Safety Standard Certified Ceramic Capacitors for Automotive

Type KJ -IEC60384-14 Class X1, Y2-

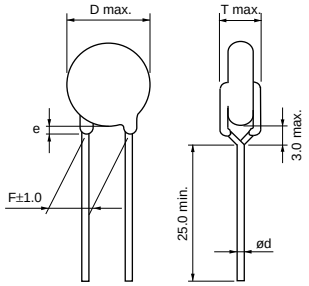
■ Features

1. Capacitors designed for AC line filters for PHEV/EV.
2. Meet AEC-Q200
3. Heat cycle: 1000cycle (-55/+125 deg.)
4. Class X1/Y2 capacitors certified by UL/ENEC(VDE).
5. Rated Voltage: AC300V
6. Coated with flame-retardant epoxy resin (conforming to UL94V-0 standard).
7. Available product for RoHS Restriction (EU Directive 2002/95/EC).
8. Taping available for automatic insertion.

■ Applications

1. Ideal for use as Y capacitors for AC line filters and primary-secondary coupling on battery chargers for PHEV/EV.
2. Ideal for use as a filter capacitor for DC-DC converters for PHEV/EV and HEV.

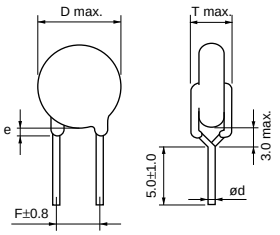
[Bulk]
Vertical Crimp Long (A3)



(in mm)

Lead Code	Coating Extension e	ød
A3	Up to the end of crimp	0.6±0.05

[Bulk]
Vertical Crimp Short (B3)



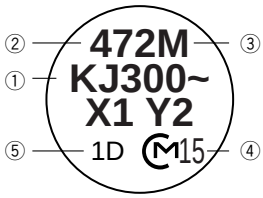
(in mm)

Lead Code	Coating Extension e	ød
B3	Up to the end of crimp	0.6±0.05

■ Standard Certification

	Standard No.	Certified No.	Rated Voltage
UL	UL 60384-14	E37921	AC300V(r.m.s.)
ENEC (VDE)	EN 60384-14	40031217	

■ Marking

Example	Item
	① Type Designation KJ
	② Nominal Capacitance (Marked with 3 figures)
	③ Capacitance Tolerance
	④ Company Name Code Ⓜ15: Made in Thailand
	⑤ Manufactured Date Code
	Class Code X1Y2
	Rated Voltage Mark 300~

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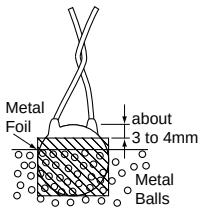
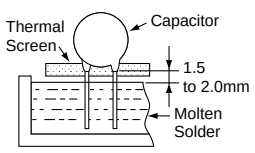
Part Number	AC Rated Voltage (Vac)	Temp. Char.	Capacitance (pF)	Body Dia. D (mm)	Lead Spacing F (mm)	Body Thickness T (mm)	Lead Package Long Bulk	Lead Package Short Bulk	Lead Package Taping (1)
DE6B3KJ101K□□□	300	B	100 ±10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6B3KJ151K□□□	300	B	150 ±10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6B3KJ221K□□□	300	B	220 ±10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6B3KJ331K□□□	300	B	330 ±10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6B3KJ471K□□□	300	B	470 ±10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6B3KJ681K□□□	300	B	680 ±10%	9 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6E3KJ102M□□□	300	E	1000 ±20%	7 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6E3KJ152M□□□	300	E	1500 ±20%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6E3KJ222M□□□	300	E	2200 ±20%	9 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6E3KJ332M□□□	300	E	3300 ±20%	10 max.	7.5	7.0 max.	A3B	B3B	N3A
DE6E3KJ472M□□□	300	E	4700 ±20%	12 max.	7.5	7.0 max.	A3B	B3B	N3A

Three blank columns are filled with the lead and packaging codes. Please refer to the 3 columns on the right for the appropriate code.
Murata part numbers might be changed depending on lead code or any other changes. Therefore, please specify only the type name (KJ) and capacitance of products in the parts list when it is required for applying safety standard of electric equipment.

