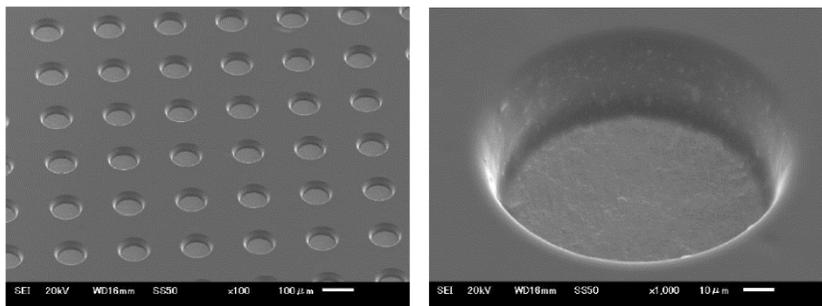


FLEXFINER SERIES ***(UL Name: FLEXFINER-AA)***

PHOTOIMAGEABLE COVER LAY FILM

- ④ **Dry Film Type for Surface Uniformity**
- ④ **Various thicknesses (15 – 40 microns)**
- ④ **Simplified Coating Process for Flex Panel**
- ④ **Capable of Tenting Vias**
- ④ **UL Listing of VTM-0**
- ④ **Available in Amber only**
- ④ **Exposes on Standard and LDI equipment**
- ④ **RoHS and Outgassing Compliant**
- ④ **Compatible with Lead-Free Processing**
- ④ **Fine Dam Resolution**
- ④ **Withstands ENIG & Immersion Tin**
- ④ **Halogen-Free**



TECHNICAL DATA SHEET

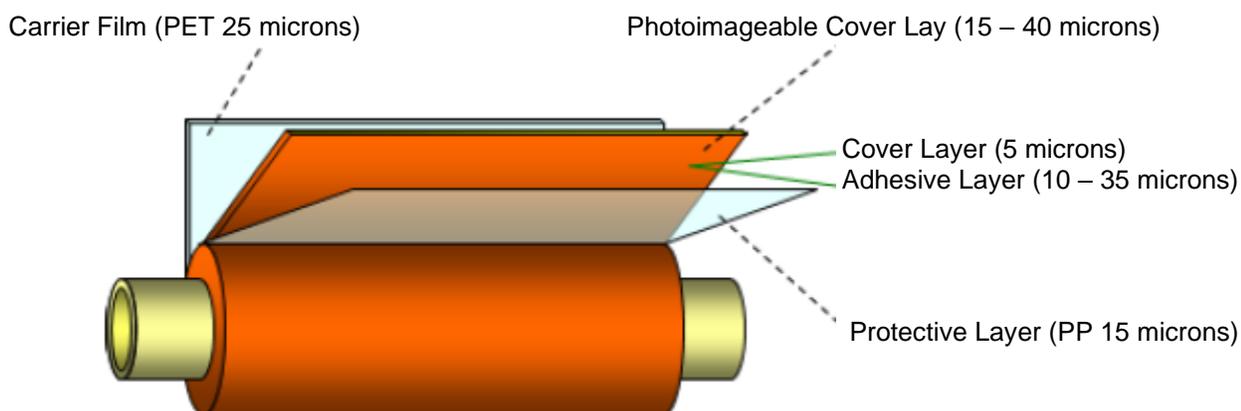
PROCESSING PARAMETERS FOR FLEXFINER

FLEXFINER is a photoimageable cover lay dry film to make fine patterns possible with photolithography process. **FLEXFINER** offers excellent heat resistance and bendability because it consists of two layers with top cover layer and bottom adhesive layer. **FLEXFINER** has fine pattern capabilities due to being photoimageable. Compared to conventional thermal curable cover lay films, **FLEXFINER** does not require punching process with expensive metal mold. All Taiyo America products comply with the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

FLEXFINER SERIES COMPONENTS:

