

PHOTEC H-8050

Fully aqueous dry film photoresist for ENIG application

GENERAL

Hitachi Chemical Photosensitive resist H-8050 - is a negative working fully aqueous resist, suitable for PWB's with selective electroless nickel – immersion gold plating. PHOTEC H-8050 is fully compatible with electroless nickel and immersion gold chemistries and has excellent stripping characteristics (from soldermask areas).

FEATURES

- * Good electroless nickel/immersion gold resistance.
- * Low plating bath contaminations.
- * Excellent for fine line adhesion.
- * Easy to strip.
- * Post-cure free process.

PHYSICAL CHARACTERISTICS

	Thickness (µm)	Length (m)
H-8050	50	150 or 300

PHOTEC H-8050
 Technical data sheet
 Page 2 of 7

PROCESS		CONDITION	REMARKS
Soldermask coating		Depends on LPISM's suppliers recommendations	<ul style="list-style-type: none"> To prevent stripping residues, legend inks should be coated on the mask after plating.
Substrate pre-treatment	Water rinsing	Spray temperature: Room temperature	<ul style="list-style-type: none"> Polish the substrate surface evenly to remove burrs, dust on the substrate surface, oil and oxidised films thoroughly Jet-scrubbing is relatively effective. Moisture adhered to the substrate surface and inside the holes by treatment will cause rust, dirt (stains) and so forth. Remove promptly and completely. Stacking or holding substrates after pre-treatment will cause scratches, oxidation of copper and dust on the surface.
		Spray time: 10 – 30 sec.	
		Spray pressure: 0.15-0.25 Mpa	
	Hot air shower	Temperature: 100-150°C	
Time: 20-40 sec.			
Lamination		Roll temperature: 120 ± 10°C Roll pressure: 0.3 – 0.5 Mpa Roll speed: 0.5-1.5 m/min <u>Recommended conditions at first trials</u> Roll temperature: 120°C Roll pressure: 0.5 Mpa Roll speed: 1.0 m/min Please adjust your laminator condition for improving the conformance and filling performance of the film	<ul style="list-style-type: none"> The temperature of substrate should be within the 20-70°C, 50-70°C is desirable. Both standard laminators and vacuum laminator are available. A vacuum laminator is preferred for improving conformance and filling performance. If air voids remain between the substrate and covered film, this could result in film breakage and underplating by electroless plating processes.
Holding ☒		Temperature: 23 ± 2°C Humidity: 60 ±10% RH Time: 30 min. – 4 days	<ul style="list-style-type: none"> Under a yellow lamp Stacking or holding substrates after lamination will cause thickness defect of the film. Rack boards vertically
Exposure		9-11 steps by a 21-step tablet (for the amount of exposure, refer to separately attached data) <u>Recommended conditions at first trials</u> 10 steps by 21-step tablet	<ul style="list-style-type: none"> The exposure light source is a high voltage mercury lamp or an extra high voltage mercury lamp. Dominant photosensitive wavelength is 365 nm