Type KJ Specifications and Test Methods

Operating Temperature Range: -40 to +125°C

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td>1</td><td colspan="2">Appearance and Dimensions</td><td>No visible defect, and dimensions are within specified range.</td><td>The capacitor should be visually inspected for evidence of defect.
Dimensions should be measured with slide calipers.</td></tr>
<tr><td>2</td><td colspan="2">Marking</td><td>To be easily legible</td><td>The capacitor should be visually inspected.</td></tr>
<tr><td>3</td><td colspan="2">Capacitance</td><td>Within specified tolerance</td><td rowspan="2">The dissipation factor should be measured at 20˚C with 1±0.1kHz and AC5V(r.m.s.) max.</td></tr>
<tr><td>4</td><td colspan="2">Dissipation Factor (D.F.)</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦2.5%</td></tr></table></td></tr>
<tr><td>5</td><td colspan="2">Insulation Resistance (I.R.)</td><td>10000MΩ min.</td><td>The insulation resistance should be measured with DC500±50V within 60±5 sec. of charging.
The voltage should be applied to the capacitor through a resistor of 1MΩ.</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Dielectric Strength</td><td>Between Lead Wires</td><td>No failure</td><td>The capacitor should not be damaged when the test voltages from Table 1 are applied between the lead wires for 60 sec.
<Table 1>
<table><tr><th>Type</th><th>Test Voltage</th></tr><tr><td>KJ</td><td>AC2600V(r.m.s.)</td></tr></table></td></tr>
<tr><td>Body Insulation</td><td>No failure</td><td>First, the terminals of the capacitor should be connected together. Then, as shown in the figure at right, a metal foil should be closely wrapped around the body of the capacitor to the distance of about 3 to 4mm from each terminal.
Then, the capacitor should be inserted into a container filled with metal balls of about 1mm diameter. Finally, AC voltage from Table 2 is applied for 60 sec. between the capacitor lead wires and metal balls.
 

<Table 2>
<table><tr><th>Type</th><th>Test Voltage</th></tr><tr><td>KJ</td><td>AC2600V(r.m.s.)</td></tr></table></td></tr>
<tr><td>7</td><td colspan="2">Temperature Characteristics</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within $^{+20}_{-55}$%</td></tr></table>(Temp. range: -25 to +85°C)</td><td>The capacitance measurement should be made at each step specified in Table 3.
<Table 3>
<table><tr><th>Step</th><th>Temperature (ºC)</th></tr><tr><td>1</td><td>20±2</td></tr><tr><td>2</td><td>-25±2</td></tr><tr><td>3</td><td>20±2</td></tr><tr><td>4</td><td>85±2</td></tr><tr><td>5</td><td>20±2</td></tr></table>Pre-treatment:
Capacitor should be stored at 125±3°C for 1 hr., then placed at room condition* for 24±2 hrs. before initial measurements.</td></tr>
<tr><td>8</td><td colspan="2">Solderability</td><td>Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.</td><td>Should be placed into steam aging for 8 hrs.±15 min. After the steam aging, the lead wire of a capacitor should be dipped into an ethanol solution of 25% rosin and then into molten solder for 5+0/-0.5 sec.
The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires.
Temp. of solder: Lead Free Solder (Sn-3Ag-0.5Cu) 245±5°C
H63 Eutectic Solder 235±5°C</td></tr>
<tr><td rowspan="4">9</td><td rowspan="4">Resistance to Soldering Heat</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">As shown in the figure, the lead wires should be immersed in solder of 260±5°C up to 1.5 to 2.0mm from the root of terminal for 10±1 sec.
Pre-treatment:
Capacitor should be stored at 125±3°C for 1 hr., then placed at room condition* for 24±2 hrs. before initial measurements.
Post-treatment:
Capacitor should be stored for 1 to 2 hrs. at room condition.*
 
</td></tr>
<tr><td>Capacitance Change</td><td>Within ±10%</td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6</td></tr>
</table>

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

Continued on the following page.

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Type KJ Specifications and Test Methods

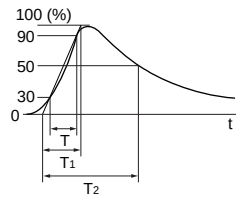
Continued from the preceding page.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td rowspan="3">10</td><td rowspan="3">Vibration</td><td>Appearance</td><td>No marked defect</td><td rowspan="3">Solder the capacitor and gum up the body to the test jig (glass epoxy board) by resin (adhesive).
 

