Application Guide Radial-Leaded Dipped Mica Capacitors

**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 below.

![DF vs. Capacitance](image)

**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 below.

![IR vs. Capacitance](image)

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

**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 °C 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:

\[
dV/dt = V / (R_d C)
\]

\( V = \) rated voltage, Vdc
\( R_d = \) 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 “CDM” as our manufacturer’s symbol, nominal capacitance in pF, capacitance tolerance, and dc working voltage followed by V, if other than 500 Vdc.

**Moisture Resistance**

Capacitors will meet the requirements of MIL-STD-202, Method 106F as outlined here and diagrammed below. Refer to MIL-STD-202 for details.

1. Dry capacitors for 24 hours in a 50 ±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 on the next page.

![24-Hour Moisture Resistance Cycle](image)

**Moisture Resistance Cycle**

65 ±2 °C 90-98% RH

25 ±2 °C 90-98% RH

–10 ±2 °C

Uncontrolled Humidity
**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**

<table>
<thead>
<tr>
<th>Test</th>
<th>Withstand</th>
<th>Insulation</th>
<th>Capacitance Change</th>
<th>DF</th>
<th>Q (whichever is greater)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>IL</td>
<td>30 GΩ</td>
<td>NV ±1% or ±1 pF</td>
<td>IL</td>
<td>150%</td>
</tr>
<tr>
<td>Life Test</td>
<td>IL</td>
<td>IL</td>
<td>NV ±1% or ±1 pF</td>
<td>IL</td>
<td>150%</td>
</tr>
</tbody>
</table>

IL = Initial Limit  NV = Nominal Value

**Dipped Mica Capacitors for Auto Insertion**

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

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 16 mm for formed leads or 18 mm for straight leads. 20 mm is available on special request. Specify reel or ammo on your purchase order.

<table>
<thead>
<tr>
<th>Type Number</th>
<th>Lead Spacing</th>
<th>Lead Material</th>
<th>Capacitance Range</th>
<th>Range of Pieces per Reel</th>
<th>Range of Pieces per Ammo Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>D10 CD10</td>
<td>0.141</td>
<td>CCS</td>
<td>1 - 249 pF</td>
<td>1000 - 2500</td>
<td>1000 - 1500</td>
</tr>
<tr>
<td>CD15</td>
<td>0.234</td>
<td>CCS</td>
<td>1 - 330 pF</td>
<td>1000 - 2500</td>
<td>1000 - 1500</td>
</tr>
<tr>
<td>CD16 CDV16</td>
<td>0.234</td>
<td>CCS</td>
<td>1 - 330 pF</td>
<td>1000 - 2500</td>
<td>1000 - 1500</td>
</tr>
<tr>
<td>CD19</td>
<td>0.344</td>
<td>CCS</td>
<td>10 - 1000 pF</td>
<td>1000 - 2500</td>
<td>1000 - 1500</td>
</tr>
</tbody>
</table>

CCS = copper clad steel

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