

# Test Report

Report No.: SZPA1205101208401E-2R1

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**TClient** : SHENZHEN RONGDA PHOTOSENSITIVE SCIENCE & TECHNOLOGY CO., LTD

**Address** : Building 27, Xintian Industrial Zone, Fuyong Town, Shenzhen City Shenzhen City

**Report on the submitted sample said to be:**

Sample Name : Liquid photoimageable solder resist ink H-9100(H-8100)

Sample Model : H-9100(H-8100)

Sample Material : /

Amount of Sample : 64pcs

Sample Received Date : May. 10, 2012

Sample tested Date : May. 10, 2012~ May. 29, 2012

**Test Requested:** Please see attached sheets.

**Test Results:** All the test item results meet the requirement of IPC-SM-840D.

Please see attached sheets.

Tested by: ANK HU

Reviewed by: ANNIE

Approved by: Alina Feng

Date: Jun. 05, 2012

Alina Feng

Approved Signatory

Centre Testing International (Shenzhen) Co., Ltd.

Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China



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**Test Requested:**

Test Sequence	Test Item
1	Moisture and Insulation Resistance
2	Chemical Resistance
3	Hydrolytic Stability
4	Visual Inspection
5	Insulation Resistance
6	Thermal Shock
7	Migration Test
8	Dielectric Strength
9	Thermal Stress
10	Dimensional Test
11	Pencil Hardness
12	Adhesive Force

# Test Report

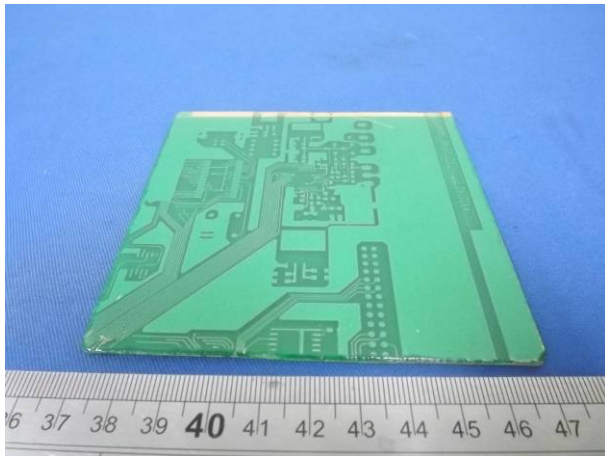
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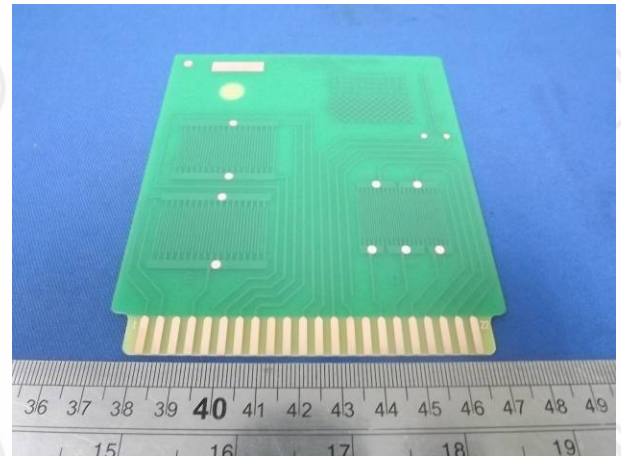
**Tested Sample:**

Sample No	Sample Name	Sample Model	Quantity
PA120510012-1~3	Liquid photoimageable solder resist ink H-9100(H-8100)	H-9100(H-8100)	64pcs

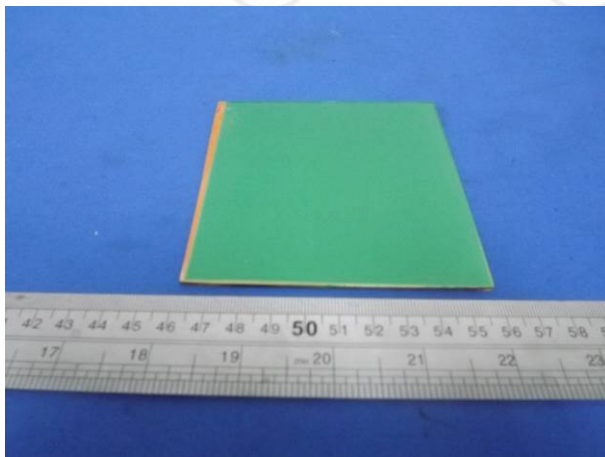
**Sample Photos:**



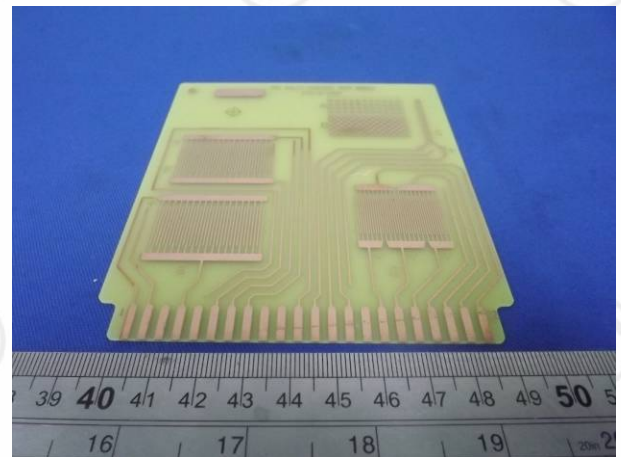
**Fig1.** Sample PA120510012-1



**Fig2.** Sample PA120510012-2



**Fig3.** Sample PA120510012-3



**Fig4.** Reference board photo before test

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## Test Item 1: Moisture and Insulation Resistance

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
High Resistivity Tester	6517B	ATTFIRFA00013	2012-09-23
Constant temperature & humidity chamber	ER-02KA	ATTFIRFA00011	2013-03-04

### (2) Environmental Conditions:

Temperature: 23.2°C; Humidity: 55%RH

### (3) Reference Standard: IPC-TM-650 2.6.3.1 Moisture and Insulation Resistance - Solder Mask

### (4) Test Sample: PA120510012-2

(5) **Test Condition:** Dry and connect treatment the reference board(Uncoated board), standard test board with solder resist ink coating and standard test board with solder resist ink coating after solder. After treatment, put both the testing board and the reference board in constant temperature & humidity chamber for 20cycles. And the cycle temperature is 25~65°C. Humidity is 90%RH. 50VDC bias voltage shall be applied between the electrodes. Insulation resistance for the final (18th cycle) readings in high temperature phase in the chamber and the reading taken outside the chamber shall be used to determine pass/fail criteria. Test voltage: 100V DC; Test time: 1 min. Finally examine at 10 X with stereoscopic microscope.

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**(6) Test Results:**

Test Sample			Insulation resistance ( $\Omega$ )		
			Readings in 18th cycle high temperature phase	Reading taken outside the chamber	Requirements
PA120510012-2	Before Soldering (solder resist ink coating board)	1-2	$3.56 \times 10^9$	$1.22 \times 10^{11}$	$\geq 5 \times 10^8$
		2-3	$3.35 \times 10^{10}$	$9.86 \times 10^{10}$	
		3-4	$6.28 \times 10^{10}$	$2.60 \times 10^{10}$	
		4-5	$4.76 \times 10^9$	$2.09 \times 10^{10}$	
	After Soldering (solder resist ink coating board)	1-2	$1.59 \times 10^{10}$	$3.24 \times 10^{10}$	
		2-3	$1.93 \times 10^{10}$	$3.38 \times 10^{10}$	
		3-4	$1.33 \times 10^{10}$	$2.73 \times 10^{10}$	
		4-5	$1.34 \times 10^{10}$	$8.33 \times 10^{10}$	
	Reference board (Uncoated board)	1-2	$9.71 \times 10^9$	$1.18 \times 10^{11}$	
		2-3	$1.17 \times 10^9$	$1.88 \times 10^{10}$	
		3-4	$1.43 \times 10^9$	$2.27 \times 10^{10}$	
		4-5	$3.70 \times 10^8$	$2.01 \times 10^{10}$	

