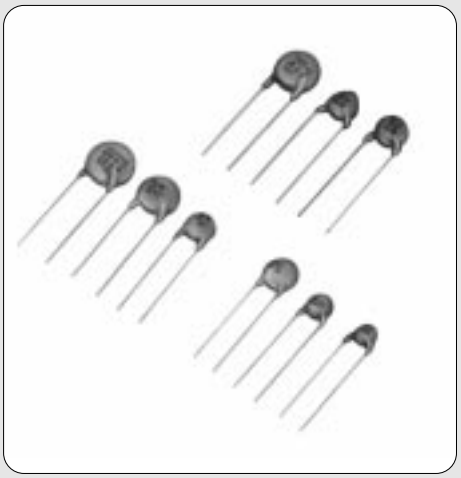
Safety Recognized Ceramic Capacitors

SAFETY RECOGNIZED CERAMIC CAPACITORS



GLOBAL PART NUMBERS
JUNE 2001

muRata Innovator in Electronics
Murata
Manufacturing Co., Ltd.

Cat.No.C80E-5

CONTENTS

● Part Numbering (The structure of the "Global Part Numbers" that have been adopted since June 2001 and the meaning of each code are described herein. If you have any questions about details, inquire at your usual Murata sales office or distributor.)

Safety Standard Recognized Ceramic Capacitors

(Global Part Number)

DE	2	E3	KH	102	M	N3	A	
❶	❷	❸	❹	❺	❻	❼	❽	❾

❶Product ID

Product ID	
DE	High-voltage (250V - 6.3kV) / Safety Standard Recognized Ceramic Capaictors

❷Series Category

Code	Outline	Contents
1	Safety Standard Recognized	IEC60384-14 Class X1, Y1
2		IEC60384-14 Class X1, Y2
J	AC250V (r.m.s.)	"Products which are based on the Electrical Appliance and Material Safety Law of Japan"

In case of Electrical Appliance and Material Safety Law of Japan, first three digit (❶Product ID and ❷Series Category) express "Series Name".
In case of Safety Recognized Capacitors, first three digit express product code. The following forth figure expresses recognized type shown in ❹Safety Standard Recognized type column.

❸Temperature Characteristics

Code	Temperature Characteristics	Cap.Change or Temp. Coeff.	Temperature Range
B3	B	±10%	−25 to +85℃
E3	E	+20%,−55%	
F3	F	+30%,−80%	
1X	SL	+350 to −1000ppm/℃	+20 to +85℃

❹Rated Voltage/Safety Standard Recognized Type

Code	Rated Voltage
E2	AC250V
KH	X1, Y2; AC250V, (Safety Standard Recognized Type KH)
KY	X1, Y2; AC250V, (Safety Standard Recognized Type KY)
KX	X1, Y1; AC250V, (Safety Standard Recognized Type KX)

❺Capacitance

Expressed by three figures. The unit is pico-farad(pF). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two numbers.
If there is a decimal point, it is expressed by the capital letter "**R**". In this case, all figures are significant digits.

❻Capacitance Tolerance

Code	Capacitance Tolerance
K	±10%
M	±20%
Z	+80%, −20%

❼Lead Style

Code	Lead Style	Dimensions(mm)		
		Lead Spacing	Lead Diameter	Pitch of Components
A2	Vertical Crimp Long	5	ø0.6±0.05	—
A3		7.5		
A5		10	ø0.6+0.1,−0.05	
B2	Vertical Crimp Short	5	ø0.6±0.05	—
B3		7.5		
B5		10	ø0.6+0.1, −0.05	
C3	Straight Long	7.5	ø0.6±0.05	—
D3	Straight Short	7.5	ø0.6±0.05	—
N2	Vertical Crimp Taping	5	ø0.6±0.05	12.7
N3		7.5		15
N5		10	ø0.6+0.1, −0.05	25.4
N7		7.5	ø0.6±0.05	30
P3	Straight Taping	7.5	ø0.6±0.05	15

❽Packaging

Code	Packaging
A	Ammo Pack
B	Bulk

❾Individual Specification

In case part number cannot be identified without "Individual Specification", it is added at the end of part number.

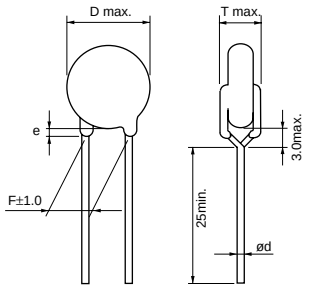
Code	Individual Specification	Application
A01	Small size	Type KX
M01	Simplicity marking, Dielectric strength : AC2000V	Type KY

Safety Recognized Ceramic Capacitors

Type KY (Basic insulation)-IEC60384-14 Class X1, Y2-

■ Features

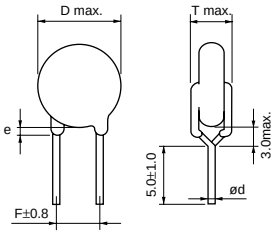
1. We design capacitors in much more compact size than type KH, having reduced the diameter by 25% max..
2. Operating temperature range guaranteed up to 125 degree(UL:85deg.).
3. Dielectric strength:AC2000V(r.m.s.)
4. Class X1/Y2 capacitors of UL1414 6th edition and IEC60384-14 2nd edition.
5. The type KY is recognized by UL/BSI/SEMKO/SEV/VDE/ FIMKO/NEMKO/DEMKO/NSW.
6. Coated with flame-retardant epoxy resin (conforming to UL94V-0 standards).
7. Automatic insertion can be, and save costs.



[Bulk]
Vertical Crimp Long (A2)

(in mm)

Lead Code	Coating Extension e	ø d
A2	Up to the end of crimp	0.6±0.05



[Bulk]
Vertical Crimp Short (B2)

(in mm)

Lead Code	Coating Extension e	ø d
B2	Up to the end of crimp	0.6±0.05

■ Standard Recognition

	Standard No.	Recognized No.		Rated Voltage
		Japan	Taiwan	
UL	UL 1414	E37921		AC250V(r.m.s.)
BSI	EN60065 (8.8, 14.2) EN132400	227935		
SEMKO	EN132400	9542043 01		
SEV		00.1494		
VDE		91889, 91893, 91895	91890, 91894, 91896	
FIMKO		189014		
NEMKO		P96100479		
DEMKO		305182		
NSW (SAA)	IEC60384-14 (2nd Edition)	6824		

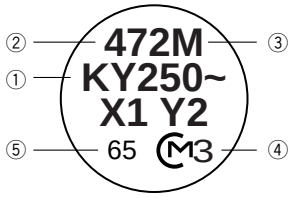
The recognition number might change by the revision of the application standard and the change within the range of acquisition.

Continued on the following page.

Continued from the preceding page.

1

■ Marking

Example	Item
	① Type Designation KY
	② Nominal Capacitance (Under 100pF : Actual value, 100pF and over : Marked with 3 figures)
	③ Capacitance Tolerance
	④ Manufacturer's Identification ＊
	⑤ Manufactured Date Code
	Class Code X1Y2
	Rated Voltage Mark 250~

＊CM3 : Made in Japan. CM8: Made in Taiwan.

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)
DE21XKY100K□□□M01	250	SL	10 +10,-10%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE21XKY150K□□□M01	250	SL	15 +10,-10%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE21XKY220K□□□M01	250	SL	22 +10,-10%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE21XKY330K□□□M01	250	SL	33 +10,-10%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE21XKY470K□□□M01	250	SL	47 +10,-10%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE21XKY680K□□□M01	250	SL	68 +10,-10%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2B3KY101K□□□M01	250	B	100 +10,-10%	7 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2B3KY151K□□□M01	250	B	150 +10,-10%	7 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2B3KY221K□□□M01	250	B	220 +10,-10%	7 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2B3KY331K□□□M01	250	B	330 +10,-10%	7 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2B3KY471K□□□M01	250	B	470 +10,-10%	7 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2B3KY681K□□□M01	250	B	680 +10,-10%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2E3KY102M□□□M01	250	E	1000 +20,-20%	7 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2E3KY152M□□□M01	250	E	1500 +20,-20%	7 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2E3KY222M□□□M01	250	E	2200 +20,-20%	8 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2E3KY332M□□□M01	250	E	3300 +20,-20%	9 max.	5.0	5.0 max.	A2B	B2B	N2A
DE2E3KY472M□□□M01	250	E	4700 +20,-20%	10 max.	5.0	5.0 max.	A2B	B2B	N2A

Lead spacing F=7.5mm is also available. Please contact us for details.