The capacitor should be firmly soldered to the supporting lead wire, 1.5mm in total amplitude, with about a 20 minutes rate of vibration change from 10Hz to 2000Hz and back to 10Hz.
This motion should be applied 12 times in each of 3 mutually perpendicular directions (total of 36 times).
The acceleration is 5g max.</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦2.5%</td></tr></table></td></tr>
<tr><td rowspan="4">11</td><td rowspan="4">Mechanical Shock</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">Solder the capacitor and gum up the body to the test jig (glass epoxy board) by resin (adhesive).
 

Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks).
The specified test pulse should be half-sine and should have a duration: 0.5ms, peak value: 100g and velocity change: 4.7m/s.</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance</td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>10000MΩ min.</td></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Humidity (Under Steady State)</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">Set the capacitor for 1000±12 hrs. at 85±3°C in 80 to 85% relative humidity.

Pre-treatment:
Capacitor should be stored at 125±3°C for 1hr., then placed at room condition* for 24±2 hrs. before initial measurements.
Post-treatment:
Capacitor should be stored for 1 to 2 hrs. at room condition.*</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within ±15%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6</td></tr>
<tr><td rowspan="5">13</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">Apply the rated voltage for 1000±12 hrs. at 85±3°C in 80 to 85% relative humidity.

Pre-treatment:
Capacitor should be stored at 125±3°C for 1hr., then placed at room condition* for 24±2 hrs. before initial measurements.
Post-treatment:
Capacitor should be stored for 1 to 2 hrs. at room condition.*</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within ±15%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Life</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">Impulse Voltage
Each individual capacitor should be subjected to a 5kV impulses for three times. Then the capacitors are applied to life test.
 

Front time (T_1) =1.2μs=1.67T
Time to half-value (T_2) =50μs
Apply a voltage from Table 4 for 1000 hrs. at 125+2/-0°C, and relative humidity of 50% max.

<Table 4>
<table><tr><th>Applied Voltage</th></tr><tr><td>AC510V(r.m.s.), except that once each hour the voltage is increased to AC1000V(r.m.s.) for 0.1 sec.</td></tr></table>
Pre-treatment:
Capacitor should be stored at 125±3°C for 1hr., then placed at room condition* for 24±2 hrs. before initial measurements.
Post-treatment:
Capacitor should be stored for 1 to 2 hrs. at room condition.*</td></tr>
<tr><td>Capacitance Change</td><td>Within ±20%</td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6</td></tr>
</table>

* "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

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Type KJ Specifications and Test Methods

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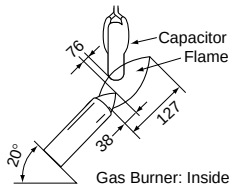
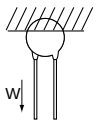
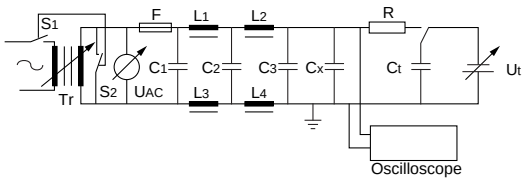
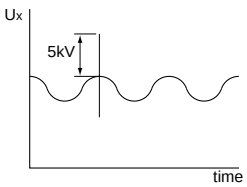
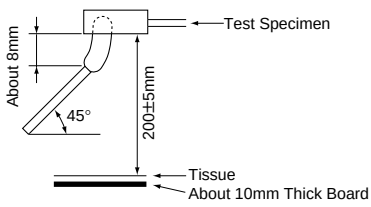
No.	Item		Specifications	Test Method
15	Flame Test		The capacitor flame extinguishes as follows. Cycle: Time (sec.) 1 to 4: 30 max. 5: 60 max.	The capacitor should be subjected to applied flame for 15 sec. and then removed for 15 sec. until 5 cycles are completed. 
16	Robustness of Terminations	Tensile	Lead wire should not be cut off. Capacitor should not be broken.	As shown in the figure at right, fix the body of the capacitor and apply a tensile weight gradually to each lead wire in the radial direction of the capacitor up to 10N and keep it for 10±1 sec. 
		Bending		Each lead wire should be subjected to 5N of weight and bent 90° at the point of egress, in one direction, then returend to its original position and bent 90° in the opposite direction at the rate of one bend in 2 to 3 sec.
17	Active Flammability		The cheesecloth should not catch on fire.	The capacitor should be individually wrapped in at least one, but not more than two, complete layers of cheesecloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 sec. The U_{AC} should be maintained for 2 min. after the last discharge.  $C_{1,2}$: 1μF±10% C_3 : 0.033μF±5% 10kV $L_{1\ to\ 4}$: 1.5mH±20% 16A Rod core choke C_t : 3μF±5% 10kV R : 100Ω±2% C_x : Capacitor under test U_{AC} : U_R±5% F : Fuse, Rated 10A U_R : Rated Voltage U_t : Voltage applied to C_t 
18	Passive Flammability		The burning time should not exceed 30 sec. The tissue paper should not ignite.	The capacitor under test should be held in the flame in the position that best promotes burning. Each specimen should only be exposed once to the flame. Time of exposure to flame: 30 sec. Length of flame : 12±1mm Gas burner : Length 35mm min. Inside Dia. 0.5±0.1mm Outside Dia. 0.9mm max. Gas : Butane gas Purity 95% min. 