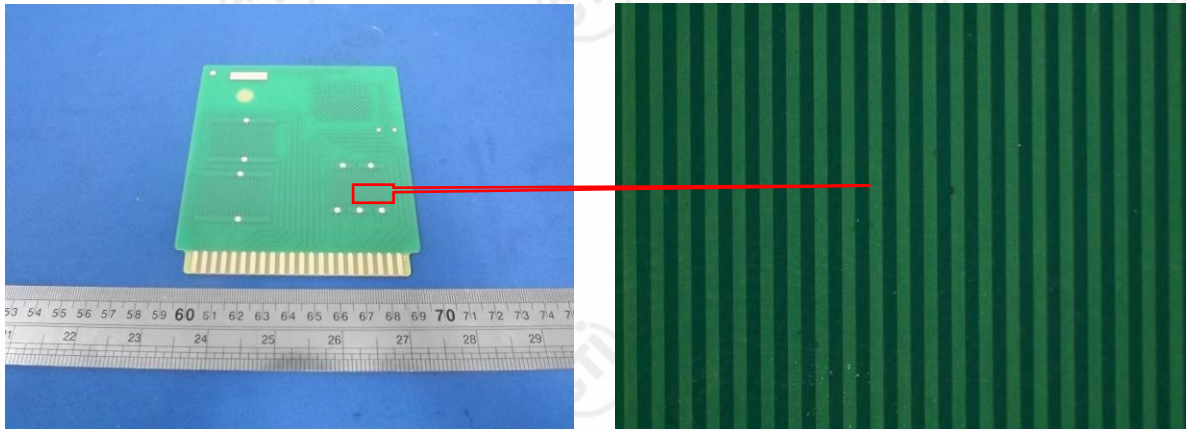
**Remark:** Insulation resistance readings in 18th cycle high temperature phase for Reference board (Uncoated board) 4-5 position is abnormal and caused by environment vibration etc.

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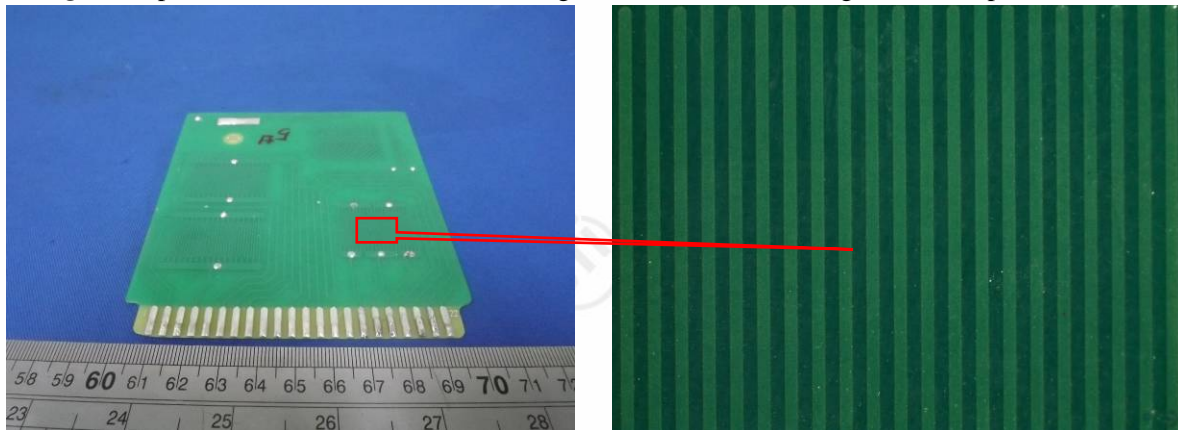
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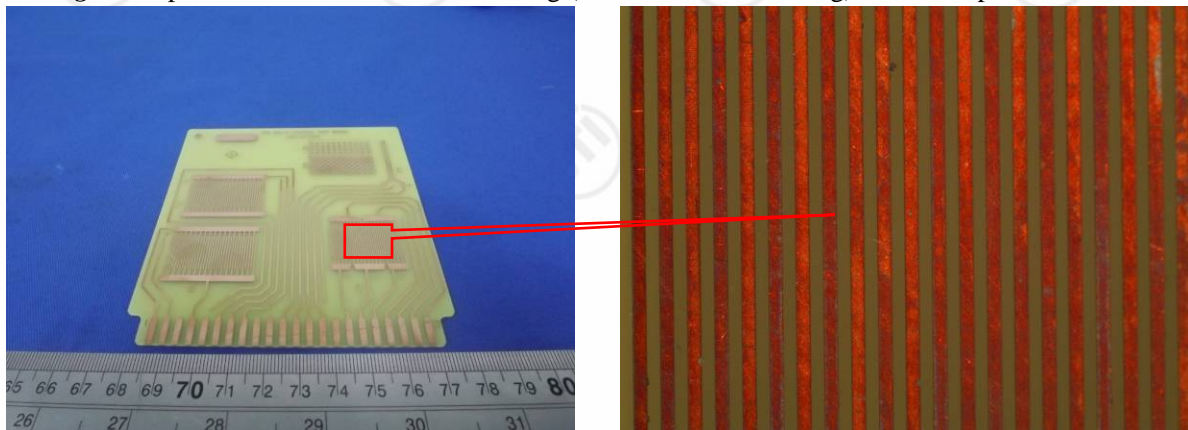
## Test Photos:



**Fig5.** Sample PA120510012-2 before soldering (solder resist ink coating) test board photo after test



**Fig6.** Sample PA120510012-2 after soldering (solder resist ink coating) test board photo after test

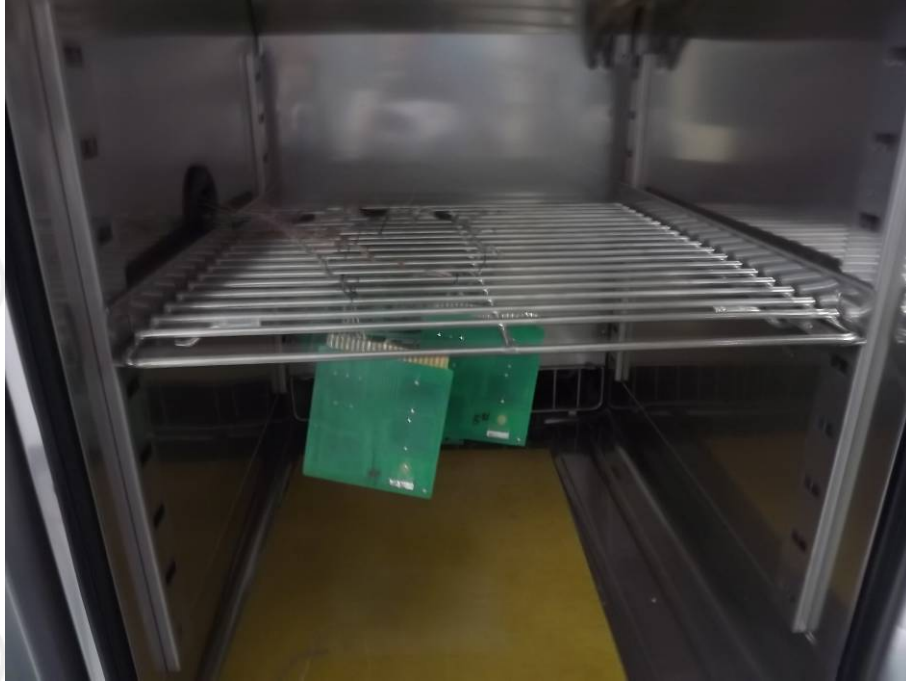


**Fig7.** Sample PA120510012-2 reference board (Uncoated board) photo after test

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*Fig8.* Sample photo during moisture and insulation resistance test

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## Test Item 2: Chemical Resistance

### (1) Environmental Conditions:

Temperature: 23±2°C

Humidity: 55±5%RH

(2) Reference Standard: IPC-TM-650 2.3.42 Solder mask - resistance to solvents and cleaning agents

(3) Tested Sample: PA120510012-1, PA120510012-2

### (4) Test Condition:

Tested sample	Chemical reagent	Temperature (°C)	Time (Min)
PA120510012-1, PA120510012-2	Isopropanol	22.5 ± 1	2
	75% isopropanol+25% deionized water	46 ± 2	15
	10% Alkaline detergent	57 ± 2	2
	Monoethanolamine	57 ± 2	2
	Deionized water	60 ± 2	5
	D-Limonene	22.5 ± 1	2