PHOTEC H-8050
 Technical data sheet
 Page 3 of 7

PROCESS		CONDITION	REMARKS				
Holding \Im		Temperature: 23 + 2°C	<ul style="list-style-type: none"> The recommended total time of holding \aleph and \Im should be within 4 days 				
		Humidity: 60 ± 10% RH					
		Time: 5 min – 3 days					
Development	Developer spray	Developer: 1.0 + 0.3 wt% - 0.1 wt% Na ₂ CO ₃ aqueous solution	<ul style="list-style-type: none"> Renew developer in reference to the following guide: <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>(Film)</th> <th>(amount of film treatment)</th> </tr> </thead> <tbody> <tr> <td>H-8050</td> <td>0.20 m²/l</td> </tr> </tbody> </table> To prevent resist chips from the substrate edges: not to expose around the substrate. Oscillation of the spray nozzle enables to develop uniformly. When resolution is enough, better adhesion can be obtained by reducing development time. Divide water rinsing into two or three steps and finally spray fresh water. Check the dry film residues with actual PWB coated solder mask, especially at through holes and blind through holes. 	(Film)	(amount of film treatment)	H-8050	0.20 m ² /l
		(Film)		(amount of film treatment)			
		H-8050		0.20 m ² /l			
		Temperature: 30 ± 2°C					
	Time: 1.5-2.0 times of the minimum development (MDT= 40 sec)						
	Spray pressure: 0.12 – 0.20 MPa						
	Water spray	Temperature: room temperature –30°C					
Time: 48-64 sec. of the development time							
Spray pressure: 0.12-0.20 MPa							
Hot air shower	Temperature: 30-50°C						
	Time 10-20 sec.						
Electroless nickel-immersion gold plating		Acc. suppliers recommendations.					
Stripping	Stripper spray	Stripper: 45 – 55°C 3.0 ± 0.5 wt% NaOH aqueous solution or 45-55°C. 5-10 vol% Amine type stripper	<ul style="list-style-type: none"> For relation between the stripper and the size of stripped pieces, refer to the separately attached data. Renew stripper in reference to the following guide: <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>(film)</th> <th>(amount of film treatment)</th> </tr> </thead> <tbody> <tr> <td>H-8050</td> <td>0.4 m²/l</td> </tr> </tbody> </table> To avoid the re-attached stripped flakes on the substrate, use conveyor rolls around the stripping zone straight bare type. 	(film)	(amount of film treatment)	H-8050	0.4 m ² /l
		(film)		(amount of film treatment)			
		H-8050		0.4 m ² /l			
	Time: 2.0-5.0 times of the minimum stripping time						
Spray pressure: 0.10 MPa or more							
Water spray	Temperature: room temperature						
	Time: 120 – 300 sec.						
	Spray pressure: 0.10 MPa or more						
		<ul style="list-style-type: none"> To use amine type stripper is effective to prevent residues and overhang When the concentration of NaOH aqueous solution is more than the recommended concentration, the size of stripped pieces tends to be larger 					

PHOTEC H-8050
 Technical data sheet
 Page 4 of 7

EXPOSURE

The determination of the correct exposure should be made with the HITACHI CHEMICAL 21 Step PHOTEC exposure tablet.

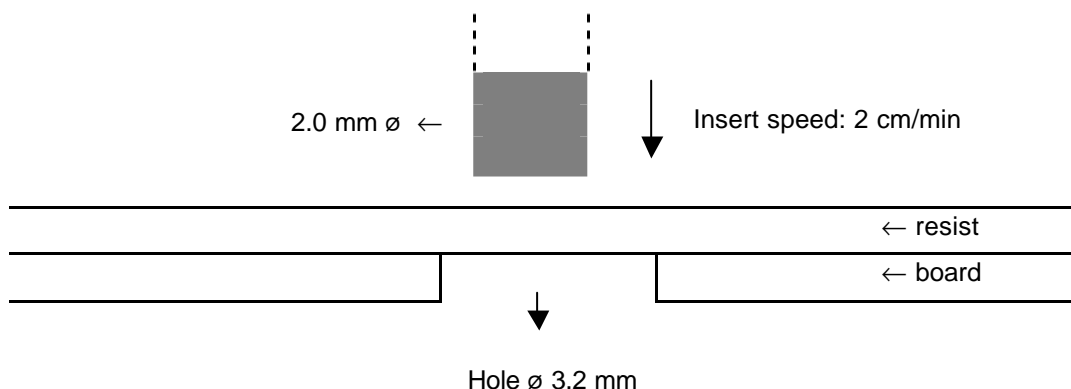
PHOTEC has a peak spectral response in the 360-380 nanometer range. High pressure mercury vapour lamps with this peak spectral output are recommended.

Exposure time will depend on the equipment, intensity of illumination, age of lamps, temperature etc.

H-8080 PHOTSENSITIVITY PROPERTIES

Dry film photoresist			H-8050
Application			Electroless nickel-immersion gold plating
Exposure	Sensitivity ¹ by UV-350 (by UV-350	(mJ/cm ²) Type SN (Conventional) Type SD (new))	70 (50)
		Adhesion ^{*3} (AD: L/S=n/400, μm) ST=8/21	40
Resolution ^{*3} (RP-2: L/S=400/n, μm) ST=8/21			60
Tenting property ⁴	Strength (N/m)		8.6
	Elongation (%)		1.4
	Breakage (%)	round hole	0
		3 circle crossed hole	2
Plating contamination ⁵	Electroless nickel plating bath A	Thickness (μm) (Appearance) (x/5)	5.1 (4)
	Electroless nickel plating bath B	Thickness (μm) (Appearance) (x/5)	4.3 (4)
	Electroless nickel plating bath C	Thickness (μm) (Appearance) (x/5)	4.9 (4)
	Immersion gold plating bath A	Thickness (μm)	0.08
	Immersion gold plating bath B	Thickness (μm)	0.07
Stripability ⁶	Normal condition 1	Minimum stripping time (size of stripped pieces)	117 (20)
	Normal condition 2	Minimum stripping time (size of stripped pieces)	110 (5)
	Severe condition	Minimum stripping time (size of stripped pieces)	110
Plating resistance ⁷	Resist breakage		none
	recommendation of post-cure		none

