⚠Caution/Notice

⚠Caution

■ Storage and Operation Conditions

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2. Operating Temperature and Self-generated Heat
3. Fail-safe

■ Soldering and Mounting

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2. Soldering
3. Bonding, Resin Molding and Coating
4. Treatment after Bonding, Resin Molding and Coating

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■ Soldering and Mounting

1. Cleaning (ultrasonic cleaning)
2. Soldering and Mounting
   (1) Allowable Conditions for Soldering Temperature and Time
   (2) Insertion of the Lead Wire

⚠Caution

■ Storage and Operation Conditions

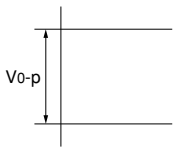
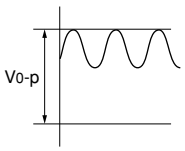
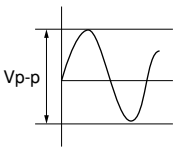
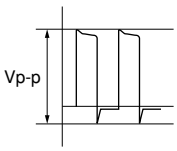
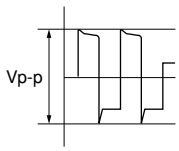
The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. Also avoid exposure to moisture. Before cleaning, bonding or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed 5 to 40 degrees centigrade and 20 to 70%.
Use capacitors within 6 months after delivery.

■ Rating

1. Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the V0-p which contains DC bias within the rated voltage range.
When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

When DC-rated capacitors are to be used in input circuits from commercial power source (AC filter), be sure to use Safety Recognized Capacitors because various regulations on withstand voltage or impulse withstand established for all equipment should be taken into consideration.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage (1)	Pulse Voltage (2)
Positional Measurement					

2. Operating Temperature and Self-generated Heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency current, pulse current or similar current, it may have self-generated heat due to dielectric loss. In the case of "High Dielectric Constant Type Capacitors," applied voltage load should be such that self-generated heat is within 20 °C under the condition where the capacitor is subjected at an atmosphere temperature of 25 °C. Please contact us if self-generated heat occurs with "Temperature Compensating Type Capacitors".

When measuring, use a thermocouple of small thermal capacity -K of ø0.1mm under conditions where the capacitor is not affected by radiant heat from other components or wind from surroundings. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.

3. Fail-Safe

Be sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure of our product.

Continued on the following page.

⚠Caution

Continued from the preceding page.

■ Soldering and Mounting

1. Vibration and Impact

Do not expose a capacitor or its leads to excessive shock or vibration during use.

2. Soldering

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

3. Bonding, Resin Molding and Coating

In case of bonding, molding or coating this product, verify that these processes do not affect the quality of the capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.

In case the amount of application, dryness/ hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.) are unsuitable, the outer coating resin of a capacitor may be damaged by the organic solvents and may result, worst case, in a short circuit.

The variation in thickness of adhesive or molding resin or coating may cause an outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

4. Treatment after Bonding, Resin Molding and Coating

When the outer coating is hot (over 100 degrees centigrade) after soldering, it becomes soft and fragile, so please be careful not to give it mechanical stress.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Notice

■ Rating

1. Capacitance change of capacitor

In case of F/X7R/X7S/X7T/X8L/Y5V/Z5U char.

Capacitors have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor is left on for a long time. Moreover, capacitance might change greatly depending on the surrounding temperature or an applied voltage.

■ Soldering and Mounting

1. Cleaning (ultrasonic cleaning)

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity: Output of 20 watts per liter or less.

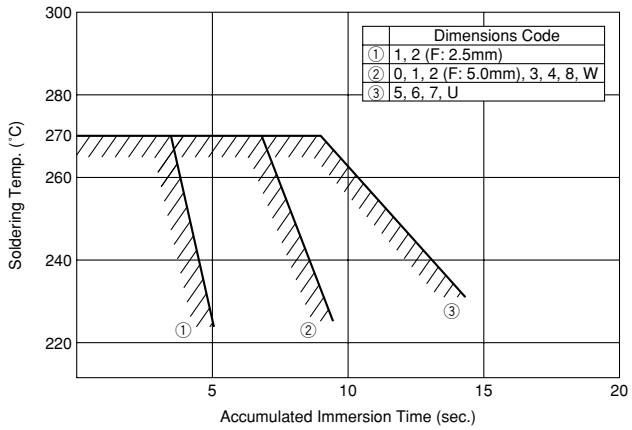
Rinsing time: 5 min. maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

2. Soldering and Mounting

(1) Allowable Conditions for Soldering Temperature and Time



Perform soldering within tolerance range (shaded portion).