### (5) Test Result:

Tested sample	Test Result
PA120510012-1, PA120510012-2	No delamination or surface degradation such as cracks, tackiness, blisters or swelling of the solder mask can be found. See Fig 9
	No delamination or surface degradation such as cracks, tackiness, blisters or swelling of the solder mask can be found. See Fig 10
	No delamination or surface degradation such as cracks, tackiness, blisters or swelling of the solder mask can be found. See Fig 11
	No delamination or surface degradation such as cracks, tackiness, blisters or swelling of the solder mask can be found. See Fig 12
	No delamination or surface degradation such as cracks, tackiness, blisters or swelling of the solder mask can be found. See Fig 13
	No delamination or surface degradation such as cracks, tackiness, blisters or swelling of the solder mask can be found. See Fig 14

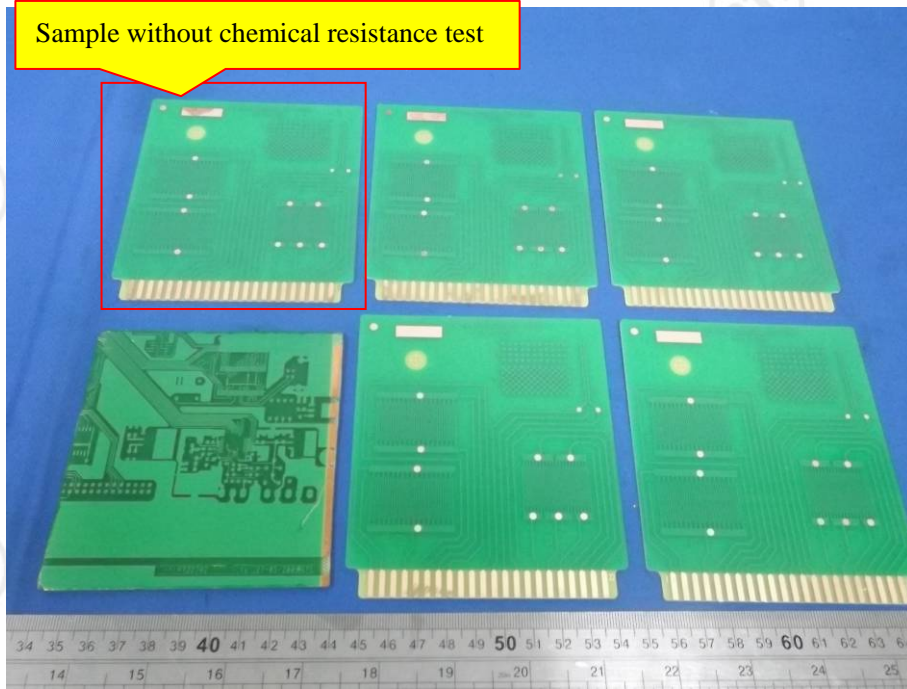


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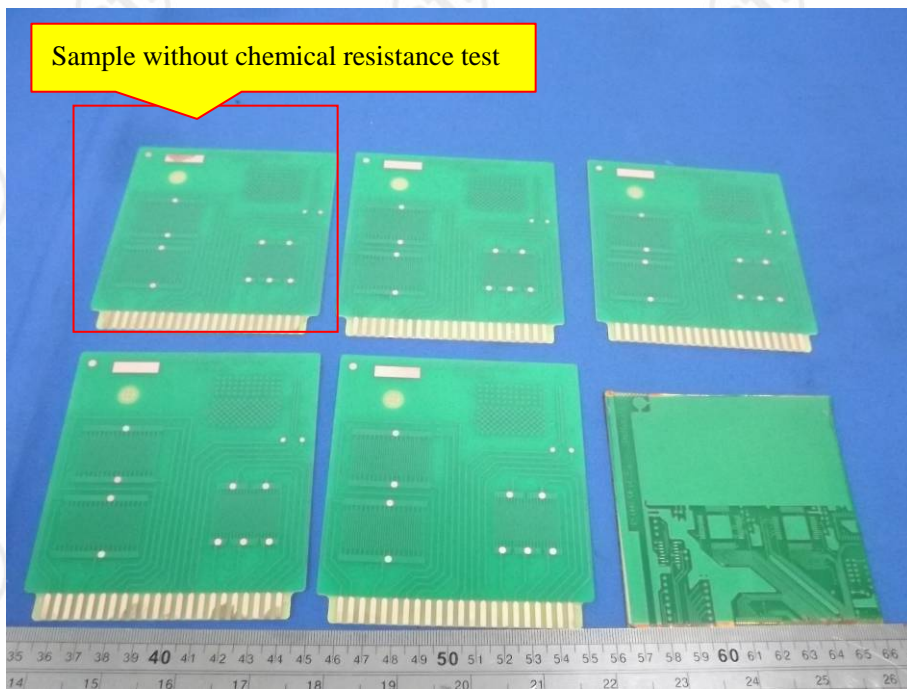
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**Test Photos:**



*Fig9.* After resistance to isopropanol

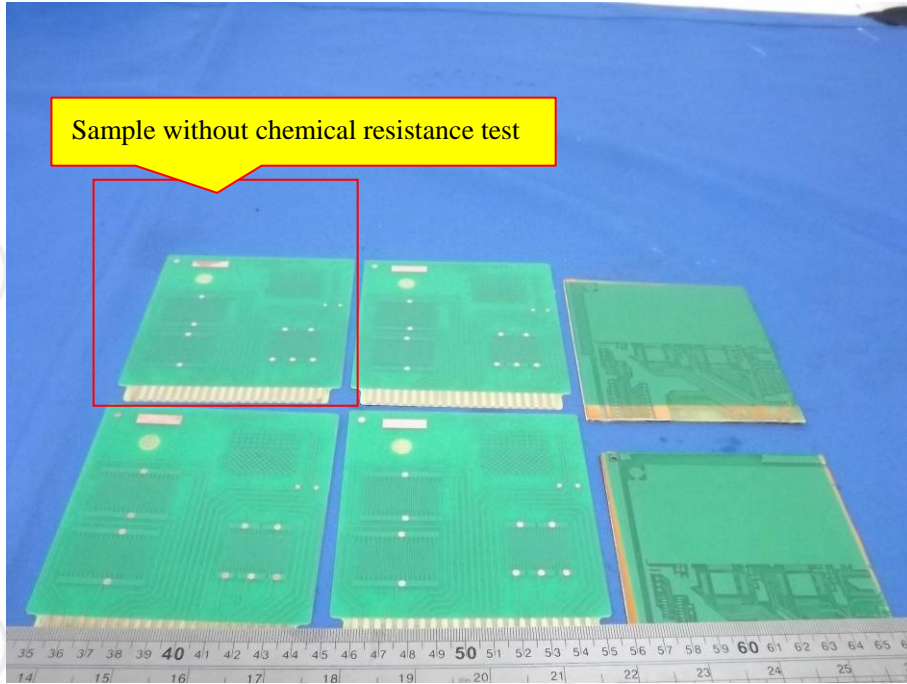


*Fig10.* After resistance to 75% isopropanol+25% deionized water

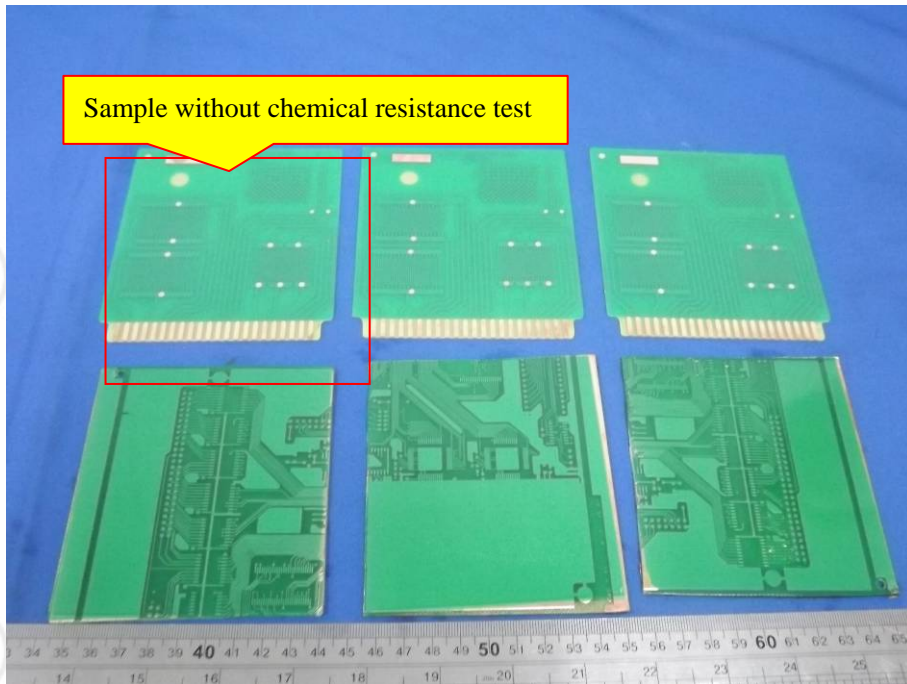
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**Fig11.** After resistance to 10% alkaline detergent

