

Product / Process Change Notice

PCN No.: Q000-PCN-PA201512-02

Date: 2015-12-01.

<p>Change Title: <u>Add ASE-CL as new assembly and testing site for I3800FYI product.</u></p> <p>Change Classification: <input checked="" type="checkbox"/> Major <input type="checkbox"/> Minor</p> <p>Change item: <input type="checkbox"/> Design <input type="checkbox"/> Raw Material <input type="checkbox"/> Wafer FAB <input checked="" type="checkbox"/> Package Assembly <input checked="" type="checkbox"/> Testing <input type="checkbox"/> Others: _____.</p>			
<p>Affected Product(s) :</p> <p>The affected product is I3800FYI.</p>			
<p>Description of Change(s) :</p> <p>Add new assembly and testing site for I3800FYI at ASECL (ASE Group ChungLi site, Taiwan) as the 2nd source for back up. ASECL is a qualified vendor for Nuvoton in assembly and testing.</p> <p><u>New Supplier</u></p> <p>ASE Group ChungLi site, Taiwan (hereinafter "ASECL"), (550, Chung-Hwa Road Section 1, Chung-Li, 320, Taiwan, R.O.C.)</p>			
<p>Reason for Change(s) :</p> <p>To increase manufacturing capacity and flexibility and to have multiple manufacturing routes for backup in case of disruption, Nuvoton is adding a new source of I3800FYI product at ASECL.</p>			
<p>Impact of Change(s) : (positive & negative)</p> <p>Form: No change on top effective marking except marking code. The marking code of ASECL shall be "A".</p> <p>Fit: No change.</p> <p>Function: No change.</p> <p>Reliability: No concern (Passed Nuvoton package qualification.)</p>			
<p>Qualification Plan/ Results :</p> <p>1. LQFP packages were qualified as per Nuvoton's standard qualification procedures, please refer to appendix A for the qualification report."</p> <p>2. Passed the testing machine correlation qualification, please refer to appendix B for the details.</p>			
<p>Implementation Plan :</p> <p><input type="checkbox"/> Date Code: _____ onward <input type="checkbox"/> Lot No.: _____ onward <input type="checkbox"/> Implemented date: <u>Feb. 28, 2016 (scheduled)</u></p>			
Originator:	H.Y. Lai / Q100	Approval:(QA Director)	K.L. Lin/ Q000
Contact for Questions & Concerns	<p>Name: <u>HYLai</u> TEL: <u>886-3-5770066 (ext. 1226)</u> FAX: <u>886-3-5792673.</u></p> <p>Address: <u>No.4, Creation Rd. III Science-Based Industrial Park Hsinchu, Taiwan, R.O.C..</u></p> <p>E-mail: <u>hylai0@nuvoton.com.</u></p>		

Customer Comments:

Note: Please sign this notice, and return to **Nuvoton** contact within **30** days. If no response is received within **30** days, this Change Request will be assumed to meet your approval.

<input type="checkbox"/> Approval	<input type="checkbox"/> Disapproval	<input type="checkbox"/> Conditional Approval: _____.
Date: _____	Dept. name: _____	Person in charge: _____.

Follow-up and Tracing:

A. copies to

FAB: Integration _____ _____ _____ _____.

Test / Product: _____ _____ _____ _____.

Design/ Marketing: _____ _____ _____ _____.

Production control/ Others: _____ _____ _____ _____.

B. Changes:

1. Document / Test program:

Document No/ test program	Document name/ test program name	version		responsibor	Completed date	Remark
		before	after			
NA	NA	NA	NA	NA	NA	NA

Verified by: _____.

PACKAGE QUALIFICATION REPORT

Subcontractor:ASE(Chung-Li)
Package:LQFP Series
Package Material: GREEN
Wire Bonding Material :Cu wire

RA ENGINEER :許心怡

RA MANAGER :蔡明耀

SUMMARY

The **LQFP Series** product was passed the qualification tests.

