Technical Data Sheet

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UV / Thermal curable (One component) solder resist ink

IJSR-4000 JM02DG(TR73851)

UL Suffix: IJSR-4000G

1. FEATURES

IJSR-4000 JM02DG(TR73851) is inkjetable solder resist ink with the following features.

- Excellent adhesion to laminate with dual cure (UV + Thermal) process
- Tack free right after printing due to On-head UV lamp on inkjet head, which provides excellent processability

2. SPECIFICATION

Color	Deep Green
Viscosity @25deg.C	42.0+/-4.0 mPa・s
Specific gravity	1.1+/-0.1
Surface tension	32.0+/-1.0 mN/m
Particle size	<1um
Solvent	Solventless
Cleaning solution	Cleaner TR70217

Technical Data Sheet

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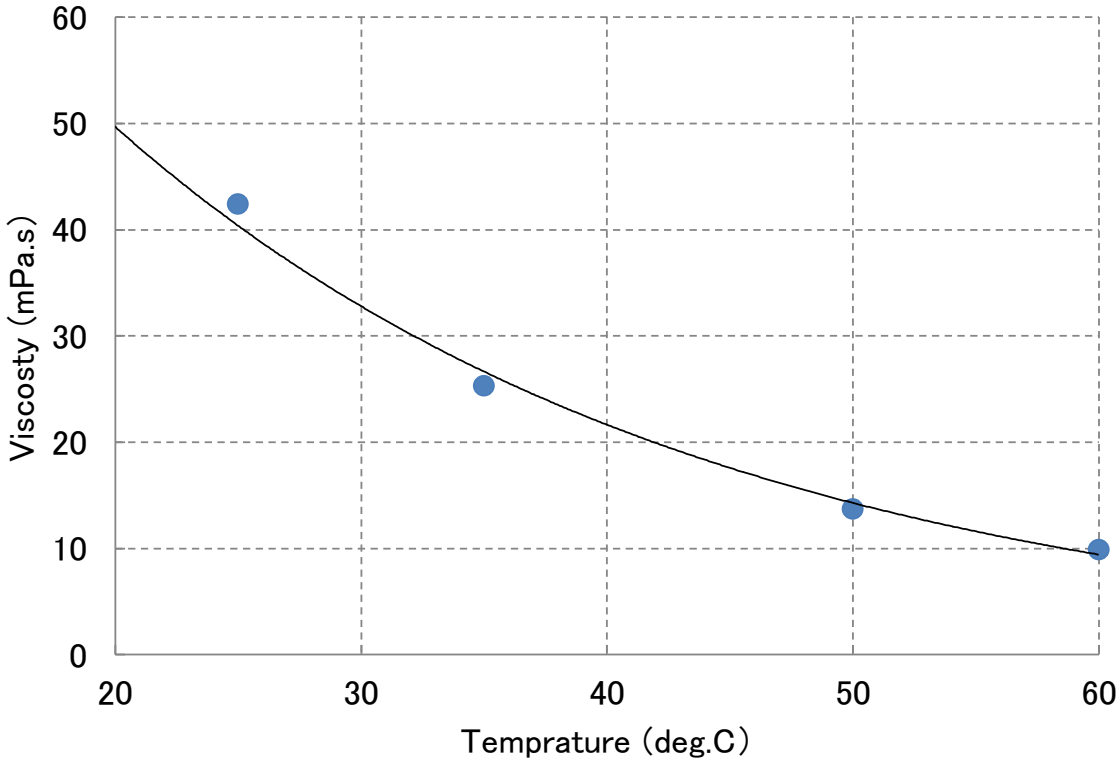
3. VISCOSITY CURVE



4. STANDARD CURING CONDITION

IJSR-4000 JM02DG(TR73851) is cured by below steps.