Three blank columns are filled with the lead and packaging codes. Please refer to each code which is shown in the right end.

Individual specification code "M01" expresses simplicity marking for product body marking.

Murata part numbers might be changed depending on lead code or any other changes.Therefore, please specify only the type name(KY) and capacitance of products in the parts list when it is required for applying

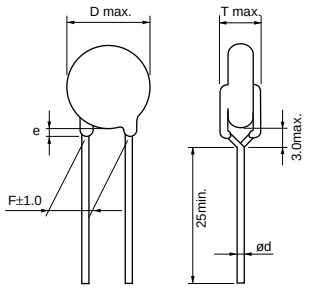
Safety Recognized Ceramic Capacitors

Type KH (Basic insulation)-IEC60384-14 Class X1, Y2-

■ Features

1. Operating temperature range guaranteed up to 125 degree(UL/CSA:85deg.).
2. Dielectric strength:AC2600V(r.m.s.)
3. Class X1/Y2 capacitors of UL1414 6th edition and IEC60384-14 2nd edition.
4. The type KH is recognized by UL/CSA/BSI/SEMKO/SEV/ VDE/FIMKO/NEMKO/DEMKO/NSW.
5. Coated with flame-retardant epoxy resin (conforming to UL94V-0 standards).
6. Automatic insertion can be, and save costs.

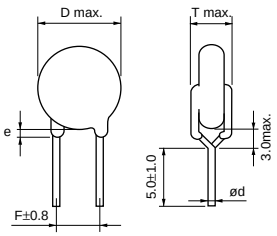
[Bulk]
Vertical Crimp Long (A3)



(in mm)

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

[Bulk]
Vertical Crimp Short (B3)



(in mm)

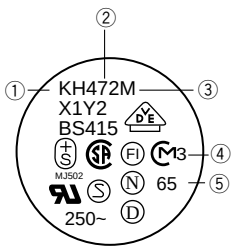
Lead Code	Coating Extension e	ø d
B3	Up to the end of crimp	0.6±0.05

■ Standard Recognition

	Standard No.	Recognized No.		Rated Voltage
		Japan	Taiwan	
UL	UL1414	E37921		AC250V (r.m.s.)
CSA	C22.2 No.1	LR36214	LR44559	
BSI	EN60065 (8.8, 14.2) EN132400	227636		
SEMKO	EN132400	9735044/01-02		
SEV		98, 5 50212		
VDE		83663, 83665, 83667	83664, 83666, 83668	
FIMKO		198418		
NEMKO		P97102089		
DEMKO		113878A/DK 98-01362		
NSW (SAA)	IEC60384-14 (2nd Edition)	6529		

- The recognition number might change by the revision of the application standard and the change within the range of acquisition.
- CCEE (Chinese Safety Standard) Safety Standard is also available as special specification. Please contact us for details.

■ Marking

Example	Item	
	① Type Designation	KH
	② Nominal Capacitance (Marked with 3 figures)	
	③ Capacitance Tolerance	
	④ Manufacturer's Identification	*
	⑤ Manufactured Date Code	
	UL Approval Mark	
	CSA Approval Mark	
	BSI Approval Mark	BS415
	SEMKO Approval Mark	
	SEV Approval Mark	
	VDE Approval Mark	
	FIMKO Approval Mark	
	NEMKO Approval Mark	
	DEMKO Approval Mark	
	Class Code (Except for CSA)	X1Y2
	Rated Voltage Mark	250~

*M3 : Made in Japan. M8: Made in Taiwan.

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)
DE2B3KH101K□□□	250	B	100 +10,-10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2B3KH151K□□□	250	B	150 +10,-10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2B3KH221K□□□	250	B	220 +10,-10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2B3KH331K□□□	250	B	330 +10,-10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2B3KH471K□□□	250	B	470 +10,-10%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2B3KH681K□□□	250	B	680 +10,-10%	9 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2E3KH102M□□□	250	E	1000 +20,-20%	8 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2E3KH152M□□□	250	E	1500 +20,-20%	9 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2E3KH222M□□□	250	E	2200 +20,-20%	10 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2E3KH332M□□□	250	E	3300 +20,-20%	12 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2E3KH472M□□□	250	E	4700 +20,-20%	13 max.	7.5	7.0 max.	A3B	B3B	N3A
DE2F3KH103M□□□	250	F	10000 +20,-20%	16 max.	7.5	7.0 max.	A3B	B3B	N7A

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

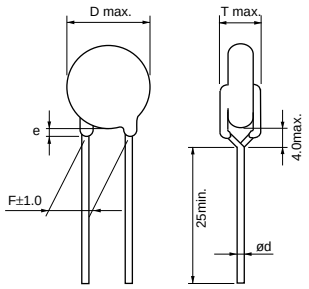
Safety Recognized Ceramic Capacitors

Type KX (Reinforced insulation)-IEC60384-14 Class X1, Y1-

■ Features

1. Operating temperature range guaranteed up to 125 degree(UL/CSA:85deg.).
2. Dielectric strength:AC4000V(r.m.s.)
3. Class X1/Y1 capacitors of UL1414 6th edition and IEC60384-14 2nd edition.
4. The type KX is recognized by UL/CSA/BSI/SEMKO/SEV/ VDE/FIMKO/NEMKO/DEMKO/IMQ.
5. Possible to use with a component in appliance req- uiring reinforced insulation and double insulation based on UL1492, IEC60065 and IEC60950.
6. Coated with flame-retardant epoxy resin (conforming to UL94V-0 standards).
7. Automatic insertion can be, and save costs.

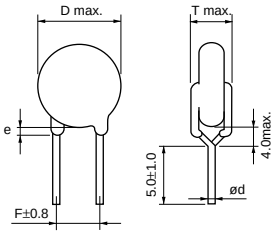
[Bulk]
Vertical Crimp Long (A5)



(in mm)

Lead Code	Coating Extension e	ø d
A5	Up to the end of crimp	$0.6^{+0.1}_{-0.05}$

[Bulk]
Vertical Crimp Short (B5)



(in mm)

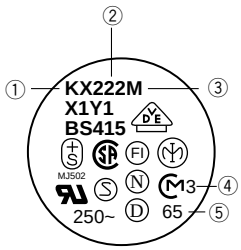
Lead Code	Coating Extension e	ø d
B5	Up to the end of crimp	$0.6^{+0.1}_{-0.05}$

■ Standard Recognition

	Standard No.	Recognized No.		Rated Voltage
		Japan	Taiwan	
UL	UL1414	E37921		AC250V (r.m.s.)
CSA	C22.2 No.1	LR36214	LR44559	
BSI	EN60065 (8.8, 14.2) EN132400	227859		
SEMKO	EN132400	9735046/01-02		
SEV		99, 5 50753		
VDE		89763, 89767	89764, 89768	
FIMKO		196766		
NEMKO		P97102026		
DEMKO		123125/DK 97-02986		
IMQ		V4069		

- The recognition number might change by the revision of the application standard and the change within the range of acquisition.
- Capacitance values less than 100pF are also recognized. Please contact us for details.
- CCEE (Chinese Safety Standard) Safety Standard is also available as special specification. Please contact us for details.

