TECHNICAL DATASHEET

Ronascreen™

SPSR 5600 Series

Aqueous Developable
PHOTOIMAGEABLE SOLDERMASK

PRODUCT DESCRIPTION

Ronascreen SPSR 5600 is a liquid photoimageable soldermask which is applied by horizontal or vertical screen printing techniques.

It is designed for contact-exposure and development in aqueous sodium or potassium carbonate. Printed circuit boards coated with Ronascreen SPSR 5600 meet the requirements of IPC 840 and are UL approved to 94V-O.

Ronascreen SPSR 5600 delivers excellent resistance to electroless nickel and gold processes (ENIG).

Use of Ronascreen SPSR HL-2 Catalyst with standard SPSR 5600 series inks gives a hard, non-tacky surface with easy artwork positioning and no sticking.

SPSR 5600 PRODUCT RANGE

5600 GDA	Green, high gloss, fast exposing
5600 GSE	Green, high gloss
5600 GM	Green, semi-matte, fast exposing
5600 GME	Green, semi-matte
5600 BDA	Blue, high gloss, fast exposing
5600 RDA	Red, high gloss, fast exposing
5600 Y	Opaque yellow, high gloss
5600 W	Opaque white, high gloss
5600 CSM	Black, semi-matte

All above inks used with HL-2 Catalyst.

Board surface preparation:

Copper surfaces should be mechanically or chemically cleaned to give a 60s waterbreak-free surface. Recommended mechanical methods are pumice, aluminium oxide or 320 grit brush.

Tin/lead boards should be thoroughly degreased using detergent/water rinse or solvent cleaning methods. Adhesion over tin/lead will be enhanced by lightly brushing the surface prior to coating.

All boards **must** be completely dry before coating.

Mixing:

Ronascreen SPSR 5600 is supplied pre-weighed.

The SPSR 5600 resist should be mixed in the ratio 80 parts 5600 paste (pt A) to 20 parts HL-2 hardener (by weight). Stir well to ensure complete mixing.

Incomplete mixing can cause poor developing, stickiness during exposure and impaired final properties.

Viscosity reduction:

Screen-print versions of SPSR 5600 are supplied screen ready. If viscosity adjustment is required prior to, or during printing, then this may be achieved using **Thinner BC.** No more than 2% reducer should be added or deterioration of the printing and drying properties may occur, resulting in thin deposits on track edges and/or prolonged drying times.

Process settings:

Mesh count:	37-55T polyester
Screen tension:	min. 18 N/cm^2
Squeegee:	60-70 Shore

20µm dry thickness should be aimed for; this is typically achieved using a 43T.

The print may be bubbled but this will clear quickly. A rack of panels should be held for 3 - 5 minutes after the last is printed before transferring to the drying oven.

The board outline image may be made on the screen using conventional stencil material or masking tape and screen filler. To prevent a build up of ink on the reverse of the screen that may block holes, it is advisable to shift alternate boards along the x- or y-axis before printing. Alternatively, a rudimentary stencil, such as an expanded drill mask, can be used on the screen to prevent ink going into the holes.

Do not utilise the vacuum bed, as this will suck an exaggerated amount of ink into the holes.

Tack-dry:

The aim of the tack-drying stage is to solely remove the solvents. It is important for the drying chamber (static or conveyorised) to have good air circulation with air supply and extraction facilities.

Recommended drying settings:

Side A: 15 - 20 minutes at 70 to 80°C
Side B: 20 minutes at 70 to 80°C

Total drying time for both sides should not exceed **45 minutes**. The coating should be touch-dry at room temperature.

The temperature must not exceed **80°C**. The oven used must have good extraction facilities to ensure that solvent vapours are removed. Drying times should allow time for the panels to reach drying temperature and for extraction of solvent vapours. The time will depend on the thermal capacity of the oven, the rate of extraction and particularly the number of panels in the batch. Thus drying times will need to be extended for larger batches.

After drying, boards must be stored away from UV and white light. Dried boards may be stored for up to **72 hours** before exposure. Storage must be in yellow light or darkness and at a temperature below 25°C.

Exposure

Spectral output: 310-420 nm. Optimum wavelength is approx. 365-385nm.

