

Solder Paste Evaluation Results

Issued date:	December 2012	
Product name :	Sn63/Pb37	NC258



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Tin-Lead No Clean Solder Paste Evaluation Results

Item	IPC/ Bellcore/ASTM	IPC result	JIS	JIS result
POWDER TESTING				
Alloy composition	J-STD-006 3.2	Ag:3.00±0.20 Cu:0.5±0.1 Sn: REM Instrument: spectrometer	JIS Z 3282	N/I
Alloy melting point	J-STD-006 2.6.10	218°C Instrument:DSC	JIS Z 3282	N/I
Particles size	J-STD-005 3.3.2 IPC-TM-650 2.2.14, 14.1, 14.2, 14.3	Type 3 = 45-25 micron Type 4 = 38-20 micron Instrument : Clemex	JIS Z 3284 4.1 JIS Z 3284 Annex 1	4 = 45-22 micron 5 = 38-22 micron
Particles shape	J-STD-005 3.3.3 Microscope	Spherical Instrument : Clemex	JIS Z 3284 4.1 JIS Z 3284 Annex 1	S
Density	ASTM B 212-99	Type 3 = 4.4 Type 4 = 4.3	----	----
FLUX TESTING				
Visual	J-STD-004	PASS	----	----
Flux activity classification	J-STD-004 3.1.2	RE	JIS Z 3284 4.2	1=resin
Flux type classification	J-STD-004 3.2.3	L1	JIS Z 3284 4.2	I=low
Specific gravity	ASTM D1729	0.9223	----	----
Acid Value	J-STD-004 3.2.6.1 IPC-TM-650 2.3.13	146.9mg KOH/ g flux	N/A	----
Copper mirror	J-STD-004 3.2.4.1 IPC-TM-650 2.3.32	LOW	JIS Z 3197 6.6.2	No corrosion
Silver chromate	J-STD-004 3.2.4.2.1 IPC-TM-650 2.3.33	PASS	N/A	----
Fluoride spot	J-STD-004 3.2.4.2.2 IPC-TM-650 2.3.35.1	No fluoride	N/A	----
Halides quantitatives				
Chloride, Bromide	J-STD-004 3.2.4.3.1 IPC-TM-650 2.3.35 or 28	Br: 0.33% Cl: 0%	JIS Z 3197 6.5 Bellcore	N/P
Fluoride	J-STD-004 3.2.4.3.2 IPC-TM-650 2.3.35.2 or 28	N/A	JIS Z 3284 Annex 2	No fluoride

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Non volatile determination	J-STD-004 3.2.4.3.3 IPC-TM-650 2.3.34	78.82%	N/A	----
Corrosion (Cu plate)	J-STD-004 3.2.4.4 IPC-TM-650 2.6.15	PASS	JIS Z 3197 6.6.1	PASS
Surface Insulation Resistance	J-STD-004 3.2.4.5 IPC-TM-650 2.6.3.3	>1E9Ω at 96 and 168 h.- pass >1E8Ω at 96 and 168 h.- pass No dendrite growth or corrosion, after a visual inspection-pass	JIS Z 3197 6.8 JIS Z 3284 Annex 3	N/P
Moisture content by Karl Fisher coulometer	AIM TM 119F-09	0.2907%	N/A	----
FOG (finess of grain)	ASTM D1210	0.10um	----	----
Flux spreading	J-STD-004 3.2.7.1 IPC-TM-650 2.4.14.2 (wetting balance)	PASS	JIS Z 3197 6.10 (spread)	91% PASS
SOLDER PASTE TESTING				
Metal/ Flux content	J-STD-005 IPC-TM-650 2.2.20	Type 3 nominal=88.50	JIS Z 3197 6.1	idem
Viscosity T-bar spindle	J-STD-005 3.5 IPC TM 650 2.4.34	Type 3 nominal=900kcp	----	----
Solder Ball	J-STD-005 3.7 IPC-TM-650 2.4.43	PASS	JIS Z 3284 Annex 11	Degree 1 PASS
Slump test	J-STD-005 3.6 IPC-TM-650 2.4.35	A-20 cold=pass A-20 hot=pass A-21 cold=pass A-21 hot=pass	JIS Z 3284 Annex 7 and Annex 8	cold=pass hot=pass
Spread	J-STD-004 IPC-TM-650 2.4.46	>90mm ²	JIS Z 3197 6.10 (spread)	91%
Wetting	J-STD-005 IPC-TM-650 2.4.46	PASS		
Tack test	J-STD-005 3.8 IPC-TM-650 2.4.44	37.9gf	JIS Z 3284 Annex 9	94.8gf
Print and soldering tests				
Printability	TM 125-01	PASS	JIS Z 3284 Annex 5	N/P
Other tests				
Dry out	TM 125-19	PASS	----	----

