

Advanced Materials

TECHNICAL DATA SHEET**Probimer® 77 MA-1 8030-3 / 8045 / 8064-3 Solder Mask****GENERAL****High Performance Photoimageable Solder Mask - Alkaline Developable Three-Component-System for Electrostatic Spray Coating & Curtain Coating****Application**

Probimer® 77 MA-1 8030-3 / 8045 / 8064-3 Solder Mask is a three component, photoimageable insulating and negative-working solder mask that dries by evaporation to give an aqueous processable film with semi-matte finish. This product system is designed for application by electrostatic spray or curtain coating to meet the high requirement of PCB manufactures.

PROPERTIES

- Very low halogen content level
- Outstanding resistance to electroless and electrolytic Nickel and Gold plating and other electrical, physical and mechanical properties
- Excellent resolution, allowing precise reproduction of the photographic master.
- Very low exposure energy is needed and therefore shorter exposure time, high exposure production output
- Non-tacky coating surface to even very warm exposure frame in virtue of its short exposure time
- Fulfills the most stringent requirements for electrical corrosion resistance, outstanding moisture and insulation resistance performance

PRODUCT COMPONENTS

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

	Probimer 77/8030-3	Hardener 77/8045	Additive 77/8064-3
Product Components	Resin	Hardener	Additive
Mix Ratio	7.2 kg	2.7 kg	8.4kg

**PROCESS
RECOMMENDATIONS****Room Requirements on Working Environment**

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

- Room Temperature: $24 \pm 1^\circ\text{C}$
- Relative Humidity $50 \pm 5\%$
- Cleanroom Class 100'000
- Overpressure Cleanroom + 3 mm WS
- UV blocked light

Mixing

- Preparation of ink
Hold each component at room temperature for a while if it has been kept in cold storage.
- Stirring of a resin component
Set up only a resin component to the high-share mixer and stir it for 5 minutes.
- Stirring of a hardener component
Stir a hardener component by plastic spatula thoroughly.
- Addition of a hardener component
Stop mixer and add a hardener component into a resin component.
- Mixing/stirring
Mix and stir the mixture of resin and hardener for 10 minutes.
- Addition of an additive component
After pre-stirring of an additive component, add it into the mixture of resin and hardener
- Mixing/stirring
Mix and stir the mixture of three components for 10 minutes.
- Addition of diluent
Add the prescribed diluent into the mixture and stir for at least 10 minutes. ^(*1)
- Viscosity check
Measure viscosity by prescribed viscometer and confirm ink viscosity is in correct range.
- Filtration
Filtrate the mixture with 50um opening nylon filter in order to trap possible contamination.
- Ink supply to the coater
Supply the ink mixture to the coater.

Note (*1)

It is recommended for curtain coat ink to adjust its ink viscosity higher than prescription when the ink is supplied to curtain coater just after splashing the coater by solvent. The residual solvent in the pipelines of the curtain coater would make ink viscosity lower.

For e-spray coating and curtain coating, it's also important to control the amount of diluent added for reproducible film thickness. Viscosity measurement is subject to temperature, shearing and hold time after mixing.

Pot Life

At above described working environment, the mixing ink has a pot life of 3 days

Pre-Cleaning

Pre-cleaning should be carried out in brushing, chemical or pumice spray units. Holding times or interim storage prior to coating should be avoided, because this might impair the mask's adhesion as a result of oxide formation. Be sure to coat only boards with absolutely dry surface and holes.

Coating

Probimer 77 MA-1 system may be applied with electrostatic spray method or curtain coating method.

Electrostatic spray coating method

Processing Parameters	from	to	standard
Lacquer temperatures (°C)	23	25	24
Viscosity at 25 °C, Iwata cup (sec) ¹⁾	30	100	40
Wet thickness (µm)	60	100 ²⁾	80

1) Proper viscosity depends on the coating thickness, the applied spray machines etc.

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

Curtain coating method

Processing Parameters	from	to	standard
Lacquer temperatures (°C)	24	26	25
Conveyor speed under curtain	60	100	70
Viscosity @25 °C DIN 4 cup (sec)	40	80	60
Wet weight (g/600cm ²)	5	9	6.5

Flash-off

For Electrostatic spray application

Flash - off after spray coating is not required.

