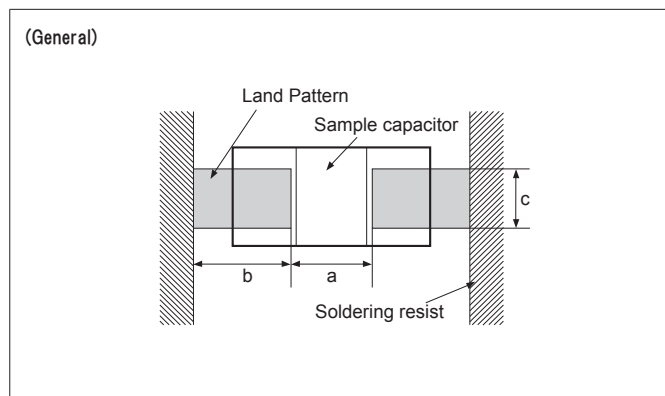


Surface Mounting Information

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

(Unit: mm)

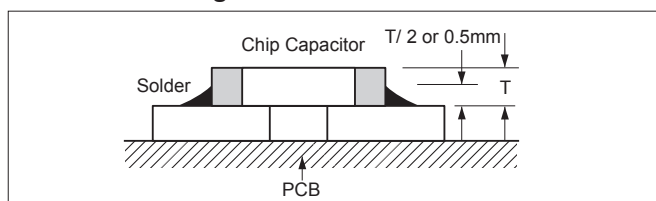
Size (EIA Code)	Dimension		Recommended land dimensions		
	L	W	a	b	c
02 (01005)	0.4 ± 0.02	0.2 ± 0.02	0.13 to 0.20	0.12 to 0.18	0.20 to 0.23
	0.6 ± 0.03	0.3 ± 0.03	0.20 to 0.25	0.25 to 0.35	0.30 to 0.40
03 (0201)	0.6 ± 0.05	0.3 ± 0.05			
	05 (0402)	0.6 ± 0.09	0.3 ± 0.09	0.23 to 0.30	0.25 to 0.35
1.0 ± 0.05		0.5 ± 0.05	0.30 to 0.50	0.35 to 0.45	0.40 to 0.60
1.0 ± 0.15		0.5 ± 0.15	0.40 to 0.60	0.40 to 0.50	0.50 to 0.75
105 (0603)	1.0 ± 0.20	0.5 ± 0.20			
	1.6 ± 0.10	0.8 ± 0.10	0.70 to 1.00	0.80 to 1.00	0.60 to 0.90
	1.6 ± 0.15	0.8 ± 0.15	0.80 to 1.00	0.80 to 1.00	0.80 to 1.10
	1.6 ± 0.20	0.8 ± 0.20			
21 (0805)	1.6 ± 0.25	0.8 ± 0.25	1.00 to 1.30	1.00 to 1.20	1.00 to 1.45
	2.0 ± 0.10	1.25 ± 0.10			
	2.0 ± 0.15	1.25 ± 0.15			
316 (1206)	2.0 ± 0.20	1.25 ± 0.20	2.10 to 2.50	1.10 to 1.30	1.40 to 1.90
	3.2 ± 0.20	1.6 ± 0.15			
	3.2 ± 0.20	1.6 ± 0.20			
32 (1210)	3.2 ± 0.30	1.6 ± 0.30	2.10 to 2.50	1.10 to 1.30	1.60 to 2.00
	3.2 ± 0.30	1.6 ± 0.30			
32 (1210)	3.2 ± 0.30	2.5 ± 0.20	2.10 to 2.50	1.10 to 1.30	1.90 to 2.80

* 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	Prohibited	Recommended example : Separation by solder resist
Multiple parts mount		
Mount with leaded parts		
Wire soldering after mounting		
Side by side layout		



