



# LPI 900W LD-4D2 Series LPI Solder Mask

## DESCRIPTION

LPI 900W LD-4D2 LPI solder mask is a two component Liquid Photoimageable (LPI) solder mask manufactured by Sanwa Chemical that has the following benefits.

- 1.) Highly reflective for use in LED devices
- 2.) Has excellent weather resistance and high reflectivity
- 2.) Very low discoloration under UV light or high temperatures

## OPERATING PARAMETERS

Make-Up	800 grams of SPSR-900W LD-4D2 200 grams of hardener SH-250 LD-4
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### Nomenclature (See ordering sheet for more details)

<b>A.</b>	<b>Colors:</b>	<b>Symbol</b>
	White	W
<b>B.</b>	<b>Texture</b>	<b>Symbol</b>
	Gloss	L

## PHYSICAL PROPERTIES

Colors	White
Textures	Gloss
Volatile %	20%
Viscosity (RT = 25C or 72F)	200-320 ps for mixed LPI 500 ps for the main component 45 ps for the additive SH-250 LD-4
Machinability (Item 3.5.3)	Acceptable
Hardness- pencil (JIS-D-0202)	>6H
Adhesion (JIS-D-0202)	100/100. Passed crosscut hatch test
Heat resistance (solder bath)	Passed three times floating at 260C for 10 seconds
Insulation resistance IPC-SM-840C at 100V	1 x 10 <sup>2</sup> Ohms as received 1 x 10 <sup>2</sup> Ohms: Class T at 65C / 90% RH for 24 days. 1 x 10 <sup>2</sup> Ohms: Class H at 40C / 85% RH for 7 days
Electrochemical migration	Less than 1 decade drop: Class T at 85C / 85% RH for 500 hours. 2 x 10 <sup>8</sup> Ohms: Class H at 85C / 85% RH for 168 hours
Dielectric constant (at 1	2.8 as received



MHz)	3.5 at 55C / 95% RH for 96 hours.
Dielectric loss/Tan	0.025 as received 0.032 at 55C / 95% RH for 96 hours
Dielectric strength	2.0 KV/mil
Solvent resistance – IPA (Item 3.6.1.1)	Passed for 60 minutes at room temperature. Passed for 20 minutes at 46C
Chemical resistance 10% HCl, 10% H <sub>2</sub> SO <sub>4</sub> , 3% NaOH	Passed for 30 minutes at room temperature
Immersion in boiling water	Passed for 2 hours
Gold plating	Electro-gold plating at 40C at 1.0 Amp/dm <sup>2</sup> for 5 min. ENIG plating, Ni 3 microns, Au 0.05 microns
Pressure cooker test (JIS-D-0202)	Passed at 121C at 2 atmosphere for 4 hours
Flammability (UL approved)	UL 94V-0
Thermal shock (Item 3.9.3)	Passed -65C / 15 min. to 125C / 15 min. for 100 cycles
Shelf life unmixed state Mixed state	9 months after delivered when stored at 20C (65F) >48 hours
Thixotropic index	1.1-1.3

**Note: Typical property values listed above are not to be construed as a specification.**

## CONTROL PROCEDURES

### 1. Preparation of the Solder Mask

- A. Add 800 grams of SPSR-900W LD-4D2 to 200 grams of hardener SH-250 LD-4
- B. Thoroughly mix up both components. This will result in the mask having a viscosity of 300 - 320 poise. Lower viscosities can be achieved by adding a small quantity of PMA solvent.
- C. Shelf life is at least 24 hours after initial mixing.

### 2. Application of the Solder Mask

- A. In screen-printing, the viscosity of the mask should be around 300 - 340 poise at 25C.
- B. A polyester or stainless steel screen of 100-180 mesh is recommended for low copper weights. For copper weights over 1 oz., use a screen mesh of 110 or lower.
- C. The bare copper surface should be polished and dried thoroughly by either pumice or aluminum oxide scrubbing.
- D. The solder mask should be applied to give a thickness of 15-20 microns. A coating greater than 25 microns may give rise to tackiness and under cut problems. A thickness less than 10 microns will make the mask more sensitive to heat and chemicals and overall increase general exposure sensitivity.

### 3. Pre-cure (tack dry)

- A. This procedure condition is very critical to the development process and finished surface.
- B. Optimum drying conditions are to be used to evaporate the solvent out of the mask. Approximately 20 - 30 minutes at 80C (176F) is recommended for thermal ovens for a thickness of 15 to 20 microns.
- C. For double sided printing, the first side should be dried for 10 - 15 minutes and the second side should be dried for 20 - 25 minutes each at 80C (176F).

**Note: Poor ventilation and poor drying will cause the surface to become matted.**

### 4. Exposure

- A. The solder mask is to be exposed by a super high-pressure mercury vapor lamp.
- B. Set the exposure unit to deliver 500-700 mJ/cm<sup>2</sup> of energy. The goal is to get a step of 11 – 12 over copper on a 21 step tablet.

### 5. Development

- A. The exact development time will depend on the actual developer and this varies from machine to machine. In screen applications, a break point of 25-40% is recommended (25% for thick solder mask) and 50% for spray and curtain coat applications. This will ensure that there is no solder mask in the holes.
- B. Typically, a 1% by weight sodium carbonate developer is used at 90-105F (30-40C) under a pump pressure of 20-40 psi (1.5 to 2.5 Kg/cm<sup>2</sup>). A 20-micron thick mask should develop in 60 to 90 seconds.
- C. Discard developing solution when the loading level reaches about 100 grams of mask per liter of working solution.
- D. Water rinsing after development is needed with a recommended pressure of 1.0-1.5 Kg/cm<sup>2</sup> (15-20 psi) for 45-60 seconds.
- E. Florida CirTech has a variety of potassium carbonate based developers with and without cleaners to minimize down time and scale build up. In addition, Florida CirTech also sells very compact and precise feed and bleed control units based on pH.

**Note: The solder mask surface is vulnerable to scratching before final cure.**

### 6. Final cure

The final cure should be as follows:

IR baking	10 minutes at 170C (340F)
Thermal oven bake	60 minutes at 150C (300F)

### Summary of process parameters

1. Processing of this LPI solder mask should be done under a yellow lamp.
2. Optimum LPI mask thickness is 10 to 20 microns over the copper circuitry.
3. Tack dry times longer than recommended may cause development problems.
4. Optimum exposure will depend upon the base laminate. For example, UV absorbing laminate and polyimide materials as well as the solder mask thickness will affect the exposure. Exposure should therefore be determined experimentally.
5. Minimize the hold time after tack dry to ensure proper developing. Hold times up to 120 hours after tack dry are acceptable.

## ANALYSIS

Not applicable.

## **SAFETY AND STORAGE**

Do not store in direct sunlight, high temperature or below freezing. Store in original uncontaminated container.

## **WASTE TREATMENT**

Not applicable.

## **MISCELLANEOUS**

Consult MSDS sheets for additional information.