

# Technical Data Sheet

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UV / Thermal curable (One component) solder resist ink

## IJSR-4000 JM03G

UL Suffix: IJSR-4000AA (File #E69262)

### 1. FEATURES

IJSR-4000 JM03G is inkjettable 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

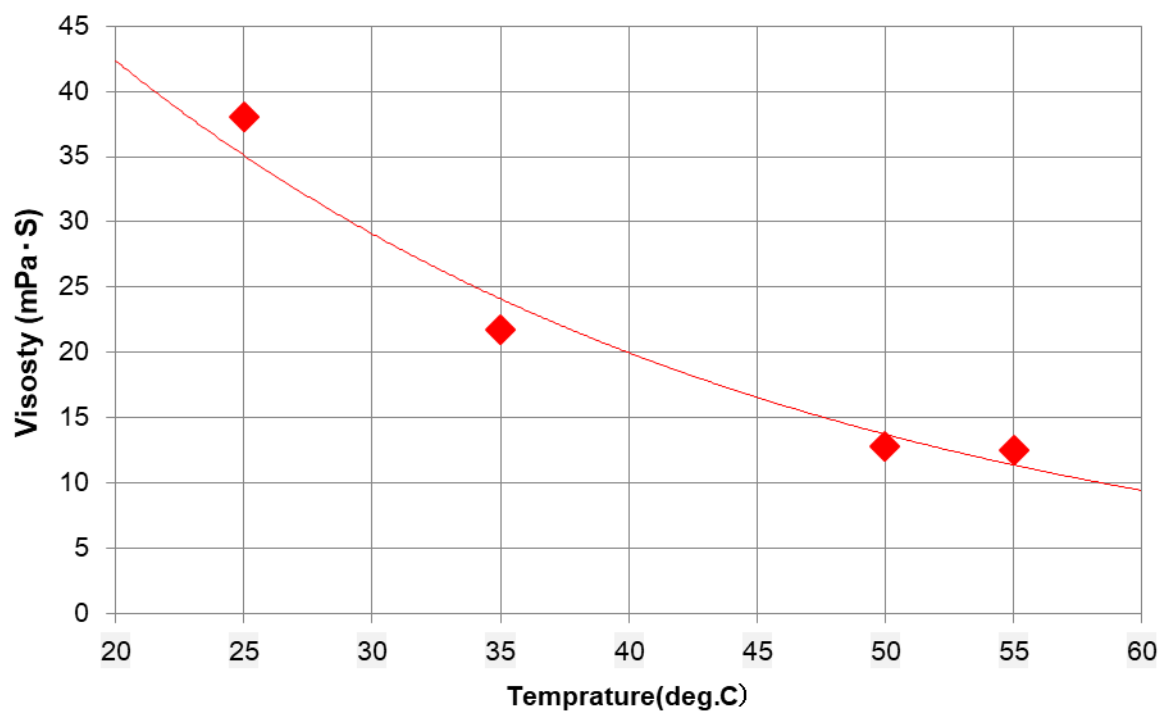
### 2. SPECIFICATION

Color	Dark green
Viscosity @25deg.C	35.5+/-4.5 mPa · S
Specific gravity	1.1+/-0.1
Surface tension	35.0+/-1.0 mN/m
Particle size	<1um
Solvent	Solventless
Cleaning solution	Cleaner TR70217

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### 3. VISCOSITY CURVE



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### 4. PRINTING PARAMETERS

This parameter is guide for starting printing test. We recommend to evaluate optimal printing parameter for your equipment by use of this guide, because the optimal printing parameter is different for structure of printer, kind of printer head and so on.

Items	Unit	Recommend
Head	-	KM1024i SHE Konica Minolta
Temperature	deg.C	55
Drive Voltage : Vh2 – Vh1	V	10.0 – 5.0
Pulse Width	us	3.7 - 7.4
Meniscus Vacuum	kPa	-0.9
Max Degassing Vacuum	kPa	-66.6
Max frequency	kHz	15
Jetting speed @1kHz	m/s	6.0
Droplet volume @1kHz	ng/drop	7.9

\*1 Value of Taiyo's test device

### 5. STANDARD CURING CONDITION

IJSR-4000 JM03G is cured by below steps.

