

# Application Guide Radial-Leaded Dipped Mica Capacitors

## Specifications

**Capacitance** is within tolerance when measured at these frequencies:

- 1–1000 pF @ 1MHz
- > 1000 pF @ 1 kHz

**Dissipation Factor** limits are below. Dissipation factor is equal to  $DF=2\pi fRC$ , where  $f$  is the test frequency,  $R$  is the equivalent series resistance, and  $C$  is the capacitance. For other capacitance values, see Figure 1.

Capacitance Factor	Dissipation
75–1,000 pF MHz	0.00075 max at 1 MHz
1,100–3,300 pF	0.0014 max at 1 kHz
3,600–9,100 pF	0.0013 max at 1 kHz
10,000 pF	0.0012 max at 1 kHz

**Quality Factor (Q)** is the reciprocal of dissipation factor.

**Insulation Resistance** for capacitances up to 10,000 pF is greater than 100 GΩ at 25 °C and greater than 10 GΩ at 125 °C. For other capacitance values and temperatures, see Figure 2.

**Withstanding Voltage** is 2 times the rated voltage, and can be applied up to 5 seconds without damage.

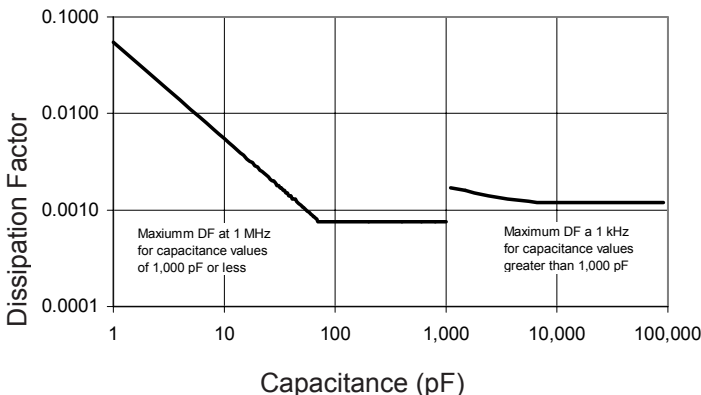


Figure 1. DF vs. Capacitance

**Temperature Coefficient and Capacitance Drift:** Measure the capacitors' capacitance at 25 °C, -55 °C, 25 °C, 125 °C (or 150 °C) and at 25 °C after stabilizing at each temperature. The capacitance will meet the limits of the Characteristic table shown in Ordering Information.

**Solderability:** After an eight-hour steam aging, coat leads with rosin flux (R) and immerse in molten 245 °C ±5% 60/40 tin/lead solder. Solder coverage will be no less than 95% when examined at 10X magnification.

**Surge Voltage:** Standard dipped capacitors will withstand 500 Vdc max peak transients above rated voltage. For example, in flyback regulators with less than 500 Vdc bias, you may use 500 Vdc-rated capacitors provided that the switching transient peaks are less than 1,000 V.

**Voltage Coefficient:** The change in capacitance from 0 volts to rated voltage is less than 0.1%.

**Pulse Handling:** Standard dipped capacitors will withstand an unlimited number of pulses with a  $dV/dt$  of 100,000 V/μs tested per IEC 384-1. Smaller capacitance ratings can withstand even faster  $dV/dt$ —ratings have been tested one million discharges at rated voltage into a 4.7 Ω resistor with no change in capacitance. For a 100 pF, 500 Vdc unit, that's a peak  $dV/dt$  in excess of 1,000,000 V/μs. The  $dV/dt$  is expressed by this relationship:

$$dV/dt = V \frac{R_d C}{V_{dc}}$$

$V$  = rated voltage,  $V_{dc}$   
 $R_d$  = minimum discharge resistor, Ω  
 $C$  = rated capacitance, μF  
 This is the initial rate of discharge into  $R_d$ .

**Marking** is in accordance with EIA RS153B and includes “CD” as our manufacturer's symbol, nominal capacitance in pF, capacitance tolerance, and dc working voltage followed by V, if other than 500 Vdc.

