



ELECTRA

TECHNICAL DATA SHEET

ELECTRAJET® EMJ110

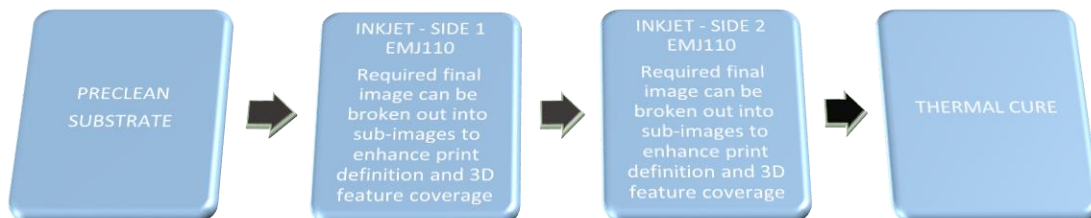
INKJET SOLDERMASK PRODUCTS Rigid & Flexible Versions

ELECTRAJET® EMJ110 is the next generation of soldermask for application by Inkjet printing using industrial inkjet printers with piezo drop on demand heads.

Using almost 40 years' of soldermask experience, EMJ110 is formulated to give high levels of performance that meet or exceed industry standards and PCB manufacturing expectations.

Inkjet coating of ELECTRAJET® EMJ110 Series is a fully additive process.

The elimination of process steps and material usage compared to traditional photoimaging processes offers large reductions in energy consumption, water usage and waste treatment.



Product Features:

- Products suitable for Rigid and Flex applications
- Optimised surface tension to reduce bleed or spreading – good edge definition
- High chemical resistance to ENIG and immersion tin
- Passes IPC-SM840 E
- Versions available to meet Bosch TC7 Thermal Shock requirement (-40°C, 150°C, 1000 cycles)
- All versions meet or exceed Bosch TC4.2 Thermal Shock requirement (-40°C, 125°C, 1000 cycles)
- Passes over 6 cycles through high temperature 260°C reflow assembly process
- UL 94 V-0 rated
- Fully compatible with Pb-free, high temperature processes
- RoHS and Halogen-Free compliant
- Version available with low dielectric constant (2.99 at 10GHz)
- Low modulus
- Passes ASTM E595 Outgassing TML and CVCM specification



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PRECLEAN

Proprietary Chemical pre-cleaning designed for Inkjet Soldermask:

It is strongly recommended to use a proprietary high roughness chemical preclean specifically designed for soldermask products. High surface roughness chemical precleans will give excellent adhesion and allow full soldermask properties and performance to be obtained (simple microetch solutions such as sodium persulphate are not recommended as the sole method of preclean).

Additional treatment with surface energy modifiers (anti-bleed or anti-tarnish):

Due to the very low viscosity of inkjet soldermask and the high surface energy of chemically cleaned copper surfaces it is essential to ensure the board surfaces are treated to reduce/eliminate soldermask spread/bleed. This treatment is done using proprietary chemistries specifically supplied for use with inkjet soldermask.

Without this additional treatment it will not be possible to maximise the resolution and edge definition capabilities of the inkjet soldermask and printer.

Anti-bleed/tarnish chemistries are designed for use with high roughness chemical preclean processes. They may not be suitable for use with alternative types of preclean such as brush or pumice.

For details of recommended chemistries, please contact Electra Technical Support who will discuss your specific requirements and options.

It is recommended that all freshly cleaned substrate is coated within 2-4 hours. The actual maximum hold time will vary depending upon ambient temperature, humidity and preclean chemistry suppliers recommendations.

Mechanical pre-cleaning:

Mechanical preclean methods can be used but full soldermask performance properties may not be achieved.

It is also likely that some degree of ink spread will be observed. Amount of spread will depend on substrate surface energy, copper topography and print/cure parameters.

It might be possible to compensate for some level of spread with print strategy but this must be discussed with the inkjet printer supplier to confirm capability.

If mechanical pre-clean is to be used, please contact Electra Technical Support to discuss specific recommendations.

Ink Properties

Viscosity at 25°C:	14-19 cP (mPa-s)
Jetting viscosity:	9-11 cP (mPa-s)
Jetting temperature:	35 – 45°C (Konica Minolta 1024 head) 50°C (FUJIFILM Dimatix Samba® GL3 head)



INKJETTING

EMJ110 is used on the following print-heads:

Konica Minolta KM1024iSHE
Konica Minolta KM1024iMHE
Konica Minolta KM1800i
FUJIFILM Dimatix Samba® G3L

EMJ110 PRODUCTS are single component materials supplied ready to use. No mixing or viscosity reduction is required.

EMJ110 PRODUCTS are designed for use with piezo drop on demand print heads combined with a LED “pin” cure lamp.

The pin-cure will harden the coating for subsequent careful handling.

Print parameters and wave-form will typically be provided by the inkjet printer manufacturer based on their optimisation tests.

Electra Technical Support can also offer advise and recommendations based on the print head being used.

UV PIN-CURE

In-line UV pin-cure is used to “fix” the inkjet soldermask in place after jetting. Energy dose is normally achieved by adjusting percentage power of the UV lamp.

All pin-curing is carried out in the inkjet printer using the in-line UV lamp.

