Test Conditions and Specifications for Temperature Compensation Type (CΔ Characteristics)
CM/ CU/ 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"><table><tr><th>Capacitance</th><th>Frequency</th><th>Volt</th></tr><tr><td>C≤1000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 to 5Vrms</td></tr><tr><td>C>1000pF</td><td>1kHz±10%</td></tr></table></td><td>Within tolerance</td></tr>
<tr><td colspan="2">Q</td><td>C≥30pF : Q≥1000
C<30pF : Q≥400+20C</td></tr>
<tr><td colspan="2">Insulation Resistance (IR)</td><td>Measured after the rated voltage is applied for 1 minute at room ambient.
For the rated voltage of over 630V, apply 500V 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 3 times of the rated voltage for 1 to 5 seconds.
Apply 1.5 times when the rated voltage is 250V or over.
Apply 1.2 times when the rated voltage is 630V or over.
The charge and discharge current of the capacitor 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. Apply 2N for 0201, and 1N for 01005 size.</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">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>Q</td><td>C≥30pF : Q≥1000
C<30pF : Q≥400+20C</td></tr>
<tr><td rowspan="5">Soldering Heat Resistance</td><td>Appearance</td><td rowspan="5">Soak the sample in 260°C±5°C solder for 10±0.5 seconds and place in room ambient, and measure after 24±2 hours.
(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 ±2.5% or ±0.25pF, whichever is larger</td></tr>
<tr><td>Q</td><td>C≥30pF : Q≥1000
C<30pF : Q≥400+20C</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">(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.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ±2.5% or ±0.25pF, whichever is larger</td></tr>
<tr><td>Q</td><td>C≥30pF : Q≥1000
C<30pF : Q≥400+20C</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 (Except CF Series)</td><td>Appearance</td><td rowspan="4">After applying rated voltage for 500+12/ −0 hours in pre-condition at 40°C±2°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement.
The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.</td><td>No problem observed</td></tr>
<tr><td>ΔC</td><td>Within ±7.5% or ±0.75pF, whichever is larger</td></tr>
<tr><td>Q</td><td>C≥30pF : Q≥200
C<30pF : Q≥100+10C/ 3</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">After applying twice the rated voltage at the temperature of 125±3°C for 1000+12/ −0 hours, measure the sample after 24±2 hours.
Apply 1.5 times when the rated voltage is 250V or over.
Apply 1.2 times when the rated voltage is 630V or over.
The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.</td><td>No problem observed.</td></tr>
<tr><td>ΔC</td><td>Within ±3% or ±0.3pF, whichever is larger</td></tr>
<tr><td>Q</td><td>C≥30pF : Q≥350
10pF<C<30pF : Q≥275+5C/ 2
C<10pF : Q≥200+10C</td></tr>
<tr><td>IR</td><td>Over 1000MΩ or 50MΩ • μF, whichever is less</td></tr>
</table>

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

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

Test Items		Test Conditions	Specifications
Capacitance Value (C)		Measure after heat treatment	Within tolerance
Tanδ (%)		Capacitance: C≤10μF — Frequency: 1kHz±10% — Volt: 1.0±0.2Vrms; C>10μF — 120Hz±10% — 0.5±0.2Vrms	Refer to capacitance chart
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 2.5 times of the rated voltage for 1 to 5 seconds. The charge and discharge current of the capacitor must not exceed 50mA.	No problem observed
Appearance		Microscope	No problem observed
Termination Strength		Apply a sideward force of 500g (5N) to a PCB-mounted sample. note : 2N for 0201 size in for 01005 size. Exclude CT series with thickness of less than 0.66mm.	No problem observed
Bending Strength		Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds. Exclude CT series with thickness of less than 0.66mm.	No significant damage at 1mm bent
Vibration 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 total.	No problem observed
	ΔC		Within tolerance
	Tanδ (%)		Within tolerance
Soldering Heat Resistance	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 room ambient, and measure after 24±2 hours. (Pre-heating conditions) Order 1: 80 to 100°C, 2 minutes; Order 2: 150 to 200°C, 2 minutes. The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.	No problem observed
	ΔC		Within ±7.5%
	Tanδ (%)		Within tolerance
	IR		Over 10000MΩ or 500MΩ • μF, whichever is less
	Withstanding Voltage		Resist without problem
Solderablity		Soaking condition: Sn-3Ag-0.5Cu — 245±5°C — 3±0.5 sec.; Sn63 Solder — 235±5°C — 2±0.5 sec.	Solder coverage : 90% min.
Temperature Cycle	Appearance	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 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 ±7.5%
	Tanδ (%)		Within tolerance
	IR		Over 10000MΩ or 500MΩ • μF, whichever is less
	Withstanding Voltage		Resist without problem
Load Humidity Test	Appearance	Take the initial value after voltage treatment. After applying rated voltage for 500+12/ −0 hours in pre-condition at 40°C±2°C, humidity 90 to 95%RH, allow parts to stabilize for 24±2 hours, at room temperature before measurement. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.	No problem observed
	ΔC		Within ±12.5%
	Tanδ (%)		200% max. of initial value
	IR		Over 500MΩ or 25MΩ • μF, whichever is less
High-Temperature with Loading	Appearance	Take the initial value after voltage treatment. After applying twice the rated voltage at the highest operation temperature for 1000+12/ −0 hours, measure the sample after 24±2 hours. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. Apply 1.5 times when the rated voltage is 10V or less. Applied voltages for respective products are indicated in the below chart.	No problem observed
	ΔC		Within ±12.5%
	Tanδ (%)		200% max. of initial value
	IR		Over 1000MΩ or 50MΩ • μF, whichever is less

