HUNTSMAN

Technical Datasheet

PROBIMER® 77 SEMI-MATTE

High Performance Photoimageable Solder Mask
Alkaline Developable Two-Component-System
for Flood Screen Print Application

- **Best in class photo-speed**
- **Outstanding compatibility with metal surface finishes**
- **High resolution capability, allowing 2 mil solder dams**
- **Wide processing window**
- **Good underfill performance**

PRODUCT INFORMATION

General Product Overview

Probimer 77 MA-1/1040 is a photoimageable, negative working solder mask optimized for flood screen print application. The solder mask exhibits a semi-matte surface. Probimer 77 MA-1/1040 offers high process flexibility and excellent small hole developability with high aspect ratio. It is developed in an aqueous alkaline solution.

At present the product system is available under the designation XB 1040 and 1050.

Special Features and Benefits

- Probimer 77 MA-1/1040 provides a semi-matte surface finish.
- “Best in Class” photo-speed; suitable for automatic exposure.
- Outstanding compatibility with metal surface finishes (ENIG, Pd, OSPs etc.)
- High resolution capability allows 2 mil solder dams.
- Develops in standard aqueous chemistry and equipment.
- Three-component system with excellent stability and high solids content.
- Wide process latitude means high productivity and yields.
  (>5 day pot-life, 3 day hold time and wide drying window)
- Conforms to IPC-SM-840C class T&H and Bellcore standards.
- UL 94 V-0 approved.
- Fulfills the most stringent requirements for electrical corrosion resistance and has outstanding moisture and insulation resistance.

Product Components

Probimer 77 MA-1/1040 is a two-component-system. It is provided in ready-to-mix packages.

	Probimer 77/1040	**Hardener 77/1050**
Product Components	Resin	Hardener
Mix Ratio	3.47 kg	0.80 kg

Storage and Expiration

Probimer lacquers are complex chemical compounds. To ensure that these products exhibit consistent quality in application we recommend storage under the following conditions:

- PROBIMER 77/1040 in original container at 2-18°C (35.6-64.4 °F)
- Hardener 77/1050 in original containers at 2-18°C (35.6-64.4 °F)

Under ‘EXP’ on the package label, the expiry date is indicated. Within this period the product should be used.

PROCESS RECOMMENDATIONS

Room Requirements on Working Environment

In order to reach best results the following room requirements should be respected:

- Room Temperature: 22 ± 2°C (71.6 ± 35.6 °F)
- Relative Humidity 50 ± 5%
- Cleanroom Class 100'000
- Overpressure Cleanroom + 3 mm WS
- UV blocked light

Mixing

Thoroughly mix the two components for 10-15 minutes. Mixing should be done with gentle mechanical stirring. High shear mixing must be avoided in order to prevent entrapment of large amounts of air, which can cause bubbles and poor levelling of the printed coating.

Dilution is generally not required. In specific cases a diluent may be added. We recommend a maximum dilution of 3% with Dipropyleneglycolmonomethylether (DPM).

Pot Life

At room temperature the ready-to-use mixture has a pot life of 3 days. (Definition of pot life is related to increased dwell time in developer.)

Pre-Cleaning

For a good adhesion of the lacquer we recommend chemical and/or mechanical pre-cleaning. Hold times prior to coating have to be minimized, since oxidation may impair the adhesion of the lacquer. Only completely dried boards should be coated, this has to be ensured especially for boards with small holes (microvia technology).

Screen Printing

Probimer 77 MA-1/1040 is applied to printed wiring boards using vertical or horizontal screen printing equipment. Monofilament polyester mesh in the range of 32-43 (mesh/cm) or 80-110 (mesh/inch) is recommended.

Flash-off / Drying

A flash-off time of 10 minutes before drying is recommended. To achieve good performance in resolution, developability of small holes and resistance to finishing processes the coated boards must be dried according to the following parameters:

Process Parameters	side	time	temperature
Horizontal (single-sided)	Side 1 Side 2	15-20 min. 35-45 min.	80-85°C (176-185 °F) 80-85°C (176-185 °F)
Vertical (double-sided)	Side 1 and 2	40-60 min.	80-85°C (176-185 °F)

PROCESS RECOMMENDATIONS

Exposure

A hold time prior to exposure is not necessary. The spectral sensitivity is in the range of 350 - 420 nm. The exposure time depends on the parameters for the developing step.

