



PRODUCT/PROCESS CHANGE NOTIFICATION

PCN APG-CRM/07/2583
Notification Date 05/29/2007

**HEPTAWATT & PENTAWATT ASSEMBLY & TESTING TRANSFER FROM
TOA PAYOH TO BOUSKOURA
CRM - CAR RADIO & MULTIMEDIA DIV**

Table 1. Change Identification

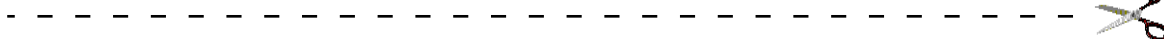
Product Identification (Product Family/Commercial Product)	ALL PRODUCTS IN HEPTAWATT & PENTAWATT PACKAGE
Type of change	Package assembly location change
Reason for change	ASSY LINE CLOSURE IN TOA PAYOH
Description of the change	Heptawatt & Pentawatt production transfer from Toa Payoh plant (Singapore) to Bouskoura 2000 plant (Morocco). Production in Bouskoura will be leadfree
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	"CZ" AS PRODUCTION AREA FOR BOUSKOURA
Manufacturing Location(s)	

Table 2. Change Implementation Schedule

Forecasted implementation date for change	31-Jul-2007
Forecasted availability date of samples for customer	22-May-2007
Forecasted date for STMicroelectronics change Qualification Plan results availability	22-May-2007
Estimated date of changed product first shipment	28-Aug-2007

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt		PCN APG-CRM/07/2583					
Please sign and return to STMicroelectronics Sales Office		Notification Date 05/29/2007					
<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
Pengo, Tullio	Division Marketing Manager
Cassani, Fabrizio	Division Product Manager
Mercandelli, Laura	Division Q.A. Manager



HEPTAWATT & PENTAWATT ASSEMBLY & TESTING TRANSFER FROM TOA PAYOH TO BOUSKOURA

WHAT:

Following Company package roadmap to concentrate in Bouskoura 2000 plant the small watt assembly activity, we are going to transfer there the assembly & testing of the Heptawatt & Pentawatt products (all splittings: vertical, horizontal, in line).

In 2004, STM already completed a first transfer of Heptawatt/Pentawatt products to Bouskoura (PCN TPA/04/472) and the plant is fully operative since mid 2004.

The products involved in this second transfer are the last ones remaining in Toa Payoh for the Car Radio Multimedia division.

Due to the changes introduced on Heptawatt/Pentawatt after 2004, production in Bouskoura for all the involved products will be with 2 mils copper wires and leadfree pure tin post plating (RoHS compliant - e3 marking on the parts).

In addition, we will change the frames from the actual bicomponent frames (slug & frame welded together before assy) to mono component frame (one piece frame) as per attached pictures.

This frame is already qualified and used in Bouskoura by other groups. As APG, we have run an additional qualification, on our test vehicles, as reported in the attached report.

WHY:

Company package roadmap

HOW:

Report ER002107AG6053 covers all the types of products involved in this PCN.

WHEN:

We will start to deliver from Bouskoura from end August 2007.

SMALL-WATT PACKAGES WITH “MONOCOMPONENT” LEADFRAME RELIABILITY EVALUATION REPORT

Abstract

HEPTAWATT and PENTAWATT packages assembled in BOUSKOURA with the new MONOCOMPONENT lead-frame have been successfully evaluated on two APG test-vehicles.

Main aim of the reliability exercise was to complete the set of results collected by HPC Group, with the addition of temperature cycling performed in conformity with AEC-Q100 “grade 1” requirements.

Conclusion

On the basis of the results summarized in the present report, HEPTAWATT and PENTAWATT packages assembled in BOUSKOURA with the new MONOCOMPONENT lead-frame can be qualified as far as reliability is concerned.

Reliability test conditions and results

TEST NAME	CONDITIONS [SPEC]	REJ./S.S.	NOTES
TCT	Ta=-65/+150°C, 1000 cycles	L570 lot 1 0/50 L570 lot 2 0/50 L540 lot 3 0/50	1, 2, 3
HTS	Ta=150°C, 1000h	L570 lot 1 0/45 L570 lot 2 0/45 L540 lot 3 0/45	2

NOTES:

- ¹ SAM analysis did not show any remarkable delamination at the die-molding compound interface, on the lead tips and through the die-attach layer. Detail in attachment n.3.
- ² Wire bonding strength after the stress has been successfully verified through wire-pull test, performed in accordance with AEC-Q100 requirement. A few bonds failed in ball-lift mode, but the relevant residual pull loads are still high, especially taking into account the impact of the molding compound decap etch which is not selective to copper. Detail in attachment n.3.
- ³ Visual and SEM inspections after the stress test have pointed out no remarkable degradation of silicon passivation, metal interconnects, stitch bonds on internal lead-tips. Detail in attachment n.3.

