Chemical Mechanical Planarization (CMP) Pad Attachment Solutions using Double Coated Adhesive Transfer Tapes

This technical bulletin presents a selection guide of 3M attachment solutions for polishing pads used in the Chemical Mechanical Planarization (CMP) process for the production of semiconductor devices. CMP is a combination of chemical and mechanical processes. A polishing pad is attached to the platen, which generally is a ceramic or metallic based material. A slurry lubricant and the polishing pad work together to remove unwanted materials from a silicon wafer resulting in high performance chips. Common materials used to manufacture polishing pads are polyurethane and polyethylene foams. The pads can be either a single layer or a multi-layered construction and are often die cut or hole punched. A multi-layered pad (called a stacked pad) is normally a combination of a soft lower pad and a hard top pad. Two key applications for attachment of CMP polishing pads are:

1. Attaching polishing pad to the platen.
2. Attaching the top pad to the bottom pad in a stacked pad construction.

The attachment solutions offered here should be of interest to pad manufacturers in the CMP industry (or other polishing applications). For more detailed performance information, please refer to technical data pages for the suggested products.

Since 1980, various types of 3M™ Double Coated Adhesive Transfer Tapes have been developed and used to attach polishing pads to the platen in the CMP industry. The most commonly used products are the family of 3M™ Double Coated Tapes 442, due to their chemical resistance and easy removal ability from the platen. With the increased demand on service life and chemical resistance of various types of slurries, new double coated tapes have been developed to meet these stringent requirements. The following table provides a list of 3M™ Double Coated Tapes currently introduced in the CMP industry to attach polishing pads to the platen. For detailed information on performance of the suggested 3M tapes, please refer to data pages of these products.
## Technical Bulletin

### Chemical Mechanical Planarization (CMP) Pad Attachment

#### Solutions using Double Coated Adhesive Transfer Tapes

<table>
<thead>
<tr>
<th>Pad to Platen Attachment</th>
<th>3M™ Double Coated Tape</th>
<th>Tape Construction: F: face side</th>
<th>C: carrier</th>
<th>B: back side (platen side)</th>
<th>Release Liner</th>
<th>Adhesion on Stainless Steel</th>
<th>Max. Width</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>442F</td>
<td>F: 0.0015&quot; natural rubber</td>
<td></td>
<td>B: 0.0015&quot; natural rubber</td>
<td>0.003&quot; clear PET film</td>
<td>70 oz/in (76 N/10cm)</td>
<td>54&quot; (1372 mm)</td>
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<tr>
<td></td>
<td></td>
<td>C: 0.001&quot; PET film</td>
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<tr>
<td></td>
<td>442KW</td>
<td>Same as above</td>
<td></td>
<td></td>
<td>0.0045&quot; white polycoated paper</td>
<td>70 oz/in (76 N/10cm)</td>
<td>54&quot; (1372 mm)</td>
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<tr>
<td></td>
<td></td>
<td>B: 0.001&quot; PET film</td>
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<tr>
<td></td>
<td>442DL</td>
<td>Same as above</td>
<td></td>
<td></td>
<td>Double liner version of 442KW F: 0.002&quot; clear PET film</td>
<td>70 oz/in (76 N/10cm)</td>
<td>54&quot; (1372 mm)</td>
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<tr>
<td></td>
<td></td>
<td>(a wider version of 442KW)</td>
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<tr>
<td></td>
<td>442W</td>
<td>Same as above</td>
<td></td>
<td></td>
<td>0.0045&quot; white polycoated paper</td>
<td>70 oz/in (76 N/10cm)</td>
<td>80&quot; (2032 mm)</td>
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<tr>
<td></td>
<td></td>
<td>(a wider version of 442KW)</td>
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<tr>
<td></td>
<td>456CR</td>
<td>F: 0.0015&quot; natural rubber</td>
<td></td>
<td>B: 0.0015&quot; blue rubber</td>
<td>0.003&quot; clear PET film</td>
<td>F: 70 oz/in B: 47 oz/in</td>
<td>54&quot; (1372 mm)</td>
</tr>
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<td></td>
<td></td>
<td>C: 0.001&quot; PET film</td>
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<td></td>
<td>9731</td>
<td>F: 0.0016&quot; 350 acrylic</td>
<td></td>
<td>B: 0.0029: silicone adhesive</td>
<td>Double lined: Tan polycoated Kraft paper &amp; non-silicone clear PET</td>
<td>F 121 oz/in B: 48 oz/in</td>
<td>38&quot; (965 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C: 0.001&quot; PET film</td>
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</tbody>
</table>