Step wedge: 8-10 clear (Stouffer 21 step).

Determination of the correct exposure should be carried out after setting the developing speed since this will affect the step wedge reading obtained.

The exposure to achieve the required Stouffer step wedge reading must be determined for each colour individually since blue and red require slightly less exposure than green, whereas black, white, yellow and dark green require about twice as much.

Step wedge checks should be carried out on brushed copper with the step wedge under the phototool.
Energy level should be measured through the artwork and mylar/glass. It is important to recognise that the energy level should only be used as a guide for setting the correct exposure; step wedges should be used for determining the actual exposure setting.

Hold-time: Not less than 10 minutes and not more than 24 hours.

Developing

Developer: 1% soln sodium or potassium carbonate.
Spray pressure: 1.5-2.5 $kgcm^{-2}$, 20-40 psi.
Spray time: 60-90s in carbonate chamber(s) (dependent on quantity of ink in holes).
Temperature: 30 to 35°C

Boards should be well rinsed with fresh water and fully dried after developing.
Do not final cure boards when wet.

The optimum developing speed is set when an unexposed board develops off completely 25 to 50% of the way through the machine. This speed should be ascertained by preliminary tests prior to making exposure tests.

Developing speed and break-point settings will be determined by the amount of ink deposited in the holes during coating.

The use of carbonate developing solutions at **above 1.5%** carbonate is not recommended. This tends to give poor developing, leaving residues on the copper, a matted surface and step wedges having more than one degraded steps between 'solid' ink and 'clean' copper.

Final Cure

Convection oven: 60 mins at 150°C **Time at board temperature**

UV bumping

It is not normally necessary to UV cure Ronascreen SPSR 5600 but under certain conditions it may be advantageous (see below). Under these conditions, conveyor speeds should be set to attain 1000 to 2000 $mJcm^{-2}$.

High film weight plating:
When depositing high filmweights and/or coating heavily plated tracks it is sometimes possible to see slight wrinkling of the soldermask between the tracks after final cure. UV curing before final cure may prevent this.

Flux residues/staining:
Occasionally flux residues or staining can be seen on boards after hot-air-solder-level of ENIG processes. Rinsing boards when still hot can cause this and may be exaggerated by using hot water.

Boards must be allowed to cool after soldering before rinsing and it is recommended all rinse solutions be below 40°C (104°F).

Cleaning

Equipment should be cleaned of residual soldermask using **SW100 or Dowanol PMA.**

Shelf-life

Minimum 6 months from date of manufacture when stored in cool, dry, recommended conditions.
Storage should be between 10 and 25°C and must be away from sources of heat and direct sunlight.

Final Properties

TEST	METHOD	RESULT	CLASSIFICATION
Hardness (pencil)	SM-840C	7H	Pass, class H
Adhesion	SM-840C	Copper: 0% removal Base laminate: 0% removal SnPb: <10% removal	Pass, class H
Chemical resistance Isopropanol (min.120s) Isopropanol/H_20 (75/25) D-Limonene Methylene chloride Deionised water	SM-840C Room temp. 120s 46 (± 2)°C 15 min Room temp. 120s Room temp. 60s 60 (± 2)°C 5 min	No surface roughness No blisters No colour change No cracking	Pass, class H
Insulation resistance	SM-840B Class III	$8.3 \times 10^{12}\ \Omega$	Pass
Hydrolytic Stability	IPC TM-650 method 2.6.11		Pass
Thermal Shock Resistance	IPC TM-650 method 2.6.7.3		Pass
Electrochemical Migration	IPC TM-650 method 2.6.14	$3x10^9\Omega$, 7 day final	Pass
Moisture & Insulation Resistance	IPC TM-650 method 2.6.3.1	$7x10^{10}\Omega$, non-soldered	Pass
Ionic Cleanliness	IPC TM-650 method 2.3.25.1	0.28µg NaCl / in^2	Pass
Wave-solder resistance 10 (± 1)s at 260 (± 5)°C	SM-840C	No loss of adhesion or solder pick-up.	Pass, class H
Hot-air-solder-level	N/A	Minimum 5 cycles	Pass
Comparative Track Index	IEC112	225 V	
UL Flammability		94 V-0	

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