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Impurities

Manual: IPC-STD-006
Test method: 2.4.34 IPC-TM-650

Scope:
The test specifies a standard procedure for determining the elements concentration in alloys

Equipment: -Atomic Absorption
- ICP

ALLOY COMPOSITION

	Ag	Al	As	Au	Bi	Cd	Cu	Fe	In	Ni	Pb	Sb	Sn	Zn
SPEC	0.05	0.001	0.02	0.002	0.025	0.001	0.02	0.01	0.007	0.001	Balan ce	0.20- 0.50	63.0 ± 0.50	0.001
Sn63Pb37	<0.01	<0.001	<0.01	<0.001	0.006	<0.001	<0.01	0.001	<0.004	<0.001	REM.	0.34	62.79	<0.001

	Ag	Al	As	Au	Bi	Cd	Cu	Fe	In	Ni	Pb	Sb	Sn	Zn
SPEC	2.0±0 .20	0.005	0.03	0.05	0.10	0.002	0.08	0.02	0.10	0.01	Balan ce	0.20	62.0± 0.5	0.003
Sn62Pb36/Ag2	2.03	<0.001	<0.01	<0.01	0.01	<0.001	<0.01	<0.01	<0.01	<0.001	REM.	0.20	62.02	<0.001

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Particle Size

Manual: IPC-STD-005
Test method: 2.2.14 IPC-TM-650

Scope:
A method to determine the powder size.

Equipment: -Sieving machine
-Clemex

Specification table:IPC

Type	None Larger Than	Less than 1% larger Than	80% minimum Between	10% maximum less Than
3	50 microns	45 microns	45-25 microns	20 microns

Sn62/Sn63 powder: Typical

<i>Powder Particle Size Distribution</i>	
<25μ	3 %
25μ-45μ	97 %
50μ -45μ	0 %
>53 μ	0%
ASPECT RATIO < 1.3	97 %

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Copper Mirror

Manual: IPC-STD-004

Test method: 2.3.32 IPC-TM-650

Scope:

This test method is designed to determine the removal effect the flux has (if any) on the bright copper mirror film which has been vacuum deposited on clear glass. The test is making at prescribed conditions temperature and humidity.

Chamber Condition:

Temperature	Relative humidity	Time (days)
23±2°C	50±5%	24hr (1days)

Corrosion level	RESULT
LOW	√
MEDIUM	
HIGH	

COPPER MIRROR AFTER 24hr



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Corrosion

Manual: IPC-STD-004

Test method: 2.6.15 IPC-TM-650

Scope:

This test method is designed to determine the corrosive properties of flux residues under extreme environmental conditions. A pellet of solder is melted in contact with the test flux on a sheet metal test piece. The solder is then exposed to prescribed conditions of humidity.

Chamber Condition:

Temperature	Relative humidity	Time (days)
40±1°C	93±2%	240hr (10days)

Result: pass (no corrosion)



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Solder Ball

Manual: IPC-STD-005
Test method: 2.4.43 IPC-TM-650

Scope:

This test is carried out to determine the reflow properties of the solder paste. The ability of the prealloyed solder particles in the paste to reflow into a sphere.

Condition:

Powder size type	3
Temperature for 15min	$25 \pm 2^{\circ}\text{C}$
Temperature for 4hours	$25 \pm 3^{\circ}\text{C}$ & $50 \pm 10\%\text{RH}$



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Halides

Manual: IPC-STD-004
Test method: 2.3.33 IPC-TM-650

Scope:

This test method is designed to determine the presence (if any) of chlorides and bromides in soldering flux by visual examination after placement on test paper.