A summary of the test result was as follows:

	S.S.
Pa. Pre-condition Test	: 405EA
Pa. Pressure Cooker Test	: 135EA
Pa. Temperature Cycle Test	: 135EA
Pa. Highly Temp. Storage Life Test	: 135EA

I. ENVIRONMENTAL TEST

A. Introduction

1. Pre-condition Test
2. Pressure Cooker Test (PCT)
3. Temperature Cycle Test (TCT)
4. High Temp. Storage Life Test(HTSL)

B. Test Results

1. Pre-condition Test
2. Pressure Cooker Test (PCT)
3. Temperature Cycle Test (TCT)
4. Highly Temp. Storage Life Test(HTSL)

II. ENVIRONMENTAL TESTS OF PROCEDURE

A. Introduction

1. Pre-condition Test

1.1 SCOPE

Pre-condition Test is to measure the resistance of SMD (Surface Mount Devices) to the storage environment at the customer site and to thermal stress created by IR reflow or Vapor Phase Reflow.

1.2 TEST CONDITION

Step 1 : TCT(-65°C/150°C, 5 cycles)

Step 2 : Bake(125°C, 24 hours)

Step 3 : Soak(30°C/60%RH, 192 hours)

Step 4 : IR reflow (260 °C), 3 Passes.

1.3 SAT COFIRMATION: To confirm delamination, cracking, popcorn .

Criteria: IPC/JEDEC J-STD-020C

2. Pressure Cooker Test (PCT)

2.1 SCOPE

PCT is to evaluate the device resistance to moisture penetration.

2.2 TEST CONDITION

Ta = 121°C, RH = 100%, Td = 168 Hrs. 2 ATM ,(JESD22-A102-A)

3. Temperature Cycle Test (TCT)

3.1 SCOPE

TCT is to evaluate the resistance of device to environmental temperature change.

3.2 TEST CONDITION

-65°C / 15min, transfer time 1min, +150 °C/15min, 1000 cycles.

MIL-STD-883E, Method 1010, Condition "C".

4. Highly Temp. Storage Life Test (HTSL)

4.1 SCOPE

The purpose of this test is to determine the effect on solid state electronic devices of storage at elevated temperature without electrical stress applied.

4.2 Test condition:

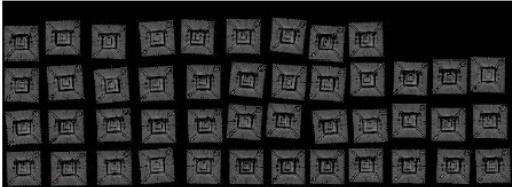
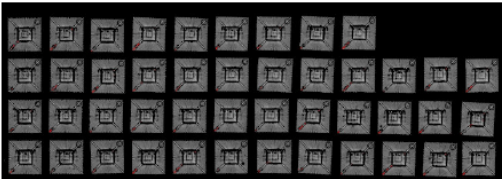
Temperature: 150°C ,Time: 500/1000hrs

B. Test Results

1.1 Pre-condition Test

Run	Lot No	SAT before Precondition	SAT After Precondition	Result	Remark
#1	2918B001-Z1	405	405	PASS	
#2	2918B001-Y1	405	405	PASS	
#3	2918B001-X1	405	405	PASS	

1.2 SAT confirmation:

SAT before Precondition	SAT after Precondition
	

2. Pressure Cooker Test (PCT)

Run	Lot No	168 Hrs(S.S.)	Result	Remark
#1	2918B001-Z1	45	PASS	
#2	2918B001-Y1	45	PASS	
#3	2918B001-X1	45	PASS	

3. Temperature Cycle Test (TCT)

Run	Lot No	1000 Cycles(S.S.)	Result	Remark
#1	2918B001-Z1	45	PASS	
#2	2918B001-Y1	45	PASS	
#3	2918B001-X1	45	PASS	

4. Highly Temp. Storage Life Test (HTSL)

Run	Lot No	1000 Hrs(S.S.)	Result	Remark
#1	2918B001-Z1	45	PASS	
#2	2918B001-Y1	45	PASS	
#3	2918B001-X1	45	PASS	

Waive Pre-cond. Of HTSL Test

Run	Lot No	1000 Hrs(S.S.)	Result	Remark
#1	2918B001-Z1	45	PASS	
#2	2918B001-Y1	45	PASS	
#3	2918B001-X1	45	PASS	

Appendix B: The testing machine correlation qualification report

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I3800 Final Test Correlation report

Introduction

I3800 production was historically run on LTX/Credence ASL3000MS ATE test platform. For capacity expansion, we have duplicated the test environment on a Chroma CMA3650MRX ATE. This report examines the test data from both platforms and shows that the two test environments are equal.