Construction note

	TV1	TV2
Technical code :	K87X*L570TOX	K87E*L540DAX
Diffusion process :	BIP	BIP
Wafer diameter :	5"	5"
Diffusion site :	Ang Mo-Kio	Ang Mo-Kio
Die size (mm²) :	1.39 x 1.43	1.86 x 2.30
Metal levels :	1,Al	1,Al
Passivation :	SiN	SiN
Back finishing :	Cr/Ni/Au	Cr/Ni/Au
Package name :	HEPTAWATT	PENTAWATT
Assembly site :	BOUSKOURA	BOUSKOURA
Leadframe :	HW 7L Mon bare copper	PW 5L Mon bare copper
Die attach :	Pb/Ag/Sn	Pb/Ag/Sn
Wire bonding :	Cu,2 mil	Cu,2 mil
Molding compound :	SUMITOMO 6300HR	SUMITOMO 6300HR
Lead finishing :		
Lot_id :	CZ6160630 (sub-lots 1 and 2)	CZ61605PZY

Attachments

- 1) Reliability tests description
- 2) Results from HPC Group qualification
- 3) Physical analysis report

ATTACHMENT 1: RELIABILITY TESTS DESCRIPTION

TEST NAME	DESCRIPTION	PURPOSE
TCT: 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.
HTS: 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: RESULTS FROM HPC QUALIFICATION

TEST NAME	CONDITIONS [SPEC]	STV8172A REJ./SS	STV9302A REJ./SS	NOTES
TCT	Ta=-40/+150°C, 1000 cycles	0/50	0/(50x2)	-
PPT	P=2atm, Ta=121°, 240h	0/50	0/(50x2)	-
HTS	Ta=175°C, 500h	0/50	0/(50x2)	1
HTRB	Ta=85°C, Tj=150°C, 1000h	-	0/(20x2)	2

NOTES:

- ¹ HTS test has been continued up to 1000h in order to investigate the wear-out curve. One parametric failure has been found on the 2nd lot of STV9302A. Being the failure root-cause identified in the molding-compound stress and taking into account that the concerned material does not have stable and controlled mechanical properties above 150°C (max. operative temperature), the failure mechanism is not realistic in the field application environment.
- ² High Temperature Reverse Bias test, devices biased in static configuration at their maximum allowed supply voltage.

Construction note

Technical code :	STV8172A	STV9302A
Diffusion process :	B50II	B50II
Wafer diameter :	6"	6"
Diffusion site :	Ang Mo-Kio	Ang Mo-Kio
Die size (mm²) :	2.71 x 1.88	2.10x2.30
Passivation :	SiN	SiN
Back finishing :	Cr/Ni/Au	Cr/Ni/Au
Package name :	HEPTAWATT	HEPTAWATT
Assembly site :	BOUSKOURA	BOUSKOURA
Leadframe :	HW 7L Mon bare copper	HW 7L Mon bare copper
Die attach :	Pb/Ag/Sn	Pb/Ag/Sn
Wire bonding :	Cu, 2 mil	Cu, 2 mil
Molding compound :	SUMITOMO 6300HR	SUMITOMO 6300HR
Lead finishing :	Matte tin	Matte tin

ATTACHMENT 3: PHYSICAL ANALYSIS REPORT

Technical code : K87X*L570TOX
K87E*L540DAX

Package : HEPTAWATT (HW)
PENTAWATT (PW)