4-1. UV pre-curing ⇒ 4-2. Thermal curing ⇒ 4-3. UV bump

4-1. UV pre-curing

Light source	Wave length	Total exposure energy (mJ/cm^2)*
365nm LED	UV-A (320-390nm) + UV-A2 (380-410nm)	800-1700

* Measured by UV Power Puck II

4-2. Thermal curing

150deg.C 60min @box oven

4-3. UV bump

Light source	Wave length	Total exposure energy (mJ/cm^2)*
Mercury lamp or Metal halide lamp	UV-A (320-390nm) + UV-A2 (380-410nm)	2000-3000

* Measured by UV Power Puck II

5. PROCESS CONDITION

PROCESS	
Laminate	FR-4 or Cu foil
Pretreatment	Acid cleaning - Buff scrubbing
Inkjet printing	Piezo inkjet printer
Coating thickness	35+/-5um
Preliminary cure*	On-head UV lamp (365nm LED): 1,000mJ/cm^2
Thermal cure	Hot air convection oven: 150deg.C / 60min
UV bump*	UV irradiation device (Mercury lamp): 2,000mJ/cm^2

*Measured by UV Power Puck II

6. ATTENTION ON EACH PROCESS

Recommendable workshop condition

- Operation under yellow lamps(UV cut) in a clean room with ambient temperature at 20~25deg.C / 50~60%RH.
- Make ink temperature reach to room temperature, and stir sufficiently before use.
- The adequate thickness after curing is 30 to 40 um .
  Coating thickness less than the said may lower solder heat resistance, chemical resistance and Tin plating resistance.
  Coating thickness more than the said my cause undercut problem and insufficient tackiness.
- As curing conditions and windows are variable depending on the type of the drying oven, the board quantity to input, etc., set it suitable to your process after testing.
- As UV pre-curing exposure energy is variable depending on material type of substrates (UV absorbent, imide-type material etc.) and on coating thickness etc. should be conducted to set to the optimum condition.
- Final baking condition should be set with consideration of curing time of nomenclature ink. Shortage or excess in curing may cause deterioration of end properties.
- In case of Ni/Au plating, curing time of nomenclature ink should be considered for setting final baking condition of solder mask. Overcure causes lower Ni/Au resistance.

7. CHARACTERISTIC (END PROPERTIES)

Item	Test method	Test result
Adhesion	On FR-4, Internal test method Cross hatch tape peeling	100 / 100
	On Cu foil, Internal test method Cross hatch tape peeling	100 / 100
Pencil hardness	TAIYO Internal Test Method On copper foil, no Cu exposure	Above 3H
Solder heat resistance	Solder float test : Rosin flux, 260deg.C / 10sec (3cycles)	Passed
Electroless Ni/Au	Taiyo internal method Ni 3um, Au 0.03um	Passed
Solvent resistance	PGM-AC dipping, 20deg.C/20min, Tape peeling test	Passed
Acid resistance	10vol % H_2SO_4 dipping, 20deg.C/20min, Tape peeling test	Passed
Alkaline resistance	10wt% NaOH dipping, 20deg.C/20min, Tape peeling test	Passed
Insulation resistance	IPC comb type B pattern Conditioned: 25-65degC(cycle), 90% RH, DC100V, 7 days. Measurement: Room temp. DC500V 1-minute value	Initial Value: $1.5 \times 10^{14}\Omega$ Conditioned: $3.7 \times 10^{13}\Omega$
Dielectric Constant	Taiyo internal method, 1MHz Conditioned: 25~65deg.C(Cycle), 90%RH /7days Measurement: at room temperature	Initial: 3.8 Conditioned:4.0
Dissipation Factor	Taiyo internal method, 1MHz Conditioned: 25~65deg.C(Cycle), 90%RH /7days Measurement: at room temperature	Initial:0.04 Conditioned:0.05
Outgassing Test ASTM E595	160deg.C 60min thermal cure and 3 J/cm2 UV Cure was done after thermal cure.	TML-0.60% CVCM-0.02% WVR-0.35%
Bendability	Test method confirms with DIN EN ISO 1519 Cylindrical Mandrel Bending Tester Diameter of Mandrel is 2mm	More than 50 times

Note: The test result is under above-referenced process conditions and test methods. Moreover, content in this technical data sheet is based on our internal experiment, not to be guaranteed. Therefore, please check the required property in advance of use.