Silver chromate paper test:



Result: pass

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Slump

Manual: IPC-STD-005
Test method: 2.4.35 IPC-TM-650

Scope:

This method is to evaluate the slump behavior after printing of solder paste at different condition and using two stencil thicknesses.

Condition:

STENCILS PATTERN	THICKNESSE	Temperature HOT	Temperature COLD	Time
IPC-A-20	0.1mm	150±10°C	25±5°C 50±10%	10-15min
IPC-A-21	0.2mm	150±10°C	25±5°C 50±10%	10-15min

Result sample: PASS

STENCILS PATTERN	COLD SLUMP bridging		HOT SLUMP bridging	
	Specification	Sample	Specification	Sample
IPC-A-20	≤0.25mm	0.15mm	≤0.30mm	0.20mm
IPC-A-21	≤0.56mm	0.10mm	≤0.63mm	0.41mm

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Tack

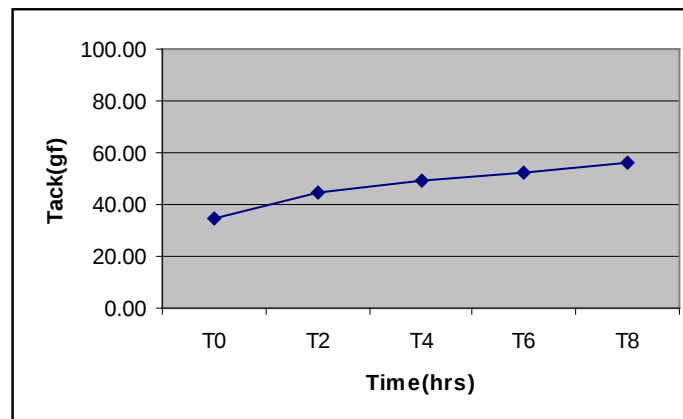
Manual: IPC-STD-005
Test method: 2.4.44 IPC-TM-650

Scope:

This test is to determine the ability of a printed pattern of solder paste to retain a probe placed in the solder paste. Time between printing and probe placement are progressively increased to simulate variables in a manufacturing process.

Condition:

Temperature & Humidity	TIME
25±2°C 50±% RH	8hr



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IPC SIR

GENERAL REFERENCES

AIM NC258 Sn63/Pb37 solder paste was tested to J-STD-004 and IPC-TM-650 method 2.6.3.7., Surface Insulation Resistance.

SAMPLE AND INSTRUMENTATION

Solder paste: NC258 Sn63/Pb37

Test coupon: IPC-B-24, bare copper

Environmental chamber: Thermotron SE-300

Electrical testing equipment: AutoSIR Gen3 System

TEST CONDITION

Temperature/humidity: 40°C/ 90%RH

Test/bias voltage: 10v/10v

Test duration: 7 days, tested at every 20 minutes

PASS-FAIL CRITERIA

IPC J-STD-004B §3.4.1.4.1

All measurements on all test patterns shall be exceed the 100 MΩ

No evidence electrochemical migration that reduces conductor spacing by more than 20%.

No corrosion of the conductors.

TEST RESULTS

1. Test data see attached result chart: Pass
2. Presence of dendrites: No
3. Maximum percent reduction of spacing: 0%.
4. Presence of discoloration between conductors: No
5. Presence of water spots: No
6. Presence of subsurface metal migration: No

