

TECHNICAL DATA SHEET

**CARAPACE-A
EMP 110**

Aqueous Developable
PHOTOIMAGEABLE SOLDERMASK

APPLICATION and END-USE DESIGN:

CARAPACE-A EMP110 is a contact exposure, negative working, photoimageable soldermask for aqueous developing. It is formulated for use on high density, copper, black oxide or tin/lead plated printed circuit boards where the required definition cannot be achieved with conventional, screenprintable resists.

FEATURES and ADVANTAGES:

1. Long pot life. 2-component mixture remains useable for up to 2 weeks at room temperature.
2. High solids. CARAPACE-S EMP110 contains 76% solids, ensuring thick, even coatings of 1mil or more with one layer.
3. Thixotropic. Good track coverage with no thinning of coating at track edges.
4. Fast exposure. 25-35s using standard 5kW PC equipment. Using 6kW lamps and times as short as 12s may be achieved. Avoids bottle necks at photoprinting stage and maintains fast throughout.
5. Easy development. Develops in 1% sodium carbonate solution. Easy development ensures fast throughput and less chance of blocked holes.
6. Thermal cure. Thermal cure ensures optimum physical and chemical properties.
7. Excellent moisture and insulation resistance. Conforms to IPC SM 840 Class III, BS6096/9000, MIL 55110D

CARAPACE-A EMP110 PRODUCT RANGE

PRODUCT CODE	COLOR	FINISH	VISCOSITY
EMP110/1100 series	Green	Gloss/Matt	95-105 P
EMP110/1200 series	Green	Gloss/Matt	95-105 P

(Other colors and finishes available on request)

EMP110/1123	Hardener		190-210 P
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(Viscosity measured at 25°C using a Haake VT24 Viscometer and pkll cone @ sp 1)

PROCESSING**PRECLEANING OF BOARDS.**

Copper tracks should be brushed or micro etched to give a waterbreak-free surface. Tin/lead boards should be thoroughly degreased using detergent/water rinse or solvent cleaning methods.

Adhesion may be helped by lightly brushing the tin/lead prior to printing.

All boards should be completely dry before printing.

MIXING

CARAPACE-A EMP 110 is supplied pre-weighed in 1 or 5 kg packs and should be mixed in the ratio 100 parts paste (pt A) to 19 parts hardener EMP110/1123. Stir well to ensure complete mixing.

Note: inadequate mixing may cause problems such as:

- Non uniform developing
- Inadequate cure

Care should be taken to avoid incorporating air into the mixture while stirring, particularly when using mechanical mixers.

No hold time is required after mixing.

VISCOSITY ADJUSTMENT/REDUCTION

CARPACE-A EMP 110 is supplied press ready. However, 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 longer drying times.

PRINTING

Mesh: 110-140 polyester mesh.
Squeegee: 55-65 Shore. (Durometer)

The choice of mesh should be made according to the thickness of soldermask required and the ease of encapsulation of the tracks.

Using a 110 mesh, a soldermask thickness of 0.8-1.0 mil should be obtained.

The board outline image may be made on the screen using conventional stencil material or masking tape and screen filler.

In order to prevent a build up of ink on the reverse of the screen blocking the holes in the board, it is advisable to turn alternate boards before printing. Alternatively, a rudimentary stencil, such as an expanded drill mas, can be used on the screen to prevent ink going into the holes.

DRYING

The following drying conditions are recommended depending whether single or double side processing is used:

Single side processing	Temperature	Time
Side 1	165-185°F	25 mins
Side 2	165-185°F	25 mins
Double side processing		
Side 1	165-185°F	15 mins
Side 2	165-185°F	25 mins

Although CARAPACE-A EMP110 has a wide process latitude at this stage, care should be taken not to overdry or development may be prolonged or completely prevented.

Boards should be cooled to room temperature before exposure.

HOLD TIME

Minimum: 0 hrs
Maximum: 72 hrs (or longer under certain conditions)

After drying it is recommended that boards should be processed within 24 hrs to avoid increasing the developing time. However boards may be held for up to 72 hrs with only a slight increase in developing time.

EXPOSURE

Spectral output:	310-420 nm.
Energy requirement:	300-600 mJ/sq cm
Step wedge:	8-10 clear (Stouffer 21 step)

Determination of the correct exposure should be carried out after setting the developing speed since this will affect the step wedge reading obtained.

The step wedge determination should be carried out on brushed copper with the step wedge under the phototool. Using a typical 5 kW exposure lamp the time is normally approximately 25-35s.

The energy requirement is between 300-600 mJ/sq cm @ 320-390 nm. with the optimum value approx. 400 mJ/sq cm. The energy level should be used for determining the actual exposure setting.

IMPORTANT: Separate exposure tests should be carried out for each different color, as variations in lamp emissions can cause differences in exposure speed.

After determining the correct setting the energy level can be measured and monitored as a means of checking for any decrease in output from the lamp with age.

HOLD TIME

Minimum:	0 hrs
Maximum:	72 hrs (or longer under certain conditions)

It is not necessary to hold boards before developing. Boards should preferably be developed within 24 hrs of exposure although they can be held for up to 72 hrs with only a slight increase in developing time.