- *1 Colour difference between exposed and unexposed film (measured by colour difference meter of Tokyo Denzyoku Co).
- *2 Developing time: MDX2, space width between lines 400 μm
- *3 Developing time: MDX2
- *4 As tested by following figure:



*5 Plating contamination

- Exposure : 23/41ST
- UV-Exposure equipment : HMM-201GX (non-collimated light, ORC Manufacturing Co. Ltd.)
- Preparation of test solution : 0.3 m²/l of exposed dry film was dissolved in electroless nickel or immersion gold plating bath.
- Evaluation : Test board: 50 x 50 mm copper clad (Thickness: Substrate 1.6 mm. Cu foil 35 μm)
- Test condition : See table 2
- Plating thickness : X-ray fluorescence measurement (Seiko Instruments Inc. SFT-158V)

Profile of plating surface: Comparison the surface roughness of each plating compared to blank.

Table 2: Evaluation of plating surface profile

Level 5	Almost the same roughness to blank was observed
Level 4	Slight decrease of the roughness was observed
Level 3	Decrease of the roughness was observed
Level 2	Relatively smooth (very little roughness) was observed
Level 1	No plating was observed

*6 Stipping (dipping test)

- Test board : Soldermask coated copper clad.
 - Exposure : 29/41ST
 - UV-Exposure equipment : HMM-201GX (non-collimated light, ORC manufacturing Co. Ltd)
 - Test conditions : See table 3
- After stirring with stirrer for 30 seconds, the size of stripped pieces was observed.

Table 3: Stripping test condition

Item	Postcure of solder mask	Stripping condition
Standard condition 1	150°C x 60 min.	3.0wt% NaOH. 50°C
Standard condition 1	150°C x 60 min.	5 vol% Resist Stripper amine based 50°C
Severe condition	none	5 vol% Resist Stripper amine based 50°C

*7 Resistance to plating

Test board : Soldermask coated copper clad
 Round hole : Ø 0.4 mm, 0.5 mm, 0.7 mm, 0.9 mm, 1.1 mm, 1.6 mm
 (24 holes each, total 144 holes)
 Exposure : 29/41ST
 Test condition : Immersed in electroless nickel plating B and immersion gold plating B.
 Evaluation : Breakage of the dry film observed.

DEVELOPMENT

The development rate of the resist depends upon, developer concentration, temperature and the spray equipment used.

PHOTEC H-8050 can be developed over a wide range of temperatures, 28-32°C. It is essential to determine the correct development time for the resist at the temperature used.

The concentration of anhydrous Sodium Carbonate used for development is within the range 1,0 (+0.3, -0.1) weight percent. To determine the correct development time for the resist proceed as follows: Establish the minimum development time taken in the spray equipment, at the operation temperature, for a laminated but unexposed board to have the resist completely removed as it exits the development chamber. The correct development time is 1,5 - 2,0 times this minimum development time.

The correct development time is when all unexposed polymer has been removed from the board when it is two-thirds (66%) through the developer spray chamber.

An addition of Antifoam may be required. Enthone Antifoams are recommended. Antifoams containing water miscible organic solvents are NOT recommended.

Development should be followed by at least two water rinse chambers to ensure complete removal of developer solution from the substrate surface.

STRIPPING

The PHOTEC H-8050 resist can be stripped in either dilute alkali metal hydroxide solutions or (amine based) proprietary strippers. Stripping is required within 1 week (max) after lamination

STORAGE CONDITIONS

Long time storage temperature : 5 – 20°C
 Short time storage temperature (max 5 days) : 15 – 25°C
 % RH : 35 – 60%

HANDLING AND SAFETY INSTRUCTIONS

For detailed information consult the material safety data sheets for this product.
Please read material safety data sheets carefully before using this product.

DISCLAIMER

All recommendations and suggestions in this bulletin concerning the use of our products are based upon tests and data believed to be reliable. Since the actual use by others is beyond our control, no guarantee expressed or implied, is made by Enthone, its subsidiaries or distributors, as to the effects of such use or results to be obtained, nor is any information to be construed as a recommendation to infringe any patent.

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