Miniature dipped units (CD6 and CD7) are marked with capacitance in pF and tolerance letter designation.

MIL-C-5 units (Type CM) are in accordance with MIL-C-5.

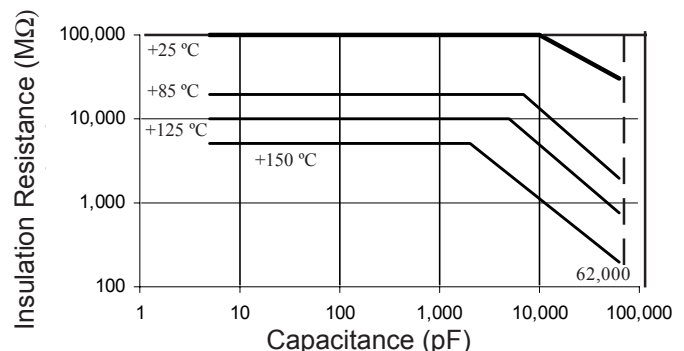


Figure 2. IR vs. Capacitance

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## Specifications

### Moisture Resistance:

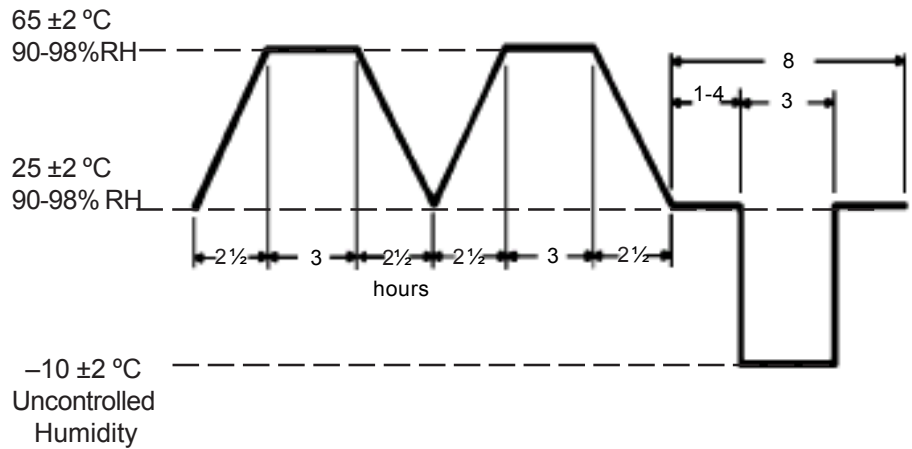
Capacitors will meet the requirements of MIL-STD-202, Method 106F as outlined here and diagrammed on the right. Refer to MIL-STD-202 for details. For miniature Types CD6 and CD7, use one 24-hour cycle rather than 10.

1. Dry capacitors for 24 hours in a  $50 \pm 2$  °C oven and then allow to stabilize at room temperature.

2. Subject the capacitors to 10 24 - hour continuous cycles with relative humidity and temperature as shown.

3. 24 hours after completion of the last cycle, the capacitors will show no visual damage and will meet the after-test limits below.

### 24-Hour Moisture Resistance Cycle



**Life Test:** Subject the capacitors to maximum operating temperature ( $+125$  °C or  $+150$  °C) with 1.5 times rated voltage applied for 2,000 hours. There will be no visual damage and the capacitors will meet the after-test limits below

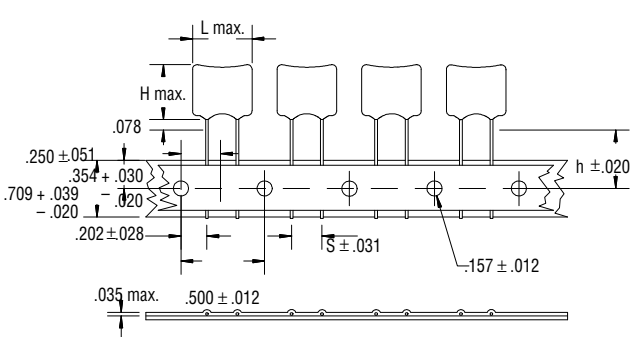
### After-Test Limits

Test	Withstand Voltage	Insulation Resistance	Capacitance Change (whichever is greater)	DF	Q
Moisture Resistance	IL	30 GΩ	NV $\pm 1\%$ or $\pm 1$ pF	150% IL	2/3xIL
Life Test	IL	IL	NV $\pm 1\%$ or $\pm 1$ pF	150% IL	2/3xIL

