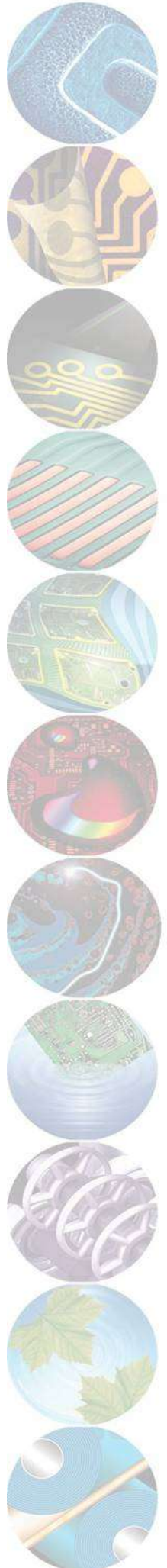




Coates Circuit Products

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imagecureSMART®

XV501T-4

LDI SCREEN

PRODUCT REFERENCE

imagecureSMART®	XV501T-4	LDI Matt Green (HF) Resist	CAWN2220
imagecureSMART®	XV501T-4	LDI SM Green (HF) Resist	CAWN2249
imagecureSMART®	XV501T-4	LDI Matt Green (HF) Resist	CAWN2255
imagecureSMART®	XV501T-4	LDI Clear Screen Hardener	CAWN2196

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U.L. FILE NUMBER E83564

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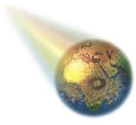
ISO9001

SM840C CLASS H PASS

ISO14001

BELLCORE PASS

imaging@ion



1) DESCRIPTION

imagecureSMART® XV501T-4 LDI soldermask is a liquid product which dries by evaporation to give a film that can be sensitised by laser exposure to UV wavelengths between 330nm and 365nm. The unexposed material is developed in a dilute alkali solution and then cured to give a durable, chemical- and heat-resistant film.

This product offers the following advantages: -

- Resolution capability down to 50µm (2mil) and less.
- Exposure sensitivity 40 - 55 mJ/cm².
- Proven resistance to HASL processing.
- Compatible with a range of Ni/ Au and immersion tin chemistries.
- Excellent adhesion to and encapsulation of copper tracks.
- Halogen free (<300ppm total halogen content)

imagecureSMART® XV501T-4 is also suitable for processing with conventional contact exposure; please refer to Technical Information Leaflet (TIL) number T224 for further information.

This TIL and the relevant Material Safety Data Sheet (MSDS) should be read carefully prior to using this product.

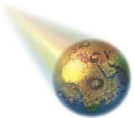
2) ENVIRONMENT

The choice of application and exposure environment has been found to have a direct effect on fine solder dam yields. Every effort should be made to minimise the incidence of dust or fibres in the application and exposure area.

It is therefore recommended that a Class 10,000 clean room be considered the minimum requirement for resolving features less than 100µm. (4mil.) at high yield.

Commercial, automated screen printing equipment may already contain some level of air filtration and the manufacturers or local Coates representatives can advise on its suitability.

It is also recommended that the screen print area be fitted with UV screened illumination (yellow lights) due to the high photosensitivity of this particular product.



3) MIXING

The resist and hardener components must be thoroughly mixed together in the ratio of 2:1 w/w before use. The hardener component must be added to the resist component.

Mechanical mixing is recommended to ensure thorough mixing of the resist and hardener components. Recommended mixers include those with variable speed motors and paddle type mixing blades as well as the shaker or rotating type mixers.

Mixing times will depend on the type of mixer or stirrer used but typical mix times of 10 - 15 minutes with stirrer speeds between 40 - 100 rpm can be expected. Avoid excessively fast speeds as this will entrap large volumes of air into the mixed resist. It is recommended that attention be paid to ensuring that any resist at the sides of the container and on the bottom is completely mixed into the main body of the resist.

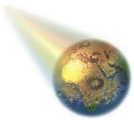
Returning of resist to the original container after use is not recommended as this can lead to dust particles or dried resist being introduced into the product which could affect future performance.

Mixed pot life at $23^{\circ}\pm 2^{\circ}\text{C}$ (70 - 77°F) will be approximately 72 hours. Always ensure the lid is replaced on the container to avoid excessive solvent evaporation.

4) THINNING

This product is supplied ready-to-use, and therefore further thinning is not generally recommended. However, should further thinning be deemed necessary, a maximum of 3% Imagecure® Thinner XZ107 should be used.

N.B. The mixed resist should be stirred well before use.