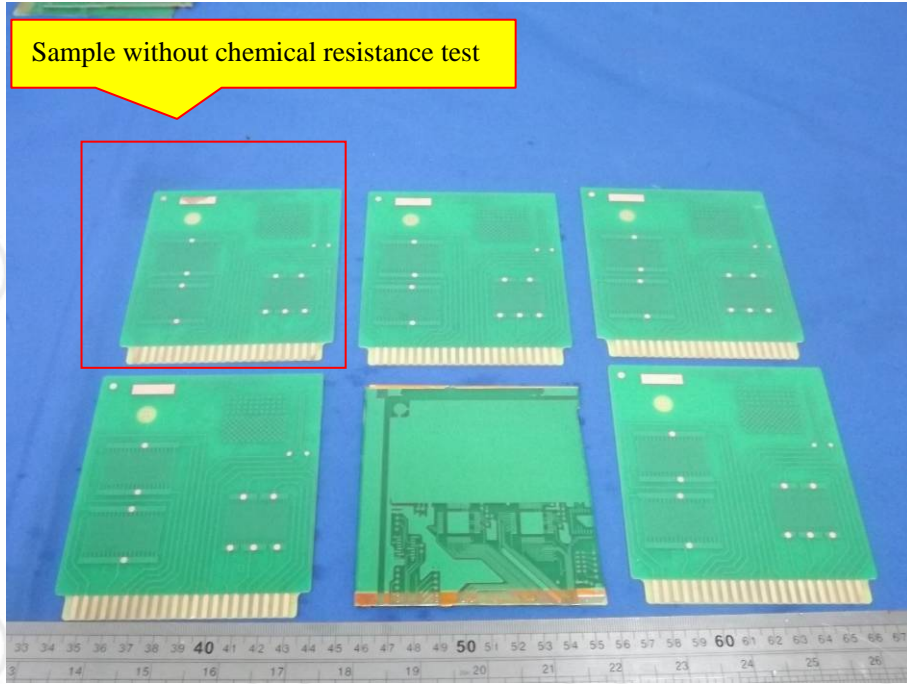


**Fig12.** After resistance to monoethanolamine

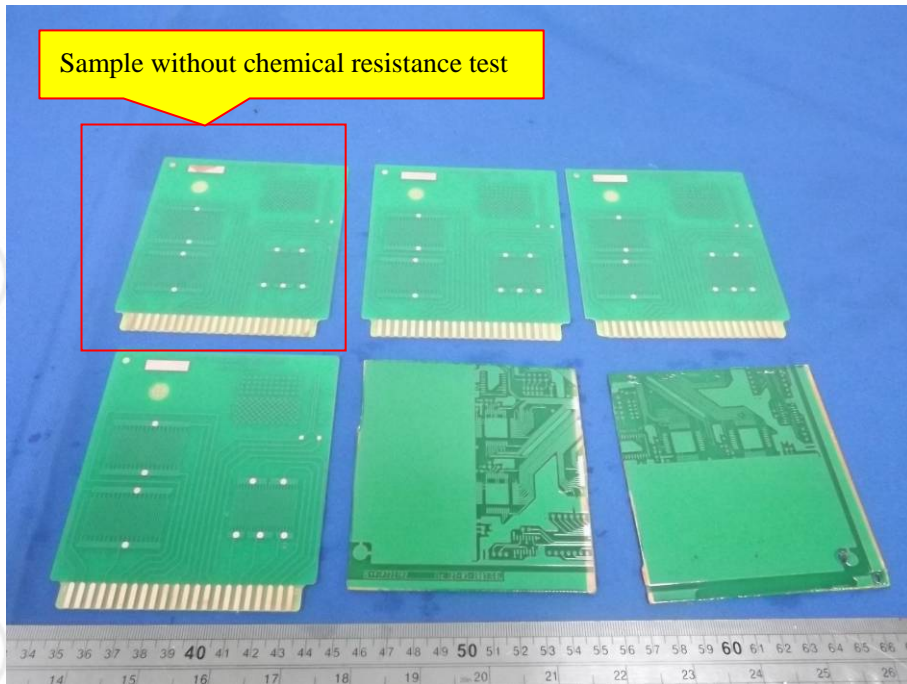
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**Fig13.** After resistance to deionized water



**Fig14.** After resistance to D-Limonene

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### Test Item 3: Hydrolytic Stability

**(1) Environmental Conditions:**

Temperature: 23±2°C

Humidity: 55±5%R.H

**(2) Reference Standard:** IPC-TM-650 2.6.11B Hydrolytic Stability Solder Mask and Conformal Coatings

**(3) Tested Sample:** PA120510012-3

**(4) Test Condition:**

Test sample	Temperature(°C)	Time (Days)
PA120510012-3	35 ± 2	4

**(5) Test Result:**

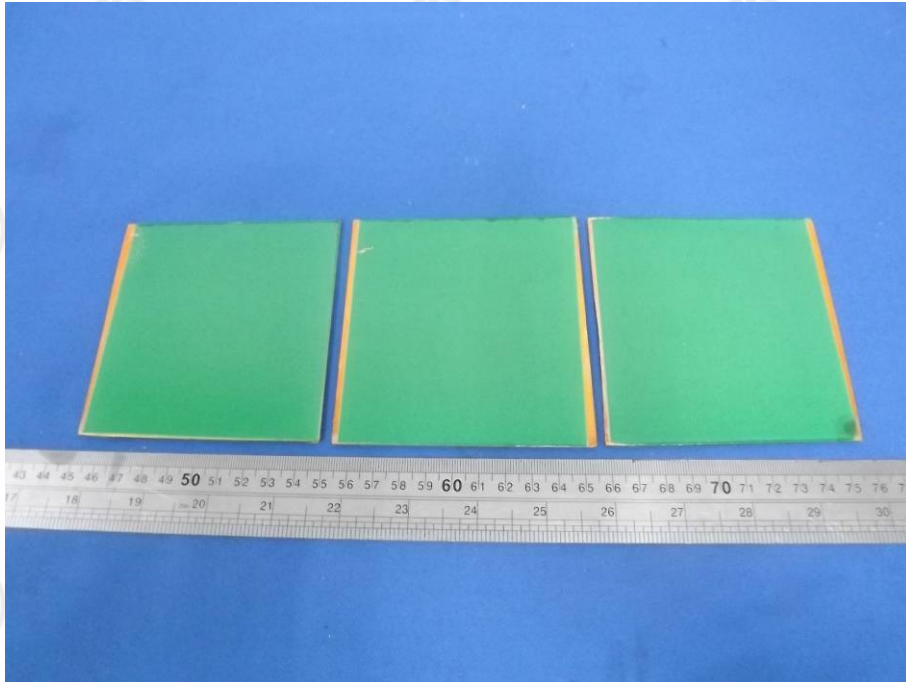
Test sample	Test Result
PA120510012-3	No chalking, blistering, cracking and general degradation can be found. See Fig15. ~Fig16.