■ Marking

Example	Item	
	① Type Designation	KX
	② Nominal Capacitance (Marked with 3 figures)	
	③ Capacitance Tolerance	
	④ Manufacturer's Identification	*
	⑤ Manufactured Date Code	
	UL Approval Mark	
	CSA Approval Mark	
	BSI Approval Mark	BS415
	SEMKO Approval Mark	
	SEV Approval Mark	
	VDE Approval Mark	
	IMQ Approval Mark	
	FIMKO Approval Mark	
	NEMKO Approval Mark	
	DEMKO Approval Mark	
	Class Code (Except for CSA)	X1Y1
	Rated Voltage Mark	250~

*M3 : Made in Japan. M8 : Made in Taiwan.

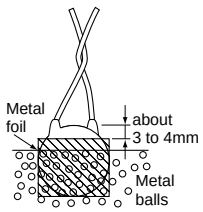
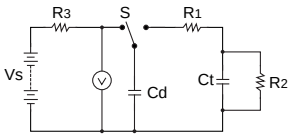
Part Number	AC Rated Voltage (Vac)	Temp. Char.	Capacitance (pF)	Body Dia. D (mm)	Lead Spacing F (mm)	Body Thickness T (mm)	Lead Package Long Bulk	Lead Package Short Bulk	Lead Package Taping (1)
DE1B3KX101K□□□	250	B	100 +10,-10%	9 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1B3KX151K□□□	250	B	150 +10,-10%	9 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1B3KX221K□□□	250	B	220 +10,-10%	9 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1B3KX331K□□□	250	B	330 +10,-10%	9 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1B3KX471K□□□	250	B	470 +10,-10%	9 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1B3KX681K□□□	250	B	680 +10,-10%	10 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1E3KX102M□□□A01	250	E	1000 +20,-20%	8 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1E3KX152M□□□A01	250	E	1500 +20,-20%	9 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1E3KX222M□□□A01	250	E	2200 +20,-20%	10 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1E3KX332M□□□A01	250	E	3300 +20,-20%	12 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1E3KX392M□□□A01	250	E	3900 +20,-20%	13 max.	10.0	8.0 max.	A5B	B5B	N5A
DE1E3KX472M□□□A01	250	E	4700 +20,-20%	15 max.	10.0	8.0 max.	A5B	B5B	N5A

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

Type KY/KH/KX Specifications and Test Methods

■ Apply to Type KY/KH/KX

Operating Temperature Range : -25 to +125°C (-25 to +85°C in case of the standard of UL / CSA)

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td>1</td><td colspan="2">Appearance and Dimensions</td><td>No marked defect on appearance form and dimensions are within specified range.</td><td>The capacitor shall be inspected by naked eyes for visible evidence of defect.
Dimensions shall 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 shall be inspected by naked eyes.</td></tr>
<tr><td>3</td><td colspan="2">Capacitance</td><td>Within specified tolerance.</td><td rowspan="2">The capacitance, dissipation factor and Q shall be measured at 20˚C with 1±0.1kHz(char. SL : 1±0.1MHz) and AC5V (r.m.s.) max.</td></tr>
<tr><td>4</td><td colspan="2">Dissipation Factor (D.F.)
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>B, E</td><td>D.F.≦2.5%</td></tr><tr><td>F</td><td>D.F.≦5.0%</td></tr><tr><td>SL</td><td>Q≧400+20C*1(C＜30pF)
Q≧1000 (C≧30pF)</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 shall be measured with DC500±50V within 60±5 s of charging.
The voltage shall 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 shall not be damage when Test voltage of Table 1 are applied between the lead wires for 60 s.
<Table.1><table><tr><th>Type</th><th>Test voltage</th></tr><tr><td>KY</td><td>In case of lead spacing F=5mm AC2000V (r.m.s.)
In case of lead spacing F=7.5mm AC2600V (r.m.s.)</td></tr><tr><td>KH</td><td>AC2600V (r.m.s.)</td></tr><tr><td>KX</td><td>AC4000V (r.m.s.)</td></tr></table></td></tr>
<tr><td>Body Insulation</td><td>No failure.</td><td>First, the terminals of the capacitor shall be connected together. Then, as shown in Figure right, a metal foil shall be closely wrapped around the body of the capacitor to the distance of about 3 to 4mm from each terminal.
Then,the capacitor shall be inserted into a container filled with metal balls of about 1mm diameter. Finally, AC voltage of Table 2 is applied for 60 s between the capacitor lead wires and metal balls.
 
<Table.2><table><tr><th>Type</th><th>Test voltage</th></tr><tr><td>KY</td><td>AC2600V (r.m.s.)</td></tr><tr><td>KH</td><td>AC2600V (r.m.s.)</td></tr><tr><td>KX</td><td>AC4000V (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><tr><td>F</td><td>Within $^{+30}_{-80}$%</td></tr></table>Temperature characteristic guarantee is -25 to +85°C
<table><tr><th>Char.</th><th>Temperature Coefficient</th></tr><tr><td>SL</td><td>+350 to -1000ppm/°C</td></tr></table>Temperature characteristic guarantee is +20 to +85°C</td><td>The capacitance measurement shall 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></td></tr>
<tr><td rowspan="3">8</td><td rowspan="3">Discharge Test (Ⅰ)</td><td>Appearance</td><td>No marked defect.</td><td rowspan="3">As in Figure 1, discharge is made 50 times at 5 s intervals from the capacitor (Cd) charged at DC voltage of specified.
 
Fig.1
Ct: Capacitor under test
Cd: 0.001μF
S: High-voltage switch
R1: 1000Ω
R2: 100MΩ
R3: Surge resistance
Vs: DC10kV</td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6.</td></tr>
</table>

*1 "C" expresses nominal capacitance value (pF).

Continued on the following page.

Type KY/KH/KX Specifications and Test Methods

Continued from the preceding page.

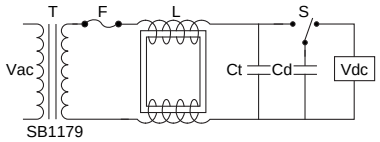
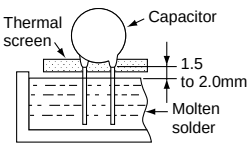
<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td>9</td><td colspan="2">Discharge Test (II)
[Not apply to Type KY]</td><td>The cheese-cloth around capacitors shall not glow or flame.</td><td>A single layer of cheese-cloth is to be placed around the body of the test capacitor. Each sample is to be subjected to four discharges from a dump capacitor charged to a voltage that, when discharged, placed DC 5kV across the capacitor under test. The interval between successive discharges is to be 5 s. AC240V (r.m.s.), 60Hz potential is to be applied across the capacitor under test and is to be maintained for 30 s after the fourth discharge, unless the circuit is opened in a shorter time by breakdown of the test capacitor.
The direct current supply is to be adjusted to provide a potential in accordance with the following.
$Vdc = \frac{5000\ (Cd+Ct)}{Cd}$ (V)
 

Fig.2
Vdc : Variable direct-current voltage source
S : High-voltage switch
L : Choke coil of approximately 3mH and 0.03Ω
F : Plug fuse rated 30A and 250V
Vac : Supply source rated 240V, 60Hz and 30A
Ct : Capacitor under test
Cd : Dump Capacitor
Capacitance value and D.F. are as follows.
<table><tr><td>Cap. value of Ct</td><td>0 to 0.005μF</td><td>0.0051 to 0.05μF</td></tr><tr><td>Cap. value of Cd</td><td>0.005μF</td><td>0.05μF</td></tr><tr><td>D.F.of Cd</td><td>0.5% max.</td><td>0.5% max.</td></tr></table></td></tr>
<tr><td>10</td><td colspan="2">Solderability of Leads</td><td>Lead wire shall be soldered with uniformly coated on the axial direction over 3/4 of the circumferential direction.</td><td>The lead wire of a capacitor shall be dipped into molten solder of 235±5°C for 2±0.5 s.
The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires.</td></tr>
<tr><td rowspan="4">11</td><td rowspan="4">Soldering Effect</td><td>Appearance</td><td>No marked defect.</td><td rowspan="4">As in figure,the lead wires shall be immersed solder of 350 ±10°C or 260±5°C up to 1.5 to 2.0mm from the root of terminal for 3.5±0.5 s (10±1 s for 260 ±5°C).
 

