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PHOTOIMAGEABLE SOLDER MASK

R-500 MK / HD-5

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1. FEATURES

- (1) For screen printing.
- (2) Excellent in adhesion.
- (3) Suitable to general printed circuit boards.

2. SPECIFICATION

Main agent	R-500 MK
Hardener	HD – 5
Color	Black
Mixing ratio	Main agent : 750g / Hardener : 250g
Viscosity (main agent)	190 ± 30 ps (R type viscometer at 25°C)
Solid content	70~75 wt%
Specific gravity	1.3 ± 0.2
Tack- dry window	75°C x 70 min (maximum)
Exposure energy	700 – 900 mJ / cm² (on the solder)
* Pot life	24 hours (stored at 25°C or below in dark place)
Shelf life	6 months after manufacturing (stored at 25°C or below in dark place)

*After mixing with hardener.

3. PROCESS CONDITIONS

Surface treatment : Acid treatment → Brushing

Coating : Screen printing with 90 - 120 mesh screen

Hold time : 10 - 20 min.

Tack dry : A. One side each exposure
 - 1st side; 70 - 75°C / 15 - 20 min. (Hot air convection oven)
 - 2nd side; 70 - 75°C / 20 - 30 min. (Hot air convection oven)
 B. Both sides simultaneous exposure
 - 70 - 75°C / 35 - 50 min. (Hot air convection oven)

Exposure : 700 - 900 mJ / cm² (on the solder)

Hold time : 10 - 30 min.

Development : Developer ; 1wt% Na₂CO₃
 Temperature ; 29 - 31°C
 Spray pressure ; 2.5 - 3.0 kg / cm²
 Dwell time ; 70 - 100 sec.

Water rinse : Temp. 30°C or below
 Spray pressure ; 1 - 1.5 kg / cm²
 Dwell time ; 45 - 60 sec.

Post cure : Non plugging ;
 150 - 160 °C / 60 min. (Hot air convection oven)
 Plugging ;
 80°C x 30min→110°C x 30分→160°C x 60min (Hot air convection oven)

4. CHARACTERISTIC

(1). TACK DRY WINDOW

Tack dry window (min. @75°C)	40	50	60	70	80	90
Developability	○	○	○	○	○△	×

(2). HOLD TIME

Hold time (hrs)	24	36	48	72
Developability	○	○	○	×

(Holding at 20°C / 60%RH after drying at 75°C / 25 mins.)

(3).PHOTOSENSITIVITY

Item	Thickness	Energy	Dwell time	Sensitivity
Sensitivity		700 mJ/cm ²		9 - 11wedges
Stouffer	25 μ m	800 mJ/cm ²	60sec	10 - 12wedges
(2lsteps tablet)		900 mJ/cm ²		11 - 13wedges

Exposure energy is measured at under Mylar film.

5. PROPERTIES

Item	Test method	Result
Adhesion	Cross Cut Adhesion Tester (Simex Cat No.01-903-01)	100/100
Pencil hardness	Pencil Hardness Tester (Yasuda/NO.553-M)	≥6H
Solder heat resistance	Rosin flux 260°C / 30sec, 1cycles	Pass
Solvent resistance	PGM-Ac, room temp./30min Cross hatch peeling	Pass
Acid resistance	10vol% H ₂ SO ₄ , room temp./20min Cross hatch peeling	Pass
Alkaline resistance	10wt% NaOH, room temp./20min Cross hatch peeling	Pass
Electroless gold plate	NI; 125 μ inch Au; 3 μ inch	Pass

Note : The above-mentioned test data is only for reference, not to guarantee the same in your process.

