I-Speed® is a 180°C Tg FR-4 resin system for multilayer PWB applications where maximum thermal performance and reliability are required.

I-Speed® laminate and prepreg products are manufactured with Isolas’ patentable high performance multi-functional resin system, reinforced with electrical grade (E-glass) glass fabric. This system delivers a 15% improvement in Z-axis expansion and offers 25% more electrical bandwidth (lower loss) than competitive products in this space. These properties coupled with superior moisture resistance at reflow, result in a product that bridges the gap from both a thermal and electrical perspective.

The I-Speed® resin system is laser fluorescing and UV blocking for maximum compatibility with Automated Optical Inspection (AOI) systems, optical positioning systems and photo imagable solder mask imaging.

Product Attributes
High Thermal Reliability, High Speed Digital, High Density Interconnect

Typical Market Applications

ORDERING INFORMATION:
Contact your local sales representative or visit www.isola-group.com for further information.

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Data Sheet
Tg 180°C
Td 360°C
Dk 3.64
Df 0.0060
IPC-4101 - / 98 / 99 / 101 / 126
UL - File Number E41625
Last Updated May 17, 2019
Revision No: D

Product Features
· Industry Recognition
  - UL File Number: E41625
  - Qualified to UL’s MCIL Program
  - RoHS Compliant
· Performance Attributes
  - Lead-free assembly compatible
· Processing Advantages
  - FR-4 process compatible
  - UV blocking and AOI fluorescence

Product Availability
· Standard Material Offering: Laminate
  - Available in full size sheet or panel form
· Copper Foil Type
  - HTE Grade 3
  - VLP-2 (2 micron), 1 oz and below
  - RTF (Reverse Treat Foil)
· Copper Weight
  - ½ to 2 oz (18 to 70 µm) available
  - Heavier copper available
  - Thinner copper foil available
· Standard Material Offering: Prepreg
  - Roll or panel form
  - Tooling of prepreg panels
· Glass Fabric Availability
  - E-glass
  - Square weave glass
  - Mechanically spread glass
<table>
<thead>
<tr>
<th>Property</th>
<th>Typical Value</th>
<th>Units</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass Transition Temperature (Tg) by DSC</td>
<td>180</td>
<td>°C</td>
<td>2.4.25C</td>
</tr>
<tr>
<td>Decomposition Temperature (Td) by TGA @ 5% weight loss</td>
<td>360</td>
<td>°C</td>
<td>2.4.24.6</td>
</tr>
<tr>
<td>Time to Delaminate by TMA (Copper removed) A. T260 B. T288</td>
<td>&gt;60</td>
<td>Minutes</td>
<td>2.4.24.1</td>
</tr>
<tr>
<td>Z-Axis CTE A. Pre-Tg B. Post-Tg C. 50 to 260°C, (Total Expansion)</td>
<td>60 230 2.7</td>
<td>ppm/°C ppm/°C %</td>
<td>2.4.24C</td>
</tr>
<tr>
<td>X/Y-Axis CTE Pre-Tg</td>
<td>16</td>
<td>ppm/°C</td>
<td>2.4.24C</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>0.4</td>
<td>W/mK</td>
<td>ASTM E1952</td>
</tr>
<tr>
<td>Thermal Stress 10 sec @ 288°C (550.4°F) A. Unetched B. Etched</td>
<td>Pass</td>
<td>Pass Visual</td>
<td>2.4.13.1</td>
</tr>
<tr>
<td>DK, Permittivity A. @ 1 GHz B. @ 2 GHz C. @ 5 GHz D. @ 10 GHz</td>
<td>3.65 3.64 3.63 3.63</td>
<td>—</td>
<td>2.5.5.9 Bereskin Stripline Bereskin Stripline Bereskin Stripline Bereskin Stripline</td>
</tr>
<tr>
<td>Df, Loss Tangent A. @ 1 GHz B. @ 2 GHz C. @ 5 GHz D. @ 10 GHz</td>
<td>0.0058 0.0060 0.0067 0.0071</td>
<td>—</td>
<td>2.5.5.9 Bereskin Stripline Bereskin Stripline Bereskin Stripline Bereskin Stripline</td>
</tr>
<tr>
<td>Volume Resistivity A. After moisture resistance B. At elevated temperature</td>
<td>4.4 x 10^7 9.4 x 10^7</td>
<td>MQ-cm</td>
<td>2.5.17.1</td>
</tr>
<tr>
<td>Surface Resistivity A. After moisture resistance B. At elevated temperature</td>
<td>2.6 x 10^6 2.1 x 10^8</td>
<td>MQ</td>
<td>2.5.17.1</td>
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<tr>
<td>Dielectric Breakdown</td>
<td>&gt;50</td>
<td>kV</td>
<td>2.5.6B</td>
</tr>
<tr>
<td>Arc Resistance</td>
<td>137</td>
<td>Seconds</td>
<td>2.5.1B</td>
</tr>
<tr>
<td>Electric Strength (Laminate &amp; laminated prepreg)</td>
<td>70 (1741)</td>
<td>kV/mm (V/mil)</td>
<td>2.5.6.2A</td>
</tr>
<tr>
<td>Comparative Tracking Index (CTI)</td>
<td>3 (175-249)</td>
<td>Class (Volts)</td>
<td>UL 746A ASTM D3638</td>
</tr>
<tr>
<td>Peel Strength A. Low profile copper foil and very low profile copper foil all copper foil &gt;17 μm (0.669 mil) B. Standard profile copper 1. After thermal stress 2. After process solutions</td>
<td>1.14 (6.5) 0.96 (5.5) 0.90 (5.1)</td>
<td>N/mm (lb/inch)</td>
<td>2.4.8C 2.4.8.2A 2.4.8.3</td>
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<tr>
<td>Flexural Strength A. Length direction B. Cross direction</td>
<td>67.0 62.0</td>
<td>ksi</td>
<td>2.4.4B</td>
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<tr>
<td>Tensile Strength A. Length direction B. Cross direction</td>
<td>48.3 35.6</td>
<td>ksi</td>
<td>ASTM D3039</td>
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<tr>
<td>Young's Modulus A. Length direction B. Cross direction</td>
<td>2868 2730</td>
<td>ksi</td>
<td>ASTM D790-15e2</td>
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<tr>
<td>Poisson's Ratio A. Length direction B. Cross direction</td>
<td>0.173 0.152</td>
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<td>ASTM D3039</td>
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<td>Moisture Absorption</td>
<td>0.061</td>
<td>%</td>
<td>2.6.2.1A</td>
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<tr>
<td>Flammability (Laminate &amp; laminated prepreg)</td>
<td>V-0</td>
<td>Rating</td>
<td>UL 94</td>
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<tr>
<td>Relative Thermal Index (RTI)</td>
<td>130</td>
<td>°C</td>
<td>UL 796</td>
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</table>

The data, while believed to be accurate and based on analytical methods considered to be reliable, is for information purposes only. Any sales of these products will be governed by the terms and conditions of the agreement under which they are sold.
Visit our site http://www.isola-group.com for more details.

Revisions:
A: Initial release - 4/17
B: Corrected units for Flexural and Tensile Strength - 8/18
C: Removed Low Dk glass option - 11/18
D: Change MOT to RTI 5/19