5-1. UV pre-curing ⇒ 5-2. Thermal curing ⇒ 5-3. UV bump

#### 5-1. UV pre-curing

Light source	Wave length	Total exposure energy (mJ/cm <sup>2</sup> )*
365nm LED	UV-A (320-390nm) + UV-A2 (380-410nm)	800-1600

\* Measured by UV Power Puck II

#### 5-2. Thermal curing

150deg.C 60min @box oven

#### 5-3. UV bump

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

\* Measured by UV Power Puck II

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### 6. 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 <sup>2</sup>
Thermal cure	Hot air convection oven: 150deg.C / 60min
UV bump*	UV irradiation device (Mercury lamp): 2,000mJ/cm <sup>2</sup>

\*Measured by UV Power Puck II

### 7. ATTENTION ON EACH PROCESS

- For operation environment, desirable to handle the ink under the yellow lamps in the clean room of temp. range 20-25deg.C and 50-60%RH.
- Make ink temperature reach to room temperature, and stir sufficiently before use.
- UV curing conditions depend on the type of UV lamp. Inappropriate UV lamp may cause insufficient curability.

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## 8. CHARACTERISTIC (FINAL 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 5H
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
Immersion Tin Plating resistance	TAIYO internal test method pretreated Sample is pretreated by Mec etch and IJSR 02RA Tin thickness: about 1 um	Passed
Solvent resistance	PGM-AC dipping, 20deg.C/20min, Tape peeling test	Passed
Acid resistance	10vol % H <sub>2</sub> SO <sub>4</sub> 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: 9.5×10 <sup>13</sup> Ω Conditioned: 2.8×10 <sup>13</sup> Ω
Dielectric ConstantTaiyo	Taiyo internal method, 1MHz Conditioned: 25~65deg.C(Cycle), 90%RH /7days Measurement: at room temperature	Initial: 3.7 Conditioned:3.9
Dissipation Factor	Taiyo internal method, 1MHz Conditioned: 25~65deg.C(Cycle), 90%RH /7days Measurement: at room temperature	Initial:0.035 Conditioned:0.041
Surface Tension after Cure	Internal test; greater than 40 dynes/cm	Under evaluation
CTI (Comparative Tracking Index)	ASTM-D-3638-07	≥600
Hot Storage Resistance	150°C for 1000 hours – cross hatch adhesion Sample is pretreated by Mec Etch and IJSR 02RA	Passed
Outgassing Test ASTM E595	160deg.C 60min thermal cure and 3 J/cm <sup>2</sup> UV Cure was done after thermal cure.	TML-1.08% CVCM-0.10% WVR-0.61%
Halogen Level	Halogen Free if < 900 ppm	< 50ppm

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.

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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 H <sub>2</sub> O 10% Alkaline Detergent Monoethanolamine DI H <sub>2</sub> O D-Limonene	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	6,000 VDC/mil
Thermal Shock	3.9.3	No Blistering, Crazeing 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 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum	1.9 x 10 <sup>14</sup> Ω 2.9 x 10 <sup>13</sup> Ω
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 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum	- 1.4 x 10 <sup>13</sup> Ω - 2.7 x 10 <sup>13</sup> Ω
Electrochemical Migration	3.9.2	>2.0 x 10 <sup>6</sup> ohms, no growth	7.5 x 10 <sup>12</sup> Ω

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### Specific Class “T” Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
Flammability	3.6.3	Bellcore 0 <sub>2</sub> Index – 28 minimum	Passed - 46
Insulation Resistance Before Soldering After Soldering	3.8.2	5 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum	1.9 × 10 <sup>14</sup> Ω 2.9 × 10 <sup>13</sup> Ω

### Specific Class “T” Requirements

TEST	SM-840 PARAGRAPH	REQUIREMENT	RESULT
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 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum 5 x 10 <sup>8</sup> ohms minimum	- 4.2 × 10 <sup>13</sup> Ω - 3.4 × 10 <sup>12</sup> Ω
Electrochemical Migration	3.9.2	< 1 decade drop, no dendritic growth	Passed

## 9. ATTENTION

Caution and care is required for handling. For the detail, refer to SDS.

No intentional usage of restricted substances in EU RoHS to this product and its production process; Namely Cadmium, Lead, Mercury, Hexavalent Chromium, PBB and PBDE.