



## Reference Specification

DHR Series  
High Voltage Lead Type Disc Ceramic Capacitors for General Purpose

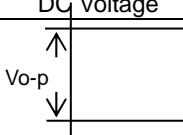
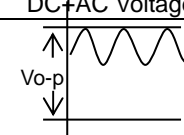
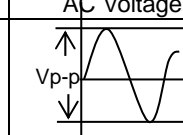
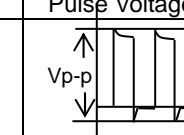
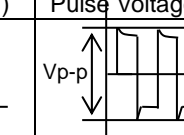
Product specifications in this catalog are as of Feb. 2018, and are subject to change or obsolescence without notice.  
Please consult the approval sheet before ordering. Please read rating and Cautions first.

## Reference only

### ⚠ CAUTION

#### 1. OPERATING VOLTAGE

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the  $V_{p-p}$  value of the applied voltage or the  $V_{o-p}$  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 10 °C on the condition of atmosphere temperature 25 °C. When measuring, use a thermocouple of small thermal capacity-K of  $\phi 0.1\text{mm}$  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.(Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

#### 3. 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 the insulating media, such as epoxy resin, silicone oil, etc.. There must be 3mm or more insulating media for each direction of the capacitor. In case of 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 °C and 15 to 85 %. Use capacitors within 6 months after delivered..

#### 4. VIBRATION AND IMPACT

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

#### 5. 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 °C max.

Soldering iron wattage : 50W max.

Soldering time : 3.5s 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.

#### 6. Limitation of Applications

Please contact us before using our products 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.

- |                                                                                                                |                        |                              |
|----------------------------------------------------------------------------------------------------------------|------------------------|------------------------------|
| 1) Aircraft equipment                                                                                          | 2) Aerospace equipment | 3) Undersea equipment        |
| 4) Power plant control 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. |                        |                              |

## Reference only

### NOTICE

#### Cleaning

To perform ultrasonic cleaning, observe the following conditions.

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

Rinsing time : 5min maximum.

Do not vibrate the PCB/PWB directly.

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

#### Capacitance change of capacitor

- 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.

- 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.

### NOTE

1. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
2. You are requested not to use our product deviating from this specification.

1. Application

This specification is applied to High Voltage Lead Type Disc Ceramic Capacitors DHR series used for General Electric equipment.

Do not use these products in any automotive power train or safety equipment including battery chargers for electric vehicles and plug-in hybrids.

2. Rating

2.1 Operating temperature

-25°C to +100°C

2.2 Part number configuration

<u>DHR</u>	<u>4E</u>	<u>4A</u>	<u>102</u>	<u>K</u>	<u>2B</u>	<u>B</u>
Series	Temperature characteristic	Rated voltage	Capacitance	Capacitance tolerance	Lead code	Packing style code

• Temperature characteristic

Code	Temperature characteristic
4E	ZM

Please confirm detailed specification on [ 5. Specification and test methods].

• Rated voltage

Code	Rated voltage
4A	DC10kV
4B	DC12kV
4C	DC15kV

• Capacitance

The first two digits denote significant figures ; the last digit denotes the multiplier of 10 in pF. ex.) In case of 102.

$$10 \times 10^2 = 1000\text{pF}$$

• Capacitance tolerance

Please refer to [ 4. Part number list ].

• Lead code

Code	Lead style
2B	Straight long
2F	

Please refer to [ 4. Part number list ].

Solder coated copper wire is applied for termination.

• Packing code

Code	Packing type
B	Bulk type

### 3. Marking

① Temperature Characteristic: Omitted for nominal body dia.  $\phi 8$ max.

Marked with •(dot): Nominal body dia.  $\phi 9$  to10.

Marked with ZM : Nominal body dia.  $\phi 11$  to 14.

Marked with Z : Nominal body dia.  $\phi 15$ min.

② Capacitance : marked with 3 figures.

③ Cap. tolerance : marked with code.

(Omitted for nominal body dia.  $\phi 8$ max.)

