Copper Foil for Fine Patterning
PF-EL

Profile-Free Copper Foil is Suitable for Fine line Patterning with Surface Roughness 1.0~2.0μm (adhesive side).

- Features
  - PF-EL is a copper foil that is appropriate for fine line patterning with semi-additive process (SAP) using rough shapes of primer made with the copper profile.
  - PF-EL has high peel strength for plating copper.
  - High flexural modulus substrates with using prepregs.

- Applications
  - Semiconductor package substrates
  - High density multi-layer PWB

### Standard Specifications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Copper Foil Thickness(μm)</th>
<th>Special Surface Treatment(μm)</th>
<th>Roughness(μm)</th>
<th>Composition</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-EL-12</td>
<td>12</td>
<td>4</td>
<td>Ra:0.3~0.4</td>
<td>Ultra low profile copper foil</td>
<td>SAP*1</td>
</tr>
<tr>
<td>PF-EL-3</td>
<td>3</td>
<td>2, 4</td>
<td>Ra:0.3~0.5</td>
<td>Special surface treatment</td>
<td>SAP*1</td>
</tr>
<tr>
<td>PF-EL-2</td>
<td>2</td>
<td>2, 4</td>
<td>Ra:0.3~0.5</td>
<td>MSAP*2</td>
<td></td>
</tr>
<tr>
<td>PF-EL-1.5</td>
<td>1.5</td>
<td>2</td>
<td>Ra:0.3~0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF-EL-1.5SP</td>
<td>1.5</td>
<td>2</td>
<td>Ra:0.2~0.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1) After lamination of the material to the prepreg, the copper foil is etched out, and the special surface treatment with appropriate roughness made by a replica of the copper profile etched out remains on prepreg surface. This process is SAP using this replica.

*2) Semi additive process using thin copper foil as seed layer for having E less copper + copper on both patterning and via plating purpose.

### Surface

- Ra: 0.3~0.5
- Ra: 0.2~0.3

PF-EL

PF-EL SP

### Fine patterning with SAP

- Design: L/S=10/10μm with PF-EL (Exposure LD1)
- Design: L/S=7/7μm with PF-EL SP (Exposure LD1)
- Design: L/S=5/5μm with PF-EL SP (Exposure Stepper)
**Fine patterning process**

**Build-up materials**

- Build-up material
- Core
- Laminate
- Via-hole formation
- Desmear
- SAP

**PF-EL**

- PF-EL
- Prepreg
- Core
- Press
- Via-hole formation & Desmear
- Copper foil Etching
- SAP

※MCL-E-770G Type (R), Copper foil 1.5μm with plating copper 20μm

※MCL-E-770G Type (R), plating copper thickness 20μm