



# PRODUCT/PROCESS CHANGE NOTIFICATION

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PCN APG/08/3435  
Notification Date 02/07/2008

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**PowerSSO-24/28/36 MUAR: GREEN MOLDING COMPOUND HITACHI CEL9240HF10**

**APG - APG**

**Table 1. Change Implementation Schedule**

Forecasted implementation date for change	24-Mar-2008
Forecasted availability date of samples for customer	01-Mar-2008
Forecasted date for <b>STMicroelectronics</b> change Qualification Plan results availability	07-Feb-2008
Estimated date of changed product first shipment	15-Apr-2008

**Table 2. Change Identification**

Product Identification (Product Family/Commercial Product)	ALL PRODUCTS IN POWERSO 24/28 & 36 LEADS
Type of change	Package assembly material change
Reason for change	Package assembly material change
Description of the change	New qualification compliant to 260 C, with green (halogen-free) molding compound HITACHI CEL9340HF10
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	No marking change / Internal traceability
Manufacturing Location(s)	1]St Muar - Malaysia

**Table 3. List of Attachments**

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt	<b>PCN APG/08/3435</b>					
Please sign and return to STMicroelectronics Sales Office	<b>Notification Date 02/07/2008</b>					
<input type="checkbox"/> Qualification Plan Denied <input type="checkbox"/> Qualification Plan Approved  <input type="checkbox"/> Change Denied <input type="checkbox"/> Change Approved	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;">Name:</td></tr> <tr><td style="padding: 2px;">Title:</td></tr> <tr><td style="padding: 2px;">Company:</td></tr> <tr><td style="padding: 2px;">Date:</td></tr> <tr><td style="padding: 2px;">Signature:</td></tr> </table>	Name:	Title:	Company:	Date:	Signature:
Name:						
Title:						
Company:						
Date:						
Signature:						
Remark ..... ..... ..... ..... ..... ..... ..... ..... .....						

## DOCUMENT APPROVAL

Name	Function
Maggioni, Giampietro	Division Marketing Manager
Russo, Alfio	Division Marketing Manager
Aparo, Sebastiano	Division Product Manager
Rivolta, Danilo	Division Product Manager
Amadeo, Matteo	Division Q.A. Manager
Parrino, Emanuele	Division Q.A. Manager



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# **PowerSSO-24/28/36 MUAR: GREEN MOLDING COMPOUND HITACHI CEL9240HF10**

## **WHAT:**

We have completed the qualification of the green molding compound HITACHI CEL9240HF10 to be used on our PowerSSO 24/28 & 36 leads line in Muar.

The qualification of a green molding compound (Halogen-free) is compliant to ST Company roadmap towards environmentally friendly components.

The change applies to all products in production for Power Powertrain & Safety and Car Body divisions, while all new products in qualification in these packages will start directly with the new Hitachi resin.

## **WHY:**

Company roadmap and compliancy to standard spec IPC/JEDEC J-STD-020C.

## **HOW:**

Here attached you find the qualification report **ER000108AG6053** for the qualification of the new molding compound that covers all the different front-end processes and back-finishing of the involved products.

## **WHEN:**

HITACHI CEL9240HF10 is going to be implemented from end Q1/08. Samples available on customer's request through our Sales offices.

**PowerSSO-24/28/36 MUAR  
HITACHI CEL9240HF10 MOLDING COMPOUND  
on FICO and ASA MOLD**

**RELIABILITY EVALUATION REPORT**

*Abstract*

Reliability activity has been performed in order to qualify new molding compound HITACHI CEL9240HF10 on FICO and ASA mold systems available in Muar for PowerSSO-24/28/36 line.

The reliability tests have been performed on two different test vehicles, as detailed in “construction note” (page 2), chosen to represent the key front-end technological families assembled in the mentioned package family and using different bonding wire diameter.

*Conclusion*

On the basis of the results summarized in the present report, the samples assembled in Muar PowerSSO package using the new molding material and mold system have passed the reliability requirements for qualification.

The two test-vehicles can be classified as Jedec MSL3 SMDs according to J-STD-020C requirements for Pb-free components. This MSL can be extended to other devices on the basis of technological similarity criteria.