(2) Insertion of the Lead Wire

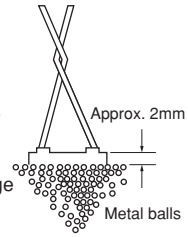
· When soldering, insert the lead wire into the PCB without mechanically stressing the lead wire.

· Insert the lead wire into the PCB with a distance appropriate to the lead space.

Dimensions Code \ Rated Voltage / Temp. Char.	DC25V		DC50V					DC100V			DC250V	DC630V	DC1kV
	X7S	X7R	C0G	X7S	X7R	F	Y5V	C0G	X7S	X7R	X7R, U2J		
0	224K	104K	A 102J	–	224K	473	103Z	A 102J	–	224K	–	–	–
1		–		–		–	–		–		U 102J	–	–
2	Ⓜ 475 K2C	–	–	Ⓜ 475 K5C	Ⓜ 105 K5C	–	–	–	–	Ⓜ 105 K1C	Ⓜ 103 J4U (U2J) Ⓜ 473 K4C (X7R)	Ⓜ 472 J7U (U2J) Ⓜ 153 K7C (X7R)	Ⓜ 102 JAU (U2J) Ⓜ 102 KAC (X7R)
3, 4, W	Ⓜ 226 K2C	–	–	–	Ⓜ 335 K5C	–	–	–	Ⓜ 225 K1C	–	Ⓜ 473 J4U (U2J) Ⓜ 224 K4C (X7R)	Ⓜ 103 J7U (U2J) Ⓜ 104 K7C (X7R)	Ⓜ 472 JAU (U2J) Ⓜ 333 KAC (X7R)
5, U	–	–	–	–	–	–	–	–	–	–	–	Ⓜ 333 J7U (U2J) Ⓜ 474 M7C (X7R)	Ⓜ 103 JAU (U2J) Ⓜ 104 KAC (X7R)

Temperature Characteristics	Marked with code (C0G char.: A, X7S/X7R char.: C, F/Y5V char.: F, U2J char.: U) A part is omitted (Please refer to the marking example.)
Nominal Capacitance	Under 100pF: Actual value 100pF and over: Marked with 3 figures
Capacitance Tolerance	Marked with code A part is omitted (Please refer to the marking example.)
Rated Voltage	Marked with code (DC25V: 2, DC50V: 5, DC100V: 1, DC250V: 4, DC500V: 9, DC630V: 7, DC1kV: A) Lower horizontal line for F char. A part is omitted (Please refer to the marking example.)
Manufacturer's Identification	Marked with Ⓜ A part is omitted (Please refer to the marking example.)

RDE Series (Only for Commercial) Specifications and Test Methods

<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specifications</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Constant Type</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>-55 to +125°C</td><td>Char. X7R, X7S: -55 to +125°C
Char. F: -25 to +85°C
Char. Y5V: -30 to +85°C</td><td>–</td></tr>
<tr><td>2</td><td colspan="2">Appearance</td><td colspan="2">No defects or abnormalities</td><td>Visual inspection</td></tr>
<tr><td>3</td><td colspan="2">Dimension and Marking</td><td colspan="2">See previous pages</td><td>Visual inspection, Vernier Caliper</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Dielectric Strength</td><td>Between Terminals</td><td colspan="2">No defects or abnormalities</td><td>The capacitors should not be damaged when test voltages of Table are applied between the terminals for 1 to 5 sec. (Charge/Discharge current ≦ 50mA)
<table>
<tr><th></th><th>Rated Voltage</th><th>Test Voltage</th></tr>
<tr><td rowspan="4">Temperature Compensating Type</td><td>DC50V, DC100V</td><td>300% of the rated voltage</td></tr>
<tr><td>DC250V</td><td>200% of the rated voltage</td></tr>
<tr><td>DC630V</td><td>150% of the rated voltage</td></tr>
<tr><td>DC1kV</td><td>130% of the rated voltage</td></tr>
<tr><td rowspan="4">High Dielectric Constant Type</td><td>DC25V, DC50V</td><td>250% of the rated voltage</td></tr>
<tr><td>DC100V, DC250V</td><td>200% of the rated voltage</td></tr>
<tr><td>DC500V, DC630V</td><td>150% of the rated voltage</td></tr>
<tr><td>DC1kV</td><td>120% of the rated voltage</td></tr>
</table></td></tr>
<tr><td>Body Insulation</td><td colspan="2">No defects or abnormalities</td><td>The capacitor is placed in a container with metal balls of 1mm diameter so that each terminal, short-circuited, is kept approximately 2mm from the balls as shown in the figure, for 1 to 5 sec. between capacitor terminals and metal balls. (Charge/Discharge current ≦ 50mA)
 