6. R-500 MK COMPLY WITH IPC-SM-840C Class H

Property	Test Method	Requirement	Test Result
3.4.8. Visual	Magnifying lens rated between 1.75 to 10X magnification	No cracks No peeling and roughness. Free of foreign materials.	OK
3.5.2.1. Adhesion (tape method)	Determined in accordance with TM2.4.28.1 of IPC-TM-650. Differentiation of class shall be required.	Bare Copper $\leq 0\%$ Gold or Nickel $\leq 5\%$ Base Laminate $\leq 0\%$ Melting Metals $\leq 10\%$ (Tin-Lead plating)	PASSED PASSED PASSED PASSED
3.5.3. Mashinability	Subjected to drilling, routing, sawing or punching.	No cracks, No peeling and roughness.	PASSED
3.5.1.. Pencil Method	45degree angle, forward pressure in a 1/4 inch.	No softer than "F"	PASSED/6H
3.4.5. Curing	3.6.1.1.Resistance to Solvents and Cleaning Agents. 3.7.1.Solderability. 3.7.2.solder resistance.	Must meet requirements of 3.6.1., 3.7.2.and 3.7.3.	PASSED PASSED PASSED
3.6.1. Resistance to solvents, Cleaning Agents, Flux	<ul style="list-style-type: none"> • Isopropanol room temperature 2 minutes. • 75%Isopropanol/25%water 46±2°c 15 minutes. room temperature. . D-Limonene room temperature 2 minutes. • 10% Alkaline detergent EXP. $\leq 40\%$ alkanolamine $\leq 20\%$ 2-butoxyethanol $\leq 20\%$ glycol ether and the remaining 90% water (PH=13 or less) 57±2°c 2 minutes. . Monoethanolamine 57±2°c 2 minutes . Deionized water 60±2°c 2 minutes 	No surface roughness, blisters, delamination,swelling, and color change.	PASSED PASSED PASSED PASSED PASSED PASSED
3.6.3. Flammibility	UL-94 flammability.	UL-94 V number shall not be raised.	94 V-0
3.7.1. Solderbility	After flux coated, hold at ambient temperature for 5 minutes, preheat and solder float at 255±5°C for 10±1 seconds.	Solderbility of boads shall not be diminished.	PASSED
3.7.2. Resistance to solder	After flux coated, hold at ambient temperature for 5 minutes, preheat and solder float at 255±5°C for 10±1 seconds.	Solder shall not adhere to the solder mask.	PASSED

3.6.2. Hydrolytic Stability/Aging	97±2°C 90-98%RH 28 days.	No irreversible change of state.	PASSED
3.8.1. Dielectric Strength	Determined in accordance with TM2.5.6.1 of IPC-TM-650	Minimum value of 500 VDC per 0.025 mm [0.001 inch] of thickness.	PASSED 1.9KV/mil
3.8.2. Insulation Resistance	Minimum resistance of show before and after soldering.	Minimum $5 \times 10^8 \Omega$ at 500 VDC. IPC-B-25 test pattern B.	Before Soldering $2.30 \times 10^{13} \Omega$ After Soldering $2.50 \times 10^{12} \Omega$
3.9.1. Moisture and Insulation Resistance	25-65°C 85%RH Cycling 6 2/3 days Bias voltage 50 VDC and Test Voltage 100 VDC.	Minimum $5 \times 10^8 \Omega$ at 500 VDC. IPC-B-25 test pattern B.	Initial $1.8 \times 10^{13} \Omega$ After Treatment $1.6 \times 10^{12} \Omega$
3.9.2. Electromigration	85±2°C 90%RH 168 hours. Bias voltage 10VCD and Test Volatage 10VC	None allowed . Resistance \geq 2M Ω	PASSED
3.9.3. Thermal Shock	-65°C 15 min +125°C 15 min, Transition should not exceed 2 minutes. 100 cycles.	No blistering, crazing , and delamination.	PASSED

Note :

All test data mentioned above in this technical data sheet and process conditions are based on our laboratory test result and only for reference, we suggest testing for suitability in your application.

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

Chemical Name:	Photoimageable Solder Mask
Trade Name:	R-500 MK
Suggestion and Restriction:	Protect PCB surface from scratch and for insulation. Fully mixing with hardener. Printing with screen, exposure and development.
Company:	Onstatic Technology Co., Ltd. 7F., No.1, Ren'ai Rd., Yingge Dist., New Taipei City 239, Taiwan(R.O.C.)
TEL:	886-2-26777481
FAX:	886-2-26777484

2. HAZARDS IDENTIFICATION

GHS Classification	<ol style="list-style-type: none"> 1. Flammable Liquids - 4 2. Skin Corrosion/Irritation - 2 3. Eye Damage/Irritation - 2A 4. Toxic to Reproduction - 1 5. Hazardous to the Aquatic Environment - Acute Hazard - 2
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Symbol



Signal word	Warning
Emergency Overview	
HAZARD	<ol style="list-style-type: none"> 1. Flammable Liquids 2. Causes skin irritation 3. Causes serious eye irritation 4. May damage fertility or the unborn child 5. Toxic to aquatic life
PRECAUTIONARY STATEMENT	
Prevention	<ol style="list-style-type: none"> 1. Obtain special instructions before use. 2. Do not handle until all safety precautions have been read and understood. 3. Wear protective gloves/clothing and eye/face protection 4. Avoid breathing fume/gas/mist/vapors. 5. Do not eat, drink or smoke when using this product. 6. Keep away from heat/sparks/open flame– No smoking. 7. Use explosion-proof electrical/ventilating/lighting equipment. 8. Wash hands thoroughly after handling. 9. Avoid contact during pregnancy/while nursing.