**Reliability test conditions and results**

TEST NAME	CONDITIONS [SPEC]	UH22 REJ./S.S.	UT32 REJ./S.S.	NOTES
JL3	24h bake @ 125°C 192h @ 30°C / 60% RH reflow simulation (3 times) at T <sub>MAX</sub> =260°C [IPC/Jedec J-STD-020C]	Lot ASA: 0/164 Lot FICO: 0/164	Lot ASA: 0/164 Lot FICO: 0/164	1
JL3 + TCT	Ta=-65/+150°C, 500 cycles	Lot ASA: 0/77 Lot FICO: 0/77	Lot ASA: 0/77 Lot FICO: 0/77	1, 2, 3
JL3 + PP	2atm, 121°C, 168h	Lot ASA: 0/77 Lot FICO: 0/77	Lot ASA: 0/77 Lot FICO: 0/77	-
HTS	Ta=150°C, 1000h	Lot ASA: 0/45 Lot FICO: 0/45	Lot ASA: 0/45 Lot FICO: 0/45	2

**NOTES:**

- <sup>1</sup> SAM analysis did not show any remarkable delamination at the die-molding compound interface and through the die-attach layer. Delamination has been found on internal lead-tips, and successfully reliability-assessed according to J-STD-020C guidelines. Detail in attachment n. 2 and 3
- <sup>2</sup> Wire bonding strength after the stress has been successfully verified through wire-pull test: neither abnormal break loads, nor forbidden failure modes have been detected. Detail in attachment n.2 and 3
- <sup>3</sup> Visual and SEM inspection after the stress test have pointed out no remarkable degradation of silicon passivation and metal interconnects. Stitch bonds integrity on internal lead-tips has been carefully checked after TC in order to assess the delamination pointed out by SAM inspection. Detail in attachment n.2 and 3

**Construction note**

<b>Technical code</b>	: AAEH*UH22AE6	A6N3*UT32BB1
<b>Diffusion process</b>	: BCD4	BCD5
<b>Wafer diameter</b>	: 6"	8"
<b>Diffusion site</b>	: Ang-Mo Kio	AGRATE AG8
<b>Die size (mm<sup>2</sup>)</b>	: 6.94 x 4.37	3.78 x 2.65
<b>Metal levels</b>	: 3, Ti/AlSiCu/TiN	3, Ti/AlCu/TiN
<b>Passivation</b>	: USG-PSG-SiON-PIX	PSG+SiON+Polyimide
<b>Back finishing</b>	: Cr/Ni/Au	Cr/Ni/Au
<b>Package name</b>	: PowerSSO-36	PowerSSO-28
<b>Assembly site</b>	: MUAR	MUAR
<b>Leadframe</b>	: PSSO 36L WMtx Opt D	PSSO 28L WMtx
<b>Die attach</b>	: Pb/Ag/Sn	Pb/Ag/Sn
<b>Wire bonding</b>	: Au, 3 mil	Au, 1.3 mil
<b>Molding compound</b>	: Hitachi CEL9240HF10	Hitachi CEL9240HF10
<b>Lead finishing</b>	: Sn	Sn
<b>Lot (s)_id</b>	: 997310C902 - 997310C901	997310B202 - 997310B201

**Attachments**

- 1) Reliability tests description      2) Physical analysis report (UH22)      3) Physical analysis report (UT32)

## ATTACHMENT 1: RELIABILITY TESTS DESCRIPTION

<b>TEST NAME</b>	<b>DESCRIPTION</b>	<b>PURPOSE</b>
<b>JLn:</b> Jedec Level n surface mounting simulation	The device is submitted to a typical temperature profile used for surface mounting, after a controlled moisture absorption.	As stand-alone test: to investigate the level of moisture sensitivity. As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance. The typical failure modes are "pop corn" effect and delamination.
<b>TCT:</b> Temperature Cycles Test	The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere.	To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are linked to metal displacement, dielectric cracking, moulding compound delamination, wire-bonds failure, die-attach layer degradation.
<b>PPT:</b> Pressure Pot Test	The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature.	To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.
<b>HTS:</b> High Temperature Storage	The device is stored in unbiased condition at the max. temperature allowed by the package materials, sometimes higher than the max. operative temperature.	To investigate the failure mechanisms activated by high temperature, typically wire-bonds solder joint ageing, data retention faults, metal stress-voiding.



