TECHNICAL DATA SHEET

MANTA® EFP140

Aqueous Developable

LASER DIRECT IMAGE (LDI)

PHOTOIMAGEABLE FLEXIBLE SOLDERMASK

PRODUCT DESCRIPTION

Manta®EFP140 is a liquid photoimageable soldermask, which has been formulated for use in the manufacture of flexible and flex-rigid printed circuit boards and BGA packages using polyimide substrates.

The LDI formulation has been engineered to deliver straight sidewalls and fine solder-dam resolution. Optimised radiation curing characteristics deliver high levels of through-cure at low energy levels without compromise in surface hardness or chemical resistance.

- Excellent flexibility
- Low exposure energy (50-100 $mJcm^{-2}$) to resolve small features sizes
- No surface damage or erosion during developing
- Fine solder-dam resolution (50μm, 2mil)
- Resistant to multiple soldering operations
- Suitable for LDI and conventional exposure systems
- Resistance to Pb-Free, ENIG & Sn Processes
- RoHS compliant and Halogen-Free
- Non toxic
- Available in gloss and matt formulations

Colour: Amber

Other colours are available upon request.

PROCESSING

Board surface preparation

Mechanical pre-cleaning:

Brush
320 to 400 grit silicon carbide brushes with a recommended footprint on the copper of 10-15mm. (0.4-0.6 inches).
Brushes should be regularly checked and dressed to ensure optimum preclean is retained.

Pumice Slurry Scrub
Pumice concentration between 18 - 22% (v/v) is recommended (3F or 4F virgin grade).
Slurry should be changed between 500-1000 panels

Aluminium Oxide Slurry Scrub
Aluminium oxide concentration between 18 - 22% (v/v) is recommended (400 grit).
Slurry should be changed between at least 20,000-30,000 panels

Aluminium Oxide Jet Slurry Spray
Aluminium oxide concentration between 18 - 22% (v/v) is recommended (220 grit virgin grade).
Jet spray pressure 20-24 PSI ensuring the jet nozzle patterns fully overlap
Slurry should be changed between at least 10,000-20,000 panels

Panels must be fully rinsed such that any slurry particles are completely removed. Failure to remove particles can result in poor cosmetics and adhesion loss.

If panels are heavily oxidised and tarnished then a micro-etch prior to mechanical pre-cleaning is strongly recommended. Panels must be thoroughly rinsed prior to mechanical cleaning stage.

Recommended Surface roughness figures are Ra 0.2-0.4µm.

Chemical pre-cleaning:

High Roughness, Deep-Etching Clean
Due to the excellent mechanical bond achieved between the copper surface and soldermask, proprietary deep-etch chemistries are the preferred method of pre-clean.
For a list of recommended and approved chemistries, please contact your Electra representative.

Microtech Clean
Simple microtech solutions such as sodium persulphate are not recommended as the sole method of preclean.

In all cases panels must be thoroughly rinsed and dried such that no tarnish is present and no water moisture remains in the holes or between closely spaced tracks.
It is recommended that all freshly cleaned panels are coated within 2-4 hours. The actual maximum time will vary depending upon ambient temperature and humidity. Panels left longer than 4 hours should be re-cleaned prior to coating.

Mixing:

EFP140 is supplied in pre-weighed paste and hardener containers. The two components should be mixed together prior to use. Stir well to ensure complete mixing.

Incomplete mixing can cause poor developing, stickiness during exposure and impaired final properties.

After mixing, ink should be consumed within 24 hours.

Viscosity reduction:

Screen Print formulations:

SP versions of EFP140 are supplied screen ready. If viscosity adjustment is required prior to, or during printing, then this may be achieved using **Electra reducer ER1.** No more than 5% reducer should be added or deterioration of the printing and drying properties may occur, resulting in thin deposits on track edges and/or prolonged drying times.

Screen print parameters:

Mesh count: 43-62T polyester (depending on copper height).
Squeegee: 60-70 Shore.

It is recommended to achieve a minimum of 10 microns over the track-edges.
For optimum flexibility, wet thickness should not exceed 35 microns.

Care should be taken to ensure the vacuum bed on the print table does not suck ink into and through the holes in the circuit.

Tack-dry:

The aim of the tack-drying stage is solely to remove the solvents. It is important for the drying chamber (static or conveyorised) to have good air circulation with air supply and extraction facilities.

Convection oven drying:

Single tack dry process	30 mins @ 75ºC	
Dual tack dry process	Side 1	15-20 mins @ 75ºC
	Side 2	20-25 mins @ 75ºC

Laser Imaging – 355nm Light Source:

Ensure panels are at room temperature before the exposure stage. Coated panels must be stored in yellow-room or UV-free conditions.

It is recommended to pass panels through a contact dust removal system prior to placing in the LDI unit.

Energy requirement: 50 - 100mJcm^{-2}

Other colours may require different energy dosage and should be determined during preliminary testing.

Determination of the correct imaging energy should be carried out after setting the developing speed.

It is strongly recommended to blank out vacuum holes except for those around the perimeter of the panel. This can be done using a sheet of mylar or a bespoke plate from the imaging equipment supplier.

Conventional Imaging

If required it is also possible to image EFP140 LDI using conventional UV exposure units.

Step wedge: 8-10 clear (Stouffer 21 step)

Developing:

Developer:	1% soln sodium or potassium carbonate.
Spray pressure:	1.5-2.5 kgcm^{-2}, 20-40 psi.
Spray time:	30-90s in carbonate chamber(s) (dependent on amount of ink in holes).
Temperature:	30 to 35ºC

Boards should be well rinsed with fresh water and fully dried after developing.

Do not final cure boards when wet.

The optimum developing speed is set when an unexposed board develops off completely, 25- 50% of the way through the machine. This speed should be ascertained by preliminary tests prior to making exposure tests.

Developing speed and break-point settings will be determined by the amount of ink deposited in the holes during coating.

Final Cure:

Convection oven: 60 mins at 150ºC **Time at temperature**

UV bumping:

It is not normally necessary to UV bump EFP140 LDI after final curing.

In the event of white staining after final-finish a UV bump of 2000 to 3000 $mJcm^{-2}$ can be utilised to help to eliminate this.

Alternatively, white staining after final-finsh can be easily and permanently removed by a short bake cycle of 10-15 mins @ 120-150°C (248 - 300°F).

Safelight:

It is recommended to process EFP140 LDI under safelight conditions. Between drying/exposing and exposing/developing, boards should be kept in yellow light. Boards should, in any case, be kept out of direct sunlight until completely processed.

Cleaning:

Equipment should be cleaned of residual soldermask using **SW200 or Dowanol PMA.**

Shelf-life:

Minimum 6 months from date of manufacture when stored in cool, dry, recommended conditions. Storage should be between 10 and 25°C and must be away from sources of heat and direct sunlight.

Final properties:

TEST	METHOD	RESULT	CLASSIFICATION
X-hatch adhesion		100%	Pass
Flexibility	3mm Mandrel	After exposure OK After final cure OK 180° bend 360° bend	Pass Pass Pass Pass
MEK resistance	20 “rubs”	No surface roughness. No blisters. No delamination. No swelling. No colour change.	Pass
Wave solder resistance	3x10s @ 260°C	No loss of adhesion or solder pick-up.	Pass

For further information, contact:

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