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<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td rowspan="5">19</td><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td>No marked defect</td><td rowspan="5">The capacitor should be subjected to 1000 temperature cycles.
<table><tr><th>Step</th><th>Temperature (ºC)</th><th>Time (min)</th></tr><tr><td>1</td><td>-55+0/-3</td><td>30</td></tr><tr><td>2</td><td>Room temp.</td><td>3</td></tr><tr><td>3</td><td>125+3/-0</td><td>30</td></tr><tr><td>4</td><td>Room temp.</td><td>3</td></tr></table>Cycle time: 1000 cycles
Pre-treatment:
Capacitor should be stored at 125±3˚C for 1 hr., then placed at room condition* for 24±2 hrs.
Post-treatment:
Capacitor should be stored for 24±2 hrs. at room condition.*</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within ±20%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6</td></tr>
<tr><td rowspan="3">20</td><td rowspan="3">High Temperature Exposure (Storage)</td><td>Capacitance Change</td><td>Within ±20%</td><td rowspan="3">Set the capacitor for 1000±12 hrs. at 150±3°C.
Pre-treatment:
Capacitor should be stored at 125±3˚C for 1 hr., then placed at room condition* for 24±2 hrs.
Post-treatment:
Capacitor should be stored for 24±2 hrs. at room condition.*</td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td rowspan="4">21</td><td rowspan="4">Thermal Shock</td><td>Appearance</td><td>No marked defect except color change of outer coating.</td><td rowspan="4">The capacitor should be subjected to 300 cycles.
<table><tr><th>Step</th><th>Temperature (ºC)</th><th>Time (min)</th></tr><tr><td>1</td><td>-55+0/-3</td><td>30</td></tr><tr><td>2</td><td>125+3/-0</td><td>30</td></tr></table>
Pre-treatment:
Capacitor should be stored at 125±3˚C for 1 hr., then placed at room condition* for 24±2 hrs.
Post-treatment:
Capacitor should be stored for 24±2 hrs. at room condition.*</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within ±20%</td></tr></table></td></tr>
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<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td rowspan="4">22</td><td rowspan="4">Resistance to Solvents</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">Per MIL-STD-202 Method 215
Solvent 1: 1 part (by volume) of isopropyl alcohol
3 parts (by volume) of mineral spirits
Solvent 2: Terpene defluxer
Solvent 3: 42 parts (by volume) of water
1 part (by volume) of propylene glycol monomethyl ether
1 part (by volume) of monoethanolomine</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within ±20%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
<tr><td rowspan="4">23</td><td rowspan="4">Biased Humidity</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">Apply the rated voltage and DC1.3+0.2/-0V (add 6.8kΩ resistor) at 85±3°C and 80 to 85% humidity for 1000±12 hrs.
Pre-treatment:
Capacitor should be stored at 125±3°C for 1hr., then placed at room condition* for 24±2 hrs.
Post-treatment:
Capacitor should be stored for 24±2 hrs. at room condition.*</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within ±15%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
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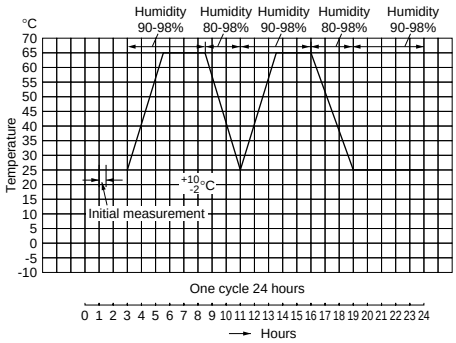
Continued from the preceding page.

