Florida CirTech
LEADERS IN PCB TECHNOLOGY

Product Data Sheet

LPI 950 LC-1 Series LPI Solder Mask

DESCRIPTION

LPI 950 LC-1 LPI solder mask is a two component Liquid Photoimageable (LPI) solder mask manufactured by Sanwa Chemical that has the following benefits.

1. Composed of mainly epoxy resin.
2. Leaves very little residue after development.
3. Wide tack dry operating window.
4. Excellent for fine solder dams.
5. Developed in standard carbonate solutions and baked for final curing.

OPERATING PARAMETERS

Make-Up	800 grams of SPSR-950 LC-1 200 grams of hardener SH-250B LC

Nomenclature (See ordering sheet for more details)

A.)	**Colors**	**Symbol**
	Green	G (D is dark green, M is normal green, and L is light green)
	Blue	B
	Black	C
	White	W
	Yellow	Y
	Red	R
	Clear	A
B.)	**Texture**	**Symbol**
	Gloss	L
	Semi-matte	SV
	Matte	V
C.)	**Examples**	
Green Gloss	SPSR-950 LC-1GL	
Yellow Gloss	SPSR-950 LC-1Y	
Green Matte	SPSR-950 LC-1GV	

Dark Green Gloss	SPSR-950 LC-1G (D)	

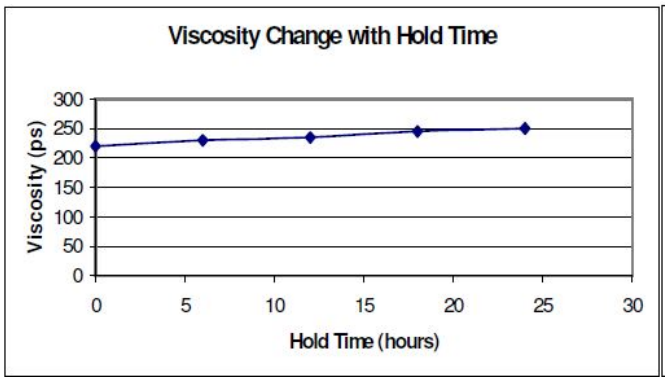
Note: Not every color and texture combination is available. Please contact FCT for details.

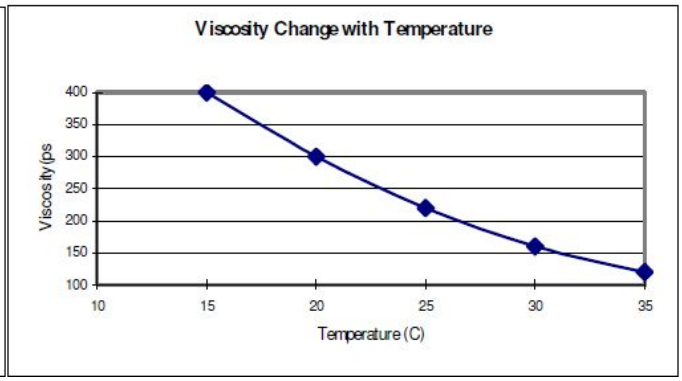
PHYSICAL PROPERTIES

Colors	Green, blue, yellow, red, white, black, red and clear
Textures	Gloss, Matte and Semi-matte
Volatile %	20%
Viscosity (RT = 25C or 72F)	220 ps for mixed LPI 280 ps for the main component 60 ps for the additive SH-250B LC
Thixotropic index	1.60 to 1.80 (after mixed up)
Hold time	The hold time is shown as a function of viscosity on the bottom of pg 2.
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-840B at 100V	1 x 10^{13}Ohms as received 1 x 10^{12} Ohms: Class T at 65C/90% RH for 24 hours 1 x 10^{11} Ohms: Class H at 40C/75% RH for 7 days
Electrochemical migration	Less than 1 decade drop: Class T at 85C/85%RH for 500 hours 2 x 10^{8} Ohms: Class H at 85C/85%RH for 168 hours
Dielectric constant (at 1 MHz)	2.8 as received 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_2SO_4, 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^2 for 5 min. Nickel/Gold plating, Ni 3 microns, Au 0.05 microns
Pressure cooker test	Passed at 121C at 2 atmosphere for 4 hours

(JIS-D-0202)	
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

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





CONTROL PROCEDURES

1. Preparation of the Solder Mask

A. Add 200 grams of SH-250B LC to 800 grams of SPSR 950 LC-1.
B. Thoroughly mix up both components. This will result in the mask having a viscosity of 220 poise. A lower viscosity can be achieved by adding a small quantity of PMA solvent.
C. Shelf life is at least 48 hours after initial mixing.

2. Application of the Solder Mask

A. In screen-printing, the viscosity of the mask should be around 200 - 240 poise at 25C.
B. A polyester or stainless steel screen of 110-140 mesh is recommended for low copper weights. For copper weights over 1 oz., use a screen mesh of 110 or lower.
C. The bare board 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 45 minutes at 165 - 170F is recommended for thermal ovens for a thickness of 15 to 20

microns. For double sided boards, the first side should be dried for 15 minutes @ 165-170F. The second side should be dried for 30 minutes @ 165-170F.

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 for the LC-1 solder mask.
B. Set the exposure unit to deliver 200-300 mJ/cm2 of energy. The goal is to get an 10-12 on the Stouffer step scale.
C. Increase the Stouffer step tablet reading to 13 for use with immersion finishes.

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 carbonate (Potassium carbonate based developer) is used at 90-105F (30-40C) under a pump pressure of 20-40 psi (1.5 to 2.5 Kg/cm2). 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 1-1.5 Kg/cm2 (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 (DV 100, DV 200 and DV 400). 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 340F
Thermal oven bake	One hour at 300-325F

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 conditions: when dried at 165-170F for 45 minutes, development will be good. Tack dry times over 45 minutes 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 by a Stouffer step wedge (range is 10-13).
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

Packaging. The main component comes in a small metal container that holds 800 grams of material. The additive comes in a plastic jar that contains 200 grams of material. Consult MSDS sheets for additional information.