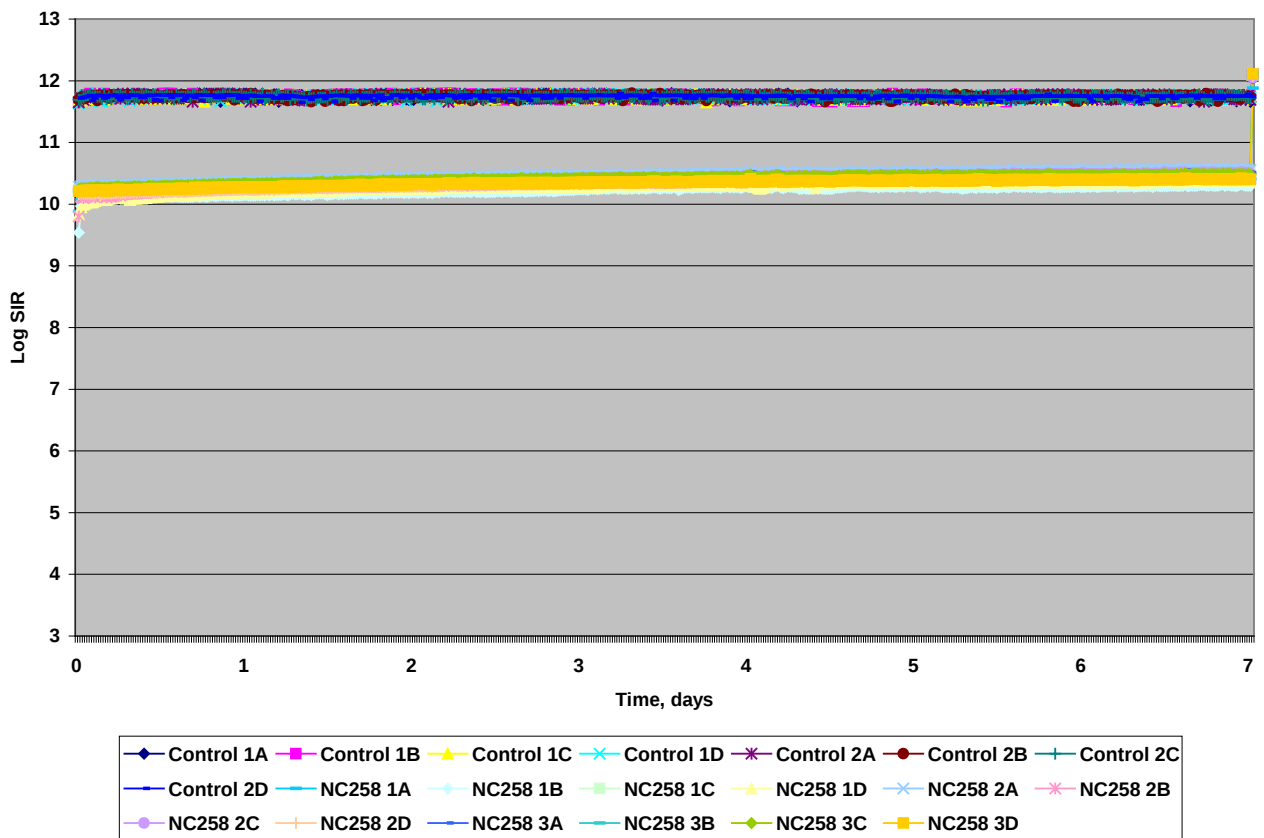
DATE: Jan.27, 2011

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Original test data in Excel format available upon request.

RESULT CHART



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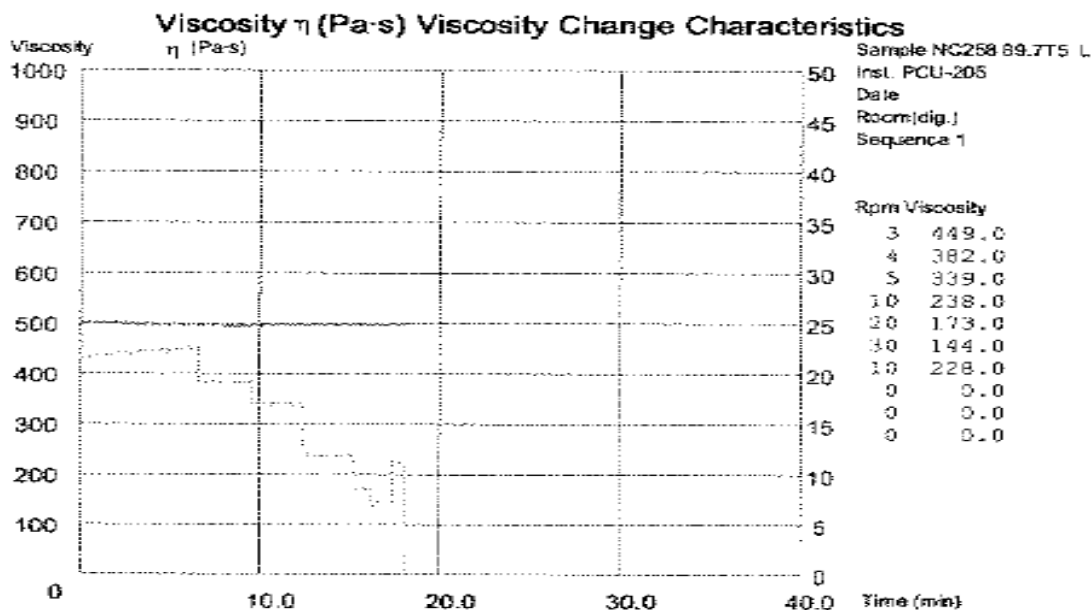
Viscosity