Pre-treatment:
Capacitor shall be stored at 85±2°C for 1 h, then placed at *1room condition for 24±2 h before initial measurements.
Post-treatment:
Capacitor shall be stored for 1 to 2 h at *1room 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>
<tr><td rowspan="3">12</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No marked defect.</td><td rowspan="3">The capacitor shall firmly be soldered to the supporting lead wire and vibration which is 10 to 55Hz in the vibration frequency range, 1.5mm in total amplitude, and about 1min in the rate of vibration change from 10Hz to 55Hz and back to10Hz is applied for a total of 6 h; 2 h each in 3 mutually perpendicular directions.</td></tr>
<tr><td>Capacitance</td><td>Within the specified tolerance.</td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>B, E</td><td>D.F.≦2.5%</td></tr><tr><td>F</td><td>D.F.≦5.0%</td></tr><tr><td>SL</td><td>Q≧400+20C*2(C＜30pF)
Q≧1000 (C≧30pF)</td></tr></table></td></tr>
</table>

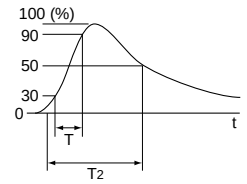
∗1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

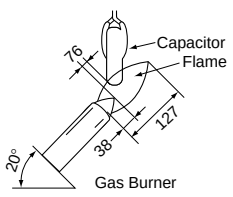
∗2 "C" expresses nominal capacitance value (pF).

Continued on the following page.

Specifications and Test Methods

Continued from the preceding page.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="5">13</td><td rowspan="5">Humidity (Under Steady State)</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Set the capacitor for 500±12 h at 40±2°C in 90 to 95% relative humidity.
Post-treatment :
Capacitor shall be stored for 1 to 2 h at *1room 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, F</td><td>Within±15%</td></tr><tr><td>SL</td><td>Within± 5%</td></tr></table></td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr><tr><td>F</td><td>D.F.≦7.5%</td></tr><tr><td>SL</td><td>Q≧275+5/2C*2(C<30pF)
Q≧350 (C≧30pF)</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">14</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply the rated voltage for 500±12 h at 40±2°C, in 90 to 95% relative humidity.
Post-treatment:
Capacitor shall be stored for 1 to 2 h at *1room 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, F</td><td>Within±15%</td></tr><tr><td>SL</td><td>Within± 5%</td></tr></table></td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr><tr><td>F</td><td>D.F.≦7.5%</td></tr><tr><td>SL</td><td>Q≧275+5/2C*2(C<30pF)
Q≧350 (C≧30pF)</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">15</td><td rowspan="5">Life</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Impulse Voltage
Each individual capacitor shall be subjected to a 5kV (Type KX: 8kV) impulses for three times. After the capacitors are applied to life test.
 

T1=1.2µs=1.67T
T2=50µs
Apply a voltage of table 4 for 1000 h at 125+2/-0°C, and relative humidity of 50% max..
<Table.4>
<table><tr><th>Applied voltage</th></tr><tr><td>AC425V (r.m.s.), except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1 s.</td></tr></table>
Post-treatment:
Capacitor shall be stored for 1 to 2 h at *1room 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>
<tr><td>Discharge Test (II) [Not apply to Type KY]</td><td>Per Item 9.</td></tr>
<tr><td>16</td><td colspan="2">Flame Test</td><td>The capacitor flame discontinue as follows.
<table><tr><th>Cycle</th><th>Time</th></tr><tr><td>1 to 4</td><td>30 s max.</td></tr><tr><td>5</td><td>60 s max.</td></tr></table></td><td>The capacitor shall be subjected to applied flame for 15 s and then removed for 15 s until 5 cycle.
 

(in mm)</td></tr>
</table>

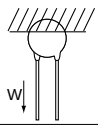
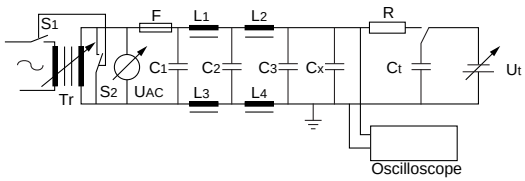
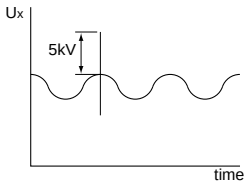
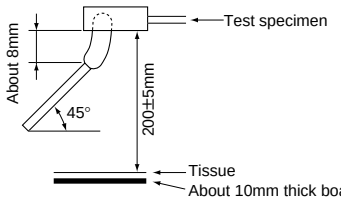
*1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

*2 "C" expresses nominal capacitance value (pF).

Continued on the following page.

Type KY/KH/KX Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specification	Testing Method
17	Robustness of terminations	Tensile	Lead wire shall not cut off. Capacitor shall not be broken.	As a figure, fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N and keep it for 10±1 s. 
		Bending		Each lead wire shall be subjected to 5N weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.
18	Active Flammability		The cheese-cloth shall not be on fire.	The capacitor shall be individually wrapped in at least one but more than two complete layers of cheese-cloth.The capacitor shall be subjected to 20 discharges. The interval between successive discharges shall be 5 s. The U_{AC} shall be maintained for 2 min after the last discharge.  $C_{1,2}$: 1µF±10% C_3 : 0.033µF±5% 10kV C_t : 3µF±5% 10kV C_x : Capacitor under test F : Fuse, Rated 10A $L_{1\ to\ 4}$: 1.5mH±20% 16A Rod core choke R : 100Ω±2% U_{AC} : U_R±5% U_R : Rated Voltage U_t : Voltage applied to C_t 
19	Passive Flammability		The burning time shall not be exceeded the time 30 s. The tissue paper shall not ignite.	The capacitor under test shall be held in the flame in the position which best promotes burning. Each specimen shall only be exposed once to the flame. Time of exposure to flame: 30 s. 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. 

Continued on the following page.

Type KY/KH/KX Specifications and Test Methods

Continued from the preceding page.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="5">20</td><td rowspan="5">Temperature and Immersion Cycle</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">The capacitor shall be subjected to 5 temperature cycles, then consecutively to 2 immersion cycles.

<Temperature cycle>
<table><tr><th>Step</th><th>Temperature (ºC)</th><th>Time</th></tr><tr><td>1</td><td>-25+0/-3</td><td>30 min</td></tr><tr><td>2</td><td>Room temp.</td><td>3 min</td></tr><tr><td>3</td><td>+125+3/-0</td><td>30 min</td></tr><tr><td>4</td><td>Room temp.</td><td>3 min</td></tr></table>Cycle time : 5 cycle

<Immersion cycle>
<table><tr><th>Step</th><th>Temperature (ºC)</th><th>Time</th><th>Immersion water</th></tr><tr><td>1</td><td>+65+5/-0</td><td>15 min</td><td>Clean water</td></tr><tr><td>2</td><td>0±3</td><td>15 min</td><td>Salt water</td></tr></table>Cycle time : 2 cycle
Pre-treatment :
Capacitor shall be stored at 85±2˚C for 1 h, then placed at *1room condition for 24±2 h.
Post-treatment :
Capacitor shall be stored for 24±2 h at *1room 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, F</td><td>Within±20%</td></tr><tr><td>SL</td><td>Within± 5%</td></tr></table></td></tr>
<tr><td>D.F.
Q</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>B, E</td><td>D.F.≦5.0%</td></tr><tr><td>F</td><td>D.F.≦7.5%</td></tr><tr><td>SL</td><td>Q≧275+5/2C*2(C<30pF)
Q≧350 (C≧30pF)</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>
</table>

∗1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

∗2 "C" expresses nominal capacitance value (pF).

