ULTEM™ polyetherimide film UTF120 is a high heat and high energy density dielectric film that meets the most stringent technical demands for use in professional-grade dielectric film capacitors. UTF120 film is also available for multiple applications requiring high temperature resistance during processing or application.

ULTEM UTF120 FILM VALUE PROPOSITIONS

• Stable properties through a range of temperatures (-40°C to +150°C) and frequencies, including
  - high temperature dimensional stability
  - high mechanical stability
• Inherent flame retardance
• Good insulation resistance
• High dielectric constant (Dk) and low dissipation factor (Df)
• Excellent metal adhesion
• Low thickness with high thickness uniformity (σd)
• High voltage breakdown strength, very clean and defect-free
• Capability to pass industry standard 260°C reflow soldering process

<table>
<thead>
<tr>
<th></th>
<th>BOPP</th>
<th>PET</th>
<th>PEN</th>
<th>PPS</th>
<th>PC</th>
<th>ULTEM UTF120 film</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic BDS 23°C (v/µm)</td>
<td>690</td>
<td>800</td>
<td>660</td>
<td>503</td>
<td>660</td>
<td>590</td>
</tr>
<tr>
<td>Intrinsic BDS 150°C (v/µm)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>465</td>
<td>NA</td>
<td>510</td>
</tr>
<tr>
<td>Dk at 1 kHz</td>
<td>2.2</td>
<td>3.3</td>
<td>3.2</td>
<td>3.0</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>Df at 1 kHz</td>
<td>0.0007</td>
<td>0.0040</td>
<td>0.0040</td>
<td>0.0005</td>
<td>0.0022</td>
<td>0.0020</td>
</tr>
<tr>
<td>Temperature Range (°C)</td>
<td>-55 to +105</td>
<td>-55 to +125</td>
<td>-55 to +140</td>
<td>-55 to +150</td>
<td>-55 to +125</td>
<td>-55 to +150</td>
</tr>
<tr>
<td>Self-Healing 23°C</td>
<td>***</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>*</td>
</tr>
<tr>
<td>Self-Healing 150°C</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Metallization</td>
<td>Requires plasma</td>
<td>**</td>
<td>**</td>
<td>*</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Solder Reflow Capable</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Available Thickness (µm)</td>
<td>&gt;2.1</td>
<td>&gt;0.5</td>
<td>&gt;1.2</td>
<td>&gt;1.2</td>
<td>&gt;2.0</td>
<td>4, 5, 7 &amp; 10µm</td>
</tr>
<tr>
<td>Cost</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
<td>High</td>
</tr>
<tr>
<td>Certainty of Supply</td>
<td>***</td>
<td>***</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>Overall Performance at 150°C</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>**</td>
</tr>
</tbody>
</table>

*** Excellent  ** Good  * Moderate  * Poor  * None
ULTEM™ FILM

Developed to offer excellent handling through metallization, capacitor winding and flattening, ULTEM UTF120 film is processable on existing equipment and has been validated with both film-foil and metalized electrodes including flat and tapered metalized electrode designs as well as patterned electrodes.

UTF120 CAN BE USED IN F.E.:

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>5µm</td>
<td>Composite tapes</td>
</tr>
<tr>
<td>5µm</td>
<td>3D circuit boards</td>
</tr>
<tr>
<td>7µm</td>
<td>Wireless devices</td>
</tr>
<tr>
<td>10µm</td>
<td>Acoustic devices (speakers)</td>
</tr>
</tbody>
</table>

PRODUCT PORTFOLIO

<table>
<thead>
<tr>
<th>Grade Name</th>
<th>Available Thicknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTF120</td>
<td>4, 5, 7 and 10µm</td>
</tr>
</tbody>
</table>

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