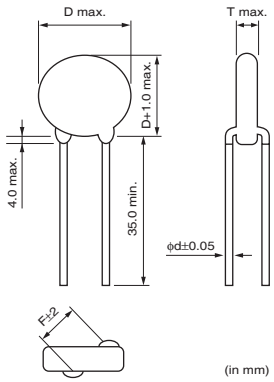
High Voltage Ceramic Capacitors DC10-40kV

Radial Lead Type DHR Series (DC10-15kV)



■ Features

1. Small size
2. Excellent heat-proof, humidity-proof and high-dielectric strength voltage.
3. Coated with flame-retardant epoxy resin.

■ Applications

1. Color TV doublers and triplers
2. High voltage DC power supplies (PPCs, X-ray apparatus, air cleaner, lasers, etc.)
3. Tuning capacitor in focus circuit for display

■ Marking

Temp. Char. / Nominal body dia.		ZM	B
ø8mm		101 10K	101 10K
ø9mm and 10mm		221K 10K•	221M 10K
ø11mm to 14mm		ZM 471K 10K	B 471M 10K
ø15mm to 18mm		102KZ Ⓜ 10K 0050	102MB Ⓜ 10K 0050
Temperature Characteristics	Nominal body dia. ø8mm	Omitted	Omitted
	Nominal body dia. ø9 and 10mm	Marked with • (dot)	
	Nominal body dia. ø11 to 14mm	Marked with code.	Marked with code.
	Nominal body dia. ø15mm min.	Marked with Z.	
Nominal Capacitance		Under 100pF : Actual value, 100pF and over : Marked with 3 figures.	
Capacitance Tolerance		Marked with code, omitted for nominal body diameter ø8mm and under.	
Rated Voltage		Marked with code.	
Manufacturer's Identification		Marked with Ⓜ, omitted for nominal body diameter ø14mm and under.	
Manufactured Date		Abbreviation, omitted for nominal body diameter ø14mm and under. (Ex.) 0 0 5 0 (①②③) ① : Last numeral in year ② : Number in the month ③ : Fix No.	

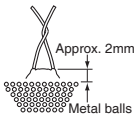
ZM Characteristics

Part Number	Rated Voltage (kV)	Capacitance (pF)	Body Dia. D (mm)	Lead Spacing F (mm)	Body Thickness T (mm)	Lead Dia. ød (mm)
DHR4E4A101K2BB	DC10	100 +10, -10%	8.0	9.5	7.0	0.65
DHR4E4A151K2BB	DC10	150 +10, -10%	8.0	9.5	7.0	0.65
DHR4E4A221K2BB	DC10	220 +10, -10%	9.0	9.5	7.0	0.65
DHR4E4A331K2BB	DC10	330 +10,-10%	10.0	9.5	7.0	0.65
DHR4E4A471K2BB	DC10	470 +10, -10%	12.0	9.5	7.0	0.65
DHR4E4A681K2BB	DC10	680 +10, -10%	13.0	9.5	7.0	0.65
DHR4E4A102K2BB	DC10	1000 +10, -10%	15.0	9.5	7.0	0.65
DHR4E4B101K2BB	DC12	100 +10, -10%	8.0	9.5	7.3	0.65
DHR4E4B151K2BB	DC12	150 +10, -10%	9.0	9.5	7.3	0.65
DHR4E4B221K2BB	DC12	220 +10, -10%	9.0	9.5	7.3	0.65
DHR4E4B331K2BB	DC12	330 +10, -10%	11.0	9.5	7.3	0.65
DHR4E4B471K2BB	DC12	470 +10, -10%	12.0	9.5	7.3	0.65
DHR4E4B681K2BB	DC12	680 +10, -10%	14.0	9.5	7.3	0.65
DHR4E4B102K2BB	DC12	1000 +10, -10%	16.0	9.5	7.3	0.65
DHR4E4C101K2BB	DC15	100 +10, -10%	8.0	9.5	8.2	0.65
DHR4E4C151K2BB	DC15	150 +10, -10%	9.0	9.5	8.2	0.65
DHR4E4C221K2BB	DC15	220 +10, -10%	10.0	9.5	8.2	0.65
DHR4E4C331K2BB	DC15	330 +10, -10%	12.0	9.5	8.2	0.65
DHR4E4C471K2BB	DC15	470 +10, -10%	13.0	9.5	8.2	0.65
DHR4E4C681K2BB	DC15	680 +10, -10%	15.0	9.5	8.2	0.65
DHR4E4C102K2FB	DC15	1000 +10, -10%	18.0	12.7	8.2	0.8