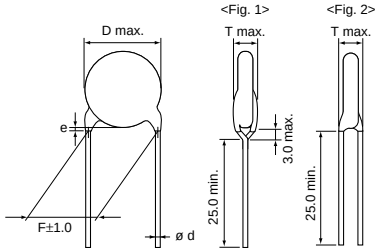
Safety Recognized Ceramic Capacitors

DEJ Series -Based on the Electrical Appliance and Material Safety Law of Japan-

■ Features

1. Coated with flame-ratardant epoxy resin (conforming to UL94V-0 standards).
2. Automatic insertion can be, and save costs.
3. This type are based on the electrical appliance and material safety law of Japan and JIS-C-5150 (general rules of AC mains supply capacitors of electronic equipment).

[Bulk]
Vertical Crimp Long (A3)
Straight Long (C3)



(in mm)

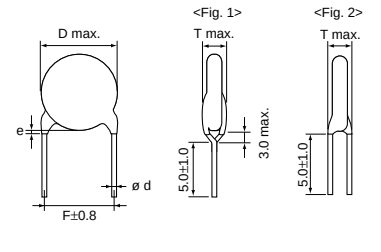
Lead Code	Coating Extension e	ø d	Style
A3	Up to the end of crimp	0.6±0.05	Fig. 1
C3	3.0 max.	0.6±0.05	Fig. 2

4

■ Marking

	Temp. Char.	E, F
Nominal Body Diameter	ø7~8mm	102Z 250~ 65
	ø9~11mm	332Z 250~ Ⓜ65
Nominal Capacitance		Marked with 3 figures
Capacitance Tolerance		Marked with code
Rated Voltage		Marked with code
Manufacturer's Identification		Marked with Ⓜ (Omitted for nominal body diameter ø8mm and under)
Manufactured Date Code		Abbreviation

[Bulk]
Vertical Crimp Short (B3)
Straight Short (D3)



(in mm)

Lead Code	Coating Extension e	ø d	Style
B3	Up to the end of crimp	0.6±0.05	Fig. 1
D3	3.0 max.	0.6±0.05	Fig. 2

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)	Lead Package Taping (2)
DEJE3E2102Z□□□	250	E	1000 +80,-20%	7 max.	7.5	4.0 max.	C3B	D3B	N2A	P3A
DEJE3E2222Z□□□	250	E	2200 +80,-20%	8 max.	7.5	4.0 max.	A3B	B3B	N2A	N3A
DEJE3E2332Z□□□	250	E	3300 +80,-20%	9 max.	7.5	4.0 max.	A3B	B3B	N2A	N3A
DEJE3E2472Z□□□	250	E	4700 +80,-20%	11 max.	7.5	4.0 max.	A3B	B3B	N2A	N3A
DEJF3E2472Z□□□	250	F	4700 +80,-20%	8 max.	7.5	4.0 max.	A3B	B3B	N2A	N3A
DEJF3E2103Z□□□	250	F	10000 +80,-20%	11 max.	7.5	4.0 max.	A3B	B3B	N2A	N3A

Three blank columns are filled with the lead and packaging codes. Please refer to each code which is shown in the right end.
Taping (1): Lead spacing F=5.0mm, Taping(2): Lead spacing F=7.5mm.

Specifications and Test Methods

■Apply to DEJ Series (Products which are based on the electrical appliance and material safety law of Japan)

Operating Temperature Range : -25 to +85°C

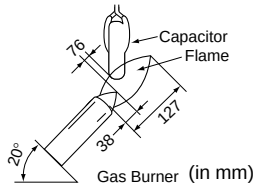
No.	Item		Specification	Testing Method
1	Appearance and Dimensions		No marked defect on appearance form and dimensions are within specified range.	The capacitor shall be inspected by naked eyes for visible evidence of defect. Dimensions shall be measured with slide calipers.
2	Marking		To be easily legible	The capacitor shall be inspected by naked eyes.
3	Capacitance		Within specified tolerance.	The capacitance shall be measured at 20˚C with 1±0.1kHz and AC5V (r.m.s.) max.
4	Dissipation Factor (D.F.)		Char. E: D.F.≦2.5% Char. F: D.F.≦5.0%	The dissipation factor shall be measured at 20˚C with 1±0.1kHz and AC5V (r.m.s.) max.
5	Insulation Resistance (I.R.)		10000MΩ min.	The insulation resistance shall be measured with DC500±50V within 60±5 s of charging.
6	Dielectric Strength	Between Lead Wires	No failure.	The capacitor shall not be damage when AC1500V (r.m.s.) are applied between the lead wires for 60 s. (Charge / discharge current≦50mA)
		Body Insulation	No failure.	First, the terminals of the capacitor shall be connected together. Then, as shown in Figure right, the capacitor shall be immersed into 10% salt solution up to a position of about 3 to 4mm apart from the terminals. Finally, AC1500V (r.m.s.) is applied for 60 s between the capacitor lead wires and electrode plate. (Charge / discharge current≦50mA)
7	Temperature Characteristics		Char. E: Capacitance Change Within $^{+20}_{-55}$% Char. F: Capacitance Change Within $^{+30}_{-80}$%	The capacitance measurement shall be made at each step specified in Table 1. <Table.1> Step 1: +20±2 Step 2: -25±2 Step 3: +20±2 Step 4: +85±2 Step 5: +20±2
8	Discharge Test	Appearance	No marked defect.	As in Figure 1, discharge is made 50 times at 5 s intervals from the capacitor (Cd) charged at DC voltage of specified. Fig.1 Ct : Capacitor under test S : High-voltage switch R1 : 1000Ω R2 : 100MΩ R3 : Surge resistance Cd: 0.001µF Vs: DC10kV
		I.R.	1000MΩ min.	
		Dielectric Strength	Per Item 6.	
9	Solderability of Leads		Lead wire shall be soldered with uniformly coated on the axial direction over 3/4 of the circumferential direction.	The lead wire of a capacitor shall be dipped into molten solder of 235±5˚C for 2±0.5 s. The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires.
10	Soldering Effect	Appearance	No marked defect.	As in figure, the lead wires shall be immersed solder of 350±10˚C up to 1.5 to 2.0mm from the root of terminal for 3.5±0.5 s. Pre-treatment: Capacitor shall be stored at 85±2˚C for 1 h, then placed at *1room condition for 24±2 h before initial measurements. Post-treatment: Capacitor shall be stored for 4 to 24 h at *1room condition.
		I.R.	1000MΩ min.	
		Dielectric Strength	Per Item 6.	

*1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

Continued on the following page.

Specifications and Test Methods

Continued from the preceding page.