④ Rated Voltage: marked with letter code.

⑤ Manufacturer's identification : Abbreviation 

(Omitted for nominal body dia.  $\phi 14$ max.)

⑥ Manufactured Date : marked with code.

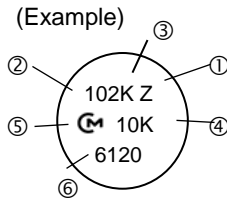
(Omitted for nominal body dia.  $\phi 14$ max.)

ex. 6 12 0

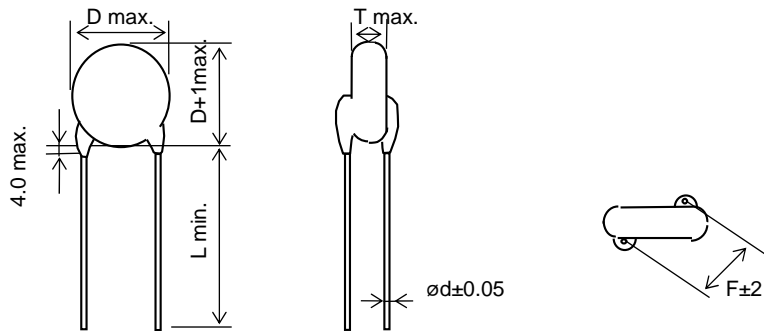
1) The last number of A.D. year

2) 2 numbers of the month January→01, ... , December→12

3) Fix No.



### 4. Part number List



Unit:mm

Temp. Char.	Cap. (pF)	Cap. tol. (%)	Customer part number	Murata Part number	DC Rated. volt. (kV)	Dimensions (mm)					Lead code	Pack qty.
						D	T	F	L	d		
ZM	100	±10		DHR4E4A101K2BB	10	8.0	7.3	9.5	35.0	0.65	2B	200
ZM	150	±10		DHR4E4A151K2BB	10	8.0	7.0	9.5	35.0	0.65	2B	200
ZM	220	±10		DHR4E4A221K2BB	10	9.0	7.0	9.5	35.0	0.65	2B	100
ZM	330	±10		DHR4E4A331K2BB	10	10.0	7.0	9.5	35.0	0.65	2B	100
ZM	470	±10		DHR4E4A471K2BB	10	12.0	7.0	9.5	35.0	0.65	2B	100
ZM	680	±10		DHR4E4A681K2BB	10	13.0	7.0	9.5	35.0	0.65	2B	50
ZM	1000	±10		DHR4E4A102K2BB	10	15.0	7.0	9.5	35.0	0.65	2B	50
ZM	100	±10		DHR4E4B101K2BB	12	8.0	7.3	9.5	35.0	0.65	2B	200
ZM	150	±10		DHR4E4B151K2BB	12	9.0	7.3	9.5	35.0	0.65	2B	100
ZM	220	±10		DHR4E4B221K2BB	12	9.0	7.3	9.5	35.0	0.65	2B	100
ZM	330	±10		DHR4E4B331K2BB	12	11.0	7.3	9.5	35.0	0.65	2B	100
ZM	470	±10		DHR4E4B471K2BB	12	12.0	7.3	9.5	35.0	0.65	2B	100
ZM	680	±10		DHR4E4B681K2BB	12	14.0	7.3	9.5	35.0	0.65	2B	50
ZM	1000	±10		DHR4E4B102K2BB	12	16.0	7.3	9.5	35.0	0.65	2B	50
ZM	100	±10		DHR4E4C101K2BB	15	8.0	8.2	9.5	35.0	0.65	2B	200
ZM	150	±10		DHR4E4C151K2BB	15	9.0	8.2	9.5	35.0	0.65	2B	100
ZM	220	±10		DHR4E4C221K2BB	15	10.0	8.2	9.5	35.0	0.65	2B	100
ZM	330	±10		DHR4E4C331K2BB	15	12.0	8.2	9.5	35.0	0.65	2B	100
ZM	470	±10		DHR4E4C471K2BB	15	13.0	8.2	9.5	35.0	0.65	2B	50
ZM	680	±10		DHR4E4C681K2BB	15	15.0	8.2	9.5	35.0	0.65	2B	50
ZM	1000	±10		DHR4E4C102K2FB	15	18.0	8.2	12.7	35.0	0.8	2F	50