10. Avoid release to the environment
 11. Keep container tightly closed when not use.

3. COMPOSITION INFORMATION

	CAS No.	CONTENT approx. percentage
Dipropylene glycol monomethyl ether	34590-94-8	10%
Di(propylene glycol) methyl ether acetate	88917-22-0	10%
Araldite (Epoxy acrylate)	25068-38-6	35%
Solvent naphtha 2-methyl-4'	64742-94-5	5%
-methylthio)-2-morpholino-propio-pheno	71868-10-5	10%
Barium sulfate and additives	7727-43-7	29%
Carbon black	1333-86-4	1%

4. FIRST-AID MEASURES

EYE CONTACT:	Immediately flush with plenty of water and continue washing for several minutes. Seek medical advice.
SKIN CONTACT:	Remove all contaminated clothing. Wash skin with soap and plenty of water. Obtain medical advice if irritation persists. Wash contaminated clothing before reuse.
INGESTION:	Wash out mouth with water. Remove dentures if any. Move exposed person to fresh air. Keep person warm and at rest. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention immediately.
INHALATION:	Move exposed person to fresh air. Seek medical advice if symptoms persist.
Notes to physician	No specific treatment. Treat symptomatically.

5. FIRE FIGHTING MEASURES

FLASH POINT: 78°C

METHOD USED: Setaflash closed-cup

EXTINGUISHING MEDIA: Water spray, carbon dioxide, dry chemical power or appropriate foam.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus (SCBA) and protective clothing to prevent contact with skin and eyes.

UNUSUAL FIRE AND EXPLOSIONS HAZARDS: Emits toxic fumes under fire conditions.

6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

Personal precautions	Avoid breathing vapor. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate.
Environmental precautions	Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
Spill	Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

7. HANDLING AND STORAGE

HANDLING:	Avoid contact with eye. Keep away from heat, flame and sunlight. Wash through after handling.
STORAGE:	Stored in dark and cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:	Mechanical exhaust required. Keep tightly closed. Store in a cool dry place.
PERSONAL PROTECTION:	Chemical safety goggles.
Hands	Compatible chemical resist gloves.
Eyes	Wear noish-approved respiration.
Skin	Safety shower and eye bath. Avoid contact with eyes, skin and clothing. Wash thorough after handling.
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9. PHYSICAL AND CHEMICAL PROPERTY

APPEARANCE:	Black paste
ODOR:	Ether odor
pH (as supplied):	Not Applicable
VAPOR PRESSURE:	2mm Hg @ 38°C
VAPOR DENSITY:	4.7
MELTING POINT:	<-20°C
BOILING POINT:	>190°C
FLASH POINT:	78°C
AUTOIGNITION POINT:	>360°C
DECOMPOSITION POINT:	Not Applicable
WATER SOLUBILITY:	immiscible
SPECIFIC GRAVITY:	1.3±0.2/25°C
EVAPORATION RATE:	Not Applicable

10. CHEMICAL STABILITY AND REACTIVITY INFORMATION

CHEMICAL STABILITY: Stable under recommended storage conditions. See storage section.

INCOMPATIBILITY (Materials to Avoid): Strong acids, strong bases, peroxides and strong oxidizing agents.

11. TOXICOLOGICAL INFORMATION

ACUTE EFFECTS: Causes eye and skin irritation.

INGREDIENT NAME:

Dipropylene glycol monomethyl ether acetate (DPMA)

LD50 Dermal Rabbit 5,000 mg/kg

LD50 Oral Rat 5,000 mg/kg

12. ECOLOGICAL INFORMATION

DO NOT discharge into sewer or waterways.

13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)

Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Observed local environmental regulations.

14. TRANSPORT INFORMATION

Not classified as hazardous under transport regulation.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be list on the TSCA inventory.

16. OTHER INFORMATION

The above information is believed to be correct but does not purport to be all-inclusive and shall be used only as a guide. Onstatic Technology Co., Ltd. shall not be held liable for any damage resulting from handling or from contacting with the above product.

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