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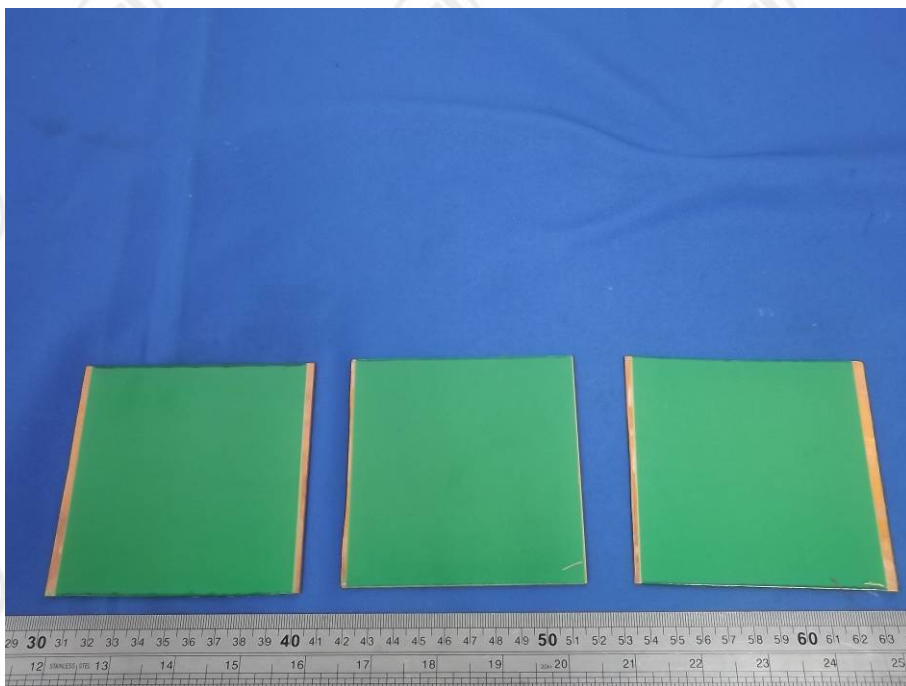
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**Test Photos:**



**Fig15.** Sample PA120510012-3 photo before hydrolytic stability test



**Fig16.** Sample PA120510012-3 photo after hydrolytic stability test

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## Test Item 4: Visual Inspection

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
Digital 3-D microscope	LEICA S8AP0	BTTEIRFA00007	-----

### (2) Environmental Conditions:

Temperature: 23.1°C ; Humidity: 54%RH

(3) **Reference Standard:** IPC-SM-840D Qualification and Performance Specification of Permanent Solder Mask

(4) **Test Sample:** PA120510012-1

### (5) Test Results:

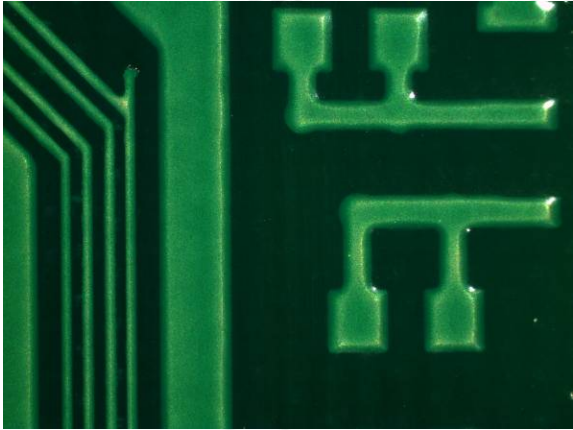
Tested Sample	Test Results
PA120510012-1	No visual crack, peeling, blistering, delamination and chalking defects

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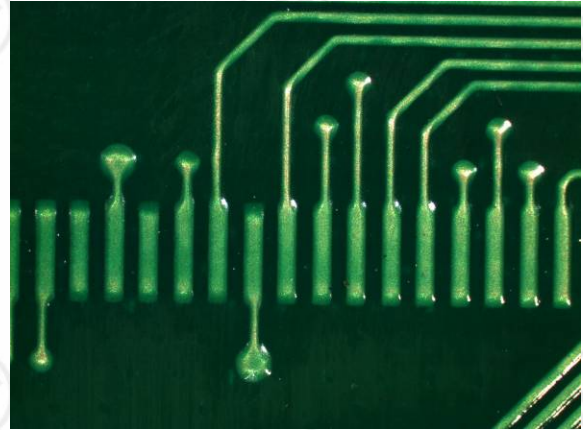
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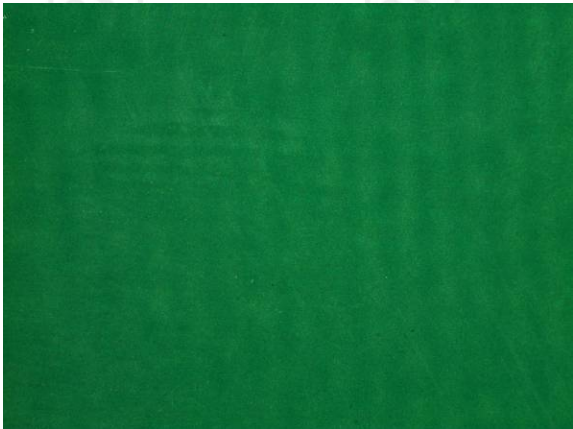
## Test Photos:



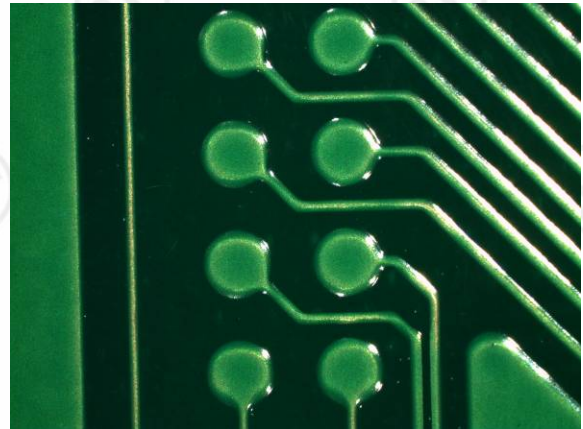
**Fig17.** Sample PA120510012-1 appearance typical  
photo 1 (10 X)



**Fig18.** Sample PA120510012-1 appearance typical  
photo 2 (10X)



**Fig19.** Sample PA120510012-1 appearance typical  
photo 3 (10 X)



**Fig20.** Sample PA120510012-1 appearance typical  
photo 4 (10 X)

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## Test Item 5: Insulation Resistance

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
High Resistivity Tester	6517B	ATTFIRFA00013	2012-09-23

### (2) Environmental Conditions:

Temperature: 23.3°C; Humidity: 57%RH

### (3) Reference Standard:

IPC-TM-650 2.6.3.1 Moisture and Insulation Resistance - Solder Mask

IPC-SM-840D Qualification and Performance Specification of Permanent Solder Mask

### (4) Test Sample: PA120510012-2

(5) **Test Condition:** Dry and connect treatment the reference board(Uncoated board), standard test board with solder resist ink coating and standard test board with solder resist ink coating after solder. After the treatment, measure and record the initial insulation resistance measurements at ambient laboratory conditions. Test voltage: 100V DC.



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**(6) Test Results:**

Tested Sample			Test Results ( $\Omega$ )	Requirements ( $\Omega$ )
PA120510012-2	Before Soldering (solder resist ink coating board)	1-2	$5.07 \times 10^{10}$	$\geq 5 \times 10^8$
		2-3	$6.05 \times 10^{10}$	
		3-4	$5.90 \times 10^{10}$	
		4-5	$8.44 \times 10^{10}$	
	After Soldering (solder resist ink coating board)	1-2	$1.43 \times 10^{11}$	
		2-3	$1.31 \times 10^{11}$	
		3-4	$1.38 \times 10^{11}$	
		4-5	$5.31 \times 10^{11}$	
	Reference board (Uncoated board)	1-2	$1.59 \times 10^{11}$	
		2-3	$1.05 \times 10^{12}$	
		3-4	$2.09 \times 10^{11}$	
		4-5	$4.74 \times 10^{11}$	

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## Test Item 6: Thermal Shock

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
Metalloscope	AXIO Imager.A1m	ATTEIRFA00005	2012-09-22
Constant temperature & humidity chamber	ER-02KA	ATTFIRFA00011	2013-03-04

### (2) Environmental Conditions:

Temperature: 21.3°C; Humidity: 55%RH

### (3) Reference Standard:

IPC-TM-650 2.6.7.3 Thermal shock-solder mask

IPC-SM-840D Qualification and Performance Specification of Permanent Solder Mask

### (4) Test Sample: PA120510012-2

### (5) Test Condition: Thermal shock test for standard board with solder resist ink coating after soldering:

low temperature -65°C; high temperature 125°C, dwell time 15 min; Transition time: less than 2min;

number of cycles: 100 times. After the treatment, observe if exhibit blisters, crazing or delamination.