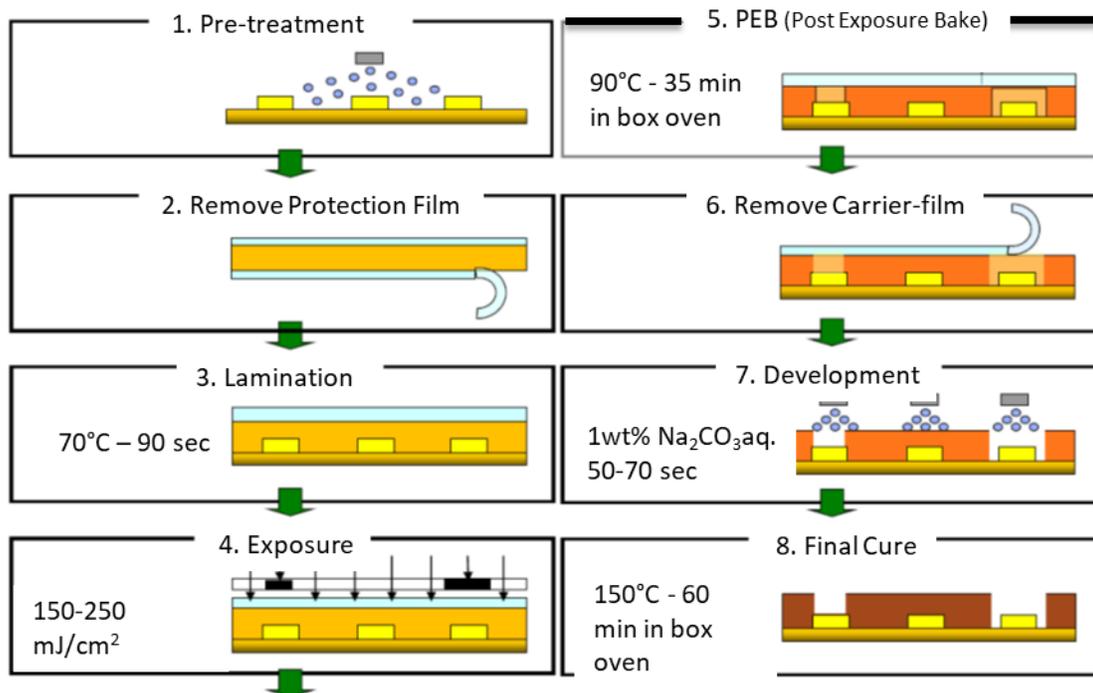
| PRODUCT: | FLEXFINER 15SA | FLEXFINER 20SA | FLEXFINER 30SA | FLEXFINER 40SA | | | | | | | | |
|------------------------|-----------------------------------------------------------------------------------------------------------|--------------------|------------------------|-----------------------------------------------------------------------------------------------------------|--------------------|------------------------|-----------------------------------------------------------------------------------------------------------|--------------------|------------------------|-----------------------------------------------------------------------------------------------------------|--------------------|------------------------|
| Feature | Ultra-Thin | Low Stiffness | Standard | For high Circuits | | | | | | | | |
| Thickness | 15 microns | 20 microns | 30 microns | 40 microns | | | | | | | | |
| Structure | <table border="1"> <tr><td>Cover layer (5 μm)</td></tr> <tr><td>Adhesive layer (10 μm)</td></tr> </table> | Cover layer (5 μm) | Adhesive layer (10 μm) | <table border="1"> <tr><td>Cover layer (5 μm)</td></tr> <tr><td>Adhesive layer (15 μm)</td></tr> </table> | Cover layer (5 μm) | Adhesive layer (15 μm) | <table border="1"> <tr><td>Cover layer (5 μm)</td></tr> <tr><td>Adhesive layer (25 μm)</td></tr> </table> | Cover layer (5 μm) | Adhesive layer (25 μm) | <table border="1"> <tr><td>Cover layer (5 μm)</td></tr> <tr><td>Adhesive layer (35 μm)</td></tr> </table> | Cover layer (5 μm) | Adhesive layer (35 μm) |
| Cover layer (5 μm) | | | | | | | | | | | | |
| Adhesive layer (10 μm) | | | | | | | | | | | | |
| Cover layer (5 μm) | | | | | | | | | | | | |
| Adhesive layer (15 μm) | | | | | | | | | | | | |
| Cover layer (5 μm) | | | | | | | | | | | | |
| Adhesive layer (25 μm) | | | | | | | | | | | | |
| Cover layer (5 μm) | | | | | | | | | | | | |
| Adhesive layer (35 μm) | | | | | | | | | | | | |
| Film Width / Length | 247 mm or 495 mm / 50 meters | | | | | | | | | | | |
| Storage | -15°C or below in a dark place for 2 years | | | | | | | | | | | |
| Manufacturing Site | Taiyo Ink Japan | | | | | | | | | | | |
| Film Thawing | Thaw film at a temperature between 20-25C for minimum 4 hours | | | | | | | | | | | |
| Shelf life after Thaw | 5 days at 25°C | | | | | | | | | | | |

