HUNTSMAN

Technical Datasheet

PROBIMER® 77

7177-1/7167

High Performance Photoimageable Solder Mask
Alkaline Developable Two-Component-System
for Curtain Coating Application

- **Low sublimation**
- **High resolution**
- **Excellent small hole developability with high aspect ratio**
- **Wide drying window**
- **Long hold times after drying and exposure**
- **High comparative tracking index (CTI)**
- **High dielectric strength**
- **Excellent adhesion of legend inks and conformal coatings**
- **High resistance with aggressive post solder mask processes**

ISO 9001 certified

PRODUCT INFORMATION

General Product Overview

Probimer 77/7177-1 is a photoimageable, negative working solder mask optimized for curtain coating application. The solder mask exhibits a semi-matt surface. Probimer 77/7177-1 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 7177-1 and 7167.

Special Features and Benefits

- Two-component-system, semi-matt surface
- Low sublimation
- High resolution
- Excellent small hole developability with high aspect ratio
- Optimized for long hold times between individual process steps
- Wide process windows offer high flexibility
- Excellent chemical, electrical and physical end properties
- Fulfills the requirements of IPC SM-840-C, classes H & T
- Corresponds to the requirements of well-known OEMs
- High comparative tracking index (CTI) and high dielectric strength
- Excellent adhesion of conformal coatings
- High resistance with aggressive post solder mask processes
- Ideally suited for SIT process (Second Image Transfer)

Product Components

Probimer 77/7177-1 is a two-component-system. It is provided in ready-to-mix packages.

	Probimer 77/7177-1	**Hardener 77/7167**
Product Components	Resin	Hardener
Mix Ratio	8.2 kg	1.8 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 77/7177-1 in original container at 2-18°C
- Hardener 77/7167 in original containers at 2-18°C

Under ‘EXP’ on the package label, a six-digit-number is printed, indicating the expiry date (month and year). 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 are recommended:

- Room Temperature: 22 ±2°C
- Relative Humidity 50 ± 5%
- Cleanroom Class 100'000
- Overpressure Cleanroom + 3 mm WS

Mixing

Thoroughly mix the resin component and the hardener component for 10-15 minutes. Mixing can be done by hand with a spatula or 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 leveling of the printed coating.

Viscosity is then adjusted with the addition of approximately 2.1 kg of the diluent methoxy-1-propyl acetate (MPA) .

Pot Life

At room temperature the ready-to-use mixture has a pot life of 3 days.

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).

Coating

For Probimer 77/7177-1 a pre-heating of the boards is not required. A wide process window of 20-50°C surface temperature facilitates a uniform coating of the boards.

The optimum temperature settings have to be defined based on the thermal properties of the boards and the processing equipment utilized.

Processing Parameters	from	to	standard
Lacquer temperatures (°C)	17	32	25
Conveyor speed under curtain (m/min)	60	100	90
Viscosity at 25°C, DIN-4-cup (s)	60	120	90
Wet weight (g/600cm^2)	4.0	8.0[1)]	7.0

1) Higher wet weights can be achieved if the respective processing parameters, e.g. drying time are adjusted.

PROCESS RECOMMENDATIONS

Flash-off / Drying

Probimer 77/7177-1 offers a wide drying window of 80-90°C between 30-70 minutes.

Processing parameters for CL-lines [1]	from	to	standard
Flash-off temperature (°C)	105	120	115
Cycle time (s)		20	

1) The recommended parameters are valid for CL-lines. For all other processing equipment, the optimum settings have to be defined.

Processing parameters for Phase III, Phase IV [1]	from	to	standard
Flash-off temperature (°C)	45	52	47
Flash-off time (min)	10	24	12[2]
Temperature setting zone 1 (°C)	135	145	140
Temperature setting zone 2 (°C)	135	145	140
Temperature setting zone 3 (°C)	135	145	140
IR rods		as needed	
Conveyor speed (m/min)		2.0	

1) The recommended parameters are valid for: Phase III and Phase IV. For all other processing equipment, the optimum settings have to be defined
2) Cycle time = 20 s.

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 77/7177-1 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 (°C)	30	35	32
Dwell time under spray (sec)	50	70	60
Spray pressure (bar)	2	4	3

Inspection and Stripping

In case of mishandling during exposure, such as mis-registration, boards can be stripped at 50°C with 10% NaOH solution.

PROCESS RECOMMENDATIONS

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 (°C)	145	155	150
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.

Legend Inks and Conformal Coatings

In general, legend inks and conformal coatings exhibit good to excellent adhesion to boards coated with Probimer 77/7177-1. 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)	≈ 53 weight %
Adhesion on copper (cross hatch)	ISO 2409	0-1 GT
Pencil hardness	IPC TM 650 2.4.27.2a	6-7 H
Resolution (solder dams after HAL)		50-75 µm

Chemical Properties

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

Electrical Properties

Electrical Properties		
Dielectric strength	IEC 60243-1	130-150 V/µm
Surface resistance	IEC 60167	10^{14}-10^{15} Ω
Volume resistivity	IEC 60093	10^{15}-10^{16} Ω/cm
Comparative Tracking Index (CTI)	IEC 60112	600 – 0.0 V [1)]
Dielectric constant ε_r at 1 MHz	IEC 60250	3.0 – 4.0
Dielectric loss factor tan δ at 50 Hz	IEC 60250	25°C 1.1 % ± 0.1 50°C 2.7 % ± 0.2 75°C 6.1 % ± 0.3 100°C 9.7 % ± 0.4 120°C 17.2 % ± 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 EC Safety Data Sheets and the brochure ‘Hygienic Precautions for Handling of Plastic Products’.

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.

Technical Support

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Disclaimer

All recommendations for use of our products, whether given by us in writing, verbally, or to be implied from the results of tests carried out by us are based on the current state of our knowledge. Notwithstanding any such recommendation the Buyer shall remain responsible for satisfying himself that the products as supplied by us are suitable for his intended process or purpose. Since we cannot control the application, use or processing of the products, we cannot accept responsibility therefore. The product(s) has not been tested for, and is therefore not recommended for, uses for which prolonged contact with mucous membranes, abraded skin, or blood is intended; or for uses for which implantation within the human body is intended.

The Buyer shall ensure that the intended use of the products will not infringe any third party's intellectual property rights. We warrant that our products are free from defects in accordance with and subject to our general conditions of supply.

Technical details are subject to change!

Status: October 2003