Surface Mounting Information

Mounting Design

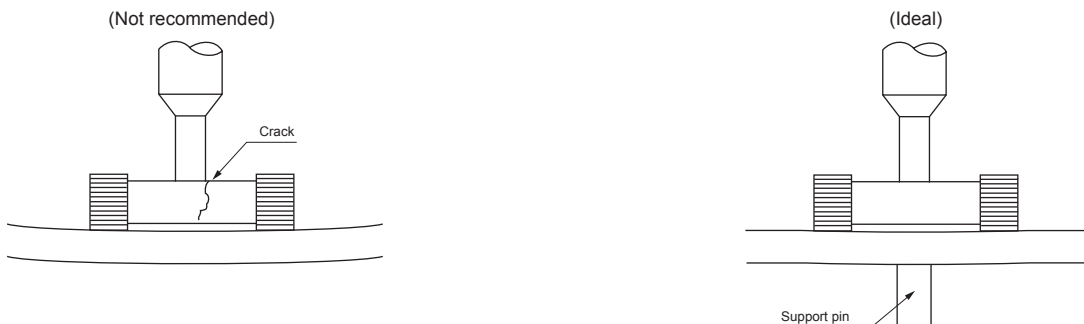
The chip could crack if the PCB warps during processing after the chip has been soldered.

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 vacuum nozzle, provide a support pin on the back of the PCB to minimize PCB flexure.



- 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.



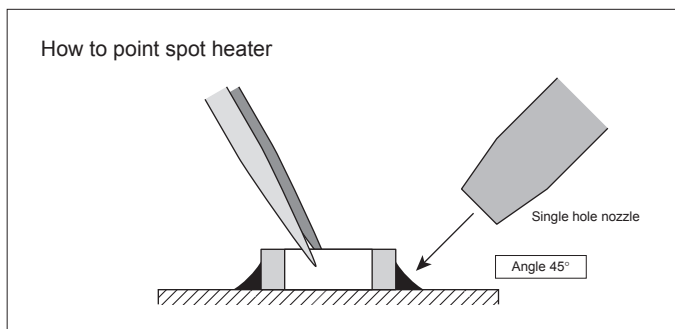
Surface Mounting Information

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 (ΔT) to within 150 degree Celsius.
- 2) The product size $1.6 \times 0.8\text{mm}$ to $3.2 \times 1.6\text{mm}$ can be used in reflow and wave soldering, and the product size of bigger than $3.2 \times 1.6\text{mm}$, or smaller than $1.6 \times 0.8\text{mm}$ 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.

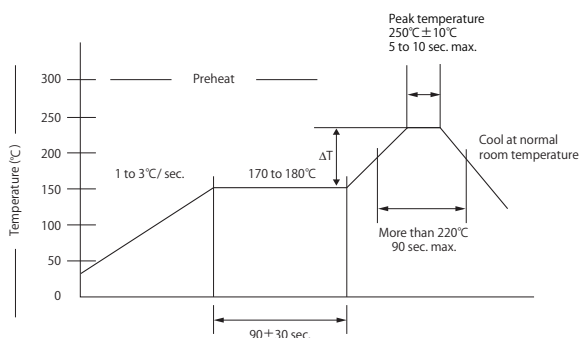
- Recommended spot heater condition

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)



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

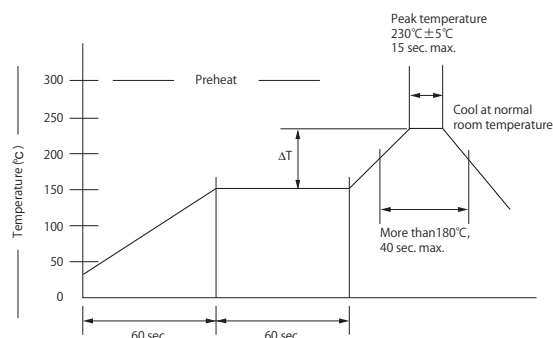
Reflow



- 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 $3.2 \times 2.5\text{mm}$ size or larger.
- ④ MLCC can withstand the above reflow conditions up to 3 times.
- ⑤ N_2 atmosphere is recommended for reflow of products of $0.4\text{mm} \times 0.2\text{mm}$ size or smaller.

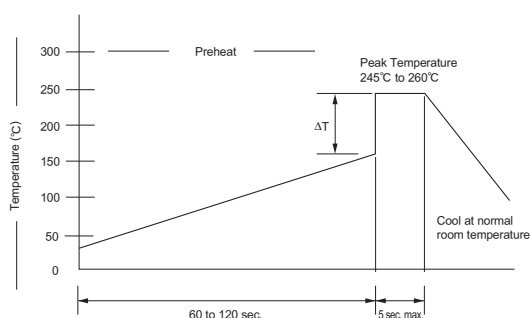
Recommended Temperature Profile (63Sn Solder)

