Process Guidelines

Halogen-free
Laminate R-1533
Prepreg R-1530
High reliability halogen-free multi-layer circuit board materials
General

Material Storage
R-1533 laminate and R-1530 prepreg is the same as our conventional FR-4 material. Laminate should be stored flat in a cool dry environment. Avoid bending or scratching the laminate surface.
When possible store the laminate in the original container.
Prepreg should be stored flat in a cool dry controlled environment, 68 F(20C) or less and 50% RH or less.

Laminate Surface Preparation
Regular Shiny Copper can be cleaned using industry standard chemical clean or mechanical clean.
Reverse Treat Copper should be cleaned using industry standard chemical clean.

Inner Layer Bond Treatment
Black or Brown Oxide can be used.
Alternative Oxide Treatment using a Peroxide/Sulfuric etch technology can be also used.

Drying
Dry finished inner layers completely to remove any absorbed moisture or surface moisture.
A racked bake at 225 F(105 C) for 20-30 minutes is preferred. For conveyorized alternative oxide processing, some equipment may have sufficient drying capability. However, a racked bake is suggested.

Note The following guidelines are provided as general recommendations. Process optimization may be necessary.
Drilling

Drilling parameters should be adjusted depending on hole size, layer count, panel thickness, stack count and stack height etc.

### Drilling parameters in general condition

<table>
<thead>
<tr>
<th>diameter (mm)</th>
<th>spindle rpm</th>
<th>velocity (m/min)</th>
<th>infeed (m/min)</th>
<th>chipload (μ m/rev)</th>
<th>infeed (m/min)</th>
<th>chipload (μ m/rev)</th>
<th>bit life (hits)</th>
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</thead>
<tbody>
<tr>
<td>0.20</td>
<td>160,000</td>
<td>100</td>
<td>1.6</td>
<td>10</td>
<td>2.4</td>
<td>15</td>
<td>750–2,000</td>
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<td>0.25</td>
<td>160,000</td>
<td>126</td>
<td>1.8</td>
<td>11</td>
<td>2.8</td>
<td>18</td>
<td>750–2,000</td>
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<td>151</td>
<td>1.9</td>
<td>12</td>
<td>3.2</td>
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<tr>
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<td>137,000</td>
<td>151</td>
<td>1.8</td>
<td>13</td>
<td>3.0</td>
<td>22</td>
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<tr>
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<td>151</td>
<td>1.8</td>
<td>15</td>
<td>2.9</td>
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<td>17</td>
<td>2.7</td>
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<tr>
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<td>96,000</td>
<td>151</td>
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<td>80,000</td>
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<td>1.7</td>
<td>21</td>
<td>2.6</td>
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<tr>
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<td>74,000</td>
<td>151</td>
<td>1.7</td>
<td>23</td>
<td>2.6</td>
<td>35</td>
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<td>149</td>
<td>1.7</td>
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<td>0.80</td>
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</table>

**Note:** The following guidelines are provided as general recommendations. Process optimization may be necessary.
Laminate

Curing temperature time will be determined by the thickness of multilayer package being laminate.
Laminate parameters should be adjusted depending on board thickness, stack count and stack thickness etc.

Please Note: below is NOT a press control program. The graph represents the recommended pressure/temperature profile that the actual panels are subjected to during the lamination program cycle.

**Vacuum:** 100 Torr (13.3 kPa) or less, Stop at 60 min from start (at 90 - 130°C)

**Heat up rate:** 1.5 ~ 3.0 C/min (90 – 140°C)

**Pressure:** 2.0 - 3.5 MPa

**Platen temperature:** 5 min (1 - 10 min)

**Product temperature:** 170 - 210°C for over 50 min
The weight loss of R-1533 laminate and R-1530 prepreg is larger than that of R-1766 as our conventional FR-4 material. Desmear parameters should be adjusted depending on board thickness, stack count and stack thickness etc.

<table>
<thead>
<tr>
<th>process</th>
<th>reagent type</th>
<th>temp. (C)</th>
<th>time (min)</th>
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<tbody>
<tr>
<td>Swelling</td>
<td>alkaline</td>
<td>65-85</td>
<td>5-10</td>
</tr>
<tr>
<td>Etching</td>
<td>permanganate</td>
<td>70-85</td>
<td>10-15</td>
</tr>
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</table>

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<th>temp. (C)</th>
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</tr>
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<tbody>
<tr>
<td>Swelling</td>
<td>organic solvent</td>
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<td>6-10</td>
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<tr>
<td>Etching</td>
<td>permanganate</td>
<td>70-85</td>
<td>10-15</td>
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<table>
<thead>
<tr>
<th>Part number</th>
<th>Weight loss ratio</th>
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<tbody>
<tr>
<td>R-1533</td>
<td>1.3 - 1.7</td>
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<tr>
<td>R-1766</td>
<td>1.0</td>
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</table>
【Notes before you use】

・Prior to adoption and use of a product contained in the Process Guideline, please verify the suitability for your application by your quality testing, evaluation, etc.

・We would like to have a delivery specifications mutually agreed for the product that you have decided to use.
   The agreements defined in the delivery specifications are assigned higher priority.

・Please note that images shown may somewhat differ from the actual product in color.

・Please note that specifications and external design are subject to change for product improvement without notice.

・For details on products in the Process Guideline, please contact your distributor or our sales department.

【Safety Information】

・Before using the product, please read the delivery specifications carefully or contact the distributor from which you purchased the product or our sales department in order to use the product correctly.

・The products in the Process Guideline are Electronic circuit board materials for electronic and electrical devices. Please do not use them for other than specified use.

Please Contact us of more

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