RT/duroid® 6002
High Frequency Laminates

RT/duroid® 6002 microwave material was the first low loss and low dielectric constant laminate to offer superior electrical and mechanical properties essential in designing complex microwave structures which are mechanically reliable and electrically stable.

The thermal coefficient of dielectric constant is extremely low from -55°C to +150°C (-67°F to 302°F) which provides the designers of filters, oscillators and delay lines the electrical stability needed in today’s demanding applications.

A low Z axis coefficient of thermal expansion (CTE) ensures excellent reliability of plated through-holes. RT/duroid 6002 materials have been successfully temperature cycled (-55°C to 125°C [-67°F to 257°F]) for over 5000 cycles without a single via failure.

Excellent dimensional stability (0.2 to 0.5 mils/inch) is achieved by matching the X and Y coefficient of expansion to copper. This often eliminates double etching to achieve tight positional tolerances.

The low tensile modulus (X,Y) greatly reduces the stress applied to solder joints and allows the expansion of the laminate to be constrained by a minimum amount of low CTE metal, (6 ppm/°C) further increasing surface mount reliability.

½ oz. to 2 oz./ft.² electrodeposited copper, ½ oz. to 1 oz. reverse treated electrodeposited copper or ½ oz. to 2 oz./ft.² rolled copper may be specified as cladding on dielectric thicknesses from 0.005” to 0.125” (0.13 to 3.18mm). RT/duroid 6002 laminate is also available clad with aluminum, brass, or copper plates and resistive foils.

Applications particularly suited to the unique properties of RT/duroid 6002 material include flat and non-planar structures such as antennas, complex multi-layer circuits with inter-layer connections, and microwave circuits for aerospace designs in hostile environments. RT/duroid 6002 laminates have Underwriters Laboratories recognition under classification 94V-0 (Vertical Flammability Test).
## Property | Typical Value | Direction | Units | Conditions | Test Method |
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Constant, $\varepsilon_r$ Process</td>
<td>2.94 ± 0.04</td>
<td>Z</td>
<td>-</td>
<td>10GHz/23°C</td>
<td>IPC-TM-650, 2.5.5.5</td>
</tr>
<tr>
<td>[2]Dielectric Constant, $\varepsilon_r$ Design</td>
<td>2.94</td>
<td>8GHz-40GHz</td>
<td>Differential Phase Length Method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissipation Factor, TAN $\delta$</td>
<td>0.0012</td>
<td>Z</td>
<td>-</td>
<td>10 GHz/23°C</td>
<td>IPC-TM-650, 2.5.5.5</td>
</tr>
<tr>
<td>Thermal Coefficient of $\varepsilon_r$</td>
<td>+12</td>
<td>Z</td>
<td>ppm/°C</td>
<td>10 GHz 0-100°C</td>
<td>IPC-TM-650, 2.5.5.5</td>
</tr>
<tr>
<td>Volume Resistivity</td>
<td>$10^4$</td>
<td>Z</td>
<td>Mohm cm</td>
<td>A</td>
<td>ASTM D257</td>
</tr>
<tr>
<td>Surface Resistivity</td>
<td>$10^7$</td>
<td>Z</td>
<td>Mohm</td>
<td>A</td>
<td>ASTM D257</td>
</tr>
<tr>
<td>Tensile Modulus</td>
<td>828 (120)</td>
<td>X,Y</td>
<td>MPa (kpsi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultimate Stress</td>
<td>6.9 (1.0)</td>
<td>X,Y</td>
<td>MPa (kpsi)</td>
<td>23°C</td>
<td>ASTM D638</td>
</tr>
<tr>
<td>Ultimate Strain</td>
<td>7.3</td>
<td>X,Y</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressive Modulus</td>
<td>2482 (360)</td>
<td>Z</td>
<td>MPa (kpsi)</td>
<td></td>
<td>ASTM D638</td>
</tr>
<tr>
<td>Moisture Absorption</td>
<td>0.02</td>
<td>-</td>
<td>%</td>
<td>D48/50</td>
<td>IPC-TM-650, 2.6.2.1 ASTM D570</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>0.60</td>
<td>-</td>
<td>W/m/K</td>
<td>80°C</td>
<td>ASTM C518</td>
</tr>
<tr>
<td>Coefficient of Thermal Expansion (-55 to 288 °C)</td>
<td>16 16 24</td>
<td>X Y Z</td>
<td>ppm/°C</td>
<td>23°C/50% RH</td>
<td>IPC-TM-650 2.4.41</td>
</tr>
<tr>
<td>$T_d$</td>
<td>500</td>
<td>°C TGA</td>
<td></td>
<td></td>
<td>ASTM D3850</td>
</tr>
<tr>
<td>Density</td>
<td>2.1</td>
<td>gm/cm³</td>
<td></td>
<td></td>
<td>ASTM D792</td>
</tr>
<tr>
<td>Specific Heat</td>
<td>0.93 (0.22)</td>
<td>-</td>
<td>J/g/K (BTU/lb/°F)</td>
<td>-</td>
<td>Calculated</td>
</tr>
<tr>
<td>Copper Peel</td>
<td>8.9 (1.6)</td>
<td>lbs/in (N/mm)</td>
<td></td>
<td></td>
<td>IPC-TM-650 2.4.8</td>
</tr>
<tr>
<td>Flammability</td>
<td>V-O</td>
<td></td>
<td></td>
<td></td>
<td>UL94</td>
</tr>
<tr>
<td>Lead-Free Process Compatible</td>
<td>YES</td>
<td></td>
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</tbody>
</table>

**NOTES:**
Typical values are a representation of an average value of the population of the property. For specification values contact Rogers Corporation.

[1] SI Units given first, with other frequently used units in parentheses.

[2] The design Dk is an average number from several different tested lots of material and on the most common thickness/s. If more detailed information is required please contact Rogers Corporation or refer to Roger’s technical reports on the Rogers Technology Support Hub at http://www.rogerscorp.com.

<table>
<thead>
<tr>
<th>Standard Thickness</th>
<th>Standard Panel Size</th>
<th>Standard Copper Cladding</th>
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</thead>
<tbody>
<tr>
<td>0.010” (0.254mm)</td>
<td>18” X 12” (457mm X 305mm)</td>
<td>½ oz. (18µm) and 1oz (35µm) electrodedeposited and rolled copper cladding</td>
</tr>
<tr>
<td>0.020” (0.508mm)</td>
<td>18” X 24” (457mm X 610mm)</td>
<td>Other claddings may be available. Contact customer service.</td>
</tr>
<tr>
<td>0.030” (0.762mm)</td>
<td></td>
<td></td>
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<tr>
<td>0.060” (1.524mm)</td>
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</tbody>
</table>

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