This section of the report presents the Malcom viscosity readings and figures for NC254 medium and solder paste. It also includes the infrared spectrum test results for the medium.

Equipment used: Malcom PCU 205 viscometer
Standard: JIS Z 3284-1994; JIS standard 25 °C

Room condition during testing: Temperature 25.0 °C
Relative humidity 27 %

Malcom



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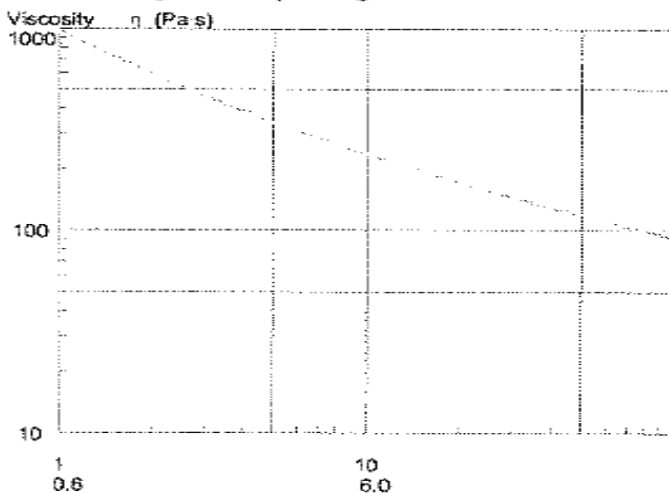
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log Viscosity - log Shear rate



Sample NC258 89.7T5
Inst. PCU-205
Operator Josette
Date
Temp(deg.) 24.9
Room(deg.)
File Name 991993D
Supr File

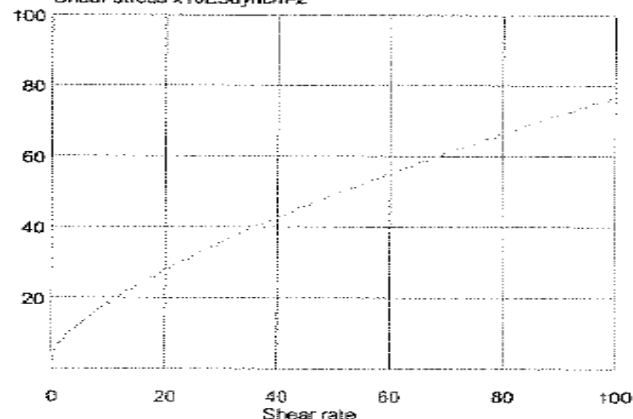
τ_0 : 3617.67
 η_0 : 238.00
 $\eta_{0.06}$: 6787.36
 η_{600} : 42.27
TI1: 0.56 TI6: 0.45

R : 4.20
n : 1.46
log K : 5.10

Graph: Auto Curve Fitting

Malcom

Shear stress - Shear rate
Shear stress x10E3dynam-2



Sample NC258 89.7T5 L
Inst. PCU-205
Operator Josette
Date
Temp(deg.) 24.9
Room(deg.)
File Name 991993D
Supr File

τ_0 : 3617.67
 η_0 : 238.00
 $\eta_{0.06}$: 6787.36
 η_{600} : 42.27
TI1: 0.56 TI6: 0.45

R : 4.20
n : 1.46
log K : 5.10

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Technical Report

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A handwritten signature in black ink, appearing to read 'Karl Seelig', is positioned above a horizontal line.

Karl Seelig, Vice President of Technology

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