FLEXFINER FILM STRUCTURE:



PROCESSING PARAMETERS FOR FLEXFINER

MANUFACTURING PROCESS USING FLEXFINER:



PRE-CLEANING

Prior to solder mask application, the printed circuit board surface needs to be cleaned. Various cleaning methods include Pumice, Aluminum Oxide, Mechanical Brush, and Chemical Clean. All these methods will provide a clean surface for the application of **FLEXFINER**. Hold time after cleaning the printed circuit board should be held to a minimum to reduce the oxidation of the copper surfaces.

REMOVE PROTECTIVE FILM AND LAMINATION:

Remove Protective Film prior to placing on circuit board

Method: Double-sided vacuum Laminator

- Lamination Temperature: 70°C
- Lamination Time: 90 seconds

TECHNICAL DATA SHEET



PROCESSING PARAMETERS FOR FLEXFINER

EXPOSURE

FLEXFINER uses UV-LED curing technology to define solder mask dams and features. The spectral sensitivity is in the area of 365 nm – 405nm. Exposure times will vary by power, light source, wavelength and age of the light source. Below are guidelines for exposing.

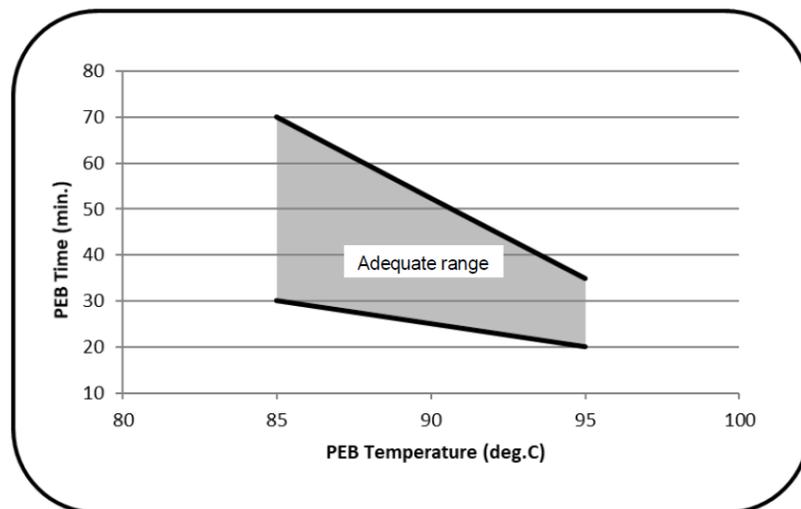
- Exposure Unit: Standard Flood Exposure or Laser Direct Imaging
- Stouffer Step 21: Clear 8 minimum (on metal)
- Energy: 200mJ / cm² minimum

POST EXPOSURE BAKE (PEB)

The post exposure bake is needed for excellent heat resistance and stability of fine openings for **FLEXFINER**. The optimum dwell time and oven temperature will depend on oven type, oven loading, air circulation, exhaust rate, and ramp times. Excessive times and temperature will result in difficulty in developing the film off of the printed circuit board.

Typical process is as follows:

- Oven Temperature: 85 - 95°C (185 - 203°F)
- Dwell Time: 20 - 40 minutes



TECHNICAL DATA SHEET

PROCESSING PARAMETERS FOR FLEXFINER

Removal of Carrier Film and DEVELOPMENT

Peel the carrier film after the printed circuit board has reached room temperature after the PEB process. Appearance defects will occur if peeling is done prior to cooling.

FLEXFINER is developed in an aqueous sodium or potassium carbonate solution. Developing can be done in either a horizontal or vertical machine.

