

CONFORMASK® 2500 DRY FILM SOLDER MASK

PRODUCT DATA SHEET
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PRODUCT DESCRIPTION

CONFORMASK® 2500 DRY FILM SOLDER MASK is the latest advance in High Conformance Solder Mask (HCSM) technology.

It has been specifically formulated to be compatible with high temperature aqueous defluxing of water soluble solder pastes and wave solder fluxes.

CONFORMASK® 2500 utilizes patented technology to provide a thin photo-imageable solder mask with excellent via-hole tenting.

In addition, this photo-imageable epoxy based material is 100% solid and aqueous processable.

PHYSICAL CHARACTERISTICS

CONFORMASK® 2500 series HCSM is supplied in roll form.

The photopolymer layer is coated as a defect free film and is available in both 1.5 mil (37 µm) and 2.3 mil (58 µm) thicknesses.

Product designations are **C2515** and **C2523** respectively.

PRODUCT CHARACTERISTICS

- Excellent resolution capability
- High gloss level
- Low odour
- Fast exposure speed
- Low light bleed characteristics
- High scratch resistance
- Improved solvent resistance

In addition, CONFORMASK® 2500 series HCSM meets or exceeds all the requirements of IPC-SM-840D Class T&H, MIL-P-55110D and Bellcore specifications.

PROCESSING

CONFORMASK® 2500 series HCSM has been designed for use as a permanent solder mask on rigid printed circuit boards (PCB's) using epoxy or polyimide laminates and copper, tin-lead or gold circuitry.

The excellent physical, chemical and electrical properties of this epoxy based solder mask provide environmental protection for printed circuit boards both during and after assembly operations.

The reduced solder mask thickness combined with the products ability to tent via holes and epoxy based chemistry provide excellent solderability and reliability for high density through hole and surface mount printed wiring assemblies.

CONFORMASK® 2500 series HCSM is applied using conventional yellow room processing equipment.

The product utilizes a patented application technique which allows the polyester cover sheet to be removed immediately after vacuum application.

The product has been successfully processed in a variety of assembly operations using water soluble, RMA and no-clean solder paste and wave soldering flux chemistries.




If required, defluxing should be carried out utilizing either a high temperature water wash, a low concentration neutralizing aqueous rinse or 1-1-1 trichloro-ethane based solvent.

The use of high concentrations of alkaline saponifying cleaners or methylene chloride is not recommended for defluxing this material.

PROCESSING ENVIRONMENT

CONFORMASK® 2500 series HCSM is a negative working photo-polymer and is sensitive to ultra violet light, excessive temperature and relative humidity.

Lamination, polyester removal, finishing and exposure steps should be conducted in a controlled yellow room environment under the following guidelines:

-  Yellow room lighting
-  Temperature controlled at 18 to 24°C (65 to 75°F)
-  Relative humidity controlled at ≤ 50%

Characteristics	Minimum	Maximum
Design	Requires a solid border either metal or laminate	
Metallization	Cu, Ni, Sn/Pb and Au	
Base material	FR-4 and polyimide (Rigid only)	
Circuit height	None	4.0 mils (100 µm) (See note ¹ below)
Tented via holes	None	25 mils (0.6 mm) (See note ² below)

Notes:

