

## Technical Datasheet

# PROBIMER<sup>®</sup> 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



# 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  $\gamma$ -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.

	<b>Probimer 65/7203-5</b>	<b>Hardener 65/7211-1</b>	<b>Diluent DY 830</b>
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 Humidity 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 <sup>2</sup> )	4.0	7.0 <sup>1)</sup>	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 <sup>1)</sup>	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 <sup>1)</sup>	from	to	standard
Flash-off temperature °C (in °F)	38 (100.4)	50 (122)	40 (104)
Flash-off time (min)	7	24	12 <sup>2)</sup>
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 <sup>2</sup> )	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) <sup>1)</sup>	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<sup>2</sup> 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	> 1h
	MEK	> 1h
	1,1,1-Trichlorethane	> 1h
	Methylenchloride	> 1h
Resistance to	E'less Ni/Au	passed
	E'less Sn, Ag	passed
	Org. Surface Passivations	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 <sup>14</sup> -10 <sup>15</sup> Ω
Volume resistivity	IEC 60093	10 <sup>15</sup> -10 <sup>16</sup> Ω/cm
Comparative Tracking Index (CTI)	IEC 60112	600 – 0.0 V <sup>1)</sup>
Dielectric constant ε <sub>r</sub> at 1 MHz	IEC 60250	3.0 – 4.0
Dielectric loss factor tan δ at 50 Hz	IEC 60250	(77 °F) 25°C 2.6 % ± 0.1
		(122 °F) 50°C 3.3 % ± 0.2
		(167 °F) 75°C 3.3 % ± 0.3
		(212 °F) 100°C 3.6 % ± 0.4
		(248 °F) 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 <sup>1)</sup>	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.

---

## Customer Service Center

### Europe/Middle East/Africa

Huntsman  
Advanced Materials  
(Switzerland) GmbH  
Klybeckstrasse 200  
4057 Basel  
Switzerland

Tel.: +41 61 9663333  
Fax: +41 61 966 3334  
electronics@huntsman.com  
www.huntsman.com/electronics

### Americas

Huntsman  
Advanced Materials  
Americas Inc.  
10003 Woodloch Forest Drive  
The Woodlands  
Texas 77380  
USA

Tel.: +1 713 235 6000  
Fax: +1 713 235 6416  
electronics@huntsman.com  
www.huntsman.com/electronics

### Asia Pacific

Huntsman  
Advanced Materials  
(Guangdong) Company Ltd.  
Flying Geese Mountain Industrial Park  
Shilou Town, Panyu City  
Guangdong 511447  
P.R. China

Tel.: +86 20 848 65123  
Fax: +86 20 8486 5122  
electronics@huntsman.com  
www.huntsman.com/electronics

---

## Disclaimer

**IMPORTANT LEGAL NOTICE:** Sales of the product described herein ("Product") are subject to the general terms and conditions of sale of Huntsman Advanced Materials Corporation, Huntsman Advanced Materials (Europe) BVBA, Huntsman Advanced Materials Americas Inc., Huntsman Advanced Materials (Hong Kong) Ltd., or its appropriate affiliate("Huntsman"). The following supercedes Buyer's documents.

**WARRANTY:** Huntsman warrants that at the time and place of delivery all Products sold to Buyer shall conform to the specifications provided to Buyer by Huntsman.

**DISCLAIMER AND LIMITATION OF LIABILITY:** EXCEPT AS SET FORTH ABOVE, HUNTSMAN MAKES NO OTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS, OR WARRANTIES AS TO QUALITY OR CORRESPONDENCE WITH PRIOR DESCRIPTION OR SAMPLE, AND THE BUYER ASSUMES ALL RISK AND LIABILITY WHATSOEVER RESULTING FROM THE USE OF SUCH PRODUCT, WHETHER USED SINGLY OR IN COMBINATION WITH OTHER SUBSTANCES. No statements or recommendations made herein are to be construed as a representation about the suitability of a Product for the particular application of Buyer or user or as an inducement to infringe any patent. Buyer is responsible to ensure that its intended use of the Product does not infringe any intellectual property rights. Huntsman's maximum liability for any claim related to the Products or breach of an agreement associated therewith shall be limited to the purchase price of the Products or portion thereof to which such claim pertains. IN NO EVENT SHALL HUNTSMAN BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL OR PUNITIVE DAMAGES, INCLUDING BUT NOT LIMITED TO ANY DAMAGES FOR LOST PROFITS OR BUSINESS OPPORTUNITIES OR DAMAGE TO REPUTATION.

**WARNING:** Technical data and results are based upon tests under controlled laboratory conditions and must be confirmed by Buyer by testing for its intended conditions of use. The Product described herein has not been tested for, and is therefore not recommended or suitable for, uses for which prolonged contact with mucous membranes, abraded skin, or blood is intended or likely, or for uses for which implantation within the human body is intended, and Huntsman assumes no liability for any such uses. Furthermore, Huntsman shall not be liable for, and Buyer assumes all risks related to, the technical or other information or advice contained herein, or hereafter provided by Huntsman whether or not at Buyer's request.

Probimer® is a registered trademark of Huntsman Corporation or an affiliate thereof in one or more, but not all countries.

Status: May 2006