TECHNICAL DATA SHEET

PSR-4000 BW01DI

(UL Name: PSR-4000HA / CA-40HJ)

LIQUID PHOTOIMAGEABLE SOLDER MASK

- **Direct Imaging**
- **Screen Print**
- **Green Glossy Surface Finish**
- **Extremely Fast Photospeed with DI Exposing Equipment**
- **Fine Dam Resolution**
- **Excellent Small Hole Clearing**
- **RoHS Compliant**
- **Halogen-Free**
- **Compatible with Lead-Free Processing**
- **Wide Processing Window**
- **Withstands ENIG & Immersion Tin**
- **Meets IPC-SM-840E Requirements**

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TECHNICAL DATA SHEET

PROCESSING PARAMETERS FOR PSR-4000 BW01DI

PSR-4000 BW01DI is a two-component alkaline developable LPI solder mask products for screen print application. The product is designed to be user friendly with low odor, fast developing and good resistance to alternate metal finishes such as ENIG and immersion Tin while maintaining dams of 3 mils or less. All Taiyo America products comply with the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

PSR-4000 BW01DI COMPONENTS:

	PSR-4000 BW01DI	/ CA-40 BW01DI
Mixing Ratio	70 parts	30 parts
Color	Green	Yellow

Mixed Properties

Solids	80%
Viscosity	220 – 270 ps
Specific Gravity	1.5

MIXING

PSR-4000 BW01DI is supplied in pre-measured containers with a mix ratio by weight of 70 parts, 0.70 kgs **PSR-4000 BW01DI** and 30 parts, 0.30 kgs, **CA-40 BW01DI. PSR-4000 BW01DI** can be mixed by a mechanical mixer at low speeds to minimize shear thinning for 10 – 15 minutes.

The mixed pot life is 48 hours at room temperature. All processing must be done under yellow light as this product is very reactive to light in the 420 nm range.

PRE-CLEANING

Prior to solder mask application, the printed circuit board surface needs to be cleaned. Various cleaning methods include Pumice, Aluminum Oxide, Mechanical Brush, and Chemical Clean. For full body gold an alkaline cleaner is recommended. All of these methods will provide a clean surface for the application of **PSR-4000 BW01DI.** Hold time after cleaning the printed circuit board should be held to a minimum to reduce the oxidation of the copper surfaces.

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PROCESSING PARAMETERS FOR PSR-4000 BW01DI

SCREEN PRINTING

Method: Single Sided and Double Sided Screening

- Screen Mesh: 29 – 43 threads/cm (74 – 110 tpi)
- Screen Mesh Angle: 22.5° Bias
- Screen Tension: 20 - 28 Newtons
- Squeegee: 60 – 80 durometer
- Squeegee Angle: 27 – 35°
- Printing Mode: Flood / Print / Print
- Flood Pressure: 20 – 30 psi
- Printing Speed: 2.0 – 9.9 inches/sec
- Printing Pressure: 65 – 100 psi

TACK DRY CYCLE

The Tack Dry step is required to remove solvent from the solder mask film and produce a firm dry surface. The optimum dwell time and oven temperature will depend on oven type, oven loading, air circulation, exhaust rate, and ramp times. Excessive tack dry times and temperature will result in difficulty developing solder mask from through holes and a reduction in photo speed. Insufficient tack dry will result in artwork marking and/or sticking. Typical tack dry condition for **PSR-4000 BW01DI** is as follows:

- Oven Type: Conventional Batch or Conveyor
- Oven Temperature: 71 - 82°C (160 - 180°F)
- For Single-Sided (Batch Oven)
  - 1st Side: Dwell Time: 15 - 30 minutes
  - 2nd Side: Dwell Time: 20 - 40 minutes
- For Double-Sided (Batch or Conveyor)
- Dwell Time: 20 - 70 minutes

EXPOSURE

PSR-4000 BW01DI uses UV-LED curing technology to define solder mask dams and features. The spectral sensitivity of **PSR-4000 BW01DI** is in the area of 365 - 405 nm. Exposure times will vary by power, light source, wavelength and age of the light source. Below are guidelines for exposing **PSR-4000 BW01DI**. Retention of smallest feature will determine the exposing energy.

- Exposure Unit: Direct Imaging Exposure Unit
- Stouffer Step 21: **Clear 8 minimum** (on metal / under phototool)
- Energy: 80 mJ / cm^2 minimum (under phototool)

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PROCESSING PARAMETERS FOR PSR-4000 BW01DI

DEVELOPMENT

PSR-4000 BW01DI is developed in an aqueous sodium or potassium carbonate solution. Developing can be done in either a horizontal or vertical machine.

- Solution: 1% by wt. Sodium Carbonate or 1.2% Potassium Carbonate
- pH: 10.6 or greater
- Temperature: 85 - 95°F (29 - 35°C)
- Spray Pressure: 25 - 45 psi (1.7 – 3.1 bars)
- Dwell Time in developing chamber: 45 - 90 seconds
- Water rinse is needed to remove developer solution followed by a drying step

PRE-CURE (OPTIONAL)

This step may be required if the vias remain tented on both sides after developing due to the board design. The added drying cycle will prevent out-gassing of the vias. This phenomenon can cause the solder mask over the vias to peel or pop and may also exhibit a degree of oozing due to the entrapped solvent. The required drying cycle is 100 - 110°C for 40 to 60 minutes. An extended time may be required on the higher aspect ratio.