B Characteristics

Part Number	Rated Voltage (kV)	Capacitance (pF)	Body Dia. D (mm)	Lead Spacing F (mm)	Body Thickness T (mm)	Lead Dia. ød (mm)
DHRB34A101M2BB	DC10	100 +20, -20%	8.0	9.5	7.0	0.65
DHRB34A151M2BB	DC10	150 +20, -20%	8.0	9.5	7.0	0.65
DHRB34A221M2BB	DC10	220 +20, -20%	9.0	9.5	7.0	0.65
DHRB34A331M2BB	DC10	330 +20, -20%	10.0	9.5	7.0	0.65
DHRB34A471M2BB	DC10	470 +20, -20%	12.0	9.5	7.0	0.65
DHRB34A681M2BB	DC10	680 +20, -20%	13.0	9.5	7.0	0.65
DHRB34A102M2BB	DC10	1000 +20, -20%	15.0	9.5	7.0	0.65
DHRB34B101M2BB	DC12	100 +20, -20%	8.0	9.5	7.7	0.65
DHRB34B151M2BB	DC12	150 +20, -20%	9.0	9.5	7.5	0.65
DHRB34B221M2BB	DC12	220 +20, -20%	9.0	9.5	7.5	0.65
DHRB34B331M2BB	DC12	330 +20, -20%	11.0	9.5	7.5	0.65
DHRB34B471M2BB	DC12	470 +20, -20%	12.0	9.5	7.5	0.65
DHRB34B681M2BB	DC12	680 +20, -20%	14.0	9.5	7.5	0.65
DHRB34B102M2BB	DC12	1000 +20, -20%	16.0	9.5	7.5	0.65
DHRB34C101M2BB	DC15	100 +20, -20%	8.0	9.5	8.5	0.65
DHRB34C151M2BB	DC15	150 +20, -20%	9.0	9.5	8.2	0.65
DHRB34C221M2BB	DC15	220 +20, -20%	10.0	9.5	8.2	0.65
DHRB34C331M2BB	DC15	330 +20, -20%	12.0	9.5	8.2	0.65
DHRB34C471M2BB	DC15	470 +20, -20%	13.0	9.5	8.2	0.65
DHRB34C681M2BB	DC15	680 +20, -20%	15.0	9.5	8.2	0.65
DHRB34C102M2FB	DC15	1000 +20, -20%	18.0	12.7	8.2	0.8

Specifications and Test Methods

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Specifications</th><th>Testing Method</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>-25 to +100˚C</td><td>—</td></tr>
<tr><td>2</td><td colspan="2">Capacitance</td><td>Within the specified tolerance.</td><td>The capacitance should be measured at 20°C with 1±0.2kHz and AC 5V(r.m.s.) max.</td></tr>
<tr><td>3</td><td colspan="2">Dissipation Factor (D.F.)</td><td>ZM 1.0% max.
B 2.5% max.</td><td>Same condition as capacitance.</td></tr>
<tr><td>4</td><td>Insulation Resistance (I.R.)</td><td>Between Lead Wires</td><td>10000MΩ min.</td><td>The insulation resistance should be measured with DC1000V within 60±5 sec. of charging.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Dielectric Strength</td><td>Between Lead Wires</td><td>No failure.</td><td>The capacitor should not be damaged when DC voltage of 150% of the rated voltage is applied between the lead wires for 60±5 sec. in insulating liquid or gas.
(Charge/Discharge current≦50mA)</td></tr>
<tr><td>Body Insulation</td><td>No failure.</td><td>The capacitor is placed in the container with metal balls of diameter 1mm so that each lead wire, shortcircuited, is kept approximately 2mm off the metal balls as shown in the figure at right, and DC voltage of 3kV is applied for 10 sec. between capacitor lead wires and metal balls.
(Charge/Discharge current≦50mA)
  </td></tr>
<tr><td>6</td><td colspan="2">Temperature Characteristics</td><td>Temp. Char. / Temp. Coefficient or Max. Cap. Change
ZM: -4700±1000ppm/˚C
B: ±10%</td><td>The capacitance measurement should be made at each step specified in table.
Capacitance change from the value of step 3 should not exceed the limit specified.
Step / Char. | 1 | 2 | 3 | 4 | 5
ZM | — | — | 20±2˚C | 85±2˚C | 20±2˚C
B | 20±2˚C | -25±3˚C | 20±2˚C | 85±2˚C | 20±2˚C</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Soldering Effect</td><td>Appearance</td><td>No marked defect.</td><td rowspan="3">The lead wires should be immersed into the melted solder of 350±10˚C up to about 1.5 to 2.0mm from the main body for 3.5±0.5 sec.
Post-treatment: Capacitor should be stored for 24±2 hrs. at *room condition.</td></tr>
<tr><td>Capacitance Change</td><td>Within ±10%</td></tr>
<tr><td>Dielectric Strength (Between Lead Wires)</td><td>No failure.</td></tr>
<tr><td rowspan="5">8</td><td rowspan="5">Humidity (Under Steady State)</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Set the capacitor for 240±8 hrs. at 40±2˚C in 90 to 95% relative humidity.