## ATTACHMENT 2: PHYSICAL ANALYSIS REPORT

**Technical code** : AAEH\*UH22AE6

**Package** : PowerSSO-36

**Lot(s)\_id** : 997310C902 (ASA)  
997310C901 (FICO)

**Evaluation subject** : New Hitachi CEL9240 HF10 + ASA mold

**Author** : D. Casiraghi

**Analysis status:**     RUNNING                       COMPLETED

### ANALYSIS PROGRAM

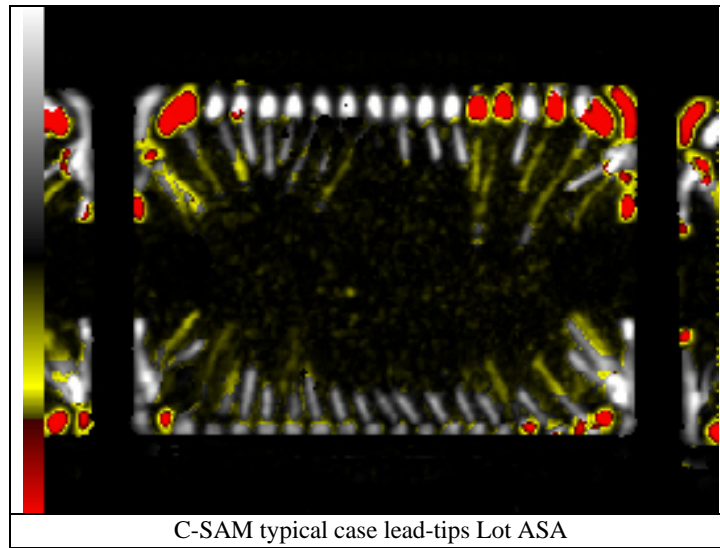
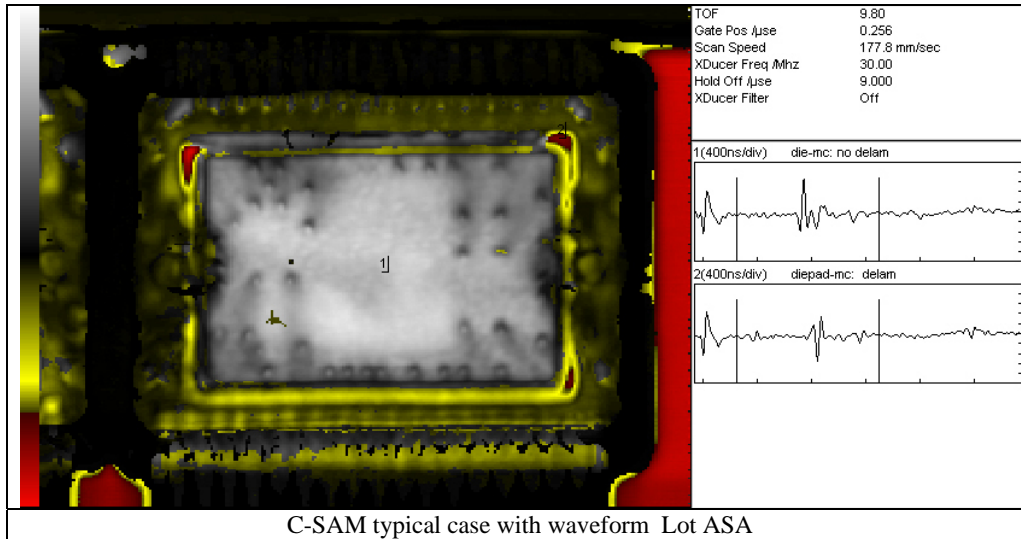
DESTRUCTIVE ITEMS				NON DESTRUCTIVE ITEMS		WHEN
Wire pull test	Ball Shear test	Internal visual	SEM inspection	SAM inspection	Other	
X		X	X	X		JL3+500TC
X						1000h HTS

### RESULTS SUMMARY

- SAM analysis did not show any remarkable delamination at the die-molding compound interface. Delamination has been observed on lead-tips and successfully assessed through long-term reliability stress tests (see SEM inspection and wire-pull results after JL3+TC).
- Visual and SEM inspection after long-term TC have pointed out no major degradation of silicon passivation, metal interconnects, stitch bonds on internal lead-tips.
- Wire bonding strength after TC and HTS stress has been successfully verified through wire-pull test: neither abnormal break loads, nor forbidden failure modes have been found.