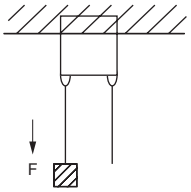
<table>
<tr><th>Rated Voltage</th><th>Test Voltage</th></tr>
<tr><td>DC25V, DC50V</td><td>250% of the rated voltage</td></tr>
<tr><td>DC100V, DC250V, DC500V, DC630V</td><td>200% of the rated voltage</td></tr>
<tr><td>DC1kV</td><td>DC1300V</td></tr>
</table></td></tr>
<tr><td>5</td><td>Insulation Resistance</td><td>Between Terminals</td><td colspan="2">Rated Voltage: DC25V, DC50V, DC100V
10,000MΩ min. or 500MΩ • μF min. whichever is smaller
Rated Voltage: DC250V, DC500V, DC630V, DC1kV
10,000MΩ min. or 100MΩ • μF min. whichever is smaller</td><td>The insulation resistance should be measured with a DC voltage not exceeding the rated voltage (DC500±50V in case of rated vlotage: DC500V, DC630V, DC1kV) at normal temperature and humidity and within 2 min. of charging.
(Charge/Discharge current ≦ 50mA)</td></tr>
<tr><td>6</td><td colspan="2">Capacitance</td><td colspan="2">Within the specified tolerance</td><td rowspan="2">The capacitance, Q/D.F. should be measured at 25°C at the frequency and voltage shown in the table.

Temperature Compensating Type
<table>
<tr><th>Item \ Capacitance</th><th>C≦1000pF</th><th>C>1000pF</th></tr>
<tr><td>Frequency</td><td>1±0.1MHz</td><td>1±0.1kHz</td></tr>
<tr><td>Voltage</td><td>AC0.5 to 5V (r.m.s.)</td><td>AC1±0.2V (r.m.s.)</td></tr>
</table>
High Dielectric Constant Type
<table>
<tr><th>Item \ Capacitance</th><th>C≦10μF</th><th>C>10μF</th></tr>
<tr><td>Frequency</td><td>1±0.1kHz</td><td>120±24Hz</td></tr>
<tr><td>Voltage</td><td>AC1±0.2V (r.m.s.)</td><td>AC0.5±0.1V (r.m.s.)</td></tr>
</table></td></tr>
<tr><td>7</td><td colspan="2">Q/Dissipation Factor (D.F.)</td><td>30pF min.: Q≧1,000
30pF max.: Q≧400+20C
C: Nominal capacitance (pF)</td><td>Char. X7R: 0.025 max.
Char. F, Y5V: 0.05 max.
Char. X7S: 0.125 max.</td></tr>
</table>

Continued on the following page.

RDE Series (Only for Commercial) Specifications and Test Methods

Continued from the preceding page.