Technical Data Sheet

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IPC-SM-840E, Class H & T, Solder Mask Vendor Testing Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Visual	3.3.1	Uniform in Appearance	Passed
Curing	3.2.5.1	Ref: 3.6.1.1, 3.7.1 and 3.7.2	Passed
Non-Nutrient	3.2.6	Does not contribute to biological growth	Passed
Pencil Hardness	3.5.1	Minimum “F”	Passed – 5H
Adhesion	3.5.2.1	Rigid – Cu, Ni, FR-4	Passed
Adhesion	3.5.2.6	Doubled Layered Solder Mask	Passed
Machinability	3.5.3	No Cracking or Tearing	Passed
Resistance to Solvents and Cleaning Agents	3.6.1.1	IPA 75/25 IPA/DI H2O 10% Alkaline Detergent Monoethanolamine DI H2O D-Limonene	Passed Passed Passed Passed Passed Passed
Hydrolytic Stability and Aging	3.6.2	No Change after 28 days of 95-99°C and 90-98% RH	Passed
Solderability	3.7.1	No Adverse Effect J-STD-003	Passed
Resistance to Solder	3.7.2	No Solder Sticking	Passed
Resistance to Solder	3.7.3	No Solder Sticking	Passed
Simulation of Lead Free Reflow	3.7.3.1	No Solder Sticking	Passed
Dielectric Strength	3.8.1	500 VDC / mil Minimum	2,800 VDC/mil
Thermal Shock	3.9.3	No Blistering, Crazing or De-lamination	Passed

Specific Class “H” Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Flammability	3.6.3	UL 94V-0	Passed, File #E69262
Insulation Resistance Before Soldering After Soldering	3.8.2	 5×10^8 ohms minimum 5×10^8 ohms minimum	 $3.8 \times 10^{14}\Omega$ $5.2 \times 10^{13}\Omega$
Moisture & Insulation Resistance Before Soldering–In Chamber Before Soldering–Out of Chamber After Soldering-In Chamber After Soldering-Out of Chamber	3.9.1	 5×10^8 ohms minimum 5×10^8 ohms minimum 5×10^8 ohms minimum 5×10^8 ohms minimum	 $1.8 \times 10^{13}\Omega$ $9.0 \times 10^{12}\Omega$
Electrochemical Migration	3.9.2	$>2.0 \times 10^6$ ohms, no growth	$3.3 \times 10^{12}\Omega$

Specific Class "T" Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Flammability	3.6.3	Bellcore 0_2 Index – 28 minimum	Passed - 49
Insulation Resistance	3.8.2		
Before Soldering		5×10^8 ohms minimum	$3.8 \times 10^{14}\Omega$
After Soldering		5×10^8 ohms minimum	$5.2 \times 10^{13}\Omega$

Specific Class "T" Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Moisture & Insulation Resistance	3.9.1		
Before Soldering–In Chamber		5×10^8 ohms minimum	
Before Soldering–Out of Chamber		5×10^8 ohms minimum	$1.4 \times 10^{13}\Omega$
After Soldering-In Chamber		5×10^8 ohms minimum	
After Soldering-Out of Chamber		5×10^8 ohms minimum	$9.8 \times 10^{12}\Omega$
Electrochemical Migration	3.9.2	< 1 decade drop, no dendritic growth	Passed

- Meets all the requirements of IPC-SM-840E Classes H and T.
- UL recognized 94V-0.

8. ATTENTION

A. This information may be subject to revision as new knowledge and experience.

B. This information is based on our current knowledge to sorely provide possible suggestions for your own experiments.
It is not intended to substitute any tests you may need to conduct for your application.

C. All test data shown above in this technical data sheet are based on our laboratory test result and only for reference, not guarantee the same on your process.

D. All chemicals used in this product might have unknown toxicity. Please handle with your most care referring to the SDS for use.

E. No intentional use of RoHS subjected 6 substances (Lead, Cadmium, Mercury, Hexavalent chromium, PBBs and PBDEs) for this product