Reflow



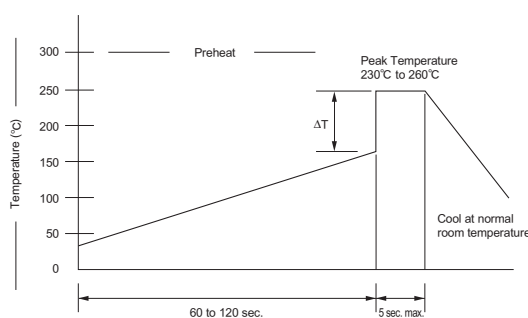
- ① Minimize soldering time.
- ② Ensure that the temperature difference (ΔT) does not exceed 150°C.
- ③ Ensure that the temperature difference (ΔT) does not exceed 130°C for $3.2 \times 2.5\text{mm}$ size or larger.
- ④ MLCC can withstand the above reflow conditions up to 3 times.

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 $3.2 \times 2.5\text{mm}$ or larger of $1.0 \times 0.5\text{mm}$ or smaller and capacitor arrays.

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 $3.2 \times 2.5\text{mm}$ or larger of $1.0 \times 0.5\text{mm}$ or smaller and capacitor arrays.



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°C .
4. Please keep voltage under the rated voltage which is applied to the capacitor. Also, please make certain the peak voltage remains below the rated voltage when AC voltage is super-imposed to the DC voltage. In the situation where AC or pulse voltage is employed, ensure average peak voltage does not exceed the rated voltage. Exceeding the rated voltage provided in both catalog and specifications may lead to defective withstanding voltage or, in worst case situations, may cause the capacitor to smoke or flame.
5. When the capacitor is to be employed in a circuit in which there is continuous application of a high frequency voltage or a steep pulse voltage, even though it is within the rated voltage, please inquire to the manufacturer. In the situation the capacitor is to be employed using a high frequency AC voltage or a extremely fast rising pulse voltage, even though it is within the rated voltage, it is possible capacitor reliability will deteriorate.
6. It is a common phenomenon of high-dielectric products to have a deteriorated amount of static electricity due to the application of DC voltage. Due caution is necessary as the degree of deterioration varies depending on the quality of capacitor materials, capacity, as well as the load voltage at the time of operation.
7. Do not use the capacitor in an environment where it might easily exceed the respective provisions concerning shock and vibration specified in the catalog and specifications. In addition, it is a common piezo phenomenon of high dielectric products to have some voltage due to vibration or to have noise due to voltage change. Please contact sales in such case.
8. If the electrostatic capacity value of the delivered capacitor is within the specified tolerance, please consider this when designing the respective product in order that the assembled product function appropriately.
9. Please contact us upon using conductive adhesives.

Storage

1. If the component is stored in minimal packaging (a heat-sealed or zippered plastic bag), the bag should be kept closed. Once the bag has been opened, reseal it or store it in a desiccator.
2. Keep storage place temperature + 5 to + 40 °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/>



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

Dielectric code	Capacitance	□:Tolerance	Voltage [V]	Part Number	Tan δ [%]	Dimension			Packaging Code (quantity)
						L[mm]	W[mm]	T[mm]	
X5R	4.3μF	M: ± 20%	4	KNH05X5R435M04AH	-	1.0 ± 0.10	0.5 ± 0.20	0.50 max.	H
	10μF			1.0 ± 0.20		0.5 ± 0.20	0.5 ± 0.20	H	
	15μF			1.0 ± 0.15		0.5 ± 0.15	0.5 ± 0.15	H	

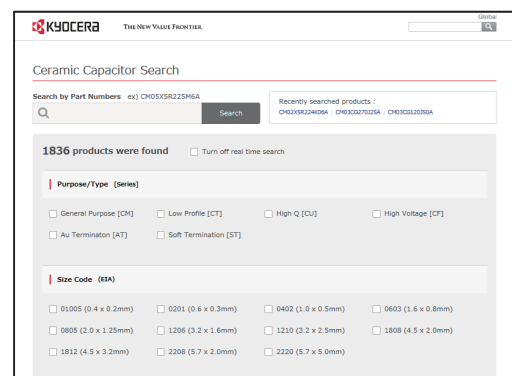


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Design Tool Introduction

Part Number, environmental documents, and other data can be searched with cap value, case size, or electrical characteristic of MLCC.

<http://prdct-search.kyocera.co.jp/electro-mlcc-en/>



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