<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specifications</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Constant Type</th></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Capacitance Temperature Characteristics</td><td>Capacitance Change</td><td>Within the specified tolerance (Table A on last column)</td><td>Within the specified tolerance (Table B on last column)</td><td rowspan="3">The capacitance change should be measured after 5 min. at each specified temperature stage.
(1) Temperature Compensating Type
The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5 (-55 to +125°C) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as shown in Table A. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in step 1, 3 and 5 by the cap. value in step 3.
<table><tr><th>Step</th><th>Temperature (°C)</th></tr><tr><td>1</td><td>25±2</td></tr><tr><td>2</td><td>-55±3</td></tr><tr><td>3</td><td>25±2</td></tr><tr><td>4</td><td>125±3</td></tr><tr><td>5</td><td>25±2</td></tr></table>(2) High Dielectric Constant Type
The ranges of capacitance change compared with the 25°C (Char. F: 20°C) value over the temperature ranges as shown in Table B should be within the specified ranges.
• Pretreatment (for high dielectric constant type)
Perform a heat treatment at 150+0/-10°C for 1 hr., and then let sit at room temperature for 24±2 hrs.</td></tr>
<tr><td>Temperature Coefficient</td><td>Within the specified tolerance (Table A on last column)</td><td rowspan="2"></td></tr>
<tr><td>Capacitance Drift</td><td>Within ±0.2% or ±0.05pF, whichever is larger</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Terminal Strength</td><td>Tensile Strength</td><td colspan="2">Termination not to be broken or loosened</td><td>As in the figure, fix the capacitor body, apply the force gradually to each lead in the radial direction of the capacitor until reaching 10N and then keep the force applied for 10±1 sec.
 
</td></tr>
<tr><td>Bending Strength</td><td colspan="2">Termination not to be broken or loosened</td><td>Each lead wire should be subjected to a force of 2.5N and then bent 90° at the point of egress in one direction. Each wire is then returned to the original position and bent 90° in the opposite direction at the rate of one bend per 2 to 3 sec.</td></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="3">The capacitor is soldered securely to a supporting terminal and a 10 to 55Hz vibration of 1.5mm peak-peak amplitude is applied for 6 hrs. total, 2 hrs. in each mutually perpendicular direction. Allow 1 min. to cycle the frequency from 10Hz to 55Hz and the converse.</td></tr>
<tr><td>Capacitance</td><td colspan="2">Within the specified tolerance</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧1,000
30pF max.: Q≧400+20C
C: Nominal capacitance (pF)</td><td>Char. X7R: 0.025 max.
Char. F, Y5V: 0.05 max.
Char. X7S: 0.125 max.</td></tr>
<tr><td>11</td><td colspan="2">Solderability of Leads</td><td colspan="2">Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.</td><td>The terminal of a capacitor is dipped into a 25% ethanol (JIS-K-8101) solution of rosin (JIS-K-5902) and then into molten solder for 2±0.5 sec. In both cases the depth of dipping is up to about 1.5mm to 2mm from the terminal body.
Temp. of solder: 245±5°C Lead Free Solder (Sn-3.0Ag-0.5Cu)
235±5°C H60A or H63A Eutectic Solder</td></tr>
<tr><td rowspan="3">12</td><td rowspan="3">Resistance to Soldering Heat</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="3">The lead wire is immersed in the melted solder 1.5mm to 2mm from the main body at 350±10°C for 3.5±0.5 sec.
The specified items are measured after 24±2 hrs.
• Pretreatment (for high dielectric constant type)
Perform a heat treatment at 150+0/-10°C for 1 hr., and then let sit at room temperature for 24±2 hrs.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±2.5% or ±0.25pF (whichever is larger)</td><td>Char. X7R, X7S: Within ±10%
Char. F, Y5V: Within ±20%</td></tr>
<tr><td>Dielectric Strength (Between Terminals)</td><td colspan="2">No defects</td></tr>
</table>

Continued on the following page.

RDE Series (Only for Commercial) Specifications and Test Methods

Continued from the preceding page.