5) PRE-CLEAN

Ensure that all copper surfaces are completely clean, tarnish free and dry prior to applying imagecureSMART®. For panels that are badly oxidised and tarnished then a micro-etch prior to mechanical pre-cleaning is recommended. The micro-etch should be capable of removing any oxide or tarnish staining and of thoroughly rinsing and drying the panel before being mechanically cleaned.

Mechanical pre-cleaning is recommended as follows: -

Brushing 280 - 400 grit silicon carbide brushes are recommended having a footprint on the copper of 8 - 15mm. (0.3 - 0.6 in). The water rinse and heater sections should be capable of thoroughly rinsing and drying the panels such that no water is left in the holes or between closely spaced conductors and that moisture or tarnish is not present on the freshly brushed panels.

It is important that each brush is regularly checked and dressed as necessary to ensure optimum efficiency during use.

Please note that Nylon brushes of 600 - 800 grit can also be used.

Pumice Pumice or Aluminium oxide slurry of between 12 - 18% is recommended with an optimum of 15%. The water rinse and heater sections must be capable of rinsing and drying the panels such that residual pumice particles are completely removed and that no water is left in the holes or between closely spaced conductors and that moisture or tarnish is not present on the freshly cleaned panels.

Microetch Where panels have close track/gap configurations, which may not be suitable for mechanical pre-cleaning, the use of a "deep etching" micro etch chemistry is recommended. It is recommended that each user ensures that the Imagecure product is compatible with the particular micro-etch used and all subsequent metal finishing processes.

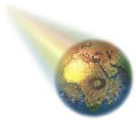
Surface roughness figures of :-

Ra 0.2 - 0.4µm.
R delta q 4 - 9°

would be considered to be optimum values for copper surfaces pre-cleaned as above. A minimum Ra of 0.2µm. with an R delta q value of >4° is recommended (optimum R delta q values 7 - 9°).

Please refer to separate technical document on surface roughness for a fuller explanation of the above roughness values.

NOTE. It is recommended that all freshly cleaned panels are coated with imagecureSMART® XV501T-4 within a maximum time of 2 - 4 hours. The actual maximum time will vary depending upon ambient temperature and humidity. Panels left longer than 4 hours before coating should be pre-cleaned again.



6) PRINTING

For optimum performance, screen print through a 43T/cm. (110TPI) polyester mesh for 0.5 or 1.0 oz. copper tracks.

For improved encapsulation at higher plating thicknesses, a 32T/cm. (80TPI) mesh may be required.

For best results, a 70 - 75° Shore squeegee, angled at 10 - 15° (from vertical) is preferred.

Print tests with subsequent micro-sections are recommended to ensure adequate track encapsulation.

All screens must be cleaned and thoroughly dried before use and free from residues of screen cleaner and ink.

7) WASHING UP

A range of specially formulated screen cleaners are available.

8) PRE-DRY

imagecureSMART® XV501T-4 LDI has a wide process window, meaning tack-dry temperature and times can be tailored to a specific process. The following data can be used as a guide:

For Batch ovens: -

Side 1: 10 minutes at 75 - 80°C (167 - 176°F).

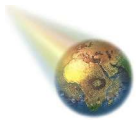
Side 2: 30 - 40 minutes at 75 - 80°C (167 - 176°F).

The maximum drying time (Side 1 + 2) should not exceed 45 minutes at 80°C (176°F).

The recommended air velocity across the panels is ≥ 1 m/s, and they should be racked at least 30mm - 40mm. (1.2" - 1.6") apart.

Because of the extreme photosensitivity of this material, it is recommended that the panels be allowed to cool either in a yellow light area or a darkened room (with controlled temperature and humidity). It is recommended that all panels be exposed and developed within 24 hours. If the humidity increases above 60% RH then the storage time of the dried panels will be reduced.

Please note that due to the varying efficiency of some ovens, drying tests should be conducted to ensure optimized drying.



9) EXPOSURE

Ensure panels are at room temperature before exposure step. Please note that due to the extreme photosensitivity of this material, it is recommended that the panels be allowed to cool either in a yellow light area or a darkened room.

To reduce the possibility of contamination, panels can be passed through a dust removal system (such as those supplied by Teknek), prior to placing in the LDI unit.

Optimal resist spectral sensitivity: 350 - 365nm.

Exposure energy requirement: 40 - 55mJ/cm²

After exposure, allow a hold time of 5 - 10 minutes before development. The maximum hold time for exposed panels is 24 hours in yellow light. Note that the Stouffer value achieved when LDI exposed will be lower than the Stouffer value achieved when conventionally exposed.