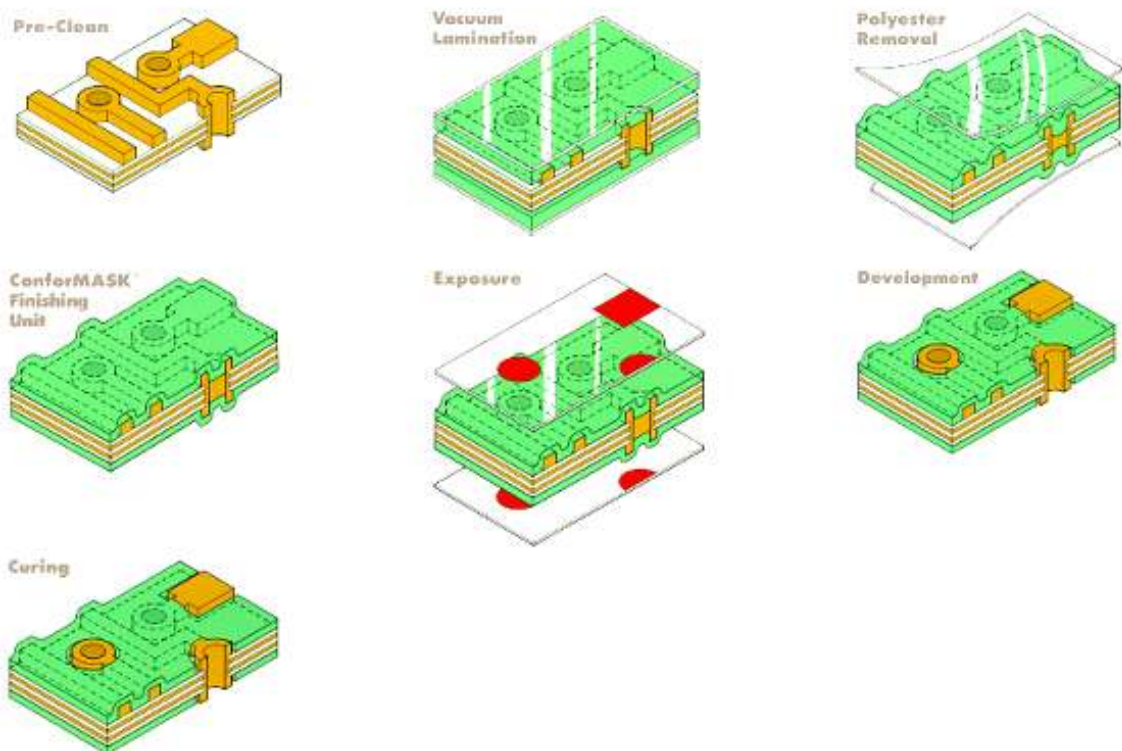
- 1) Circuit heights greater than 4.0 mils (100 μm) may be reliably encapsulated depending upon the board design and lamination conditions.

Minimum resist coverage over conductors greater than 4.0 mils is less than the IPC-SM-840D Class H requirement of 0.7 mils (17 μm) minimum.

- 2) In order to achieve reliable tenting performance the stated application and environmental conditions must be followed.

PROCESS SEQUENCE

CONFORMASK[®] 2500 series HCSM processing sequence is shown schematically below:



SURFACE PREPARATION

Pre-cleaning of the circuit board is essential to the adhesion of the solder resist and the electrical performance of the solder resist and the electrical performance of the printed circuit board.

Any moisture and/or organic contaminants trapped by the solder resist during lamination may cause solder mask delamination, blistering and/or adhesion loss during subsequent soldering operations or during extended use.

When cleaning copper circuitry which has been produced using a metallic etch process, it is important to remove all inter-metallic compounds, oxides, organic and ionic contaminants.

An abrasive scrub is necessary to provide a rough surface for the resist to adhere.

The presence of contaminants or the elimination of the abrasive scrub step may cause adhesion loss.

Good drying is essential to prevent the solder mask blistering during hot air solder levelling.

One method which has proven successful for pre-cleaning copper circuitry is as follows:

1. Conveyorized acid spray rinse (5% H₂SO₄)
2. Water spray rinse
3. Pumice (3F / 4F) or impregnated brush (320 grit) scrub
4. High pressure water spray rinse
5. DI water spray rinse
6. Turbine dry
7. Bake dry for 30-minutes at 71 to 82°C (160 to 180°F)
8. Maximum hold time from pre-clean to lamination 4 hours.

Ideally substrates should go directly to the laminating area to avoid the risk of contamination.

When cleaning fused tin-lead circuitry and other melting metals for which abrasive scrubbing is not permitted, it is important to remove all oxides, organic contaminants and moisture prior to solder resist application.