IL = Initial Limit      NV = Nominal Value

# Application Guide Radial-Leaded Dipped Mica Capacitors

## Specifications — Dipped Mica Capacitors for Auto Insertion

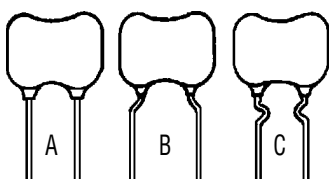


For tape and reel or ammo-packed packaging, specify on the order.

For high-volume auto insertion applications, the best value choice is Type CDA15. Reel packing is also available for Types CD4, CD5, CD6, CD7, CD10, CD15, CD17, CD19, CM04, and CM05.

Reel Packing with 0.200" lead spacing is available for Types CD5, CD6, CD7, and CD10. To order 0.200" lead spacing, change the Catalog Number by inserting the letter "A" in the CDE Type. Example: Type CD5 capacitors, reel packed with 0.200" lead spacing, is designated as Type CDA5.

## Lead Configuration



See the table below for available reel-packed types, lead configurations, lead spacing, lead material, pieces per reel and pieces per ammo packs.

Packaging will be in accordance with EIA-468. Dimension "h" will be 16mm for formed leads or 18mm for straight leads. 20mm is available on special request. Specify reel or ammo on your purchase order.

Type Number	Lead Spacing	Lead Configuration	Lead Material	Capacitance Range	Range of Pieces per Reel	Range of Pieces per Ammo Pack
CD4	0.100	A	CCS	1– 560 pF 561– 780 pF 781–1500 pF	1000–2500 1000–2000 1000–1500	1000–2000 1000–1500 1000
CD5 CDA5	0.120 0.200	A B	CCS	1–158 pF 159–256 pF 257–400 pF	1000–2500 1000–2000 1000–1500	1000–2000 1000–1500 1000
CD6 CDA6	0.172 0.200	A	CCS	1– 120 pF	1000–2500	1000–2000
CD7 CDA7	0.172 0.200	A A (up to 820 pF) C (All values)	CCS	1– 560 pF 561– 780 pF 781–1500 pF	1000–2500 1000–2000 1000–1500	1000–2000 1000–1500 1000
D10 CD10/CM04 CDA10	0.141 0.200	A C	CCS	1– 265 pF 266– 470 pF 471–1200 pF	1000–2500 1000–2000 1000–1500	1000–2000 1000–1500 1000
CD15/CM05 CD17	0.234	A	CCS	1– 330 pF 331– 470 pF 471–1500 pF	1000–2500 1000–2000 1000–1500	1000–2000 1000–1500 1000
CD16 CDV16	0.234	A	CCS	1– 330 pF 331– 470 pF 471–1500 pF 1501–2000 pF > 2000 pF	1000–2500 1000–2000 1000–1500 800 500	1000–2000 1000–1500 1000 600 600
CDA15 CDA17	0.200	A, C	Copper	1– 330 pF 331– 470 pF 471–1500 pF	1000–2500 1000–2000 1000–1500	1000–2000 1000–1500 1000
CD19	0.344	A	CCS	10–1000 pF 1001–1500 pF 1501–3000 pF 3001–5000 pF	1000 800 600 400	800 800 600 400

CCS = copper clad steel

CDA indicates 0.200" lead spacing for a bulk part. If you want it configured for auto insertion, it must be so noted on the order (i.e. tape/reel or ammo pack the referenced parts)