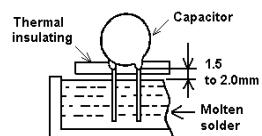
## Reference only

### 5. Specification and test methods

No.	Item		Specification	Test method								
1	Appearance dimensions		No marked defect on appearance form and dimensions. Please refer to [Part number list].	The capacitor should be inspected by naked eyes for visible evidence of defect. Dimensions should be measured with slide calipers.								
2	Marking		To be easily legible.	The capacitor should be inspected by naked eyes.								
3	Dielectric Strength	Between Lead wires	No failure	The capacitors shall not be damage when DC voltage of 150% of the rated voltage are applied between the lead wires for 60 s in insulate liquid or gas. (Charge/discharge current: 50mA max.)								
		Body insulation		The capacitors is placed in the container with metal balls of diameter 1mm so that each lead wires, Short-circuited, is kept approximately 2mm off the balls as shown in the figure, and DC voltage of 3kV is applied for 10 s between capacitor lead wires and small metals. (Charge/discharge current: 50mA max.)								
4	Insulation Resistance (I.R.)	Between Lead wires	10,000MΩ min.	The insulation resistance shall be measured with DC 1kV within 60±5 s of charging.								
5	Capacitance		Within the specified tolerance.	The capacitance shall be measured at 20°C with 1±0.2kHz and AC5V(r.m.s.) max..								
6	Dissipation Factor (D.F.)		1.0% max.	Same condition as capacitance.								
7	Temperature Characteristic		-4700±1000ppm/°C	The capacitance measurement shall be made at each step specified in table. Capacitance change from the value of step 3 shall not exceed the limit specified.								
				<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Step Temp</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">5</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">ZM</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">20±2°C</td> <td style="text-align: center;">85±2°C</td> <td style="text-align: center;">20±2°C</td> </tr> </tbody> </table>	Step Temp	1	2	3	4	5	ZM	-
Step Temp	1	2	3	4	5							
ZM	-	-	20±2°C	85±2°C	20±2°C							
8	Charge Discharge Test	Appearance	No marked defect.	Charge discharge test shall be measured in the following test circuit and cycle. Applied voltage: rated voltage Cycle numbers: 20,000 cycles Post-treatment: Capacitor shall be stored for 4 h at room condition.								
		Capacitance Change	Within ±10%									
		D.F.	1.5% max.									
		I.R.	5,000MΩ min.									
		Dielectric Strength (Between Lead wires)	No failure									
				<p>             E: Direct-current Voltage source              Co: Supplied energy for Cx.              (Co≠10Cx)              Cx: Specimen              R1: Circuit protective resistor (300kΩ)              R2: Current limiting Resistor (E/10Ω)           </p>								
9	Strength of Lead	Pull	Lead wire shall not cut off. Capacitor shall not be broken.	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° to 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.								

## Reference only

No.	Item	Specification	Test method
10	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 shall be dipped into a 25% ethanol solution of rosin and then into molten solder of 235±5°C for 2±0.5 s. In both cases the depth of dipping 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
11	Soldering Effect (Non-preheat)	Appearance	No marked defect.
		Capacitance Change	Within±10%
		Dielectric Strength (Between lead wires)	No failure
12	Soldering effect (On-preheat)	Appearance	No marked defect.
		Capacitance Change	Within±10%
		Dielectric Strength (Between lead wires)	No failure
13	Humidity (Under steady state)	Appearance	No marked defect.
		Capacitance Change	Within±10%
		D.F.	1.5% max.
		I.R.	5000MΩ min.
		Dielectric Strength (Between lead wires)	No failure
14	Life (High temperature load)	Appearance	No marked defect.
		Capacitance Change	Within±10%
		D.F.	1.5% max.
		I.R.	5000MΩ min.
		Dielectric Strength (Between lead wires)	No failure
15	Temperature Cycling	Appearance	No marked defect.
		Capacitance Change	Within±10%
		D.F.	1.5% max.
		I.R.	5000MΩ min.
		Dielectric Strength (Between lead wires)	No failure



Post-treatment : Capacitor should be stored for 24±2 h at room condition.

