

## **Technical Datasheet**

# **PROBIMER<sup>®</sup> 77 GLOSSY**

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

- **Halogen-free – exceeds JPCA Standard**
- **Green glossy version**
- **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**
- **High resistance with aggressive post solder mask processes**



# PRODUCT INFORMATION

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## General Product Overview

Probimer 77/9000 is a photoimageable, negative working solder mask optimized for flood screen print application. The solder mask exhibits a glossy surface. Probimer 77/9000 is halogen-free and exceeds the requirements of the JPCA standard e.g. the system has a total halogen content after final curing of less than 900 ppm. Probimer 77/9000 offers high process flexibility and excellent small hole developability with high aspect ratio. It is developed in aqueous alkaline solution.

At present the product system is available under the designation LMB 9000 and LMB 9002.

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## Special Features and Benefits

- Two-component-system, green version, glossy surface
- Halogen-free: exceeds JPCA standard, total halogen content after final curing less than 900 ppm
- 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
- High comparative tracking index (CTI) and high dielectric strength
- High resistance with aggressive post solder mask processes
- Easy strippable

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## Product Components

Probimer 77/9000 is a two-component-system. It is provided in ready-to-mix packages.

|                    | <b>Probimer 77/9000</b> | <b>Hardener 77/9002</b> |
|--------------------|-------------------------|-------------------------|
| Product Components | Resin                   | Hardener                |
| Mix Ratio          | 2.4 kg                  | 0.4 kg                  |

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## 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 77/9000 in original container at 2-25°C (35.6-77 °F)
- Hardener 77/9002 in original containers at 2-25°C (35.6-77 °F)

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

# PROCESS RECOMMENDATIONS

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## 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

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## Mixing

Thoroughly mix the resin component and the hardener component for 10-15 minutes. Mixing can 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 leveling 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) or specified thinner LSP-819.

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## Pot Life

At room temperature the ready-to-use mixture has a pot life of > 1 day. (Definition of pot life is related to increased dwell time in developer.)

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## 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 or blind vias.

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## Screen Printing

Probimer 77/9000 is applied to printed wiring boards using vertical or horizontal screen printing equipment. Monofilament polyester mesh in the range of 32-48 (mesh/cm) or 80-120 (mesh/inch) is recommended. Squeegee hardness in range of 70-80 (Shore A)

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## Flash-off / Drying

A flash-off time (RT) of 5-10 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       | 10-20 min. | 75-85°C<br>(167-185 °F) |
|                           | Side 2       | 20 min.    | 75-85°C<br>(167-185 °F) |
| Vertical (double-sided)   | Side 1 and 2 | 30-50 min. | 75-85°C<br>(167-185 °F) |

# PROCESS RECOMMENDATIONS

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## 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 <sup>2</sup> ) – Fe doped lamp   | 200          | 400 | 300      |
| Stouffer step on Cu clear (21-step, ΔD = 0.15) | 10           | 13  | 11       |
| Hold time after exposure                       | not required |     |          |

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## Developing

The areas of unexposed Probimer 77/9000 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)  |

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## 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. After thermal cure the boards could be stripped in 50% KOH at 60-80 °C (140-176 °F) for approx. 60 minutes.

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## 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)   | 45        | 70        | 60        |

After thermal curing, we recommend UV curing of 1000–2000 mJ/cm<sup>2</sup> for increased chemical resistance. After curing Probimer lacquers exhibit extremely high chemical resistance and, thus, cannot be easily removed without damaging the board.

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## UV-Curing

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

# PROCESS RECOMMENDATIONS

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## Legend Inks and Conformal Coatings

In general, legend inks and conformal coatings exhibit good to excellent adhesion to boards coated with Probimer 77/9000. However, due to the large variety of available products preliminary trials are strongly recommended.

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## 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) | 72 weight % |
| Halogen content level              | JPCA standard                | < 900 ppm   |
| Adhesion on copper (cross hatch)   | ISO 2409                     | 0-1 GT      |
| Pencil hardness                    | IPC TM 650 2.4.27.2a         | > 6 H       |
| Resolution (solder dams after HAL) |                              | 2-3 mil     |

## Chemical Properties

| Chemical Properties |                                |          |
|---------------------|--------------------------------|----------|
| Solvent resistance  | Isopropanol                    | > 30 min |
|                     | MEK                            | > 30 min |
|                     | 1,1,1-Trichlorethane           | > 30 min |
|                     | Methylenchloride               | > 30 min |
| Resistance to       | E'less Ni/Au                   | passed   |
|                     | E'less Sn, Ag                  | passed   |
|                     | Org. Surface Passivations      | passed   |
|                     | "HASL" horizontal and vertical | passed   |
| Ionic contamination | IPC TM 650 2.3.25              | passed   |

## Electrical Properties

| Electrical Properties                            |             |                                       |
|--|-------------|---------------------------------------|
| Dielectric strength                              | IEC 60243-1 | 140 V/μm                              |
| Surface resistance                               | IEC 60167   | $8.7 \times 10^{12} \Omega$           |
| Volume resistivity                               | IEC 60093   | $8.2 \times 10^{14} \Omega/\text{cm}$ |
| Comparative Tracking Index (CTI)                 | IEC 60112   | 600 – 0.0 V <sup>1)</sup>             |
| Dielectric constant $\epsilon_r$ at 1 MHz        | IEC 60250   | 3.8-4.2                               |
| Dielectric loss factor $\tan \delta$<br>at 50 Hz | IEC 60250   | (77 °F) 25°C 1.5 ± 0.1                |
|  |             | (122 °F) 50°C 1.8 ± 0.2               |
|  |             | (167 °F) 75°C 2.0 ± 0.3               |
|  |             | (212 °F) 100°C 4.0 ± 0.4              |
|  |             | (248 °F) 120°C 5.5 ± 0.5              |

1) on CTI 400 laminate or with double coating

## Approvals

| Approvals                               |                    |        |
|---|--------------------|--------|
| UL 94 V-0                               | Internal test      | passed |
| IPC SM-840 C, Classes H&T <sup>1)</sup> | Trace Laboratories | passed |
| Bellcore TR-TSY-00078                   | 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

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## 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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