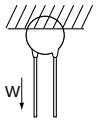
<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td>No marked defect.</td><td rowspan="3">The capacitor shall firmly be soldered to the supporting lead wire and vibration which is 10 to 55Hz in the vibration frequency range, 1.5mm in total amplitude, and about 1min in the rate of vibration change from 10Hz to 55Hz and back to10Hz is applied for a total of 6 h; 2 h each in 3 mutually perpendicular directions.</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>Specification</th></tr><tr><td>E</td><td>D.F.≦2.5%</td></tr><tr><td>F</td><td>D.F.≦5.0%</td></tr></table></td></tr>
<tr><td>12</td><td>Solvent Resistance</td><td>Appearance</td><td>No marked defect.</td><td>The capacitor shall be immersed into a isopropyl alcohol for 30±5 s.</td></tr>
<tr><td rowspan="5">13</td><td rowspan="5">Humidity (Under Steady State)</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Set the capacitor for 500±12 h at 40±2˚C in 90 to 95% relative humidity.
Pre-treatment :
Capacitor shall be stored at 85±2˚C for 1 h, then placed at *1room condition for 24±2 h before initial measurements.
Post-treatment :
Capacitor shall be stored for 1 to 2 h at *1room condition.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>E</td><td>Within±20%</td></tr><tr><td>F</td><td>Within±30%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>E</td><td>D.F.≦5.0%</td></tr><tr><td>F</td><td>D.F.≦7.5%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6.</td></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Humidity Insulation</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">The capacitor shall be subjected to 40±2˚C, relative humidity of 90 to 98% for 8 h, and then removed in room temperature for 16 h until 5 cycles.
Pre-treatment :
Capacitor shall be stored at 85±2˚C for 1 h, then placed at *1room condition for 24±2 h before initial measurements.
Post-treatment :
Capacitor shall be stored for 1 to 2 h at *1room condition.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>E</td><td>Within±20%</td></tr><tr><td>F</td><td>Within±30%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>E</td><td>D.F.≦5.0%</td></tr><tr><td>F</td><td>D.F.≦7.5%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6.</td></tr>
<tr><td rowspan="5">15</td><td rowspan="5">Humidity Loading</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply the rated voltage for 500±12 h at 40±2˚C in 90 to 95% relative humidity.
Pre-treatment :
Capacitor shall be stored at 85±2˚C for 1 h, then placed at *1room condition for 24±2 h before initial measurements.
Post-treatment :
Capacitor shall be stored for 1 to 2 h at *1room condition.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>E</td><td>Within±20%</td></tr><tr><td>F</td><td>Within±30%</td></tr></table></td></tr>
<tr><td>D.F.</td><td><table><tr><th>Char.</th><th>Specification</th></tr><tr><td>E</td><td>D.F.≦5.0%</td></tr><tr><td>F</td><td>D.F.≦7.5%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6.</td></tr>
<tr><td rowspan="5">16</td><td rowspan="5">Life</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply a voltage of table 2 for 1500 h at 85±2˚C, relative humidity 50% max.
<Table.2>
<table><tr><th>Applied voltage</th></tr><tr><td>AC500V (r.m.s.), except that once each hour the voltage is increased to AC1000V (r.m.s.) for 0.1 s.</td></tr></table>
Pre-treatment:
Capacitor shall be stored at 85±2˚C for 1 h, then placed at *1room condition for 24±2 h before initial measurements.
Post-treatment:
Capacitor shall be stored for 4 to 24 h at *1room condition.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>E</td><td>Within±20%</td></tr><tr><td>F</td><td>Within±30%</td></tr></table></td></tr>
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6.</td></tr>
<tr><td>17</td><td colspan="2">Flame Test</td><td>The capacitor flame discontinue as follows.
<table><tr><th>Cycle</th><th>Time</th></tr><tr><td>1 to 2</td><td>15 s max.</td></tr><tr><td>3</td><td>60 s max.</td></tr></table></td><td>The capacitor shall be subjected to applied flame for 15 s and then removed for 15 s until 3 cycle.
 
</td></tr>
</table>

*1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

Continued on the following page.

Specifications and Test Methods

Continued from the preceding page.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specification</th><th>Testing Method</th></tr>
<tr><td rowspan="2">18</td><td rowspan="2">Robustness of Terminations</td><td>Tensile</td><td rowspan="2">Lead wire shall not cut off. Capacitor shall not be broken.</td><td>As a figure, fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N and keep it for 10±1 s.
 
</td></tr>
<tr><td>Bending</td><td>Each lead wire shall be subjected to 5N weight and then a 90° bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.</td></tr>
<tr><td rowspan="5">19</td><td rowspan="5">Temperature and Immersion cycle</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">The capacitor shall be subjected to 5 temperature cycles, then consecutively to 2 immersion cycles.

<Temperature cycle>
<table><tr><th>Step</th><th>Temperature (ºC)</th><th>Time</th></tr><tr><td>1</td><td>-25+0/-3</td><td>30 min</td></tr><tr><td>2</td><td>Room temp.</td><td>3 min</td></tr><tr><td>3</td><td>+85+3/-0</td><td>30 min</td></tr><tr><td>4</td><td>Room temp.</td><td>3 min</td></tr></table>Cycle time : 5 cycle

<Immersion cycle>
<table><tr><th>Step</th><th>Temperature (ºC)</th><th>Time</th><th>Immersion water</th></tr><tr><td>1</td><td>+65+5/-0</td><td>15 min</td><td>Clean water</td></tr><tr><td>2</td><td>0±3</td><td>15 min</td><td>Salt water</td></tr></table>Cycle time : 2 cycle

Pre-treatment :
Capacitor shall be stored at 85±2˚C for 1 h, then placed at *1room condition for 24±2 h.
Post-treatment :
Capacitor shall be stored for 4 to 24 h at *1room condition.</td></tr>
<tr><td>Capacitance Change</td><td><table><tr><th>Char.</th><th>Capacitance Change</th></tr><tr><td>E</td><td>Within±20%</td></tr><tr><td>F</td><td>Within±30%</td></tr></table></td></tr>
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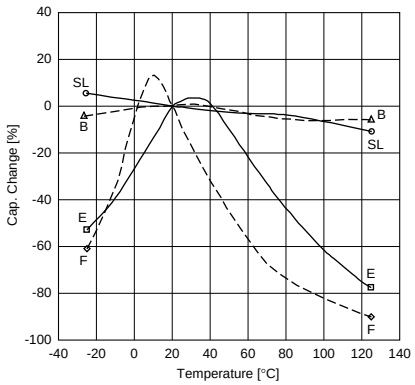
<tr><td>I.R.</td><td>1000MΩ min.</td></tr>
<tr><td>Dielectric Strength</td><td>Per Item 6.</td></tr>
</table>

*1 "room condition" temperature : 15 to 35°C, relative humidity : 45 to 75%, atmospheric pressure : 86 to 106kPa

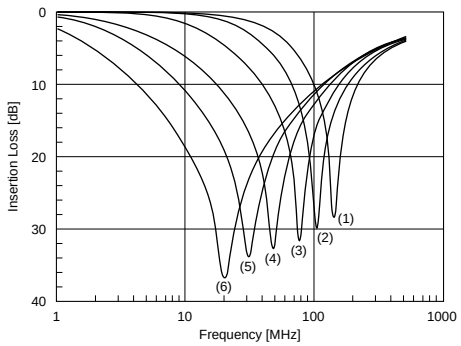
Characteristics Data (Typical Example)

■ Capacitance-Temperature Characteristics



■ Insertion Loss-Frequency Characteristics

Type KY

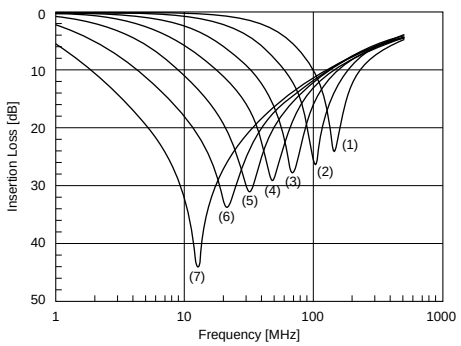


Type KY

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

(1) DE2B3KY101KA2BM01
(2) DE2B3KY221KA2BM01
(3) DE2B3KY471KA2BM01
(4) DE2E3KY102MA2BM01
(5) DE2E3KY222MA2BM01
(6) DE2E3KY472MA2BM01

Type KH

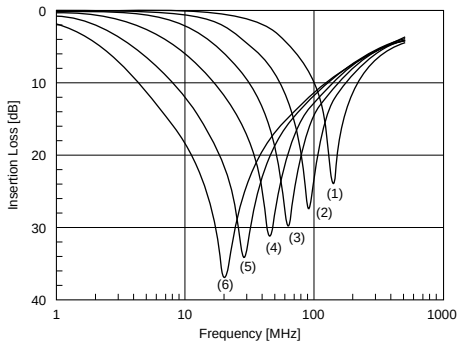


Type KH

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

(1) DE2B3KH101KA3B
(2) DE2B3KH221KA3B
(3) DE2B3KH471KA3B
(4) DE2E3KH102MA3B
(5) DE2E3KH222MA3B
(6) DE2E3KH472MA3B
(7) DE2F3KH103MA3B