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>D.F.</td><td>ZM 1.5% max.
B 4.0% max.</td></tr>
<tr><td>I.R.</td><td>5000MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between Lead Wires)</td><td>No failure.</td></tr>
<tr><td rowspan="5">9</td><td rowspan="5">Life</td><td>Appearance</td><td>No marked defect.</td><td rowspan="5">Apply a DC voltage of 125% of the rated voltage for 1000^{+48}_{0} hrs. in silicon oil at 85±2˚C.

Post-treatment: Capacitor should be stored for 24±2 hrs. at *room condition.
(Charge/Discharge current≦50mA)</td></tr>
<tr><td>Capacitance Change</td><td>Within ±10%</td></tr>
<tr><td>D.F.</td><td>ZM 1.5% max.
B 4.0% max.</td></tr>
<tr><td>I.R.</td><td>5000MΩ min.</td></tr>
<tr><td>Dielectric Strength (Between Lead Wires)</td><td>No failure</td></tr>
</table>

(Note) Tests for Dielectric Strength (between lead wires), Charge Discharge Test, Humidity, Temperature Cycle and Life should be performed with specimens having molded resin (MR1023C : made by Murata) extending over 3mm on all the surface.

* "room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

Continued on the following page.

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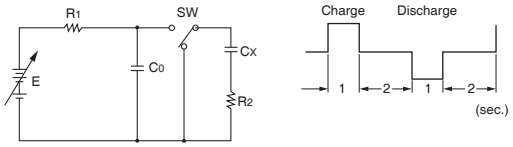
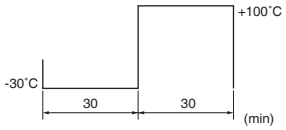
Specifications and Test Methods

Continued from the preceding page.

No.	Item		Specifications	Testing Method
10	Charge Discharge Test	Appearance	No marked defect.	Charge discharge test should be measured in the following test circuit and cycle. Applied voltage : Rated voltage Cycle time : 20000 cycle Post-treatment : Capacitor should be stored for 4 hrs. at *room condition. <Circuit> <Cycle>  Cx : specimen R1 : circuit protective resistor (300kΩ) C0 : supplied energy for Cx. C0≒10Cx R2 : current limitting resistor (E/10Ω) E : direct-current voltage source
		Capacitance Change	Within ±10%	
		D.F.	ZM 1.5% max. B 4.0% max.	
		I.R.	5000MΩ min.	
		Dielectric Strength (Between Lead Wires)	No failure.	
11	Temperature Cycle	Appearance	No marked defect.	Temperature cycle should be measured in the following test. Cycle time : 5 cycle Post-treatment : Capacitor should be stored for 4 hrs. at *room condition. 
		Capacitance Change	Within ±10%	
		D.F.	ZM 1.5% max. B 4.0% max.	
		I.R.	5000MΩ min.	
		Dielectric Strength (Between Lead Wires)	No failure.	
12	Strength of Lead	Pull	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 direciton, then returned to its original position and bent 90˚ in the opposite direction at the rate of one bend in 2 to 3 sec.
13	Solderability of Leads		Lead wire should be soldered with uniform coating on the axial direction over $\frac{3}{4}$ of the circumferential direction.	The lead wire of a capacitor should be dipped into a 25% methanol solution of rosin and then into molten solder of 235±5˚C for 2±0.5 sec. In both cases the depth of dipping is up to about 1.5 to 2.0mm from the root of lead wires.

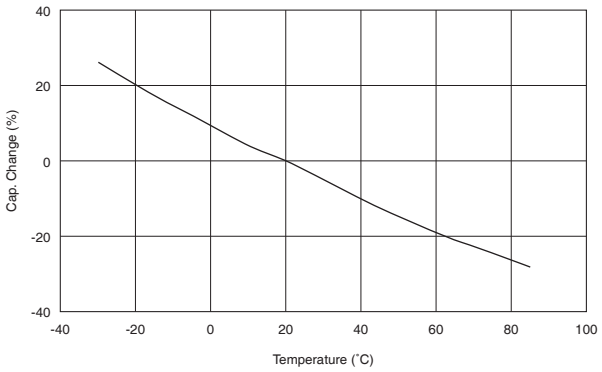
(Note) Tests for Dielectric Strength (between lead wires), Charge Discharge Test, Humidity, Temperature Cycle and Life should be performed with specimens having molded resin (MR1023C : made by Murata) extending over 3mm on all the surface.