Process Parameters	from	to	standard
Energy (mJ/cm^2) – Fe doped lamp	200	400	300
Stouffer step clear on Cu (21-step, ΔD = 0.15)	8	12	10
Hold time after exposure	not required		

Developing

The areas of unexposed Probimer 77 MA-1/1040 lacquer should be developed in a continuous spray developing line. Developing is carried out in a 0.8-1.2 % aqueous alkaline solution.

Process Parameters	from	to	standard
Developing temperature in °C (in °F)	30 (86)	35 (95)	32 (89.6)
Dwell time under spray (sec)	60	90	60
Spray pressure in MPa (psi)	0.3 (30)	0.4 (40)	0.3 (30)

Inspection and Stripping

In case of mishandling during exposure, such as mis-registration, boards can be stripped at 60-80°C (140-176 °F) with 10% NaOH solution.

Final Curing

Thermal curing is required to ensure optimal properties in the cured film. It can be done in a standard convection oven.

Process Parameters	from	to	standard
Air temperature in °C (in °F)	145 (293)	155 (311)	150 (302)
Temperature hold time (min)	50	70	60

After curing Probimer lacquers exhibit extremely high chemical resistance and, thus, cannot be easily removed without damaging the board.

UV-Curing

After thermal curing, we recommend UV curing of 1000–2000 mJ/cm^2 for increased chemical resistance.

PROCESS RECOMMENDATIONS

Legend Inks and Conformal Coatings

In general, legend inks and conformal coatings exhibit good to excellent adhesion to boards coated with Probimer 77 MA-1/1040. However, due to the large variety of available products preliminary trials are strongly recommended.

Production Release Trials

A variety of flow agents, soldering machines and soldering techniques as well as cleaning processes are used to mount components on circuit boards. Adjustment of the processing parameters and design guidelines to ensure optimal use of solder masks leads to the best overall results. Users should carry out their own tests prior to release for production runs.

PROPERTIES & APPROVALS

Physical Properties

Physical Properties		
Solid content ready for use	PR 2/85 (internal test norm)	70-72 weight %
Adhesion on copper (cross hatch)	ISO 2409	0-1 GT
Pencil hardness	IPC TM 650 2.4.27.2a	7-8 H
Resolution (solder dams after HAL)		2-3 mil

Chemical Properties

Chemical Properties		
Solvent resistance	Isopropanol MEK 1,1,1-Trichlorethane Methylenchloride	> 1h > 1h > 1h > 30 min.
Resistance to	E'less Ni/Au E'less Sn, Ag Org. Surface Passivations	passed passed passed
	"HASL" horizontal and vertical	passed
Ionic contamination	IPC TM 650 2.3.28	passed

Electrical Properties

Electrical Properties			
Dielectric strength	IEC 60243-1		120-130 V/µm
Surface resistance	IEC 60167		10^{13}-10^{14} Ω
Volume resistivity	IEC 60093		10^{14}-10^{15} Ω/cm
Comparative Tracking Index (CTI)	IEC 60112		600 – 0.0 V [1]
Dielectric constant ε_r at 1 MHz	IEC 60250		3.8-4.2
Dielectric loss factor tan δ At 50 Hz	IEC 60250	(77 °F) (122 °F) (167 °F) (212 °F) (248 °F)	25°C 3.0 % ± 0.1 50°C 5.4 % ± 0.2 75°C 8.4 % ± 0.3 100°C 10.0 % ± 0.4 120°C 12.0 % ± 0.5

1) on CTI 400 laminate or with double coating

Approvals

Approvals		
UL 94 V-0	Underwriter Laboratories Inc.	passed
IPC SM-840 C, Classes H&T [1]	Trace Laboratories	passed
Bellcore TR-TSY-00078	Internal test	passed
Siemens SN 47044	Internal test	passed
Siemens SN 57030	Internal test	passed
Siemens SN 57047	Internal test	passed
Bosch Y 273 R80 029	Internal test	passed

1) The norm IPC SM 840 C, H&T, includes the following tests:
Visual inspection, fungus resistance, hydrolytic stability, dielectric strength, dimensional stability, adhesion on copper, machinability, abrasion, pencil hardness, resistance to solvents and fluxes, solderability and resistance to solder, insulation resistance before and after soldering, electro migration, thermal shock.

SAFETY AND TECHNICAL SUPPORT

Safety

When working with our products, the appropriate hygiene precautions and safety regulations should always be observed. For details, please see our Material Safety Data Sheets.

Probimer products contain flammable solvents. When the line is in operation no open flame or light is allowed in the vicinity. Before carrying out maintenance or repair work the line should be cleaned and the work area thoroughly ventilated.

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