One method which has proven successful for pre-cleaning such circuitry is as follows:

1. Conveyorised saponifying spray cleaner
2. Water spray rinse
3. DI water spray rinse
4. Turbine dry
5. Bake dry for 20 to 30-minutes at 110 to 130°C (230 to 265°F)
6. Maximum hold time from pre-clean to lamination 4 hours.

Ideally panels should go directly to the laminating area to avoid the risk of contamination.

Process monitoring:

Ionic cleanliness should be monitored utilising solvent extract resistivity in a frequency in accordance with customer requirements.

Reference should also be made to the following:

- Surface Organic Detection Test – IPC-TM-650 2.3.38
- Surface Organic Detection Test – Infrared analytical method IPC-TM-650.2.3.39

VACUUM LAMINATION

CONFORMASK®2500 series HCSM is best applied to the printed circuit board utilizing vacuum lamination equipment. Hot roll lamination is not recommended because of potential conformation and/or entrapment issues. Lamination of CONFORMASK®2500 series HCSM should be performed in an environment that is free from dust and dirt.

The condition and maintenance of the lamination equipment is very important to help achieve consistently high yields.

After CONFORMASK® 2500 series HCSM film is pre-tacked onto the substrate, it is placed in a vacuum applicator. During vacuum lamination, a hard vacuum is drawn within the lamination chamber assuring complete air removal between the circuit traces.

Concurrently both the solder mask and the substrate are heated to laminating temperature.

Once the vacuum cycle is complete, the upper platen blanket "slaps down" forming the initial physical bond between the solder mask and the substrate.

The rigid polyester sheet does not allow for the complete conformation of the thin solder mask to the circuitry. However, with the unique processing characteristics of CONFORMASK®2500 series HCSM film the polyester sheet can be removed immediately after lamination allowing atmospheric pressure to conform the coating to the circuitry. Following polyester removal, the substrate must be cooled to a minimum of 6°C to stop further resist flow and also degradation in tenting quality.

This can be achieved with the aid of an in-line refrigerated air cooling unit (RFU).

VACUUM LAMINATOR	
Cycle time	45 - 60 seconds
Slap down time	2.0 - 4.0 seconds (See note ¹ below)
Platen temperature	65 - 76°C (150 to 170°F)
Panel temperature	60 - 65°C (140 to 150°F)
Vacuum	0.2 - 1.0 mBar
Free space	0.50 - 1.50 mm (0.02 to 0.06 inches)

Notes:

- ¹⁾ If utilizing a bleed-in adaptor kit, adjust air bleed-in valve time to 3 sec and slap down timer to 5 to 7 seconds.

The CONFORMASK®2500 series HCSM coating after polyester removal is soft and susceptible to damage. For this reason, substrates should be racked individually to prevent damage.

EXPOSURE

CONFORMASK® 2500 series HCSM can be processed on a conventional light source as used in the PCB industry. Acceptable exposure levels can be achieved by using time/energy parameters that result in Clear metal step 9 to 11 when using a Stouffer™ 21 step sensitivity guide. The energy requirement is normally in the range of 200 mJ/cm²

DEVELOPMENT

CONFORMASK®2500 series HCSM develops in a totally aqueous solution of sodium or potassium carbonate. Development is followed by thorough water rinsing, DI water rinsing and turbine dry in order to meet stringent ionic cleanliness requirements (1.00 to 1.56mg/cm²).

DEVELOPMENT	
Equipment	Horizontal or Vertical
Chemistry	0.5 - 1.0% Na ₂ CO ₃ or K ₂ CO ₃
Temperature	26 - 29°C (80 to 85°F)
Breakpoint	35 to 50%
Developing time	105 – 130 seconds
Spray pressure	25 – 30 psi
Rinse chamber length	Minimum of 50% of developing chamber
Spray pressure	25 – 30 psi
Turbine dry	---

The operating temperature of the working solution is extremely important to the development of the resist. Exceeding the recommended temperature range can cause attack of the resist. Operating at a lower temperature can result in attack of the resist due to excessive dwell time in the developing chamber. The breakpoint should be maintained within the recommended range of the developing chamber length.