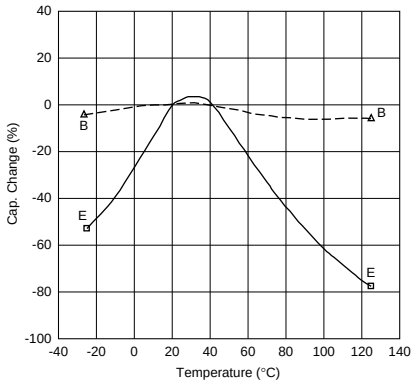
<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Test Method</th></tr>
<tr><td rowspan="4">24</td><td rowspan="4">Moisture Resistance</td><td>Appearance</td><td>No marked defect</td><td rowspan="4">Apply 24 hrs. of heat (25 to 65°C) and humidity (80 to 98%) treatment shown below, 10 consecutive times.

Pre-treatment:
Capacitor should be stored at 125±3˚C for 1 hr., then placed at room condition* for 24±2 hrs.
Post-treatment:
Capacitor should be stored for 24±2 hrs. at room condition.*
 
</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>B</td><td>Within ±10%</td></tr><tr><td>E</td><td>Within ±20%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specifications</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>3000MΩ min.</td></tr>
</table>

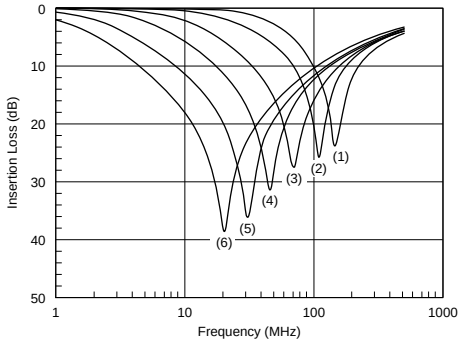
* "Room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

Safety Certified Ceramic Capacitors for Automotive Characteristics Data (Typical Example)

■ Capacitance - Temperature Characteristics



■ Insertion Loss - Frequency Characteristics



Type KJ

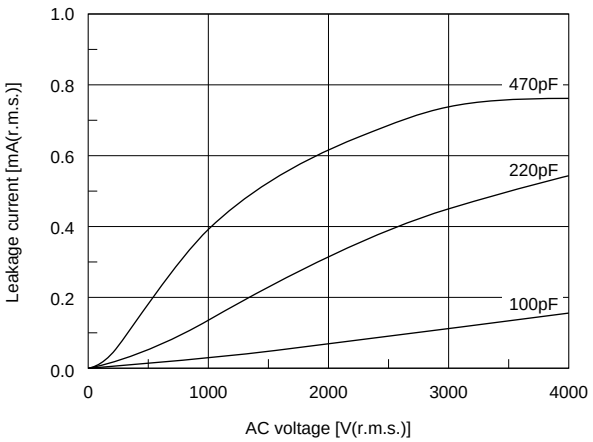
Signal power: 1mW
AC240V(r.m.s.) / 60Hz is applied on the capacitor.

(1) 100pF
(2) 220pF
(3) 470pF
(4) 1000pF
(5) 2200pF
(6) 4700pF

■ Leakage Current Characteristics

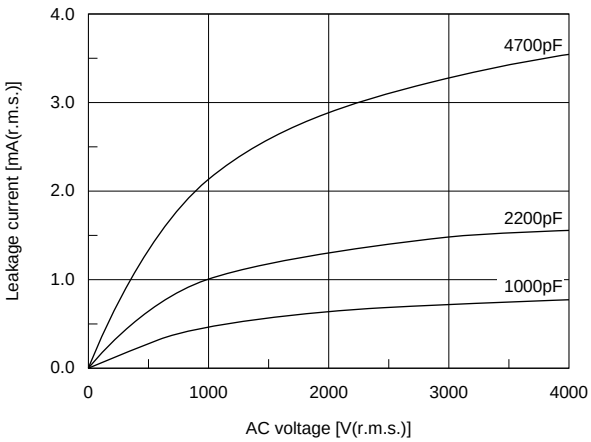
Type KJ (B char.)

AC voltage : 60Hz
Temperature : 25°C



Type KJ (E char.)