Set the capacitor for 240±8 h at 40±2°C in 90 to 95% humidity.  
Post-treatment: Capacitor shall be stored for 1 to 2 h at room condition.  
(Charge/discharge current: 50mA max.)

Apply a DC voltage of 125% of the rated voltage for 1000+48/-0 h in silicon oil at 100±2°C.  
Post-treatment: Capacitor shall be stored for 24±2 h at room condition.  
(Charge/discharge current:50mA max.)

Step	Temperature(°C)	Time
1	-30	30 min
2	+100	30 min

Temperature cycling shall be measured in the following test.  
Cycle numbers: 5 cycles  
Post-treatment: Capacitor shall be stored for 4 h at room condition.

Note) Tests for Dielectric strength(Between lead wires) ,Charge/Discharge test, Humidity , Life and Temperature Cycling shall be performed with specimens having molded resin (MR1023C:made by Murata) extending over 3mm on all the surface.

Room condition

Temperature:15~35°C

Relative Humidity:45~75%

Atmospheric pressure:86~106kPa

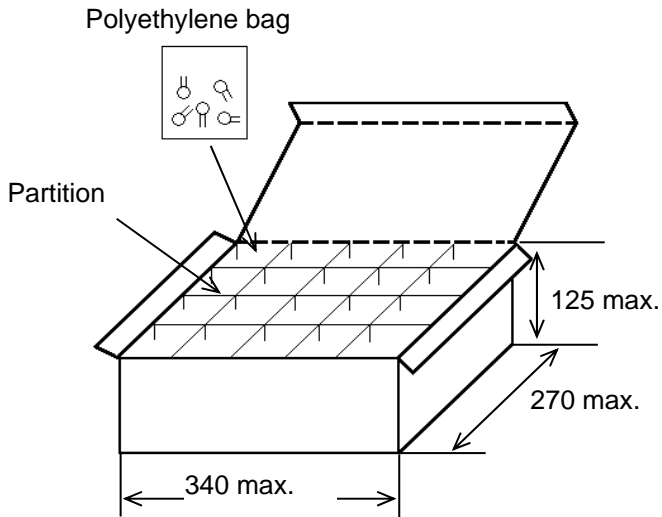
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6. Packing Specification

Packaging Styles : Bulk type  
(Packing style code : B)

The number of packing = Packing quantity × n<sup>\*1</sup> × n<sup>\*2</sup>

The size of packing case and packing way



\*1 : Please refer to [Part number list].

\*2 : Standard n = 20 (bag)

Note)

The outer package and the number of outer packing be changed by the order getting amount.

Unit : mm



EU RoHS  
RoHS指令への対応

This products of the following crresponds to EU RoHS  
当製品は以下の欧州RoHSに対応しています。

(1) RoHS

EU RoHS 2011/65/EC compliance  
2011/65/EC(改正RoHS指令)に対応

maximum concentration values tolerated by weight in homogeneous materials

- ・1000 ppm maximum Lead
- ・1000 ppm maximum Mercury
- ・100 ppm maximum Cadmium
- ・1000 ppm maximum Hexavalent chromium
- ・1000 ppm maximum Polybrominated biphenyls (PBB)
- ・1000 ppm maximum Polybrominated diphenyl ethers (PBDE)

鉛:1000ppm以下

水銀:1000ppm以下

カドミウム:100ppm以下

六価クロム:1000ppm以下

ポリ臭化ビフェニル(PBB):1000ppm以下

ポリ臭化ジフェニルエーテル(PBDE):1000ppm以下