<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specifications</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Constant Type</th></tr>
<tr><td rowspan="5">13</td><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="5">The capacitor should be subjected to 5 temperature cycles.
Remove and set for 24±2 hrs. at room temperature, then measure.
<table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (min)</th></tr><tr><td>1</td><td>Min. Operating Temp. ±3</td><td>30±3</td></tr><tr><td>2</td><td>Room Temp.</td><td>3 max.</td></tr><tr><td>3</td><td>Max. Operating Temp. ±3</td><td>30±3</td></tr><tr><td>4</td><td>Room Temp.</td><td>3 max.</td></tr></table>• Pretreatment (for high dielectric constant type)
Perform a heat treatment at 150+0/-10°C for 1 hr., and then let sit at room temperature for 24±2 hrs.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (whichever is larger)</td><td>Char. X7R, X7S: Within ±12.5%
Char. F, Y5V: Within ±30%</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧350
10pF to 30pF: Q≧275+5C/2
10pF max.: Q≧200+10C
C: Nominal capacitance (pF)</td><td>Char. X7R: 0.05 max.
Char. F, Y5V: 0.075 max.
Char. X7S: 0.2 max.</td></tr>
<tr><td>Insulation Resistance</td><td colspan="2">Rated Voltage: DC25V, DC50V, DC100V
1,000MΩ, 50MΩ • μF min. (whichever is smaller)
Rated Voltage: DC250V, DC500V, DC630V, DC1kV
1,000MΩ, 10MΩ • μF min. (whichever is smaller)</td></tr>
<tr><td>Dielectric Strength (Between Terminals)</td><td colspan="2">No defects or abnormalities</td></tr>
<tr><td rowspan="4">14</td><td rowspan="4">Humidity (Steady State)</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="4">Set the capacitor at 40±2°C and relative humidity of 90 to 95% for 500^{+24}_{0} hrs.
Remove and set for 24±2 hrs. at room temperature, then measure.
• Pretreatment (for high dielectric constant type)
Perform a heat treatment at 150+0/-10°C for 1 hr., and then let sit at room temperature for 24±2 hrs.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±5% or ±0.5pF (whichever is larger)</td><td>Char. X7R, X7S: Within ±15%
Char. F, Y5V: Within ±30%</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧350
10pF to 30pF: Q≧275+5C/2
10pF max.: Q≧200+10C
C: Nominal capacitance (pF)</td><td>Char. X7R: 0.05 max.
Char. F, Y5V: 0.075 max.
Char. X7S: 0.2 max.</td></tr>
<tr><td>Insulation Resistance</td><td colspan="2">Rated Voltage: DC25V, DC50V, DC100V
1,000MΩ, 50MΩ • μF min. (whichever is smaller)
Rated Voltage: DC250V, DC500V, DC630V, DC1kV
1,000MΩ, 10MΩ • μF min. (whichever is smaller)</td></tr>
<tr><td rowspan="4">15</td><td rowspan="4">Humidity Load</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="4">Apply the rated voltage for 500^{+24}_{0} hrs. at 40±2°C and in 90 to 95% humidity.
Remove and set for 24±2 hrs. at room temperature, then measure.
(Charge/Discharge current ≦50mA)
• Pretreatment (for high dielectric constant type)
Perform a heat treatment at 150+0/-10°C for 1 hr., and then let sit at room temperature for 24±2 hrs.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±7.5% or ±0.75pF (whichever is larger)</td><td>Char. X7R, X7S: Within ±15%
Char. F, Y5V: Within ±30%</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧200
30pF max.: Q≧100+10C/3
C: Nominal capacitance (pF)</td><td>Char. X7R: 0.05 max.
Char. F, Y5V: 0.075 max.
Char. X7S: 0.2 max.</td></tr>
<tr><td>Insulation Resistance</td><td colspan="2">Rated Voltage: DC25V, DC50V, DC100V
500MΩ or 25MΩ • μF min. (whichever is smaller)
Rated Voltage: DC250V, DC500V, DC630V, DC1kV
1,000MΩ or 10MΩ • μF min. (whichever is smaller)</td></tr>
<tr><td rowspan="4">16</td><td rowspan="4">High Temperature Load</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="4">Apply voltage in Table for 1000^{+48}_{0} hrs. at the maximum operating temperature±3°C.
Remove and set for 24±2 hrs. at room temperature, then measure. (Charge/Discharge current ≦50mA)
<table><tr><th></th><th>Rated Voltage</th><th>Test Voltage</th></tr><tr><td rowspan="2">Temperature Compensating Type</td><td>DC50V, DC100V, DC250V</td><td>150% of the rated voltage</td></tr><tr><td>DC630V, DC1kV</td><td>120% of the rated voltage</td></tr><tr><td rowspan="3">High Dielectric Constant Type</td><td>DC25V, DC50V, DC100V, DC250V</td><td>150% of the rated voltage</td></tr><tr><td>DC500V, DC630V</td><td>120% of the rated voltage</td></tr><tr><td>DC1kV</td><td>110% of the rated voltage</td></tr></table>• Pretreatment (for high dielectric constant type)
Appy test voltage for 1 hr., at test temperature.
Remove and set for 24±2 hrs. at room temperature.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±3% or ±0.3pF (whichever is larger)</td><td>Char. X7R, X7S:
Within ±15%
(Rated Voltage: DC630V or less)
Within ±20%
(Rated Voltage: DC1kV)
Char. F, Y5V: Within ±30%</td></tr>
<tr><td>Q/D.F.</td><td>30pF min.: Q≧350
10pF to 30pF: Q≧275+5C/2
10pF max.: Q≧200+10C
C: Nominal capacitance (pF)</td><td>Char. X7R: 0.05 max.
Char. F, Y5V: 0.075 max.
Char. X7S: 0.2 max.</td></tr>
<tr><td>Insulation Resistance</td><td colspan="2">Rated Voltage: DC25V, DC50V, DC100V
1,000MΩ, 50MΩ • μF min. (whichever is smaller)
Rated Voltage: DC250V, DC500V, DC630V, DC1kV
1,000MΩ, 10MΩ • μF min. (whichever is smaller)</td></tr>
<tr><td rowspan="2">17</td><td rowspan="2">Solvent Resistance</td><td>Appearance</td><td colspan="2">No defects or abnormalities</td><td rowspan="2">The capacitor should be fully immersed, unagitated, in reagent at 20 to 25°C for 30±5 sec. and then removed gently. Marking on the surface of the capacitor should immediately be visually examined.
Reagent:
• Isopropyl alcohol</td></tr>
<tr><td>Marking</td><td colspan="2">Legible</td></tr>
</table>