TECHNICAL CODE	PACKAGE	ANALYSIS ITEM	STRESS TEST
AAEH*UH22AE6	PowerSSO-36	SAM inspection	JL3+500TC

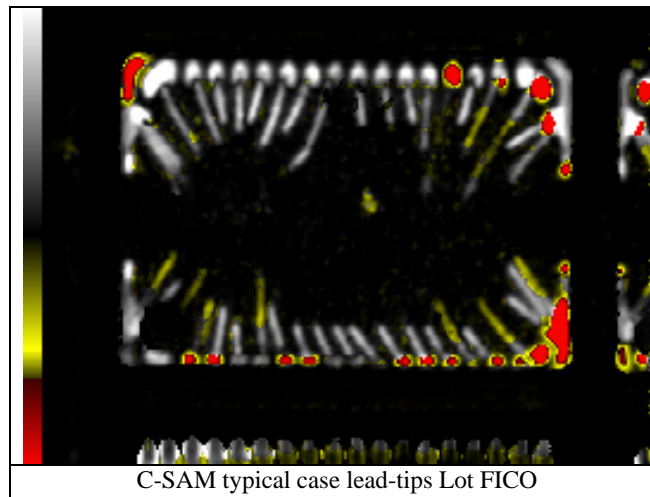
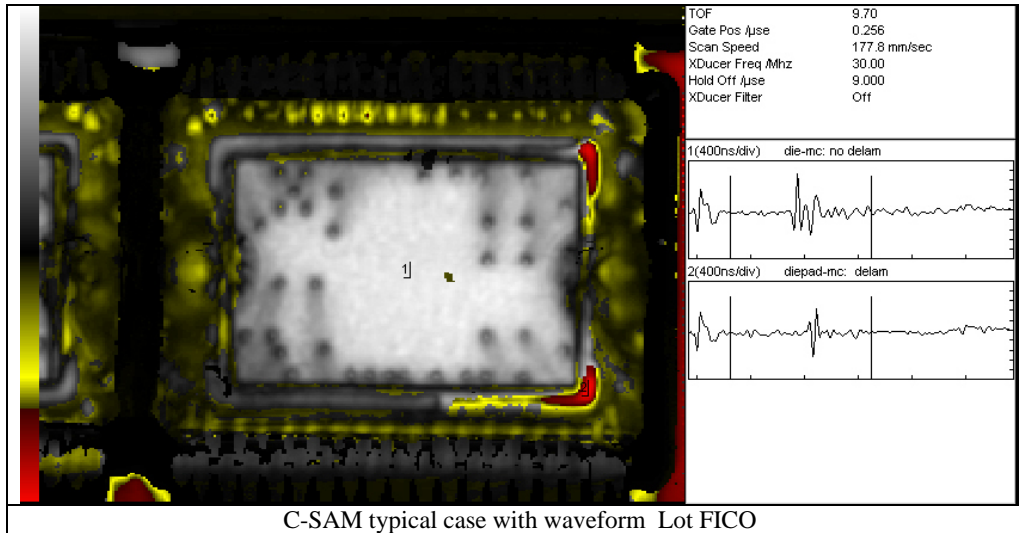
TEST EQUIPMENT: SONOSCAN D9000 (Scanning Acoustic Microscope)



Lot	Sample size	Defective parts (delamination)		
		die-mold (C-scan)	I/f-mold (C-scan)	diepad-mold (C-scan)
997310C902-ASA	10	0/10	10/10	10/10
Transducer frequency (MHz)		30	30	30

TECHNICAL CODE	PACKAGE	ANALYSIS ITEM	STRESS TEST
AAEH*UH22AE6	PowerSSO-36	SAM inspection	JL3+500TC

TEST EQUIPMENT: SONOSCAN D9000 (Scanning Acoustic Microscope)



Lot	Sample size	Defective parts (delamination)		
		die-mold (C-scan)	I/f-mold (C-scan)	diepad-mold (C-scan)
997310C901-FICO	10	0/10	10/10	10/10
Transducer frequency (MHz)		30	30	30

TECHNICAL CODE	PACKAGE	LOTS	ANALYSIS ITEM
AAEH*UH22AE6	PowerSSO-36	997310C902 - 997310C901	Internal visual

**ANALYSIS SUMMARY:**

WHAT	WHEN	SAMPLE SIZE /LOTS	RESULT
Passivation and metal	JL3+500TC (-65/+150°C)	5pcs /ASA	Minor passivation cracks (photo 1-3)
		5pcs /FICO	Minor passivation cracks (photo 4-6)

**DOCUMENTATION:**



Photo 1 (20X)

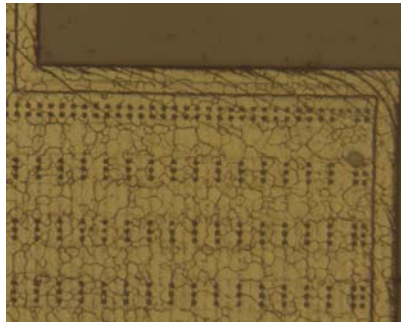


Photo 2 (20X)



Photo 3 (20X)



Photo 4 (20X)



Photo 5 (20X)



Photo 6 (20X)

**TEST EQUIPMENT:** LEICA (Optical Microscope)

TECHNICAL CODE	PACKAGE	LOT	ANALYSIS ITEM
AAEH*UH22AE6	PowerSSO-36	997310C902 - 997310C901	SEM inspection

**ANALYSIS SUMMARY:**

WHAT	WHEN	SAMPLE SIZE	RESULT
Stitch-bond on lead and ball bond	JL3+500TC (-65/+150°C)	5pcs/ ASA	No visible defect (photo 1-3)
		5pcs/ FICO	No visible defect (photo 4-6)