The required UV energy will be dependent on print speed, print thickness and overall print strategy (i.e. number and design of print layers to achieve final finished soldermask coating).

Below are typical values for a 395nm lamp:

1. UV pin-cure for individual feature layers = 50 to 75 mJ/cm² per pass
2. Final higher energy UV pin-cure = 500 to 1000 mJ/cm²
The final UV pin-cure can be applied at the same time as the final print pass or as a separate “in-printer” step after the print stages are complete.
3. For increased through-put, an additional “external” UV cure stage could be used for the final high energy cure as an alternative to using “in-printer” pin-cure lamps.

365nm UV can also be used but energy levels will need to be increased to compensate for the different wavelength. Please contact Electra Technical Support to discuss specific recommendations.

Required UV energy can also be affected by lamp operating temperature.



THERMAL CURE Convection cure: 60 mins at 150°C (time at substrate temperature)

UV BUMPING Generally not required. UV curing is carried out in the inkjet printer (see UV pin-cure).
Note: acetone solvent resistance of EMJ110 Flex is improved with a UV bump after final curing (see tables 1 and 2).

FLUSHING Ink delivery system and print heads should be flushed using **ECJ1**.

SHELF-LIFE Minimum 6 months from date of manufacture when stored between 10 and 25°C (50 to 77°F), away from sources of heat and direct sunlight.

PRODUCT PERFORMANCE

Industry Standards/Qualifications

STANDARD	REQUIREMENT	RESULT
IPC SM-840 E	CLASS T & H	PASS
UL94	V-0	PASS

Additional Final Properties:

TEST	REQUIREMENT	RESULT
LEAD-FREE SOLDER RESISTANCE	3 x 10s at 288°C – tape test	PASS
MULTIPLE ASSEMBLY REFLOW	6 reflow cycles (peak 260°C)	PASS
SOLVENT RESISTANCE	30 seconds methylene chloride	PASS
ENIG PLATING RESISTANCE	Ni 5-10 microns, Au <0.1 microns – tape test	PASS
ACID RESISTANCE	10% HCl, 30 min dip at 20°C – tape test	PASS
ALKALI RESISTANCE	10% NaOH, 30 min dip at 20°C – tape test	PASS
ADHESION TO GOLD	Cross-hatch & tape test	PASS



TEST	REQUIREMENT	RESULT
THERMAL STORAGE DIN IEC 60068-2-2	TC7 1000h at 150°C	PASS
THERMAL SHOCK Bosch TC7	-40°C, 150°C, 1000 cycles	PASS (formulation dependent)
THERMAL SHOCK Bosch TC4.2	-40°C, 125°C, 1000 cycles	PASS
THERMAL SHOCK IPC-TM-650 Method 2.6.7.3	-65°C, 125°C, 100 cycles	PASS
DIELECTRIC CONSTANT	Measured at 10GHz, 22°C	2.99
DISSIPATION FACTOR	Measured at 10GHz, 22°C	0.0228
HEAT/HUMIDITY	1000 hours 85°C/85%RH	PASS
PRESSURE COOKER (PCT)	100 min at 121°C (2 atm) – tape test	PASS
FLEX TEST POLYIMIDE SUBSTRATE	180° crease – tape test (formulation specific)	PASS (formulation dependent)

Soldermask Outgassing

	Total Mass Loss (TML)	Collected Volatile Condensable Material (CVCM)	Recovered Mass Loss (RML) TML-WVR	Water Vapour Recovered (WVR)
ASTM E595-15 requirement	Max. 1.0%	Max. 0.10%	Report	Report
EMJ110	0.70%	<0.01%	0.49%	0.21%



Cleaning solvent resistance

SOLVENT RUB TEST

The surface of soldermask is rubbed using cotton wool soaked in the stated solvent with a force of approx. force 15g per cm²).

After the specified number of rubs the cotton wool is inspected for any staining and the surface of the soldermask is inspected for any signs of degradation.

See Table 1.

PRODUCT	ISOPROPANOL ALCOHOL (IPA) 100 Rubs	ACETONE 20 Rubs
EMJ110 FLEX VERSION 60 mins at 150°C No UV Bump	Pass No staining No degradation	Slight staining
EMJ110 FLEX VERSION 60 mins at 150°C 600mJ/sqcm UV Bump	Pass No staining No degradation	Pass No staining No degradation
EMJ110 RIGID VERSION 60 mins at 150°C No UV Bump	Pass No staining No degradation	Pass No staining No degradation

Table 1 – Cleaning Solvent Rub Test

SOLVENT IMMERSION TEST

A PCB coated with soldermask is immersed in the stated solvent for 90 minutes at room temperature.

After the specified time, the PCB is removed from the solvent and allowed to air dry.

After drying the surface is tape tested and inspected to any signs of softening or degradation.

See Table 2.

PRODUCT	ISOPROPANOL ALCOHOL (IPA) 90 minute immersion	ACETONE 90 minute immersion
EMJ110 FLEX VERSION 60 mins at 150°C No UV Bump	Pass No softening, peeling or degradation	Pass No softening, peeling or degradation
EMJ110 RIGID VERSION 60 mins at 150°C No UV Bump	Pass No softening, peeling or degradation	Pass No softening, peeling or degradation

Table 2 – Cleaning Solvent Immersion Test



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