For curtain coating application

In order to achieve a uniform coating quality, the solvents in the wet Probimer film must be flashed off under controlled condition.

Process Parameters	from	to	standard
Flash - off temperatures (°C)	45	52	47
Flash - off time (°C)	10	24	12

Drying

The coated boards must be dried before further processing. Tests have shown that the drying step lays a critical role in determining performance properties with regard to resolution, and resistance to finishing processes.

For Electrostatic spray application

Process Parameters	from	to	standard
Drying temperature (°C)	80	90	80
Drying time (min)	30	70	40

For curtain coating application

Process Parameters	from	to	standard
Drying temperature (°C)	80	90	80
Side 1 Drying time (min.)	10	30	20
Side 2 Drying time (min)	20	40	35

Exposure

Probimer 77 MA-1 has a spectral absorption between 350 and 420 nm. Good vacuum during exposure will ensure best resolution.

Process Parameters	from	to	standard
Energy (mJ/cm ²) (Metal Halide lamp)	150	300	200
Stouffer step clear on Cu (21step)	11	13	12

Maximum hold time between exposure and development is 72 hours at proper condition.

Both silver halide and diazo films are suitable working films for exposure. Care should be taken to ensure that the film density in the 350-500 nm range is sufficient.

PROCESS RECOMMENDATIONS

Developing

The areas of unexposed Probimer 77 MA-1 should be developed in a continuous spray developing line.

Developing is carried out in a 0.9 – 1.1% aqueous sodium carbonate solution.

Process Parameters	from	to	standard
Developing temperature in °C	28	32	30
Dwell time under spray (sec)	60	90	60
Spray pressure in MPa (psi)	0.2	0.4	0.25

Final Curing

Final curing may be performed in a conventional air - circulating oven.

Process Parameters	from	to	standard
Air temperature in °C	145	160	150
Temperature hold time (min)	60	90	60

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

UV-Curing

For better resistance toward some aggressive fluxes and electroless Ni & Au plating, a UV bump of 1000-2000 mJ/cm² may be required after thermal curing.

Legend Inks and Conformal Coatings

In general, legend inks and conformal coatings exhibit well to excellent adhesion to boards coated with Probimer 77 MA-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

Physical Properties

Halogen content level		300 – 500ppm
Resistance to solder bath	IPC-SM-840 C	Satisfied
Resistance to fluxes (3 cycles at 260 °C at 20sec)	Solbond K-183 Kester 951	Satisfied
Resistance to solvents	Isopropanol 1.1.1. Trichlorethane MEK Methylene chloride	> 30 min
Boiling water test	After 1 hour followed by cross cut and tape	Satisfied
Resistance to chemicals (25 °C 1hr)	10% H ₂ SO ₄ , 10% HCl 10% NaOH	Satisfied
Adhesion		Satisfied
Electroless Ni and Au plating	Tape test	No penetration No peel off
Pencil hardness		7H
Ionic contamination		Very low

Chemical Properties

Surface resistance	IEC 60167	10^{12} - $10^{13}\Omega$
Volume resistivity	IEC 60093	10^{14} - $10^{15}\Omega$ /cm
Dielectric Strength (50 Hz) (20-s value)	IEC 60243	150 – 170 V/(m
Dielectric constant ϵ_r at 1 MHz	IEC 60250	3.8 - 4.2
Dielectric loss factor (tan δ , at 1 MHz)	IEC 250	2.6% \pm 0.2
Insulation resistance	IPC-SM-840C	
	Before soldering	$10^{13}\Omega$
	After soldering	$10^{13}\Omega$
Moisture and insulation resistance 25 - 65 °C/85%RH/50VDC/160hr	IPC-SM-840C (class H)	Pass
	Before soldering	Pass
	After soldering	

**STORAGE /
EXPIRATION**

When stored in a sealed container, in a cool place (5-25 °C) away from direct heat and sunlight.
The expiry date is printed on the package label. Within this period the product should be used.

**HANDLING
PRECAUTIONS**

The appropriate industrial hygiene precautions and safety regulations should always be observed when handling our products.
PROBIMER products contain flammable solvents. Contact with heat, spark and open flame is hazardous.

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