### (6) Test Results:

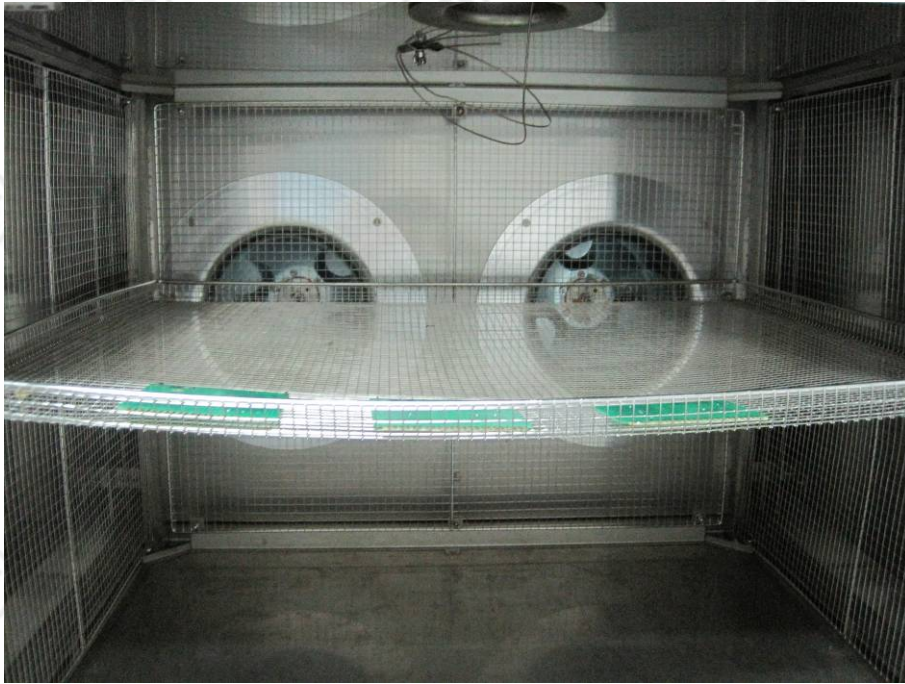
Tested Sample	Test Results	
PA120510012-2	1	No blisters, crazing and delamination
	2	No blisters, crazing and delamination
	3	No blisters, crazing and delamination

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**Test Photo:**



**Fig21.** Sample PA120510012-2 photo during thermal shock test



**Fig22.** Sample PA120510012-2 typical photo1  
before thermal shock test (10 X)



**Fig23.** Sample PA120510012-2 typical photo 1  
after thermal shock test (10 X)

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**Fig24.** Sample PA120510012-2 typical photo 2  
before thermal shock test (10 X)



**Fig25.** Sample PA120510012-2 typical photo 2  
after thermal shock test (10 X)



**Fig26.** Sample PA120510012-2 typical photo 3  
before thermal shock test (10 X)



**Fig27.** Sample PA120510012-2 typical photo 3  
after thermal shock test (10 X)

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## Test Item 7: Migration test

### (1) Test Equipment:

Equipment Name	Equipment Model	Valid Date to
Constant temperature & humidity chamber	KTHG-415TDS	2013-01-06
Insulation resistance tester	SIR13	2012-12-01

### (2) Environmental Conditions:

Temperature: 23.2°C; Humidity: 55%RH

### (3) Reference Standard:

IPC-TM-650 2.6.14 Resistance to Electrochemical Migration, Solder Mask

IPC-SM-840D Qualification and Performance Specification of Permanent Solder Mask

- (4) **Test Condition:** Dry and connect treatment the reference board(Uncoated board), and standard test board with solder resist ink coating after solder. After treatment, And the cycle temperature is 85°C. Humidity is 95%RH. 10VDC bias voltage , Test time: 168H. and the reading taken outside the chamber shall be used to determine pass/fail criteria. Test voltage: 10V DC; Finally examine at 10 X with stereoscopic microscope.

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**(5) Test Results:**

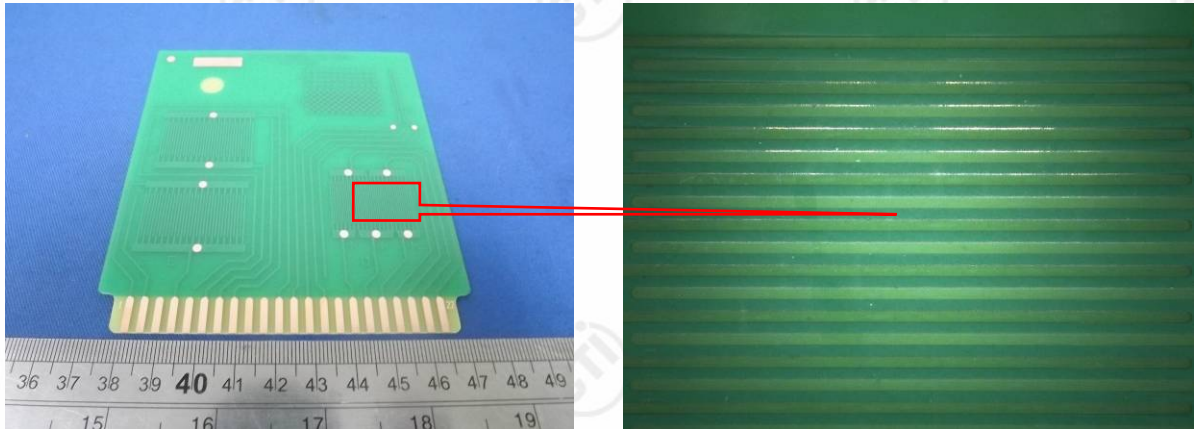
Test Sample				Test Results ( $\Omega$ )		
				Before Test	After Test	Requirements
PA120510012-2	Solder resist ink coating board	1	1-2	$1.00 \times 10^{11}$	$1.67 \times 10^{10}$	$\geq 2 \times 10^6$
			2-3	$1.00 \times 10^{11}$	$2.50 \times 10^{10}$	
			3-4	$1.00 \times 10^{11}$	$5.00 \times 10^{10}$	
			4-5	$1.00 \times 10^{11}$	$1.00 \times 10^{11}$	
		2	1-2	$1.00 \times 10^{11}$	$5.00 \times 10^{10}$	
			2-3	$1.00 \times 10^{11}$	$1.00 \times 10^{11}$	
			3-4	$1.00 \times 10^{11}$	$1.00 \times 10^{11}$	
			4-5	$5.00 \times 10^{11}$	$5.00 \times 10^{10}$	
		3	1-2	$1.00 \times 10^{11}$	$1.43 \times 10^{10}$	
			2-3	$5.00 \times 10^{11}$	$1.43 \times 10^{10}$	
			3-4	$1.00 \times 10^{11}$	$3.33 \times 10^{10}$	
			4-5	$1.00 \times 10^{11}$	$1.00 \times 10^{11}$	
	Reference board (Uncoated board)	1-2	$3.33 \times 10^{10}$	$2.50 \times 10^{10}$		
		2-3	$1.00 \times 10^{11}$	$3.33 \times 10^{10}$		
		3-4	$1.00 \times 10^{11}$	$1.67 \times 10^{10}$		
		4-5	$1.00 \times 10^{11}$	$1.67 \times 10^{10}$		