#### Solutions for Pad to Pad Attachment

The pad to pad attachment for reinforcement of the overall pad performance has received a lot of interest by many CMP pad manufacturers. The adhesive used for pad to pad attachment not only needs to have high adhesion strength, but also needs to perform well in harsh chemical and heat environment. 3M™ Double Coated Tapes utilize various types of high performance adhesives having excellent long term adhesion strength with excellent chemical and heat resistance properties. Depending upon types of pad materials, the following table provides a list of 3M™ Double Coated Adhesive Transfer Tapes for pad-to-pad attachment. For detailed information on performance of the suggested 3M tapes, please refer to data pages of these products.
## Chemical Mechanical Planarization (CMP) Pad Attachment Solutions using Double Coated Adhesive Transfer Tapes

| Pad to Pad Attachment | 3M™ Adhesive Transfer Tape | Tape Construction:  
F: face side  
C: carrier  
B: back side | Release Liner | Adhesion on Plastic/Foam | Max. Width |
|----------------------|---------------------------|--------------------------|-------------|----------------|-------------|
| 9690                 | F: 0.0028" 300MP acrylic  
C: 0.0005" PET film  
B: 0.0023" 300MP acrylic | 0.0062" tan polycoated Kraft paper | Good/Excellent | 54"  
(1372mm) |
| 9490LE               | F: 0.0028" 300MP acrylic  
C: 0.0005" PET film  
B: 0.0034" 300MP acrylic | 0.0042" tan polycoated Kraft paper | Good/Excellent | 54"  
(1372mm) |
| 9500PC               | F: 0.0023" 350 acrylic  
C: 0.001" PET film  
B: 0.0023" 350 acrylic | 0.0045" natural polycoated Kraft paper | Good/Excellent | 48"  
(1219mm) |
| 9495LE               | F: 0.0028" 300LSE acrylic  
C: 0.0005" PET film  
B: 0.0034" 300LSE acrylic | 0.0042" tan polycoated Kraft paper | Good/Excellent | 54"  
(1372mm) |
| 9490LE               | F: 0.0028" 300MP acrylic  
C: 0.0005" PET film  
B: 0.0034" 300LSE acrylic | 0.0042" tan polycoated Kraft paper | Good/Excellent | 54"  
(1372mm) |
| 9795                 | F: 0.0023" 420 acrylic  
C: 0.0005" PET film  
B: 0.0023" 420 acrylic | 0.0065" tan polycoated Kraft paper | Good/Excellent | 54"  
(1372mm) |
| 9799                 | F: 0.0035" 420 acrylic  
C: 0.002" PET film  
B: 0.0035" 420 acrylic | 0.0065" tan polycoated Kraft paper | Good/Excellent | 48"  
(1219mm) |
| 9598BF               | F: 0.0035" 200MP acrylic  
C: 0.0005" black PET film  
B: 0.0035" 200MP acrylic | 0.002" clear PET | Good/Excellent | 54"  
(1372mm) |
| 9731                 | F: 0.0016" 350 acrylic  
C: 0.001" PET film  
B: 0.0029" silicone adhesive | F: 0.005" tan polycoated Kraft paper  
B: 0.0029" non-silicone PET | Good | 38"  
(965mm) |
| 443                  | F: 0.002" synthetic rubber  
C: 0.001" PET film  
B: 0.002" synthetic rubber | 0.0042" tan polycoated Kraft paper | Good/Excellent | 48"  
(1219mm) |
Application Techniques

To obtain optimum adhesion, all substrate surfaces must be clean and dry. A typical cleaning solvent is an isopropyl alcohol/water solution with a mixture ratio of 50:50 (rubbing alcohol).*

Ideal tape application temperature range is 70°F to 100°F (21°C to 38°C). Initial tape application to surfaces at temperatures below 50°F (10°C) is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is generally satisfactory.

Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and helps improve bond strength. The bond strength will increase as the adhesive flows onto the surface. At room temperature approximately 50% of the ultimate strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. In some cases ultimate bond strength can be achieved more quickly by exposure of the bond to elevated temperatures (e.g. 150°F or 66°C for one hour). This provides better adhesive wet-out onto the surface.

Please also refer to the technical bulletin of “Lamination Techniques for Converters for Laminating Adhesives” for more useful information on lamination techniques.

*When using solvents, read and follow the manufacturer’s precautions and directions for use.

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