DEVELOPING

Developer:	1% solution sodium or potassium carbonate
Spray pressure:	20-35 p.s.i.
Spray time:	30-60s (developing stage)
Temperature:	80-90°F

Boards should be rinsed with fresh water after developing.

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.

STRIPPING

After developing, any reject boards may be stripped of soldermask using a 5% NaOH soln @ 105-125°F.

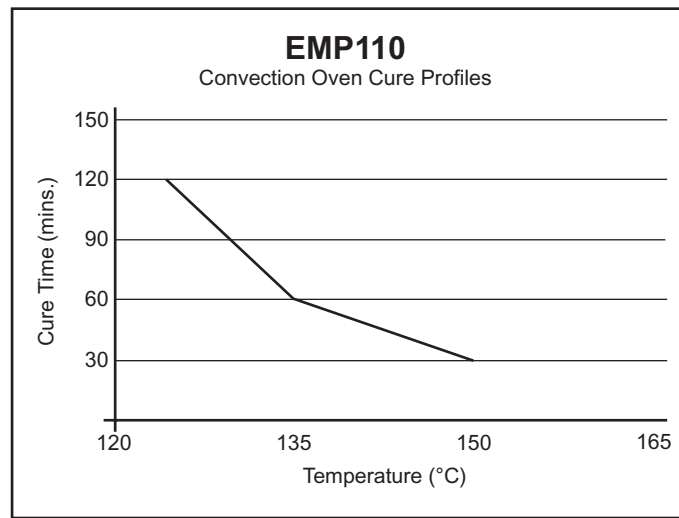
FINAL CURE

Typical Cure Schedules

Convection Oven:
30 mins @ 300°F
60 mins @ 275°F
120 mins @ 255°F
(See Graph)

UV BUMP CURVE

It is not normally necessary to UV cure CARAPACE-A EMP110 but under certain conditions it may be advantageous (see below).



HIGH FILMWEIGHT/PLATING

When depositing high filmweights and/or printing over heavily plated tracks it is sometimes possible to see slight wrinkling of the soldermask between the tracks after final cure. This may be prevented by UV curing before the final thermal cure.

FLUX RESIDUES/STAINING

Occasionally flux residues or staining can be seen on boards, particularly after Hot Air Solder Levelling with very acidic or aggressive fluxes. This is caused by washing boards while still hot. All boards should be allowed to cool after HASL before washing off the flux.

If staining does occur it can be removed by post baking boards, after soldering, for 10-15 mins @ 250-300°F. Alternatively if it is not possible to cool boards before HASL, staining can be prevented by giving boards a UV bump cure after the final thermal cure.

NOTATION/MARKING INKS

Both UV and thermal curing notation inks are suitable for use with CARAPACE-A EMP110. Thermal curing inks may be applied before or after final cure. If UV curing notation inks are used they should be applied before final cure and before UV bump if this is used. In this case UV curing the notation ink will serve as the bump cure for the soldermask.

SCREEN CLEANING

Afer printing the screen and stencil should be cleaned of residual soldermask using Universal Screen-wash SW100.

SAFE LIGHT

It is not normally necessary to print CARAPACE-A EMP110 under safelight conditions, although it may be advisable if there are long delays before drying. 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.

STORAGE

Store between 50-75°F in a dry store.

Avoid subjecting containers to temperatures below 40°F because of risk of splitting.

SHELF LIFE

Minimum 6 months from date of manufacture when stored in cool dry conditions.

FINAL PROPERTIES

TEST	TEST METHOD	RESULT	CLASSIFICATION
Hardness (pencil)	SM-840B	7H	Pass
Adhesion	SM840B	Copper: 0% removal	Class 3
		Sn/Pb: <10% removal	Class 3
Chemical Resistance	SM840B	No surface roughness, blisters, delamination, swelling or color change	Pass
Isopropanol			
1,1,1, Trichloroethane Azeotrope of 4% Ethyl alcohol & 96% Trichloroethane Alkaline detergent Methylene chloride			
Hydrolytic Stability	SM-840B	No irreversible change of state	Class 3
Insulation Resistance	SM-840B	Before solder 10^{10} - 10^{12} Ohms	Class 3
		After solder 10^9 - 10^{11} Ohms	Class 3

QUICK TURN CIRCUITS

TEST	TEST METHOD	RESULT	CLASSIFICATION
Moisture & Insulation	SM-840B	2.8-14 x 10 ⁹ Ohms Resistance (7 days @ 25- 65°C/95% RH)	Class 3
Electromigration	SM-840B	No voltage drop	Class 3
Solder Resistance Wave solder	SM-840B	No loss of adhesion or solder pickup	Class 3
HASL		Min 5 cycles	Pass
Thermal Shock 100 x (-65 - +125°C)	SM-840B	No cracks or deterioration	Pass
SPECIFICATIONS	IPC-SM840B BS6096/9000 MIL 55110D	Class 3	Pass Pass Pass
FLAMMABILITY	UL File E95722		94 V0

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