Table A

Char.	Nominal Values (ppm/°C) *1	Capacitance Change from 25°C (%)					
		–55°C		–30°C		–10°C	
		Max.	Min.	Max.	Min.	Max.	Min.
C0G	0±30	0.58	–0.24	0.40	–0.17	0.25	–0.11
U2J	-750±120	8.78	5.04	6.04	3.47	3.84	2.21

*1: Nominal values denote the temperature coefficient within a range of 25 to 125°C

Table B

Char.	Temp. Range	Reference Temp.	Cap. Change Rate
X7R	–55 to +125°C	25°C	Within ±15%
X7S			Within ±22%
Y5V	–30 to + 85°C		Within $^{+22}_{-82}$%
F	–25 to + 85°C	20°C	Within $^{+30}_{-80}$%

■ Packaging

Two types of packaging for monolithic ceramic capacitors are available.

1. Bulk Packaging

Minimum Quantity

Dimensions Code	Dimensions (L×W)	Minimum Quantity (pcs./Bag)*
0	3.6×3.5mm or 4.0×3.5mm or 5.0×3.5mm (Depends on Part Number)	500
1	4.0×3.5mm or 4.5×3.5mm or 5.0×3.5mm (Depends on Part Number)	
2	5.0×3.5mm or 5.5×4.0mm or 5.7×4.5mm (Depends on Part Number)	
3	5.0×4.5mm or 5.5×5.0mm or 6.0×5.5mm (Depends on Part Number)	
4	7.5×5.5mm	
5	7.5×7.5mm or 7.5×8.0mm (Depends on Part Number)	
6	10.0×10.0mm	
8	7.5×5.5mm	
7	12.5×12.5mm	100
U	7.7×12.5mm or 7.7×13.0mm (Depends on Part Number)	200
W	5.5×7.5mm or 6.0×8.0mm (Depends on Part Number)	500

Please order with an integral multiple of the minimum quantity above.

* Minimum Quantity may change depends on part number.
  Please check our website 'Product details'.