* "room condition" Temperature: 15 to 35℃, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

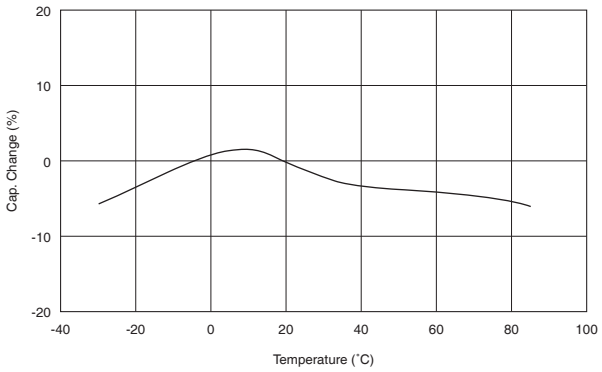
Typical Characteristics Data/Packaging

■ Cap.-Temp. Char.

ZM Characteristics

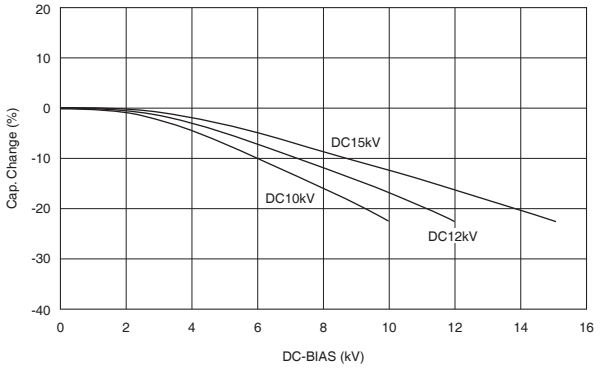


B Characteristics

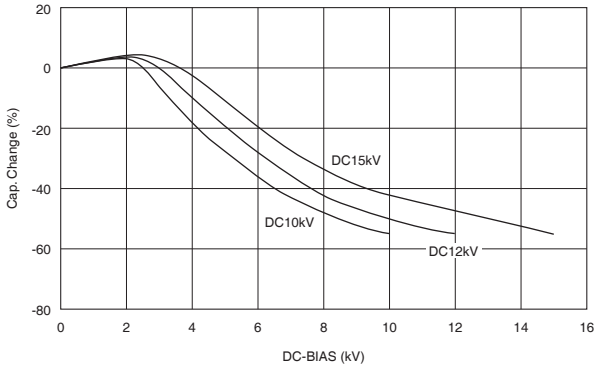


■ Cap.-DC Bias Char.

ZM Characteristics



B Characteristics



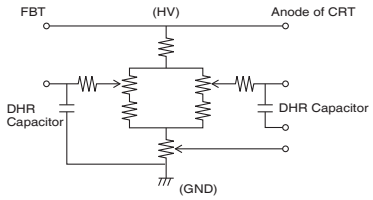
■ Packaging Styles

Bulk
Polyethylene Bag 

Minimum Quantity (Order in Sets Only)	200 (pcs.)
Minimum Order Quantity	200 (pcs.)

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

■ Example



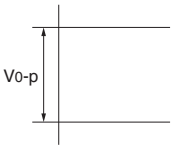
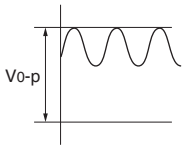
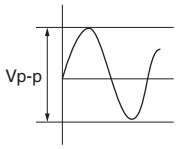
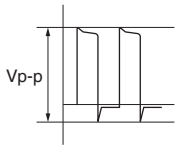
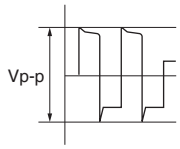
DHR Series ⚠Caution/Notice

■ ⚠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 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 self-generate heat due to dielectric loss. The applied voltage load should be such that the capacitor's self-generated heat is within 10°C at an atmosphere temperature of 25°C. When measuring, use a thermocouple of small thermal capacity-K of ø0.1mm in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations. 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.)

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 (Storage and Operation 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.

The capacitor is designed to be used in insulating media, such as epoxy resin, silicone oil, etc. There must be 3mm or more of insulating media for each direction of the capacitor.

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.

DHR Series ⚠Caution/Notice

■ ⚠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.
   When soldering capacitor with a soldering iron, it should be performed in following conditions.
   Temperature of iron-tip: 400 degrees C. max.
   Soldering iron wattage: 50W max.
   Soldering time: 3.5 sec. max.

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 (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 capacitor

1. Class 1 capacitors
   Capacitance might change a little depending on the surrounding temperature or an applied voltage. Please contact us if you intend to use this product in a strict time constant circuit.
2. Class 2 and 3 capacitors
   Class 2 and 3 capacitors with temperature characteristics B, E and F 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. So, it is not likely to be suitable for use in a time constant circuit. Please contact us if you need detailed information.