FINAL CURE

PSR-4000 BW01DI requires a thermal cure to insure optimal final property performance. Thermal curing can be done in a batch oven or conveyorized oven.

- Temperature: 275 – 300°F (135 – 149°C)
- Time at Temperature: 45 – 60 minutes

UV CURE

To improve moisture and chemical resistance a UV cure of 2 - 3 J/cm^2 is recommended.

For Process Optimization please contact your local Taiyo America Representative

Taiyo America, Inc. (TAIYO) warrants its products to be free from defects in materials and workmanship for the specified warranty period **PSR-4000 BW01DI / CA-40 BW01DI Warranty period is 6 Months** provided the customer has, at all times, stored the ink at a temperature of 68°F or less. TAIYO accepts no responsibility or liability for damages, whether direct, indirect, or consequential, resulting from failure in the performance of its products. If a TAIYO product is found to be defective in material or workmanship, its liability is limited to the purchase price of the product found to be defective. TAIYO MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. TAIYO'S obligation under this warranty shall not include any transportation charges or costs of installation or any liability for direct, indirect, or consequential damages or

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delay. If requested by TAIYO, products for which a warranty claim is made are to be returned transportation prepaid to TAIYO'S factory. Any improper use or any alteration of TAIYO'S product by the customer, as in TAIYO'S judgment affects the product materially and adversely, shall void this limited warranty.

FINAL PROPERTIES FOR PSR-4000 BW01DI

IPC-SM-840E, Class H & T, Solder Mask Vendor Testing Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Visual	3.3.1	Uniform in Appearance	Pass
Curing	3.2.5.1	Ref: 3.6.1.1, 3.7.1 and 3.7.2	Pass
Non-Nutrient	3.2.6	Does not contribute to biological growth	Pass
Pencil Hardness	3.5.1	Minimum "F"	Pass – 8H
Adhesion	3.5.2.1	Rigid – Cu, Ni, FR-4	Pass
Adhesion	3.5.2.6	Doubled Layered Solder Mask	Pass
Machinability	3.5.3	No Cracking or Tearing	Pass
Resistance to Solvents and Cleaning Agents	3.6.1.1	Table 3 Solvents	Pass
Hydrolytic Stability and Aging	3.6.2	No Change after 28 days of 95-99°C and 90-98% RH	Pass
Solderability	3.7.1	No Adverse Effect J-STD-003	Pass
Resistance to Solder	3.7.2	No Solder Sticking	Pass
Resistance to Solder	3.7.3	No Solder Sticking	Pass
Simulation of Lead Free Reflow	3.7.3.1	No Solder Sticking	Pass
Dielectric Strength	3.8.1	500 VDC / mil Minimum	Pass – 5900 VDC/mil
Thermal Shock	3.9.3	No Blistering, Crazing or De-lamination	Pass

Specific Class "H" Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Flammability	3.6.3.1	UL 94V-0	Pass – File #E166421
Insulation Resistance Before Soldering After Soldering	3.8.2	 5×10^8 ohms minimum 5×10^8 ohms minimum	 9.5×10^{11} ohms 2.3×10^{13} ohms
Moisture & Insulation Resistance Before Soldering–In Chamber Before Soldering–Out of Chamber After Soldering-In Chamber After Soldering-Out of Chamber	3.9.1	 5×10^8 ohms minimum 5×10^8 ohms minimum 5×10^8 ohms minimum 5×10^8 ohms minimum	 3.1×10^{11} ohms 6.5×10^{12} ohms 1.8×10^{11} ohms 9.6×10^{12} ohms
Electrochemical Migration	3.9.2	$>2.0 \times 10^6$ ohms, no dendritic growth	Pass (6.9×10^{11} ohms)

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FINAL PROPERTIES FOR PSR-4000 BW01DI

Specific Class "T" Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Flammability	3.6.3.2	Bellcore 0_2 Index – 28 minimum	Pass – 70
Insulation Resistance Before Soldering After Soldering	3.8.2	 5×10^8 ohms minimum 5×10^8 ohms minimum	 Pass (2.8×10^{11} ohms) Pass (1.9×10^{13} ohms)

Specific Class "T" Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Moisture & Insulation Resistance Before Soldering–In Chamber Before Soldering–Out of Chamber After Soldering-In Chamber After Soldering-Out of Chamber	3.9.1	 5×10^8 ohms minimum 5×10^8 ohms minimum 5×10^8 ohms minimum 5×10^8 ohms minimum	 Pass (3.7×10^9 ohms) Pass (2.4×10^{11} ohms) Pass (1.1×10^9 ohms) Pass (1.0×10^{13} ohms)
Electrochemical Migration	3.9.2	< 1 decade drop, no dendritic growth	Pass

Additional Tests / Results

TEST	REQUIREMENT	RESULT
Adhesion	GIP-008AA (TAIYO Internal Test Method) Cross-cut tape stripping test	100/100
Solder Heat Resistance	Solder float test: Rosin Flux 300°C/10sec., 3 cycle	Pass
Solvent Resistance	PGM-AC dipping, temp 20°C. / 20 min, Tape peeling test	Pass
Acid Resistance	10 vol% H_2SO_4, temp 20°C. / 20 min, Tape peeling test	Pass
Alkaline Resistance	10 wt% NaOH, temp 20°C. / 20 min, Tape peeling test	Pass
Electroless Ni/Au	TAIYO Internal Test Method Ni: 3 microns, Au: 0.03 microns	Pass
Halogen Content	Halogen-Free if < 900 ppm	Pass

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