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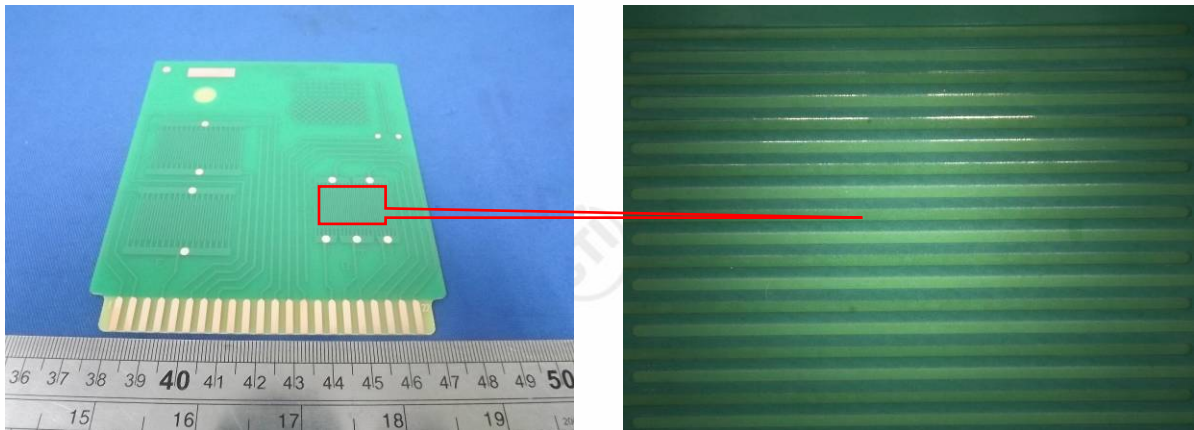
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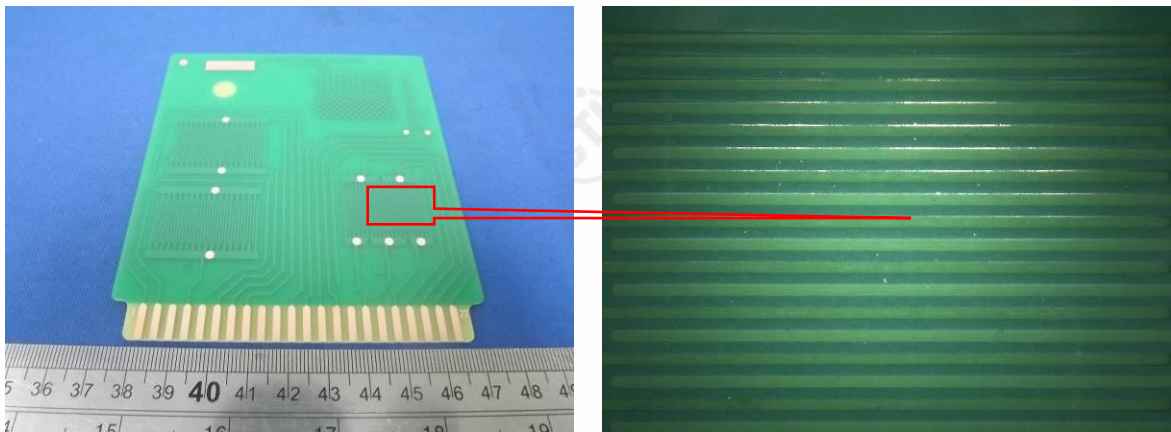
## Test Photos:



**Fig28.** Sample PA120510012-2 test board 1 photo after test



**Fig29.** Sample PA120510012-2 test board 2 photo after test

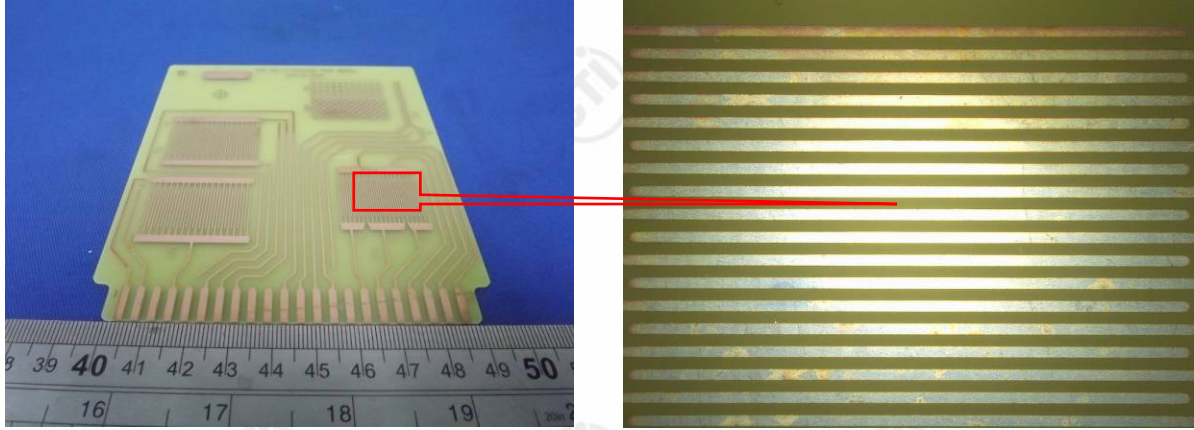


**Fig30.** Sample PA120510012-2 test board 3 photo after test

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**Fig31.** Sample PA120510012-2 Reference board photo after test



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## Test Item 8: Dielectric Strength

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
Voltage breakdown tester	FYDY-50K	BTTEIRFA00031	2013-05-07

### (2) Environmental Conditions:

Temperature: 22.3°C; Humidity: 55%RH

### (3) Reference Standard:

IPC-TM-650 2.5.6.1 Solder Mask-Dielectric Strength.

IPC-SM-840D Qualification and Performance Specification of Permanent Solder Mask

### (4) Test Sample: A120510012-3

### (5) Test Condition: DC voltage; Judge current: 5mA; Solder resists ink thickness: 0.023 mm.

### (6) Test Results:

Tested Sample		Test Results (VDC)	
		Test Result	Requirements
PA120510012-3	1	2670	≥500
	2	2430	
	3	2800	

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## Test Item 9: Thermal Stress

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
Lead-free titanium tin stove	FX320	ATTFIRFA00011	2012-09-22
Digital 3-D microscope	LEICA S8AP0	BTTEIRFA00007	-----

### (2) Environmental Conditions:

Temperature: 23.2°C; Humidity: 55%RH

### (3) Reference Standard:

IPC-TM-650 2.6.8 Thermal Stress-Plated-Through Holes

IPC-SM-840D Qualification and Performance Specification of Permanent Solder Mask

### (4) Test Sample: PA120510012-3

### (5) Test Condition: Dry sample at 125°C for 6h. Then place the test samples in a desiccator on a ceramic

plate to cool to room temperature. Flux coats the surface before soldering. Solder temperature :260°C;

Dwell time 10s; Number of cycles: 3 times.

### (6) Test Results:

Tested Sample		Test Results
PA120510012-3	1	No delamination, blisters and crazing defects
	2	No delamination, blisters and crazing defects
	3	No delamination, blisters and crazing defects

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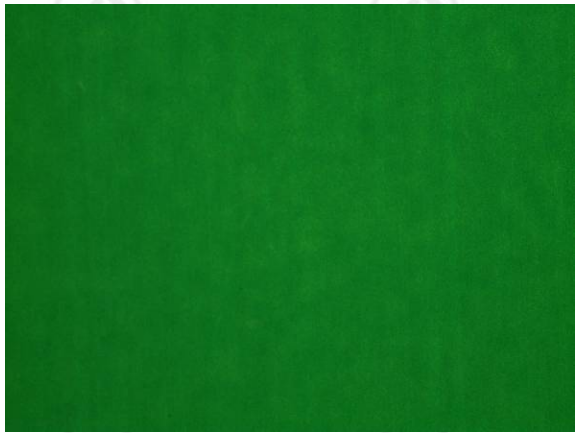
## Test Photos:



**Fig32.** Sample PA120510012-3 before the picture 1  
(10 X)



**Fig33.** Sample PA120510012-3 after test picture 1  
(10 X)



**Fig34.** Sample PA120510012-3 before the picture 2  
(10 X)



**Fig35.** Sample PA120510012-3 after test picture 2  
(10 X)

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**Fig36.** Sample PA120510012-3 before the picture 3  
(10 X)



**Fig37.** Sample PA120510012-3 after test picture 3  
(10 X)

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## Test Item 10: Dimensional Test

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
Metallographic Microscope	AXIO Imager. A1m	ATTEIRFA00005	2012-09-22

### (2) Environmental Conditions:

Temperature: 22.0°C; Humidity: 55%RH

### (3) Reference Standard:

IPC-TM-650 2.1.1 Micro sectioning, Ceramic Substrate

IPC-SM-840D Qualification and Performance Specification of Permanent Solder Mask

### (4) Tested flow: After cross section, girding, polishing and etching put the test sample on sample-stand of

Metallographic Microscope to measure the thickness of the layer and calculate the average value