**DOCUMENTATION:**

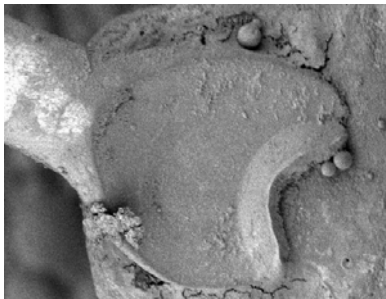


Photo 1



Photo 2



Photo 3



Photo 4

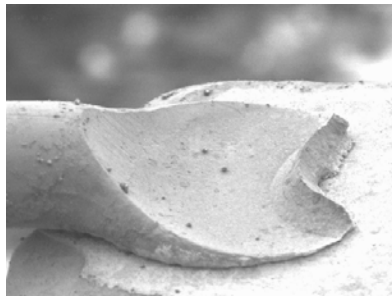


Photo 5

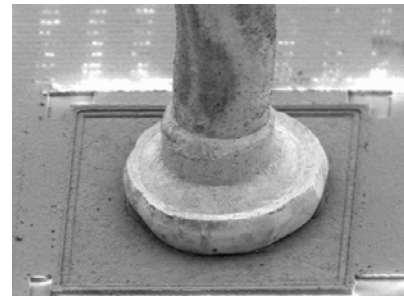


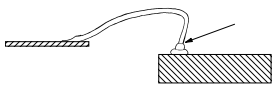
Photo 6

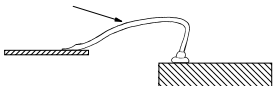
**TEST EQUIPMENT:** HITACHI (Scanning Electron Microscope)

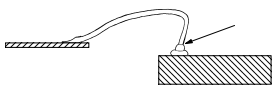
TECHNICAL CODE	PACKAGE	LOT	ANALYSIS ITEM
AAEH*UH22AE6	PowerSSO-36	997310C902 - 997310C901	Wire pull-test

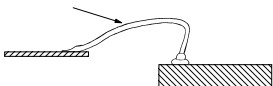
Wire type : Au, 3 mil  
 LSL (g) : 26

Sample size (pcs) : 5  
 Sample size (wires) : 100

Failure mode	JL3@260°C+500 TC (-65/+150°C)		
		ASA	FICO
<b>2: BALL NECK</b> 	mean (g)	57.02	56.78
	stdev (g)	4.22	3.86
	min (g)	49.22	45.84
	max (g)	69.70	64.93
	occurrence	33%	59%

<b>3: LOOP CENTRE</b> 	mean (g)	52.47	55.35
	stdev (g)	5.28	4.63
	min (g)	43.38	45.54
	max (g)	68.52	70.03
	occurrence	67%	41%

Failure mode	HTS 1000h 150°C		
		ASA	FICO
<b>2: BALL NECK</b> 	mean (g)	56.44	55.06
	stdev (g)	3.00	3.13
	min (g)	48.76	48.61
	max (g)	63.10	62.59
	occurrence	46%	48%

<b>3: LOOP CENTRE</b> 	mean (g)	53.71	52.85
	stdev (g)	5.00	3.43
	min (g)	44.71	46.24
	max (g)	69.04	60.67
	occurrence	54%	52%