- Solution: 1% by wt. Sodium Carbonate or 1.2% Potassium Carbonate
- pH: 10.6 or greater
- Temperature: 85 - 95°F (29 - 35°C)
- Spray Pressure: 25 - 45 psi (1.7 – 3.1 bars)
- Dwell Time in developing chamber: 40 - 80 seconds
- Water rinse is needed to remove developer solution followed by a drying step

FINAL CURE

FLEXFINER requires a thermal cure to insure optimal final property performance. Thermal curing can be done in a batch oven or conveyORIZED oven.

- Temperature: 275 – 300°F (135 – 149°C)
 - Time at Temperature: 45 – 60 minutes
-

For Process Optimization please contact your local Taiyo America Representative

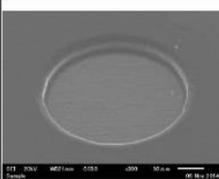
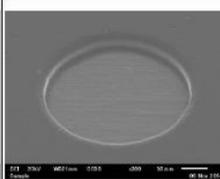
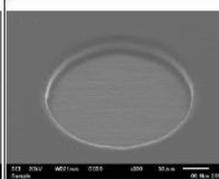
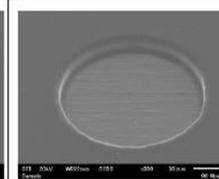
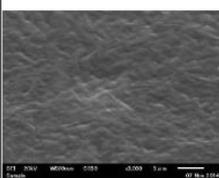
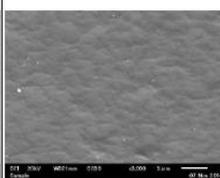
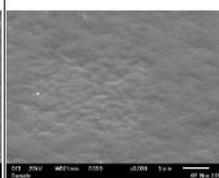
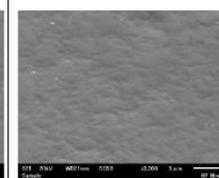
Taiyo America, Inc. (TAIYO) warrants its products to be free from defects in materials and workmanship for the specified warranty period (**FLEXFINER Warranty period is 1 year**) provided the customer has, at all times, stored the film at a temperature of -15°C (5°F) or less. TAIYO accepts no responsibility or liability for damages, whether direct, indirect, or consequential, resulting from failure in the performance of its products. If a TAIYO product is found to be defective in material or workmanship, its liability is limited to the purchase price of the product found to be defective. TAIYO MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. TAIYO'S obligation under this warranty shall not include any transportation charges or costs of installation or any liability for direct, indirect, or consequential damages or delay. If requested by TAIYO, products for which a warranty claim is made are to be returned transportation prepaid to TAIYO'S factory. Any improper use or any alteration of TAIYO'S product by the customer, as in TAIYO'S judgment affects the product materially and adversely, shall void this limited warranty.

TECHNICAL DATA SHEET



Appendix: PEB Process

FLEXFINER consist of a top layer and bottom adhesive layer. The composition of the tope layer is polyimide base. With only a UV exposure, polyimide network is not sufficiently formed. The PEB (Post Exposure Bake) is required after exposure to ensure sufficient polyimide curing.

| | Without PEB process | PEB process 85deg.C / 35min | PEB process 90deg.C / 35min | PEB process 95deg.C / 35min |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Cross section view (image) |  Dissolved cover layer by development |  Formed cover layer |  Formed cover layer |  Formed cover layer |
| Top view of formed pattern (Design value $\phi 300\mu\text{m}$) |  |  |  |  |
| Surface of FLEXFINER |  |  |  |  |
| Solder heat resistance 288deg.C /10sec | Blister | Pass | Pass | Pass |

