HUNTSMAN

Technical Datasheet

PROBIMER® 65 halogen-free

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

- **Halogen-free – exceeds JPCA Standard**
- **Green version**
- **Exposure time reduced by 50% compared to standard systems**
- **High resolution**
- **Excellent resistance at high temperatures (up to 150°C / 302°F)**
- **Excellent thermal cycling resistance**
- **High comparative tracking index (CTI)**
- **High dielectric strength**
- **Excellent adhesion of legend inks and conformal coatings**
- **Compatible with most aggressive post solder mask processes such as high phosphor/nickel gold and immersion tin**
- **High resolution in bar code laser process**

ISO 9001 certified

7203-5 / 7211-1

PRODUCT INFORMATION

General Product Overview

Probimer 65/7203-5 is a photoimageable, negative working solder mask optimized for curtain coating application. The solder mask exhibits a semi-matte surface. Probimer 65/7203-5 is halogen-free and exceeds the requirements of the JPCA standard: the system has a total halogen content after final curing of less than 500 ppm. Probimer 65/7203-5 offers high process flexibility - also for the developing step: the solder mask can be processed with ethyl-diglycol (EDG), butyl-diglycol (BDG) or γ-butyrolactone (GBL). After recycling, the developer medium can be reused for processing.

At present the product system is available under the designation XB 7203-5 and XB 7211-1.

Special Features and Benefits

- Two-component-system, green version, semi-matte surface
- Halogen-free: exceeds JPCA standard, total halogen content after final curing less than 500 ppm
- Low sublimation
- High resolution
- Exposure time reduced by 50% compared to standard systems
- 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
- Excellent resistance at high temperatures (up to 150°C / 302°F) and during thermal cycling
- High comparative tracking index (CTI) and high dielectric strength
- Excellent adhesion of conformal coatings
- High resistance with most aggressive post solder mask processes such as high phosphor ENIG, immersion tin and e'less Ag, with maximum metal turn over (MTO)
- Ideally suited for SIT process (Second Image Transfer)
- High resolution in bar code laser process

Product Components

Probimer 65/7203-5 is a two-component-system. It is provided in ready-to-mix packages.

	Probimer 65/7203-5	Hardener 65/7211-1	Diluent DY 830
Product Components	Resin	Hardener	Diluent
Mix Ratio	9.7 kg	2.5 kg	≈ 0.2 kg

Storage and Expiration

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

- PROBIMER 65/7203-5 in original container at 2-40°C (35.6-104 °F)
- Hardener 65/7211-1 in original containers at 2-40°C (35.6-104 °F)
- Diluent DY 830 in original containers at 2-40°C (35.6-104 °F)

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 should be respected:

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

Mixing

Prior to application we recommend to thoroughly mix both components in mechanical mixers or shakers. The recommended mixing time is 10-15 minutes.

The hardener component 65/7211-1 is mixed with the viscous resin component Probimer 65/7203-5. Viscosity is then adjusted with the addition of diluent DY 830.

Pot Life

At room temperature the ready-to-use mixture has a pot life of one week.

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 65/7203-5 a pre-heating of the boards is not required. A wide process window of 20-50°C (68-122 °F) 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 in °C (in°F)	17 (62.6)	32 (89.6)	25 (77)
Conveyor speed under curtain (m/min)	60	100	90
Viscosity at 25°C, DIN-4-cup (s)	60	110	70
Wet weight (g/600cm^2)	4.0	7.0[1)]	6.0

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

PROCESS RECOMMENDATIONS

Flash-off / Drying

Probimer 65/7203-5 offers a wide drying window of 80-100°C between 30-70 minutes.

Processing parameters for CL-lines [1]	from	to	standard
Flash-off temperature °C (in °F)	105 (191)	135 (275)	120 (248)
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 (in °F)	38 (100.4)	50 (122)	40 (104)
Flash-off time (min)	7	24	12 [2]
Temperature setting zone 1 °C (in °F)	135 (245)	160 (320)	155 (311)
Temperature setting zone 2 °C (in °F)	135 (245)	160 (320)	155 (311)
Temperature setting zone 3 °C (in °F)	135 (245)	160 (320)	155 (311)
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 for ORC 7 kW	from	to	standard
Energy – Fe-doped lamp (mJ/cm^2)	250	500	300
Stouffer Step clear on Cu (21-step, ΔD = 0.15)	7	11	9
Hold time after exposure		Not necessary	

Developing

For the developing step we recommend a continuous spray developing line. As developer medium we recommend BDG, EDG or GBL. The process parameters depend on small hole development.

Process parameters for EDG developer medium	from	to	standard
Developing temperature chamber 1 °C (in °F)	33 (91.4)	37 (98.6)	35 (95)
Developing temperature chamber 2 °C (in °F)	23 (73.4)	27 (80.6)	25 (77)
Developing temperature chamber 3 °C (in °F)	18 (64.4)	22 (71.6)	20 (68)
Dwell time under spray (s)	150	75	110
Spray pressure in bar (psi)	1 (14.5)	5 (72.5)	4 (58)
Conveyor speed (m/min) [1]	0.6	1.2	0.8

1) The recommended parameters are valid for PR 450. For all other process equipment, the optimum settings have to be defined.

PROCESS RECOMMENDATIONS

Inspection and Stripping

In case of mishandling during exposure, such as misregistration, boards can be stripped at 50-60°C (122 - 140°F) with GBL or any other conventional stripping medium.

UV-Curing

We recommend to process the boards through a continuous UV exposure unit at 1-2 J/cm^2 before final curing. The exposure energy depends on the processing equipment and its temperature profile.

Final Curing

Processing parameters for batch oven	from	to	standard
Air temperature °C (in °F)	145 (293)	155 (311)	150 (302)
Temperature hold time (min)	45	60	60

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

Legend Inks and Conformal Coatings

In general, legend inks and conformal coatings exhibit good to excellent adhesion to boards coated with Probimer 65/7203-5. 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)	≈ 51 weight %
Halogen content level	JPCA standard	< 500 ppm
Boiling water test	JPCA-ES-01/1999	passed
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)		40-60 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		150-170 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	(77 °F) (122 °F) (167 °F) (212 °F) (248 °F)	25°C 2.6 % ± 0.1 50°C 3.3 % ± 0.2 75°C 3.3 % ± 0.3 100°C 3.6 % ± 0.4 120°C 4.6 % ± 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, Class 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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