Please note that imagecureSMART® XV501T-4 is also suitable for processing with conventional contact exposure; please refer to Technical Information Leaflet (TIL) number T224 for further information.

10) DEVELOPMENT

Spray develop with 1% sodium (or potassium) carbonate at 30 - 35°C (86 - 95°F). Spray pressure should be between 2 - 4 bar (30 - 60psi). Optimum temperature is 35°C (95°F).

The dwell time in the developer chamber should be set so that an unexposed board develops completely off within 65% of the chamber length. In practice, this should result in dwell times of 55 - 65 seconds.

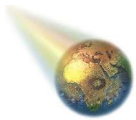
The panels should be well rinsed with fresh water immediately after development. It has been shown that a warm water rinse is particularly suited for sodium carbonate developers.

The panels should be thoroughly dry (including through-holes) before the final cure step.

It should be noted that imagecureSMART® films needing to be removed can be stripped by dipping in either a propriety solder mask stripper or 5% sodium hydroxide solution at 50 - 70°C (122 - 158°F).

11) UV BUMP

For additional chemical and thermal resistance, a UV 'bump' of 1000mJ - 1500mJ/cm² is required with the use of a conveyors UV cure unit.



12) POST BAKE

It is important to ensure that all ovens have an independent thermal profile taken, as the set air temperature is not always reliable and the air flow in the oven or the door seals may give rise to either hot or cold spots.

The recommended bake cycle is 150°C (302°F) for 45 - 60 min. Optimum is 150°C for 60 min. Bake times should be taken when board temperature reaches the pre-set point.

Sufficient air flow is necessary to ensure a consistent temperature gradient in the oven as well as a uniform degree of cure for the solder resist.

With respect to batch ovens boards should be racked 25 - 40mm. (1.0 - 1.6 in.) apart.

All exhaust ducting and extraction fans should be adequately insulated to avoid any volatile emissions condensing around the oven area.

13) ELECTROLESS NICKEL GOLD or IMMERSION TIN PROCESSING

There are a number of competing chemistries available, each with a differing aggressiveness towards the solder resist. The following guidelines are given to help imagecureSMART® users avoid some of the problems associated with solder resists and these alternative solderable finishes :-

Pre-clean: Either the use of a deep etch copper microetchant., silicon carbide brushing, or pumice scrubbing. The copper must be clean, tarnish free and with a good micro topography.

Application: Ensure that the tracks have sufficient solder mask. A minimum of 8 - 10µm. (0.32 - 0.4mil.) is recommended.

Pre-dry: Insufficient pre-dry can lead to a lowering of the cured film's resistance to either Ni/Au or immersion tin as well as increasing the degree of undercut on development. The pre-dry should be carried out at 75 - 85°C (167 - 185°F). It is recommended that oven thermal profiling be carried out to achieve optimum results.

Exposure: To achieve straight side walls with minimal undercut 40 - 55mJ/cm² exposure energy is recommended.

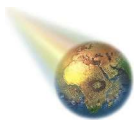
Development: Extended dwell times, high developing temperatures and high spray pressures should be avoided otherwise excessive undercut will take place. To achieve optimum results the developed edges should be straight with minimal undercut.

UV Bump: For additional chemical and thermal resistance, a UV 'bump' of 1000mJ - 1500mJ/cm² is required with the use of a conveyerised UV cure unit.

Post bake: Avoid excessive temperatures during post bake as these can lead to oxidation of the copper surfaces. Recommended process temperature 140 - 150°C (284 - 302°F) with a maximum dwell of 60 minutes. Bake times should be taken when board temperature reaches the pre-set point.

Micro-etch: Only 1.0µm. etching should be necessary to remove the oxide layer when processing for metallisation. Excessive micro-etching (> 2.0µm) can lead to under plating and edge lifting of the solder resist film. Ensure that the micro-etch process is controlled and consistent across the panel.

Tape Test: Panels should be tape tested a minimum of 1 hour after metallization.



14) NOTATION / LEGENDPRINTING

All imagecureSMART® XV501T-4 LDI screen products are compatible with a wide range of Coates UV curing, thermal curing and photoimageable notation inks. Coates thermal curing inks can be applied prior to post-bake to increase productivity.

Product details can be obtained from your Coates representative.

15) STORAGE AND SHIPPING

When stored in a cool place (15 - 20°C / 59 - 68°F), imagecureSMART® XV501T-4 LDI resist and hardener have a shelf life of 18 months.

