Technical Data Sheet

THICK FILM MATERIALS

Product Type: Resistors

9300 Series

Low TCR Resistor Series

Description
Series 9300 resistors were developed for use in multilayer hybrid circuits. This system provides excellent environmental stability, low firing sensitivity and low TCR’s. Resistance values range from 100 ohms/sq up to 100 Mohms/sq.

Key Benefits
- REACH\(^1\) and ROHS\(^2\) compliant
- Low TCRs
- Excellent stability on dielectric

Typical Properties

<table>
<thead>
<tr>
<th>9300 Series(^1)</th>
<th>9321</th>
<th>9331</th>
<th>9333</th>
<th>9341</th>
<th>9343</th>
<th>9351</th>
<th>9361</th>
<th>9371</th>
<th>9371</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistivity(^2) (Ω/□)</td>
<td>100</td>
<td>1K</td>
<td>3K</td>
<td>10K</td>
<td>30K</td>
<td>10K</td>
<td>100K</td>
<td>1M</td>
<td>10M</td>
</tr>
<tr>
<td>Tolerance %</td>
<td>± 10</td>
<td>± 10</td>
<td>± 10</td>
<td>± 10</td>
<td>± 10</td>
<td>± 10</td>
<td>± 10</td>
<td>± 10</td>
<td>± 10</td>
</tr>
<tr>
<td>Short term overload voltage(^3) (V/mm)</td>
<td>27</td>
<td>71</td>
<td>125</td>
<td>205</td>
<td>275</td>
<td>470</td>
<td>775</td>
<td>1200</td>
<td>480</td>
</tr>
<tr>
<td>Standard working voltage(^4) (V/mm)</td>
<td>10.8</td>
<td>28.4</td>
<td>50</td>
<td>82</td>
<td>110</td>
<td>188</td>
<td>310</td>
<td>480</td>
<td>240</td>
</tr>
<tr>
<td>Quan tech noise(^5) (db)</td>
<td>&lt; -35</td>
<td>&lt; -25</td>
<td>-13</td>
<td>&gt; -17</td>
<td>&gt; -16</td>
<td>&gt; -15</td>
<td>&gt; -0.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ESD(^6) (2000V/mm)</td>
<td>± 0.1 %</td>
<td>± 0.1 %</td>
<td>0.2 %</td>
<td>± 0.4 %</td>
<td>± 0.5 %</td>
<td>± 0.3 %</td>
<td>± 0.1 %</td>
<td>&lt; 0.1 %</td>
<td>0.1 %</td>
</tr>
</tbody>
</table>

TEST CONDITIONS

1. Resistor properties based on laboratory tests using recommended processing conditions;
   - Termination: 3504 Palladium Silver Conductor pre-fired at 850 °C
   - Substrate: 96 % alumina
   - Printing: 280 mesh stainless screen, 0.5 mil emulsion thickness
   - Dried thickness: 20 – 22 μm
   - Firing: 30 minute cycle to peak temperature of 850 °C for 10 minutes.
2. Resistor geometry: 1mm x 1mm
   - CTCR: -55 °C to +25 °C and HTCR: +25 °C to +125 °C.
3. Short Term overload voltage. Voltage required (5 second duration) to induce a resistance change to 0.1% in a 1mm x 1mm resistor at 25 °C.
4. Standard working voltage = 0.4 x short term overload voltage.
5. Resistor geometry 5mm x 1mm.
6. Electrostatic Discharge. Resistance change after two X 2000 volt pulses on a 1mm x 1mm resistor.
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Low TCR Resistor Series

**Thinner:**
RV-372

**Warranty:**
Material guaranteed to meet specifications for 6 months from date of shipment.

**Storage:**
Store in a dry location at 5 – 25 °C.
DO NOT REFRIGERATE.
Allow paste to come to room temperature prior to opening. Spatulate well before using, as settling may occur during storage.

**Legend:**

1) REACH compliant according to the latest * Annex XIV to Regulation (EC) of the European Parliament and of the council on the Registration, Evaluation, Authorisation and Restriction of Chemicals ("REACH") by European Chemicals Agency and its subsequent amendments; the material does not contain any substance listed in Annex XIV.

2) RoHS compliant according to the latest * Directives (European Union) of Restriction of Hazardous Substances ("RoHS") and its subsequent amendments (including the exceptions related to Pb)