**Remarks:** neither abnormal break loads, nor forbidden failure modes. AEC-Q100 criteria after TC passed.

## ATTACHMENT 3: PHYSICAL ANALYSIS REPORT

**Technical code** : A6N3\*UT32BB1

**Package** : PowerSSO-28

**Lot(s)\_id** : 997310B202 (ASA)  
997310B201 (FICO)

**Evaluation subject** : New Hitachi CEL9240 HF10 + ASA mold

**Author** : D. Casiraghi

**Analysis status:**     RUNNING                       COMPLETED

### ANALYSIS PROGRAM

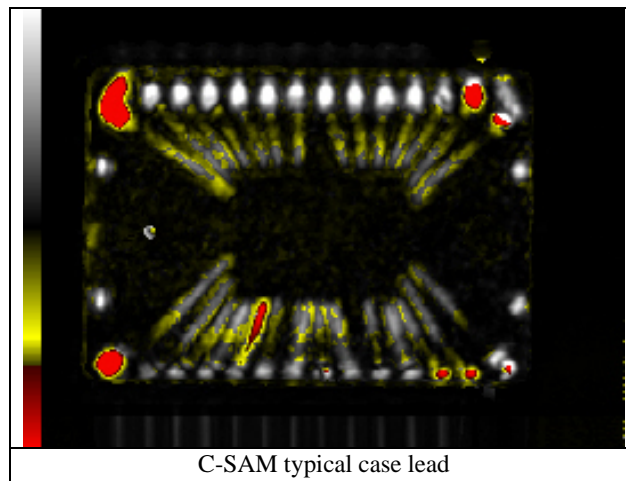
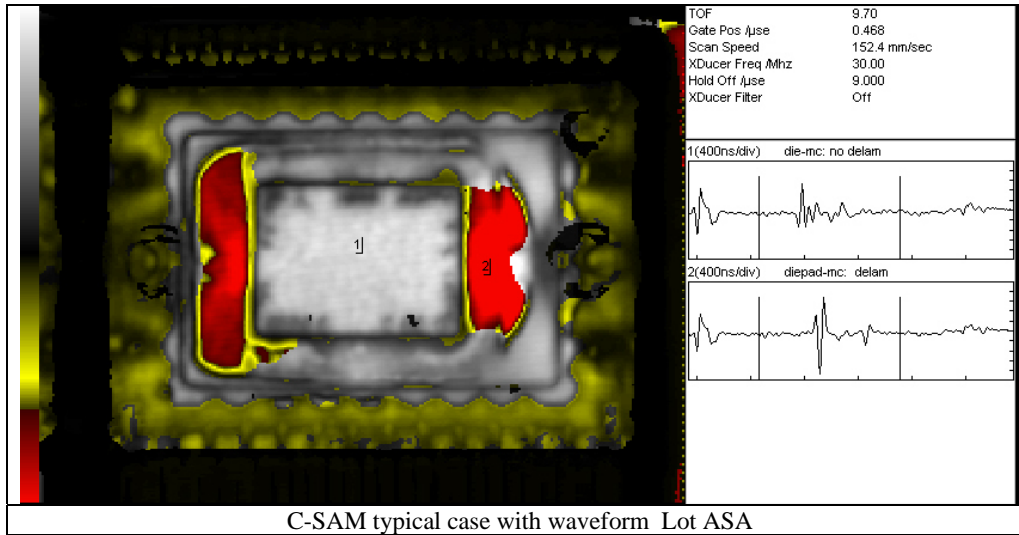
DESTRUCTIVE ITEMS				NON DESTRUCTIVE ITEMS		WHEN
Wire pull test	Ball Shear test	Internal visual	SEM inspection	SAM inspection	Other	
X		X	X	X		JL3+500TC
X						1000h HTS

### RESULTS SUMMARY

- SAM analysis did not show any remarkable delamination at the die-molding compound interface. Delamination has been observed on lead-tips and successfully assessed through long-term reliability stress tests (see SEM inspection and wire-pull results after JL3+TC).
- Visual and SEM inspection after long-term TC have pointed out no degradation of silicon passivation, metal interconnects, stitch bonds on internal lead-tips.
- Wire bonding strength after TC and HTS stress has been successfully verified through wire-pull test: neither abnormal break loads, nor forbidden failure modes have been found.

TECHNICAL CODE	PACKAGE	ANALYSIS ITEM	STRESS TEST
A6N3*UT32BB1	PowerSSO-28	SAM inspection	JL3+500TC

TEST EQUIPMENT: SONOSCAN D9000 (Scanning Acoustic Microscope)

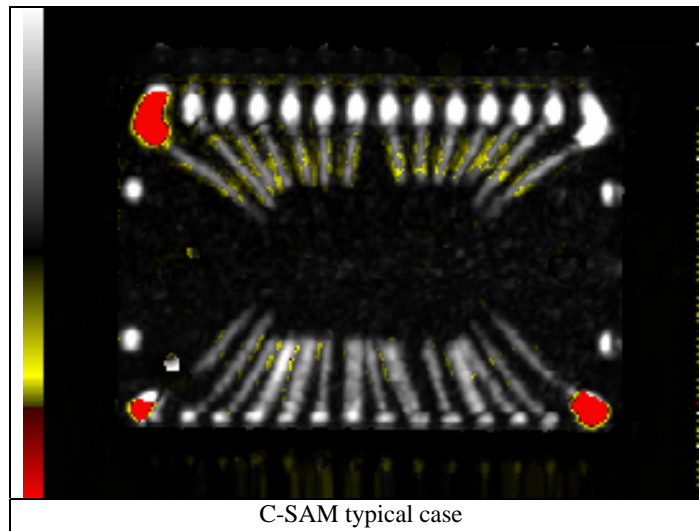
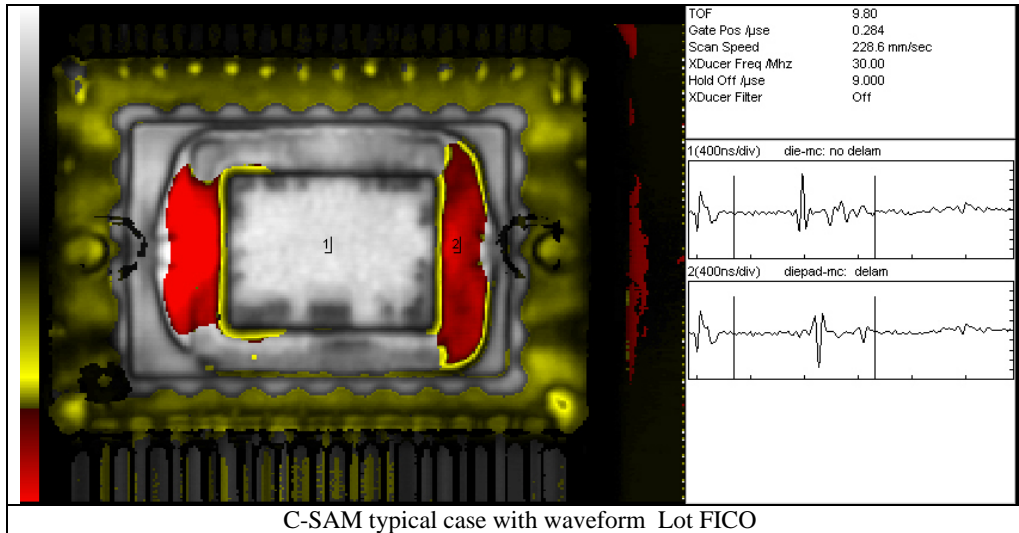