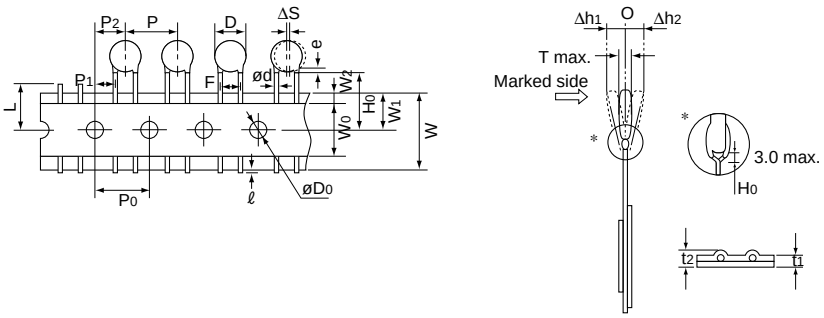
AC voltage : 60Hz
Temperature : 25°C



Safety Certified Ceramic Capacitors for Automotive Packaging

■ Taping Specifications

● 15mm pitch / lead spacing 7.5mm taping
Vertical crimp type
(Lead Code: N3)



Item	Code	N3
Pitch of component	P	15.0±2.0
Pitch of sprocket hole	P_0	15.0±0.3
Lead spacing	F	7.5±1.0
Length from hole center to component center	P_2	7.5±1.5
Length from hole center to lead	P_1	3.75±1.0
Body diameter	D	See the individual product specifications.
Deviation along tape, left or right	ΔS	0±2.0
Carrier tape width	W	18.0±0.5
Position of sprocket hole	W_1	9.0±0.5
Lead distance between reference and bottom planes	H_0	$18.0^{+2.0}_{-0}$
Protrusion length	ℓ	+0.5 to -1.0
Diameter of sprocket hole	$øD_0$	4.0±0.1
Lead diameter	ød	0.6±0.05
Total tape thickness	t_1	0.6±0.3
Total thickness, tape and lead wire	t_2	1.5 max.
Body thickness	T	7.0 max.
Portion to cut in case of defect	L	$11.0^{+0}_{-1.0}$
Hold down tape width	W_0	11.5 min.
Hold down tape position	W_2	1.5±1.5
Coating extension on lead	e	Up to the end of crimp
Deviation across tape, front	$Δh_1$	2.0 max.
Deviation across tape, rear	$Δh_2$	

(in mm)

■ Packaging Styles

Bulk	Taping
Polyethylene Bag	Ammo Pack
	

■ Minimum Quantity (Order in Sets Only)

[Bulk] (pcs./Bag)

Body Dia. D (mm)	Lead Code A3	Lead Code B3
	Long	Short
7 to 10	250	500
12	200	250

[Taping]
Lead Code: N3
700pcs./Ammo Pack

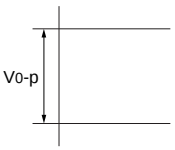
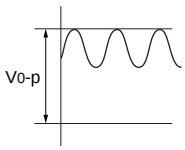
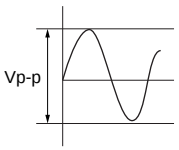
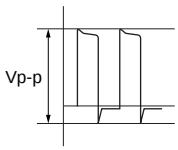
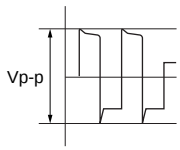
Safety Certified Ceramic Capacitors for Automotive ⚠Caution

■ ⚠Caution (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 Vo-p that 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.

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. Applied voltage load should be such that self-generated heat is within 20°C under the condition where the capacitor is subjected to an atmospheric temperature of 25°C. 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. Test Condition for Withstanding Voltage

(1) Test Equipment

Test equipment for AC withstanding voltage should be used with the performance of the wave similar to 50/60Hz sine wave.

If the distorted sine wave or overload exceeding the specified voltage value is applied, a defect may be caused.

Continued on the following page.

Safety Certified Ceramic Capacitors for Automotive ⚠Caution

Continued from the preceding page.

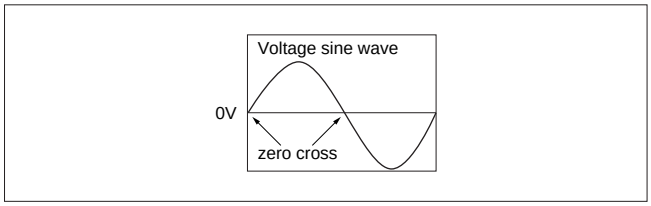
(2) Voltage Applied Method

When the withstanding voltage is applied, the capacitor's lead or terminal should be firmly connected to the output of the withstanding voltage test equipment, and then the voltage should be raised from near zero to the test voltage.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, test voltage should be applied with the zero cross.* At the end of the test time, the test voltage should be reduced to near zero, and then capacitor's lead or terminal should be taken off the output of the withstanding voltage test equipment.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, the surge voltage may rise, and therefore, a defect may be caused.