2. Tape Carrier Packaging

(1) Dimensions of Ammo Pack

(in mm)

(2) Minimum Quantity

Dimensions Code	Dimensions (L×W)	Minimum Quantity (pcs./Ammo Pack)*
0	3.6×3.5mm or 4.0×3.5mm or 5.0×3.5mm (Depends on Part Number)	2000
1	4.0×3.5mm or 4.5×3.5mm or 5.0×3.5mm (Depends on Part Number)	
2	5.0×3.5mm or 5.5×4.0mm or 5.7×4.5mm (Depends on Part Number)	
3	5.0×4.5mm or 5.5×5.0mm or 6.0×5.5mm (Depends on Part Number)	
4	7.5×5.5mm	
5	7.5×7.5mm or 7.5×8.0mm (Depends on Part Number)	2000
6	10.0×10.0mm	1500
8	7.5×5.5mm	
U	7.7×12.5mm or 7.7×13.0mm (Depends on Part Number)	1000
W	5.5×7.5mm or 6.0×8.0mm (Depends on Part Number)	1500

Please order with an integral multiple of the minimum quantity above.

* Minimum Quantity may change depends on part number.
  Please check our website 'Product details'.

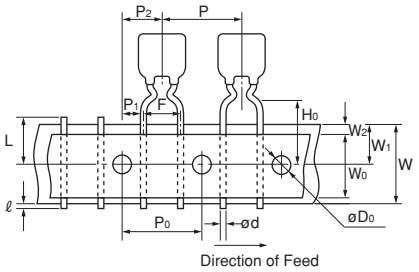
"Minimum Quantity" means the numbers of units of each delivery or order. The quantity should be an integral multiple of the "minimum quantity".
(Please note that the actual delivery quantity in a package may change sometimes.)

Continued on the following page.

Continued from the preceding page.

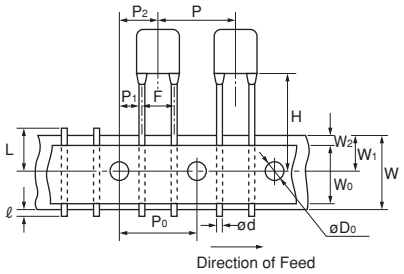
Taping Dimensions

Inside Crimp Taping



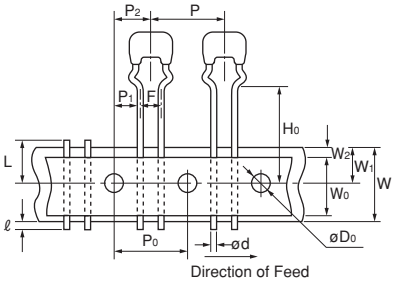
Dimensions and Lead Style Code
0M1
1M1
2M1
2M2
3M1
3M2
4M1
4M2
8M1
8M2
WM1

Straight Taping

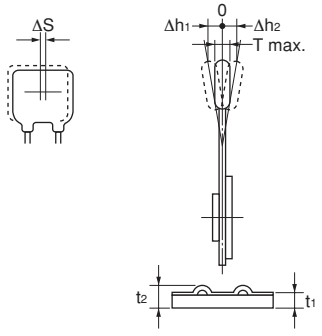


Dimensions and Lead Style Code
1DB
2DB
3DB
5E1
5E2
6E1
6E2
UE1

Outside Crimp Taping



Dimensions and Lead Style Code
0S1
1S1
2S1
2S2
3S1
3S2



Item	Code	Dimensions (mm)	
Pitch of Component	P	12.7±1.0	
Pitch of Sprocket Hole	P0	12.7±0.2	
Lead Spacing	F	$2.5^{+0.4}_{-0.2}$ (DB) (S1) (S2)	
		$5.0^{+0.6}_{-0.2}$	
Length from Hole Center to Component Center	P2	6.35±1.3	
Length from Hole Center to Lead	P1	3.85±0.7	
		5.1±0.7 (DB) (S1) (S2)	
		254±1.5 Total length of components pitch X 20	
Body Dimension		Depends on Part Number	
Deviation Along Tape, Left or Right Defect	ΔS	±2.0	
Carrier Tape Width	W	18.0±0.5	
Position of Sprocket Hole	W1	$9.0^{+0}_{-0.5}$	
Lead Distance between Reference and Bottom Plane	H0	16.0±0.5 (M1) (S1)	
		20.0±0.5 (M2) (S2)	
For Straight Lead Type	H	20±0.5 (E2), 17.5±0.5 (E1), 16±0.5 (DB)	
Diameter of Sprocket Hole	D0	4.0±0.1	
Lead Diameter	d	0.5±0.05	
Total Tape Thickness	t1	0.6±0.3	
Total Thickness of Tape and Lead Wire	t2	1.5 max.	
Body Thickness	T	Depends on Part Number	
Deviation Across Tape	Δh1 Δh2	2.0 max.	Dimensions Code: W, U
		1.5 max.	RHD Series
		1.0 max.	except as above
Portion to Cut in Case of Defect	L	$11.0^{+0}_{-1.0}$	
Protrusion Length	ℓ	0.5 max.	
Hold Down Tape Width	W0	9.5 min.	
Hold Down Tape Position	W2	1.5±1.5	
Coating Extension		Depends on Dimensions	