Lot	Sample size	Defective parts (delamination)		
		die-mold (C-scan)	I/f-mold (C-scan)	diepad-mold (C-scan)
997310B202-ASA	10	0/10	10/10	10/10
Transducer frequency (MHz)		30	30	30



TECHNICAL CODE	PACKAGE	ANALYSIS ITEM	STRESS TEST
A6N3*UT32BB1	PowerSSO-28	SAM inspection	JL3+500TC

TEST EQUIPMENT: SONOSCAN D9000 (Scanning Acoustic Microscope)



Lot	Sample size	Defective parts (delamination)		
		die-mold (C-scan)	I/f-mold (C-scan)	diepad-mold (C-scan)
997310B201-FICO	10	0/10	10/10	10/10
Transducer frequency (MHz)		30	30	30

TECHNICAL CODE	PACKAGE	LOTS	ANALYSIS ITEM
A6N3*UT32BB1	PowerSSO-28	997310B202-997310B201	Internal visual

**ANALYSIS SUMMARY:**

WHAT	WHEN	SAMPLE SIZE /LOTS	RESULT
Passivation and metal	JL3+500TC (-65/+150°C)	5pcs /ASA	No passivation cracks (photo 1-3)
		5pcs /FICO	No passivation cracks (photo 4-6)

**DOCUMENTATION:**

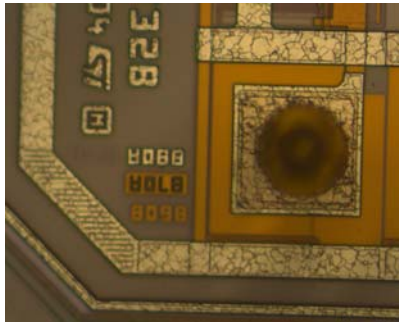


Photo 1 (20X)

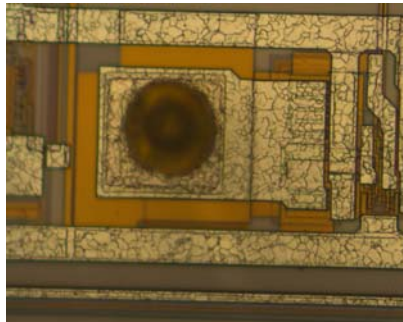


Photo 2 (20X)

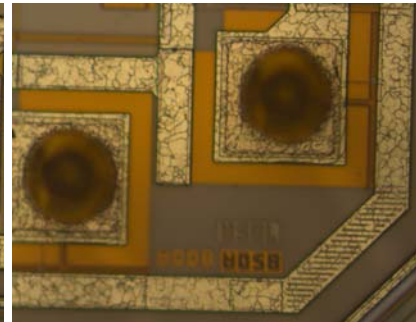


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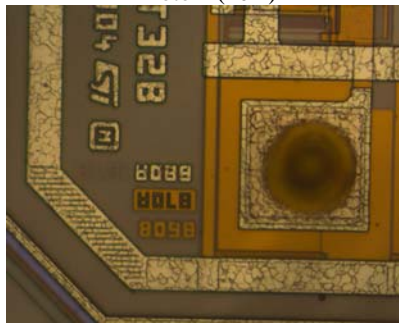