10 samples were taken for datalog analysis, 7 pass devices and 3 fail devices. 14 key parameters were chosen for detailed analysis. Criteria are that results are within +/-5%. Known differences should be explainable.

1000 pcs are taken from a normal production lot and run on both test platforms. Criteria for correlation are that these results should match within 3% of overall yield.

Results for pass units

1. Continuity tests measure the protection diode breakdown voltages and match between platforms.
2. Bias Voltages measure 1.22V for ASL3000 on average vs. 1.22V for CMA3650 and meet correlation requirements.
3. VMID voltage measures 1.68V for ASL3000 on average vs. 1.68V for CMA3650 and meet correlation requirements.
4. VCCF voltage measures 3.01V for ASL3000 on average vs. 3.01V for CMA3650 and meet correlation requirements.
5. VREG voltage measures 1.86V for ASL3000 on average vs. 1.80V for CMA3650 and meet correlation requirements.
6. RINT OSC trim codes match for both platforms and OSC measurements for ASL3000 are 2.0553MHz vs. 2.0626MHz on CMA3650. They meet correlation requirements.
7. ISA current test measure 12.9mA on ASL3000 and 12.5mA on CMA3650 and pass correlation.
8. ISB standby current was measured at 863uA for CMA3650. ASL3000 measured 785uA
9. Functional Flash read and write tests both pass on ASL3000 and CMA3650.
10. Scan test vectors match and both pass on ASL3000 and CMA3650.
11. RAM tests both pass on ASL3000 and CMA3650. No errors for all good devices.
12. Four gain tests are included in the AUX input path; they are configured to be measured directly at the output. Four gain settings are measured 0dB, 3dB, 6dB, 9dB. ASL3K results 0.6dB, 3.6dB, 6.6dB and 9.5dB with CMA3650 measuring -0.1dB, 2.9dB, 5.8dB and 8.7dB respectively.

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- a. Test limit window is +/- 1 dB or a 2dB window for each parameter. ASL3K measures slightly higher gain setting than the CMA3650 for all settings. This is a non-issue as this test is highly sensitive to the input signal amplitude provided by the tester. The gain calculation is done by the following equation, $Gain = 20 \cdot \log(V_{out}/V_{in})$. Where V_{out} is the measured output signal and V_{in} is the input amplitude and is a hard coded number (on both platforms). Because V_{in} is a hard-coded number and not actually measured, this gain variation can vary system to system and platform to platform. So some variance in the measured gain is expected due to the variance of the actual input voltage which is not actually measured.
 - b. It is expected that the CMA3650 is more accurate than the ASL3000 system due to a more precise sine-wave driver to the DUT.
13. Total Harmonic distortion single test, THD
- a. THD is measured with various different conditions. As stated below
 - i. Analog input, analog output. Chroma typical THD = 70 dB, ASL THD typical = 68 dB
 - ii. DAC (digital input) speaker output with no load Chroma typical THD = 72 dB, ASL THD typical = 69 dB
 - iii. DAC (digital input) speaker output with 8 ohm load Chroma typical THD = 70 dB, ASL THD typical = 72 dB
14. SNR is measured with various different conditions. As stated below
- a. Analog input, analog output. Chroma typical SNR = 69 dB, ASL SNR typical = 62 dB
 - b. DAC (digital input) speaker output with 8 ohm load Chroma typical SNR = 69 dB, ASL SNR typical = 70 dB

Results for fail units

Fail items included two scan failures, where fail vectors were shown to match in each case and one signal path failure for THD. For this fail sample the THD measured was low and comparable to both test platforms.

Conclusion

Correlation report shows that the two test platforms can equally screen fail units and have comparable measurement and yield results. Correlation result is PASS and recommend that the test programs be released to production.