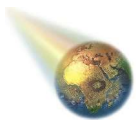
Subjecting the container to extremes of heat or cold (i.e., direct sunlight or frost) is not recommended.

16) HEALTH AND SAFETY

Detailed material safety data sheets will be supplied by your local Coates representative.

17) PACKING

imagecureSMART®	XV501T-4	LDI Matt Green (HF) Screen Resist	2.00 kg.	CAWN2220
imagecureSMART®	XV501T-4	LDI Semi Matt Green (HF) Screen Resist	2.00 kg.	CAWN2249
imagecureSMART®	XV501T-4	LDI Matt Green (HF) Screen Resist	2.00 kg.	CAWN2255
imagecureSMART®	XV501T-4	LDI Clear Screen Hardener	1.00 kg.	CAWN2196
imagecureSMART®	XZ107	Slow Thinner	5.00 L.	CDSN4059

**18) FILM PERFORMANCE / TECHNICAL SPECIFICATION****PHYSICAL PROPERTIES OF imagecureSMART® XV501T-4 SCREEN**

Pack Code	Viscosity	S.G.	Flash point	Non volatile content
CAWN2220	18.5 - 21.5 PaS.	1.30	>70°C (158°F)	67.5%
CAWN2249	18.5 - 21.5 PaS.	1.32	>70°C (158°F)	68.1%
CAWN2255	18.5 - 21.5 PaS.	1.30	>70°C (158°F)	67.5%
CAWN2196	11.0 - 17.0 PaS.	1.29	>70°C (158°F)	80.8%

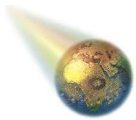
*Viscosity measured at 25°C (77°F). Please note viscosity can vary greatly depending on ink temperature, volume of ink tested, type of viscometer used and the test method.

Non Volatiles (as supplied) 72 - 74%

Volatile Organic Content (VOC) T.B.A.

PHYSICAL & CHEMICAL PROPERTIES OF imagecureSMART® XV501T-4 CURED FILM

Solder Resistance	MILP55110 IPC SM840C	30 secs @ 288°C (550°F) 10 secs @ 260°C (500°F)
Resistance to Solder Levelling		> 5 passes
Resistance to Fluxes	IPC SM840C	Pass
Electroless Ni/Au Plating		Pass
Hydrolytic Stability	IPC SM840C Class H	Pass
Solvent, Cleaning Agent, & Flux Resistance	IPC SM840C Class H	Pass
Fungal Resistance	IPC SM840C Class H	Pass
Thermal Shock	IPC SM840C Class H MIL 551100 MIL STD202E BS6096 Tests	Pass Pass Pass Pass
Chemical Resistance	IPA 1,1,1 Trichloroethane MEK Methylene Chloride Alkaline Detergent Fluxes	>1 hour >1 hour >1 hour >1 hour >1 hour >1 hour
Abrasion Pencil Hardness	IPC SM840C Class H	Pass
Adhesion (Copper)	IPC SM840C Class H	Pass
Flammability	UL 94V0 Rating	File No. E83564
Ionic Contamination	MILP55110D	<0.3µg. NaCl/cm ² Using Alpha Ionograph 500M



18) FILM PERFORMANCE / TECHNICAL SPECIFICATION (cont.)

ELECTRICAL PROPERTIES OF imagecureSMART® XV501T-4 CURED FILM

Bellcore	TR-NWT000078	Pass
Insulation Resistance	IPC SM840C Classes T and H	Pass
Moisture & Insulation Resistance	IPC SM840C Classes T and H	Pass
Electromigration	IPC SM840C Classes T and H	Pass
Comparitive Tracking Index	DIN EN 60112 / IEC 112	>600V
Siemens E-Corrosion Test	SN 57030	Pass
Dielectric Strength (50 Hz.)	IPC SM840C Class H DIN53481	120kV/mm.

19) DISCLAIMER

This information has been carefully compiled from experience gained in field conditions and extensive laboratory testing. However the products' performance and its' suitability for the customers' purpose depend on the particular conditions of use and the material being printed. We recommend that customers satisfy themselves that each product meets their requirements in all respects before commencing a production run. Since we cannot anticipate or control the conditions under which our products are used, it is impossible to guarantee their performance. All sales are also subject to our standard terms and conditions.

20) SUPPORT

Coates are an international company, and as such can offer technical, engineering and sales support to our customers worldwide. If you require more information regarding this product, or any of our extensive range of materials for PCB fabrication, please contact our local sales offices.