TECHNICAL DATA SHEET

FINAL PROPERTIES FOR FLEXFINER

IPC-SM-840E, Class H & T, Solder Mask Vendor Testing Requirements

| TEST | SM-840 PARAGRAP H | REQUIREMENT | RESULT |
|--------------------------------------------|-------------------|--------------------------------------------------|----------------------|
| Visual | 3.3.1 | Uniform in Appearance | Pass |
| Curing | 3.2.5.1 | Ref: 3.6.1.1, 3.7.1 and 3.7.2 | Pass |
| Non-Nutrient | 3.2.6 | Does not contribute to biological growth | Pass |
| Pencil Hardness | 3.5.1 | Minimum "F" | Pass – 4H |
| Adhesion | 3.5.2.1 | Rigid – Cu, Ni, FR-4 | Pass |
| Adhesion | 3.5.2.6 | Doubled Layered Solder Mask | Pass |
| Machinability | 3.5.3 | No Cracking or Tearing | Pass |
| Flexural Endurance | 3.5.4.1 | MIT Test R=0.38mm Load 500g L/S=200/200 | 210–220 cycles |
| Resistance to Solvents and Cleaning Agents | 3.6.1.1 | Table 3 Solvents | Pass |
| Hydrolytic Stability and Aging | 3.6.2 | No Change after 28 days of 95-99°C and 90-98% RH | Pass |
| Solderability | 3.7.1 | No Adverse Effect J-STD-003 | Pass |
| Resistance to Solder | 3.7.2 | No Solder Sticking | Pass |
| Resistance to Solder | 3.7.3 | No Solder Sticking | Pass |
| Simulation of Lead Free Reflow | 3.7.3.1 | No Solder Sticking | Pass |
| Dielectric Strength | 3.8.1 | 500 VDC / mil Minimum | Pass 4200 VDC/mil |
| Thermal Shock | 3.9.3 | No Blistering, Cracking or De-lamination | Pass |

Specific Class "H" Requirements

| TEST | SM-840 PARAGRAPH | REQUIREMENT | RESULT |
|-------------------------------------------------------------------------|------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|
| Flammability | 3.6.3.1 | UL 94VTM-0 | Pass |
| Insulation Resistance Before Soldering After Soldering | 3.8.2 | 5 x 10 ⁸ ohms minimum 5 x 10 ⁸ ohms minimum | Pass (4.0 x 10 ¹² ohms) Pass (1.7 x 10 ¹² ohms) |
| Moisture & Insulation Resistance Before Soldering After Soldering | 3.9.1 | 5 x 10 ⁸ ohms minimum 5 x 10 ⁸ ohms minimum | Pass (1.9 x 10 ¹² ohms) Pass (1.7 x 10 ¹² ohms) |
| Electrochemical Migration | 3.9.2 | >2.0 x 10 ⁶ ohms, no dendritic growth | Pass (1.9 x 10 ¹¹ ohms) |

Specific Class "T" Requirements

| TEST | SM-840 PARAGRAP H | REQUIREMENT | RESULT |
|--------------------------------------------------------------|-------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|
| Flammability | 3.6.3.2 | Bellcore O ₂ Index – 28 minimum | Pass |
| Insulation Resistance Before Soldering After Soldering | 3.8.2 | 5 x 10 ⁸ ohms minimum 5 x 10 ⁸ ohms minimum | Pass (4.0 x 10 ¹² ohms) Pass (1.7 x 10 ¹² ohms) |

TECHNICAL DATA SHEET

FINAL PROPERTIES FOR FLEXFINER

Specific Class “T” Requirements

| TEST | SM-840 PARAGRAPH H | REQUIREMENT | RESULT |
|-------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------|--------------------------------------------------------------------------|
| Moisture & Insulation Resistance Before Soldering After Soldering | 3.9.1 | 5 x 10 ⁸ ohms minimum 5 x 10 ⁸ ohms minimum | Pass (1.9 x 10 ¹² ohms) Pass (1.7 x 10 ¹² ohms) |
| Electrochemical Migration | 3.9.2 | < 1 decade drop, no dendritic growth | Pass |

Additional Tests / Results

| TEST | REQUIREMENT | RESULT |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------|
| Adhesion | GIP-008AA (TAIYO Internal Test Method) Cross-cut tape stripping test | 100/100 |
| Solder Heat Resistance | Solder float test: Rosin Flux 288°C/10sec., 2 cycle | Pass |
| Bendability | TAIYO Internal Test Method 190 degree bending | No cracks |
| Outgassing Test ASTM E 595-90 A 2-3 J/cm ² UV Cure was done after thermal curing. | TML < 1% CVCM < 0.10% | Pass - TML = 0.83% Pass - CVCM = 0.04% |