### (5) Test Results:

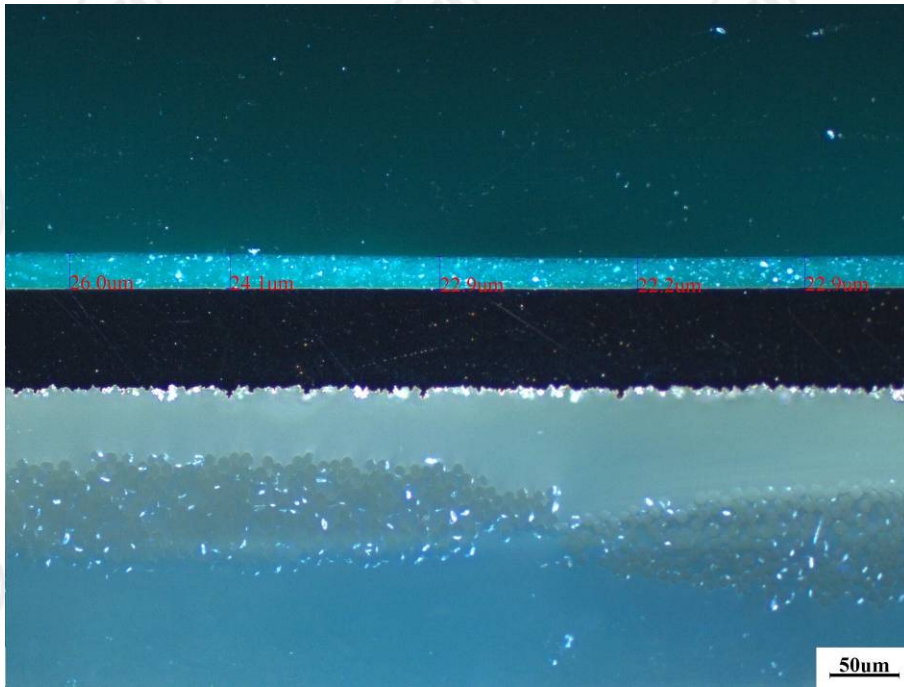
Tested Sample		Test Position	Solder resist ink thickness					Unit: $\mu\text{m}$
			Point1	Point 2	Point 3	Point 4	Point 5	Ave.
PA120510012-1	1	Solder resist ink	26.0	24.1	22.9	22.2	22.9	23.6
	2		21.0	21.6	21.6	21.6	21.6	21.5
PA120510012-3			23.5	23.5	24.1	24.1	24.1	23.9

# Test Report

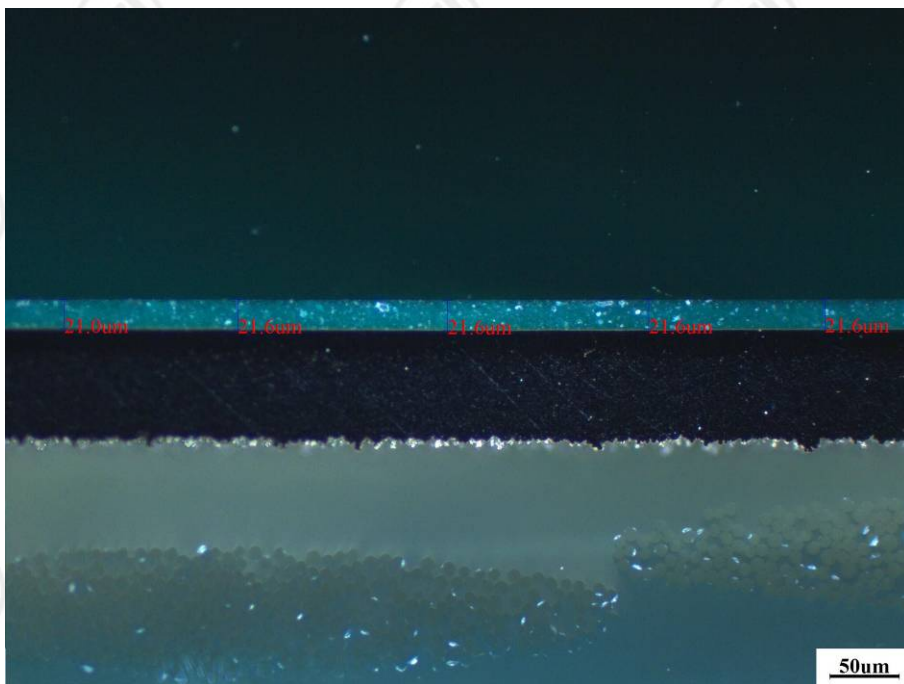
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**Test Photos:**



**Fig38.** Solder resist ink thickness cross section photo of sample PA120510012-1-1 (200X)

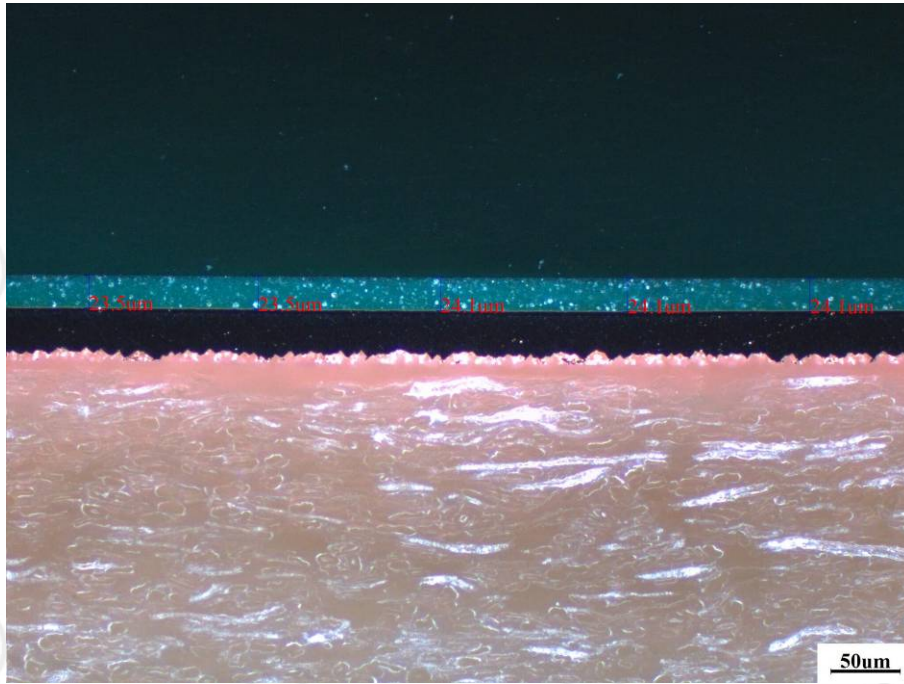


**Fig39.** Solder resist ink thickness cross section photo of sample PA120510012-1-2 (200X)

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**Fig40.** Solder resist ink thickness cross section photo of sample PA120510012-3 (200X)

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## Test Item 11: Pencil Hardness

### (1) Test Equipment:

Equipment Name	Equipment Model	Equipment Number	Valid Date to
Pencil hardness tester	MY-6602	BTTEELSZ20015	2012-09-23

### (2) Environmental Conditions:

Temperature: 22.9°C; Humidity: 56%RH

(3) **Reference Standard:** IPC-TM-650 2.4.27.2 The solder mask abrasion (Pencil Hardness)

(4) **Test Sample:** PA120510012-1

(5) **Test Conditions:** Test load: 500g; test angle: 45°

(6) **Test Results:** The solder mask has a pencil hardness of 4H



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## Test Item 12: Adhesive Force

### (1) Environmental Conditions:

Temperature: 22.9°C; Humidity: 57%RH

(2) **Reference Standard:** IPC-TM-650 2.4.28.1 The solder mask adhesive force

(3) **Test Sample:** PA120510012-1

(4) **Test Conditions:** Take 600 long 50mm wide 13mm tape, even down to the sample surface, squeeze out the internal air, within one minute, plus a vertical force to the surface to be measured quickly pull up. Check on the tape with or without residues.

(5) **Test Results:** After testing, The tape without any residue.

\*\*\* End of Report \*\*\*

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.

Remarks: This report replaced the report entitled SZPA1205101208401E-2.