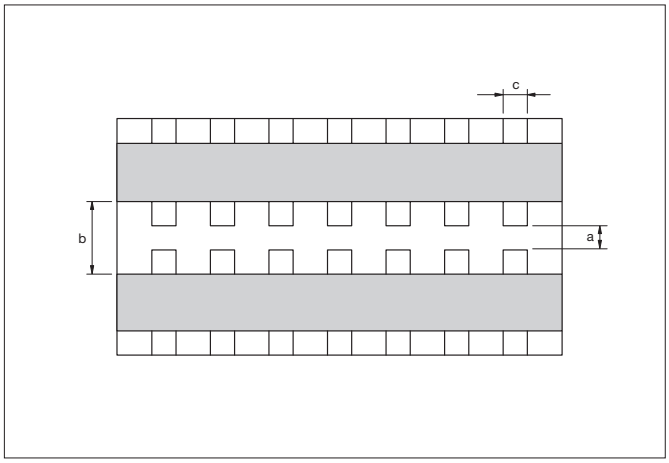
Pre-treatment	Heat	Keep specimen at 150+0/ −10°C for 1 hour, leave specimen at room ambient for 24±2 hours.
	Voltage	Apply the same test condition for 1 hour, then leave the specimen at room ambient for 24±2 hours.

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

Applied Voltage	Rated Voltage	Products
×1.3	4V	CT03X5R104
	6.3V	CM105X5R475, CM316X5R476, CM02X5R153-104
		CT05X5R104, CT21X5R106, CT03X5R104
×1.5	16V	CM02X7R101–222, CM05X7R333–104, CM105X7R474-105, CM21X7R105-475, CM316X7R475-106, CM32X7R106-226, CM05X5R224, CM105X5R225, CM21X5R475-106, CM316X5R226
		CT105X5R105, CT21X5R225-475, CT316X5R106, CM03X5R332-103, CM02X5R101-103
	25V	CM105X7R474, CM21X7R105-225, CM316X7R475, CM32X7R106, CM105X5R474-105, CM21X5R225-106, CM316X5R106, CM32X5R106-226
		CT316X5R225-106, CM03X5R152-103, CM05X7R103-104
	50V	CM21X5R105, CM32X5R106, CM32X7R106
		CT21X5R225, CT316X5R105-475
	100V	CM32X7RK74, CM43X7R105

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

Substrate for Electrical Tests

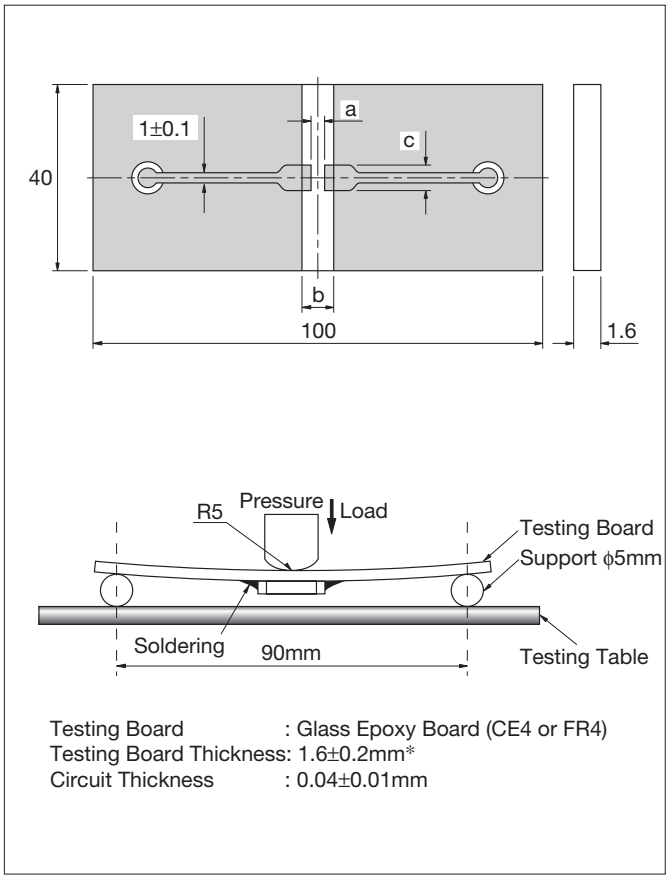


(Unit: mm)

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
52 (2208)	4.5	8.0	5.6
55 (2220)	4.5	8.0	5.6

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

Substrate for Adhesion Strength Test