Photo 4 (20X)

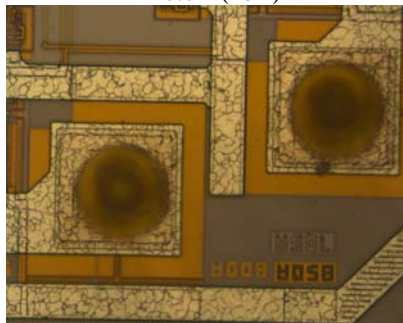


Photo 5 (20X)

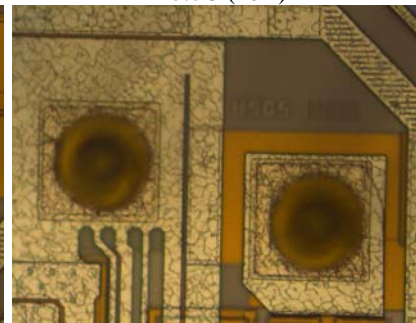


Photo 6 (20X)

**TEST EQUIPMENT:** LEICA (Optical Microscope)

TECHNICAL CODE	PACKAGE	LOT	ANALYSIS ITEM
A6N3*UT32BB1	PowerSSO-28	997310B202-997310B201	SEM inspection

**ANALYSIS SUMMARY:**

WHAT	WHEN	SAMPLE SIZE	RESULT
Stitch-bond on lead and ball bond	JL3+500TC (-65/+150°C)	5pcs/ ASA	No visible defect (photo 1-3)
		5pcs/ FICO	No visible defect (photo 4-6)

**DOCUMENTATION:**



Photo 1



Photo 2

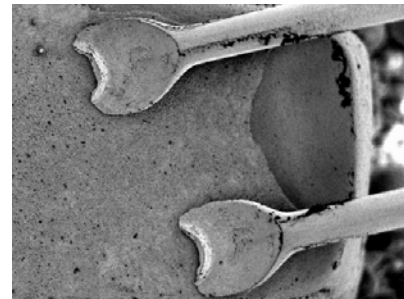


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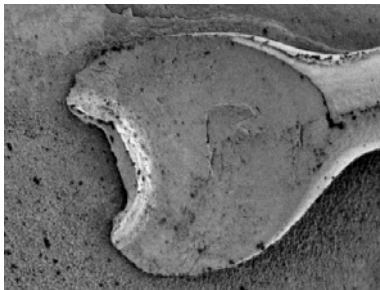


Photo 4

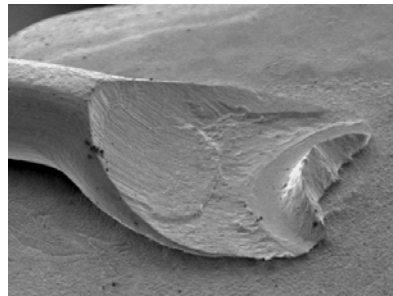


Photo 5

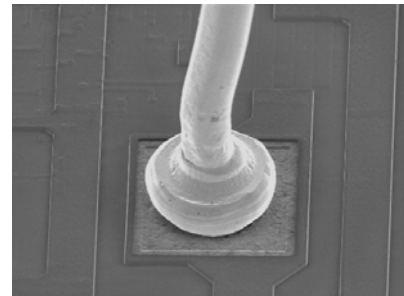


Photo 6

**TEST EQUIPMENT:** HITACHI (Scanning Electron Microscope)

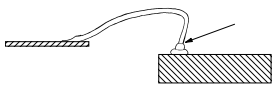
TECHNICAL CODE	PACKAGE	LOT	ANALYSIS ITEM
A6N3*UT32BB1	PowerSSO-28	997310B202-997310B201	Wire pull-test

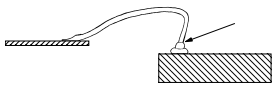
Wire type : Au, 1.3 mil

Sample size (pcs) : 5

LSL (g) : 5.5

Sample size (wires) : 100

Failure mode	JL3@260°C+500 TC (-65/+150°C)		
		ASA	FICO
<b>2: BALL NECK</b> 	mean (g)	11.63	11.89
	stdev (g)	0.88	0.99
	min (g)	9.29	9.44
	max (g)	13.28	14.15
	occurrence	100%	100%

Failure mode	HTS 1000h 150°C		
		ASA	FICO
<b>2: BALL NECK</b> 	mean (g)	11.67	11.39
	stdev (g)	1.16	1.27
	min (g)	8.97	7.73
	max (g)	13.93	13.72
	occurrence	100%	100%

**Remarks:** neither abnormal break loads, nor forbidden failure modes. AEC-Q100 criteria after TC passed.

**Please Read Carefully:**

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