Type KX



Type KX

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

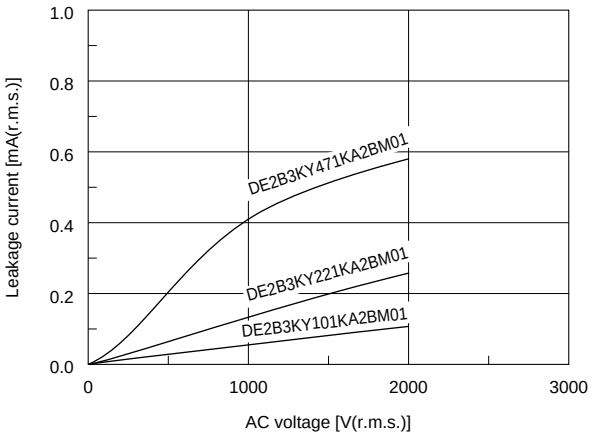
(1) DE1B3KX101KA5B
(2) DE1B3KX221KA5B
(3) DE1B3KX471KA5B
(4) DE1E3KX102MA5BA01
(5) DE1E3KX222MA5BA01
(6) DE1E3KX472MA5BA01

Characteristics Data (Typical Example)

■ Leakage Current Characteristics

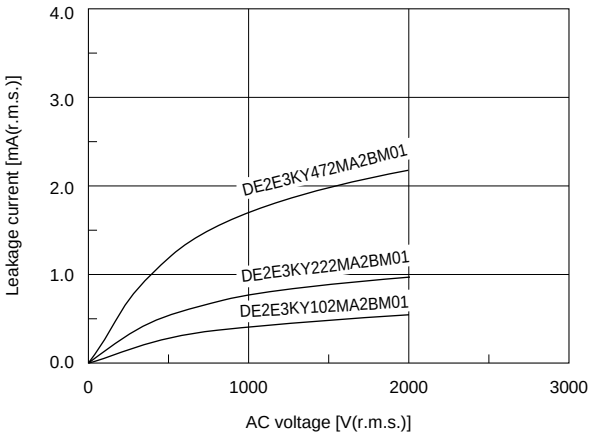
Type KY (B char.)

AC voltage : 60Hz
Temperature : 25°C



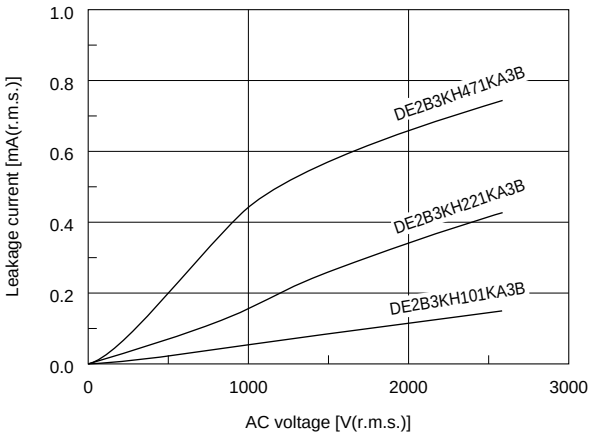
Type KY (E char.)

AC voltage : 60Hz
Temperature : 25°C



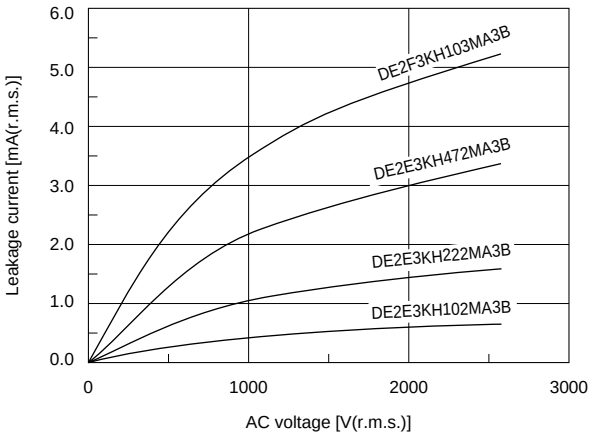
Type KH (B char.)

AC voltage : 60Hz
Temperature : 25°C



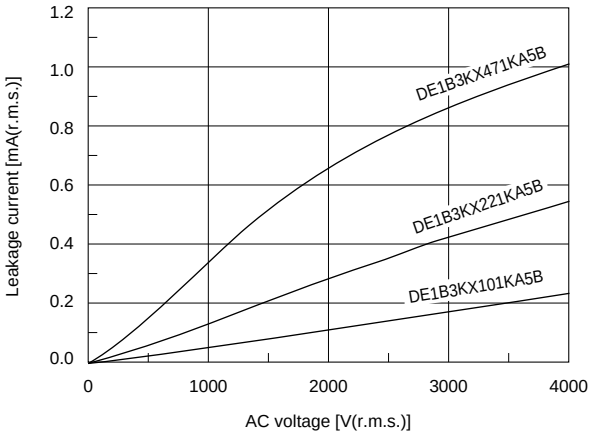
Type KH (E, F char.)

AC voltage : 60Hz
Temperature : 25°C



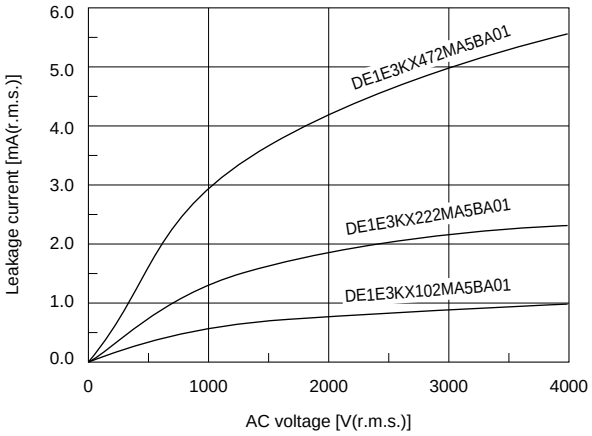
Type KX (B char.)

AC voltage : 60Hz
Temperature : 25°C



Type KX (E char.)

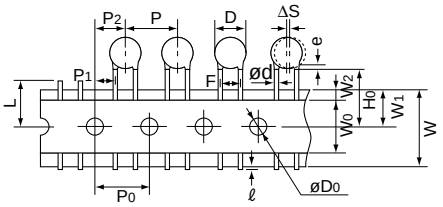
AC voltage : 60Hz
Temperature : 25°C



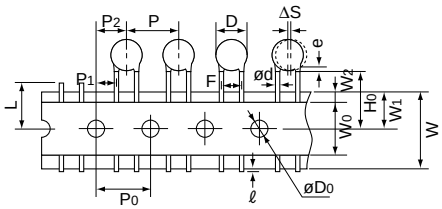
Packaging

■ Taping Specification

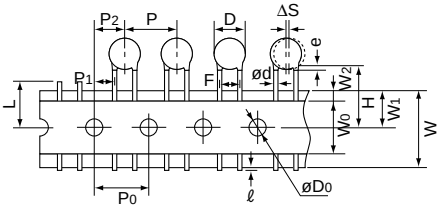
● 12.7mm pitch / lead spacing 5mm taping
Vertical crimp type
(Lead Code : N2, Previous Lead Code : -979)



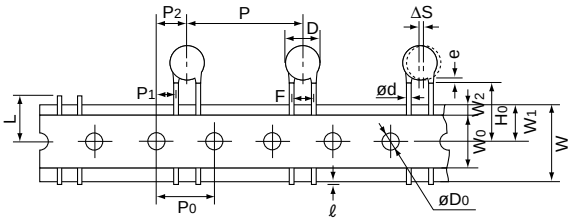
● 15mm pitch / lead spacing 7.5mm taping
Vertical crimp type
(Lead Code : N3, Previous Lead Code : -486)



