Type CD Low Resistance Precision Chip Resistors

Low Resistance Chip down to 0.010Ω at ±1% with unique Pedestal Terminal Design for Current Sense in Hybrid and SMT Applications

Type CD Low Resistance Precision Chip Resistors utilize the proven Caddock Micronox® resistance films to achieve the unique low resistance range in this family. The special performance features of the Type CD Low Resistance Precision Film Resistor include:

- **Style FC** - Flip Chip version for surface mount applications.
- **Style WB** - Wire Bond version for hybrid applications with metallized back surface for solder down heat sinking of the chip, includes bondable termination pedestals to receive aluminum wire bonds.
- Resistance as low as 0.010 ohm at ±1%.
- Pedestal terminals in this design provide an ultra low resistance connection pad which maintains the precision 0.010Ω ±1% at the point of customer Kelvin connection to the resistor chip. The pedestal terminal with its copper core also provides heat spreading which enhances the high power handling capability.
- Thermal resistance is provided to optimize high power designs when utilizing higher thermal conductivity circuit board substrates such as IMS or Alumina.
- High pulse handling and overload capability.
- Low inductance provides excellent high frequency and pulse response.

**Style FC - Flip Chip Version** is a surface mount version with solderable pedestal terminals for flip chip soldering.

<table>
<thead>
<tr>
<th>Model</th>
<th>Resistance</th>
<th>Power Capability Information</th>
<th>Power Rating at 70°C (see note 1)</th>
<th>Tolerance CD2520FC ±1% Standard.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD2520FC Standard Resistance Values:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Rating</td>
<td>Thermal Resistance - $R_{θJC}$ to Solder Pad (C) (see note 2)</td>
<td>Max. Chip Temperature</td>
<td>Dimensions in inches and (millimeters)</td>
<td>Comments</td>
</tr>
<tr>
<td>CD2015FC</td>
<td>0.010 Ω</td>
<td>0.20 Ω</td>
<td>1.0 Watt</td>
<td>High Power Applications</td>
</tr>
<tr>
<td>CD2520FC</td>
<td>0.010 Ω</td>
<td>0.20 Ω</td>
<td>1.5 Watts</td>
<td>9.0°C/Watt</td>
</tr>
</tbody>
</table>

**Note 1:** General Applications - The power rating for general applications is based upon 0.5 sq. in. (300 mm²) of termination pad or trace area (2 oz. copper) connected to each end of the resistor. Maximum chip temperature is 150°C. Use Derating Curve to derate appropriately for the maximum ambient temperature and for the temperature limitations of the adjacent materials.

**Note 2:** Thermal Resistance - In High Power Applications where the circuit board material provides high heat sinking benefits (such as IMS, Alumina, or other) the thermal resistance of the chip resistor is useful to establish the maximum power capability of the chip resistor in the application. The film temperature is measured at the center of the resistor element and solder pad temperature at the center of the solderable pedestal (point X in the recommended circuit layout shown below). Maximum temperature of the chip resistor (at the center of chip) should not exceed 150°C through the temperature range of the application.

**Recommended Circuit Board Layout (current and sense connections):**

Fig. 1A: Recommended Kelvin layout.

C = Current connection
S = Sense connection

Custom resistance values and non-standard tolerances can be manufactured for high quantity applications. Please contact Caddock Applications Engineering.
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**Style WB - Wire Bond Version** is a hybrid mountable version with copper pedestal terminals and an aluminum surface layer for wire bonding. The back surface of these devices is metallized for solder attachment of the chip resistor to a heat sinking substrate.

#### General Information for Type CD - Style FC and Style WB - Chip Resistors

**Specifications:**
- **Temperature Coefficient:** TC referenced to +25°C, AR taken at +150°C.
- **Inductance:** Less than 5 nH typical.
- **Load Life:** 1000 hours at rated power, based upon 150°C max. chip temperature, \( \Delta R (0.5\% + 0.0005 \text{ ohm}) \).
- **Momentary Overload:** 1.5 times rated power, for 5 seconds, \( \Delta R (0.5\% + 0.0005 \text{ ohm}) \).
- **Operating Temperature:** -55°C to +150°C.

**Solder attachment notes:**
- During soldering of the Type CD Resistor the soldering temperature profile must not cause the pedestal terminals of this device to exceed 220°C.
- **Style FC - Flip Chip version** resistors have a bare ceramic back surface. The recommended solder for flip chip soldering is 62Sn / 36Pb / 2Ag.
- **Style WB - Wire Bond version** resistors have a metallized back surface for soldering to a substrate or a heat sink.

**Packaging information:**
- **Style FC:** flip chip resistors, are shipped with the bare ceramic side up in the pocket, with the solderable pedestals facing down.
- **Style WB:** wire bondable resistors, are shipped with the wire bondable pedestals facing up in the pocket.

**Location for Sense (Potential) Connection:**
- Note: The sense connection for each pedestal is positioned inboard of the current connection (single or multiple current wires).

#### Dimensions and Remarks

- **CD2015WBA**
  - Dimensions: 0.200" x 0.150"
  - Resistor Value: 0.010 Ω to 0.200 Ω
  - TC: 6.35 ± 0.150 Ω
- **CD2520WBA**
  - Dimensions: 0.250" x 0.200"
  - Resistor Value: 0.010 Ω to 0.200 Ω
  - TC: 6.35 ± 0.300 Ω

**Comments:**
- Terminals have an Aluminum surface layer for wire bonding. Aluminum wire to be used for bonding.

**Ordering Information:**
- **Type CD**
  - Style: FC or WBA
  - Resistor Value (Ω)
  - See charts for availability
  - Tolerance: ±0.010 Ω and above.

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**CD2015WBA Standard Resistance Values:**
- Tolerance CD2015WBA ±1% Standard.
  - 0.010 Ω: 0.005 Ω to 0.075 Ω
  - 0.015 Ω: 0.003 Ω to 0.10 Ω
  - 0.020 Ω: 0.040 Ω to 0.20 Ω
  - 0.025 Ω: 0.050 Ω

**CD2520WBA Standard Resistance Values:**
- Tolerance CD2520WBA ±1% Standard.
  - 0.010 Ω: 0.005 Ω to 0.075 Ω
  - 0.015 Ω: 0.003 Ω to 0.10 Ω
  - 0.020 Ω: 0.040 Ω to 0.20 Ω
  - 0.025 Ω: 0.050 Ω

**Custom resistance values and non-standard tolerances can be manufactured for high quantity applications. Please contact Caddock Applications Engineering.**