Mouser Electronics

Authorized Distributor

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Murata:

RDER72J474MUB1C13B RDER72E102K2K1A11B RDER72E102K2M1A11A RDER72E103K2K1A11B RDER72E103K2M1A11A RDER72E104K3K1C11B RDER72E104K3M1C11A RDER72E152K2K1A11B RDER72E152K2M1A11A RDER72E154K8K1C11B RDER72E154K8M1C11A RDER72E222K2K1A11B RDER72E222K2M1A11A RDER72E224K8K1C11B RDER72E224K8M1C11A RDER72E332K2K1A11B RDER72E332K2M1A11A RDER72E333K2K1C11B RDER72E333K2M1C11A RDER72E334K5B1C13B RDER72E334K5E1C13A RDER72E472K2K1A11B RDER72E472K2M1A11A RDER72E473K2K1C11B RDER72E473K2M1C11A RDER72E474K5B1C13B RDER72E474K5E1C13A RDER72E682K2K1A11B RDER72E682K2M1A11A RDER72E683K3K1C11B RDER72E683K3M1C11A RDER72J102K2K1C11B RDER72J102K2M1C11A RDER72J103K2K1C11B RDER72J103K2M1C11A RDER72J104K8M1C11A RDER72J152K2K1C11B RDER72J152K2M1C11A RDER72J153K2K1C11B RDER72J153K2M1C11A RDER72J154K5B1C13B RDER72J154K5E1C13A RDER72J222K2K1C11B RDER72J222K2M1C11A RDER72J224K5B1C13B RDER72J224K5E1C13A RDER72J332K2K1C11B RDER72J332K2M1C11A RDER72J333K3K1C11B RDER72J333K3M1C11A RDER72J472K2K1C11B RDER72J472K2M1C11A RDER72J473K3K1C11B RDER72J473K3M1C11A RDER72J474MUE1C13A RDER72J682K2K1C11B RDER72J682K2M1C11A RDER72J683K8K1C11B RDER72J683K8M1C11A RDER72J104K8K1C11B RDER73A102K2K1C11B RDER73A102K2M1C11A RDER73A104K5B1C13B RDER73A104K5E1C13A RDER73A152K2K1C11B RDER73A152K2M1C11A RDER73A153K3K1C11B RDER73A153K3M1C11A RDER73A222K2K1C11B RDER73A222K2M1C11A RDER73A223K3K1C11B RDER73A223K3M1C11A RDER73A224MUB1C13B RDER73A224MUE1C13A RDER73A332K2K1C11B RDER73A332K2M1C11A RDER73A333K8K1C11B RDER73A333K8M1C11A RDER73A471K2K1C11B RDER73A471K2M1C11A RDER73A472K2K1C11B RDER73A472K2M1C11A RDER73A473K8K1C11B RDER73A473K8M1C11A RDER73A681K2K1C11B RDER73A681K2M1C11A RDER73A683K5B1C13B RDER73A683K5E1C13A RDEC71E105K0K1C03B RDEC71E106K2K1C03B RDEC71E224K0K1C03B RDEC71E225K1K1C03B RDEC71E226K3K1C03B RDEC71E474K0K1C03B RDEC71E475K2K1C03B RDEC71H475K2K1C03B RDEF51H103Z0K1C03B RDEF51H104Z0K1C03B RDEF51H223Z0K1C03B RDEF51H473Z0K1C03B