CURING

Optimum physical, chemical, electrical, environmental and soldering performance properties of CONFORMASK[®] 2500 series HCSM are obtained only after final curing.

Final curing (polymerization) is a two-step process involving both UV and thermal cross-linking, utilising conventional UV curing units and convection air ovens.

UV CURING	
Speed	2.4 – 3.65 m/min (8.0 – 12.0 ft/min)
Energy	3.0 – 5.0 J/cm ²
Panel Temperature	121°C maximum (250°F)

UV cure side A at the above conditions

Allow panels to cool completely to room temperature

UV cure side B at the above conditions

THERMAL CURING	
Equipment	Forced air oven
Time	60 minutes
Temperature	150 – 155°C (300 – 310°F)
Total Time	90 minutes

Allow oven to reach temperature before the one hour timing starts

HOT AIR SOLDER LEVELLING

Recommended hot air solder levelling parameters may include:

PRE-CLEAN	
Micro-Etch	5% HCl or H ₂ SO ₄ or Persulfate type
Rinse	Spray
SOLDERING	
Flux	Consult technical representative
Flux dwell time	4 – 10 seconds
Solder temperature	240 - 260°C (465 - 500°F)
Solder dwell time	4 – 10 seconds
Air temperature	165 - 193°C (330 - 380°F)
Air pressure	35 – 45 psi
DEFLUXING	
Unit	Conveyorised spray
Deflux time	45 – 120 seconds
Solution	3 - 5% solution of alkaline cleaner (See flux manufacturer recommendations)
Temperature	49 - 55°C (120 - 130°F)
Rinse	Conveyorised spray

STORAGE

CONFORMASK® 2500 series HCSM should be stored in a limited access area between 5 and 20°C (41 and 68°F) and 50 ± 10% relative humidity.

For optimum performance, store in an area not exceeding 15°C (60°F).

CONFORMASK® 2500 series HCSM is sensitive to sunlight and indirect white light.

Gold or yellow safelights are required in the immediate work area.

We recommend a shelf life of 3 months.

The product will be slitted only after orders reception.

SAFETY AND HANDLING

BEFORE USING CONFORMASK® 2500 SERIES HCSM, PLEASE REFER TO THE CURRENT MATERIAL SAFETY DATA SHEET (MSDS) FOR DETAILED SAFETY, HANDLING AND STORAGE INFORMATION.

CONFORMASK® 2500 series HCSM should be applied in a well ventilated area.

Commercial lamination equipment may cause vapours to be generated from the dry film, and these should be removed by conventional exhaust techniques.

It is the customer's responsibility to ensure that disposal of this and other ancillary products comply with local, state and national federal guidelines.

Wash thoroughly after handling any dry film resist.

Contact of the unexposed resist with the skin may cause irritation and should be avoided.

Sensitisation may occur in some individuals.

If contact occurs, wash thoroughly with soap and water.

If irritation occurs and persists consult a physician.

Avoid reuse of or contact with the dry film release sheets and cover sheets as they may retain small amounts of un-polymerised photo resist components.

During cleaning, developing, stripping and etching operations follow the safety precautions pertaining to the particular solution(s) being used.

WARRANTY

Based on our experience, we believe that the above information is accurate, but we offer no guarantee as to the use or application of our products or of this information.

We warrant our products to be free from defects in material and workmanship; but because their use is beyond our control, we accept no responsibility or liability for damages, whether direct, indirect or consequential, resulting from failure in performance.

In cases where our products are found to be defective in material and workmanship, our liability is limited to the purchase price of the products found to be defective.

THIS WARRANTY IS TO THE EXCLUSION OF ALL OTHER WARRANTIES OR GUARANTEES, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, DESCRIPTION, PRODUCTIVENESS OR ANY OTHER MATTER.

None of the above information may be construed as a recommendation that our products be used in violation of any patent rights.

We accept your orders at our shipping points only on the basis of the above understanding which our employees have no authority to vary.

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