*ZERO CROSS is the point where voltage sine wave passes 0V. See the figure at right.



4. Fail-Safe

When the capacitor is broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure could result in an electric shock, fire or fuming.

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.

Safety Certified Ceramic Capacitors for Automotive ⚠Caution

■ ⚠Caution (Storage and Operating Condition)

Operating and Storage Environment

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 -10 to 40 degrees centigrade and 15 to 85%.

Use capacitors within 6 months after delivery.
Check the solderability after 6 months or more.

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.

■ ⚠Caution (Soldering and Mounting)

1. Vibration and Impact
   Do not expose a capacitor or its lead wires to excessive shock or vibration during use.
   Excessive shock or vibration may cause fatigue destruction of lead wires mounted on the circuit board.
   Please take measures to hold a capacitor on the circuit boards by adhesive, molding resin or another coating.
   Please confirm there is no influence of holding measures on the product with the intended equipment.
2. Soldering
   When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specifications 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.
   Soldering the capacitor with a soldering iron should be performed in the following conditions.
   Temperature of iron-tip: 400 degrees C. max.
   Soldering iron wattage: 50W max.
   Soldering time: 3.5 sec. max.
3. Bonding, Resin Molding and Coating
   For 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. When the amount of applications, 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 is damaged by the organic solvents and it may result, worst case, in a short circuit.
   The variation in thickness of adhesive, molding resin or coating may cause 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 C.) after soldering, it becomes soft and fragile.
   Therefore, 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.

■ ⚠Caution (Handling)

Vibration and Impact

Do not expose a capacitor or its lead wires to excessive shock or vibration during use.
Excessive shock or vibration may cause fatigue destruction of lead wires mounted on the circuit board.
Please take measures to hold a capacitor on the circuit boards by adhesive, molding resin or another coating.

Please confirm there is no influence of holding measures on the product with the intended equipment.

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.

Safety Certified Ceramic Capacitors for Automotive Notice

■ Notice (Soldering and Mounting)

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.

■ Notice (Rating)

1. Capacitance Change of Capacitors
   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. Therefore, it is not likely to be suitable for use in a constant time circuit.
   Please contact us if you need detailed information.
2. Performance Check by Equipment
   Before using a capacitor, check that there is no problem in the equipment's performance and the specifications.

Generally speaking, CLASS 2 ceramic capacitors have voltage dependence characteristics and temperature dependence characteristics in capacitance. Therefore, the capacitance value may change depending on the operating condition in the equipment. Therefore, be sure to confirm the apparatus performance of receiving influence in the capacitance value change of a capacitor, such as leakage current and noise suppression characteristic.
Moreover, check the surge-proof ability of a capacitor in the equipment, if needed, because the surge voltage may exceed specific value by the inductance of the circuit.

Safety Certified Ceramic Capacitors/High Voltage Ceramic Capacitors ISO9000 Certifications

Manufacturing plants that produce the products in this catalog have obtained the ISO9000 quality system certificate.

Plant	Applied Standard
Izumo Murata Manufacturing Co., Ltd.	ISO9001
Murata Electronics (Thailand), Ltd.	ISO9001
Taiwan Murata Electronics Co., Ltd.	ISO9001

⚠Note:

1. Export Control
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   No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.
   <For customers in Japan>
   For products which are controlled items subject to the “Foreign Exchange and Foreign Trade Law” of Japan, the export license specified by the law is required for export.
2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.
   ① Aircraft equipment ② Aerospace equipment
   ③ Undersea equipment ④ Power plant equipment
   ⑤ Medical equipment ⑥ Transportation equipment (vehicles, trains, ships, etc.)
   ⑦ Traffic signal equipment ⑧ Disaster prevention / crime prevention equipment
   ⑨ Data-processing equipment ⑩ Application of similar complexity and/or reliability requirements to the applications listed above
3. Product specifications in this catalog are as of May 2011. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.
4. Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.
5. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please review our product specifications or consult the approval sheet for product specifications before ordering.
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