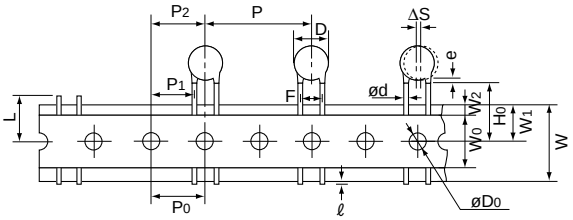
● 15mm pitch / lead spacing 7.5mm taping
Straight type
(Lead Code : P3, Previous Lead Code : -486)

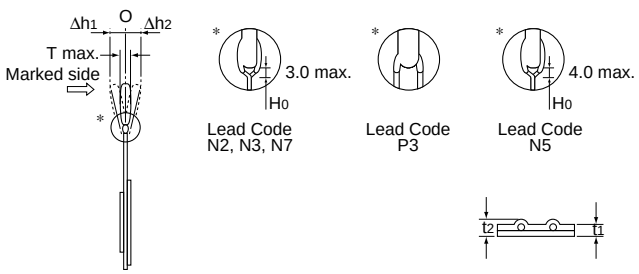


● 30mm pitch / lead spacing 7.5mm taping
Vertical crimp type
(Lead Code : N7, Previous Lead Code : -477)



● 25.4mm pitch / lead spacing 10.0mm taping
Vertical crimp type
(Lead Code : N5, Previous Lead Code : -452)





Item	Code	N2	N3	P3	N7	N5
Pitch of component	P	12.7	15.0	15.0	30.0	25.4
Pitch of sprocket hole	P_0	12.7±0.3	15.0±0.3	15.0±0.3	15.0±0.3	12.7±0.3
Lead spacing	F	$5.0^{+0.8}_{-0.2}$	7.5±1.0	7.5±1.0	7.5±1.0	10.0±1.0
Length from hole center to component center	P_2	6.35±1.3	7.5±1.5	7.5±1.5	7.5±1.5	—
Length from hole center to lead	P_1	3.85±0.7	3.75±1.0	3.75±1.0	3.75±1.0	7.7±1.5
Body diameter	D	See the individual product specification				
Deviation along tape, left or right	ΔS	0±1.0	0±2.0			
Carrier tape width	W	18.0±0.5				
Position of sprocket hold	W_1	9.0±0.5				
Lead distance between reference	H_0	$18.0^{+2.0}_{-0}$		—	$18.0^{+2.0}_{-0}$	
and bottom planes	H	—		$20.0^{+1.5}_{-1.0}$	—	
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				$0.6^{+0.1}_{-0.05}$
Total tape thickness	t_1	0.6±0.3				
Total thickness, tape and lead wire	t_2	1.5 max.				
Body thickness	T	See the individual product specification				
Protion 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		3.0 max.	Up to the end of crimp	
Deviation across tape, front	$Δh_1$	1.0 max.	2.0 max.			
Deviation across tape, rear.	$Δh_2$					

(in mm)

Continued on the following page.

Packaging

Continued from the preceding page.

■ Packaging Styles

Bulk	Taping
Polyethylene Bag 	Ammo Pack 

■ Minimum Quantity (Order in Sets Only)

[Bulk] 1,000 pcs.

[Taping] (pcs.)

Lead Code	Type KY	Type KH	Type KX	DEJ Series
N2	1,000	–	–	1,500
N3, P3	–	900	–	1,000
N7	–	400	–	–
N5	–	–	500	–

■ Minimum Order Quantity

[Bulk] 3,000 pcs.

[Taping] (pcs.)

Lead Code	Type KY	Type KH	Type KX	DEJ Series
N2	3,000	–	–	3,000
N3, P3	–	2,700	–	3,000
N7	–	2,000	–	–
N5	–	–	2,000	–

"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 in case.)

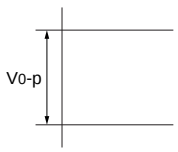
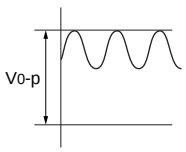
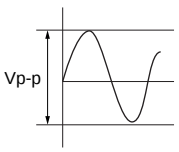
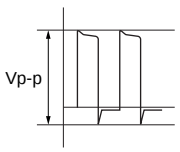
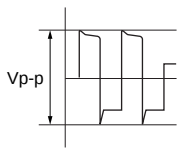
⚠Caution

■ ⚠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 which contains DC bias within the rated voltage range.

When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use a capacitor within rated voltage containing these irregular voltage.

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 the like, it may have the self-generated heat due to dielectric-loss.

Applied voltage should be the load such as self-generated heat is within 20 °C on the condition of atmosphere temperature 25 °C. When measuring, use a thermocouple of small thermal capacity-K of ø0.1mm and be in the condition where capacitor is not affected by radiant heat of other components and wind of surroundings. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability.

3. Test condition for withstanding Voltage

(1) Test Equipment

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

If the distorted sine wave or over load exceeding the specified voltage value is applied, the defective may be caused.

Continued on the following page.

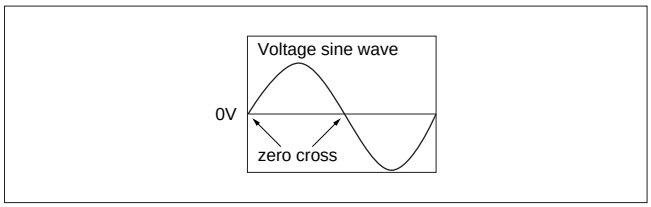
⚠Caution

Continued from the preceding page.

(2) Voltage Applied Method

When the withstanding voltage is applied, capacitor's lead or terminal shall be firmly connected to the out-put of the withstanding voltage test equipment, and then the voltage shall 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 shall be reduced to near zero, and then capacitor's lead or terminal shall be taken off the out-put 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 arise, and therefore, the defective may be caused.

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



4. Fail-Safe

When capacitor would be 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 would follow an electric shock, fire or fume.

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

■ ⚠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. And 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.

"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 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.

"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 leads to excessive shock or vibration during use.

"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

■ 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)

Capacitance change of capacitors

1. Class 1 capacitors
   Capacitance might change a little depending on a surrounding temperature or an applied voltage. Please contact us if you use for the strict time constant circuit.
2. Class 2 and 3 capacitors
   Class 2 and 3 capacitors like temperature characteristic B, E and F have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor leaves for a long time. Moreover, capacitance might change greatly depending on a surrounding temperature or an applied voltage. So, it is not likely to be able to use for the time constant circuit. Please contact us if you need a detail information.

ISO9000 Certifications

Manufacturing plants of these products in this catalog have obtained the ISO9000 quality system certificate.

Plant	Certified Date	Organization	Registration No.	Applied standard
Izumo Murata Manufacturing Co., Ltd.	Feb. 1. '00	Underwriters Laboratories Inc.	A5587	ISO9001
Taiwan Murata Electronics Co., Ltd.	Nov. 26. '93	Bureau of Commodity Inspection and Quarantine	5E8Y001	ISO9002

⚠Note:

1. Export Control
   〈For customers outside Japan〉
   Murata products should not be used or sold for use in the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (nuclear weapons, chemical or biological weapons, or missiles), or any other weapons.
   〈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 our products listed in this catalog for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property, or when intending to use one of our products for other applications than 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 in the above
3. Product specifications in this catalog are as of November 2001. 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 your ordering. If there are any questions, please contact our sales representatives or product engineers.
4. Please read CAUTION and Notice in this catalog for safety. This catalog has only typical specifications. Therefore you are requested to approve our product specification or to transact the approval sheet for product specification, before your ordering.
5. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or third party's intellectual property rights and other related rights in consideration of your using our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.
6. None of ozone depleting substances (ODS) under the Montreal Protocol is used in manufacturing process of us.

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