Lot(s)_id : Lot 1 CZ6160630
Lot 2 CZ6160630
Lot 3 CZ61605PZY

Evaluation subject : Small-WATT packages with Mono-component lead-frame

Author : D. Casiraghi

Analysis status: RUNNING COMPLETED

ANALYSIS PROGRAM

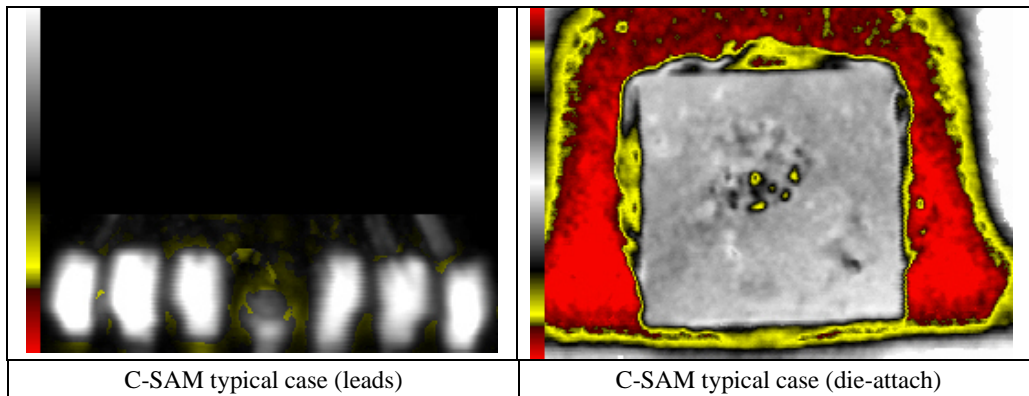
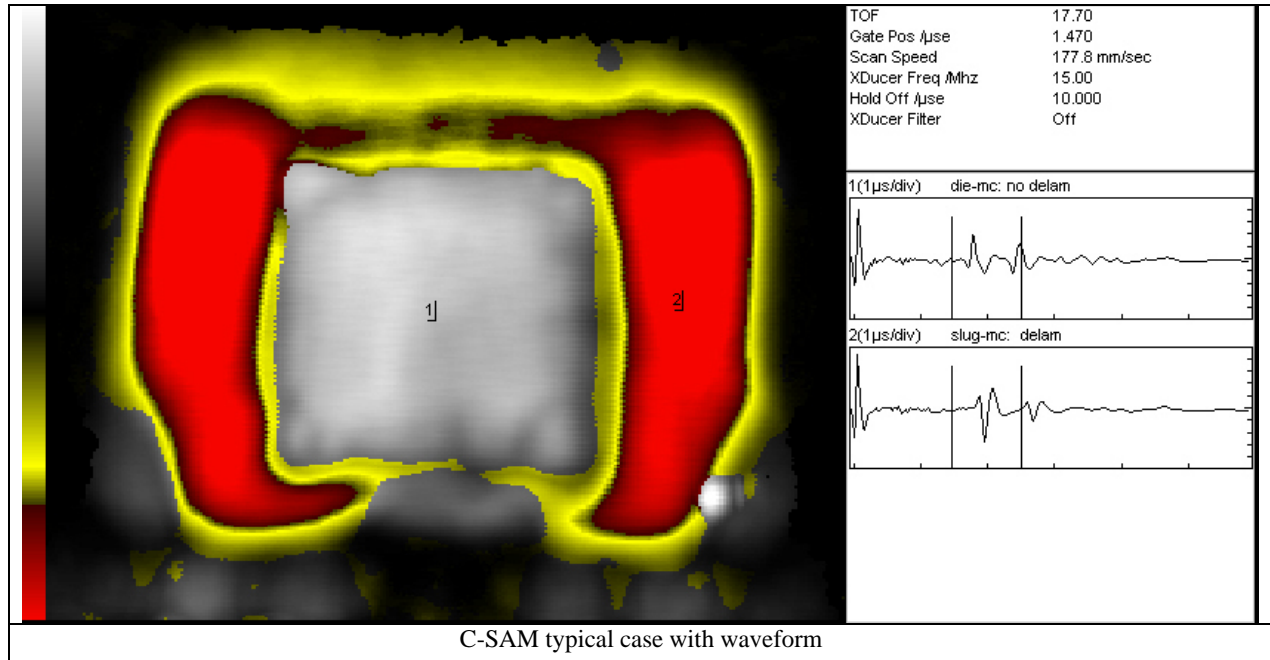
DESTRUCTIVE ITEMS				NON DESTRUCTIVE ITEMS		WHEN
Wire pull test	Ball Shear test	Internal visual	SEM inspection	SAM inspection	Other	
X		X	X	X		1000 TC
X						1000h HTS

RESULTS SUMMARY

- SAM analysis did not show any remarkable delamination at the die-molding compound interface, on the lead tips and through the die-attach layer.
- Wire bonding strength after TC and HTS stress has been successfully verified through wire-pull test, performed in accordance with AEC-Q100 requirement. A few bonds failed in ball-lift mode, but the relevant residual pull loads are still high, especially taking into account the impact of the molding compound decap etch which is not selective to copper.
- Visual and SEM inspections after TC stress have pointed out no remarkable degradation of silicon passivation, metal interconnects, stitch bonds on internal lead-tips.

TECHNICAL CODE	PACKAGE	ANALYSIS ITEM	STRESS TEST
K87X*L570TOX	HEPTAWATT	SAM inspection	1000 TC (-65/+150°C)

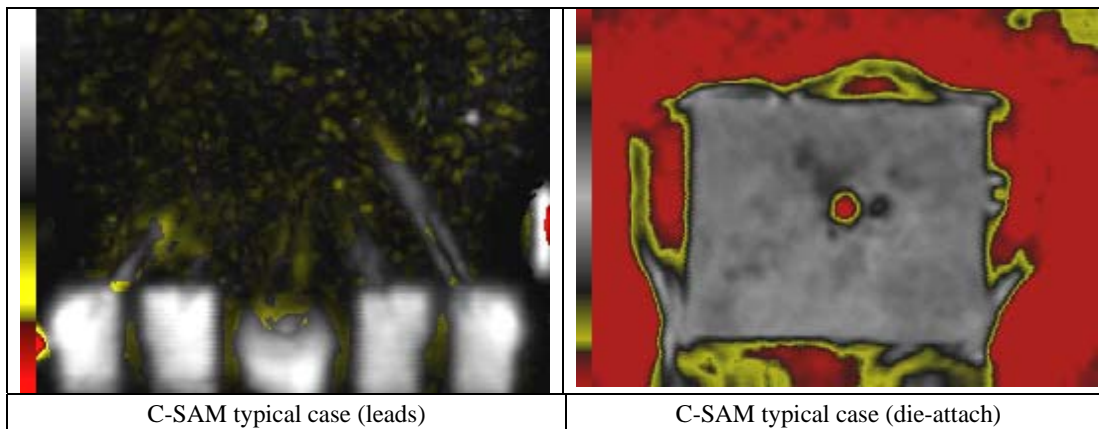
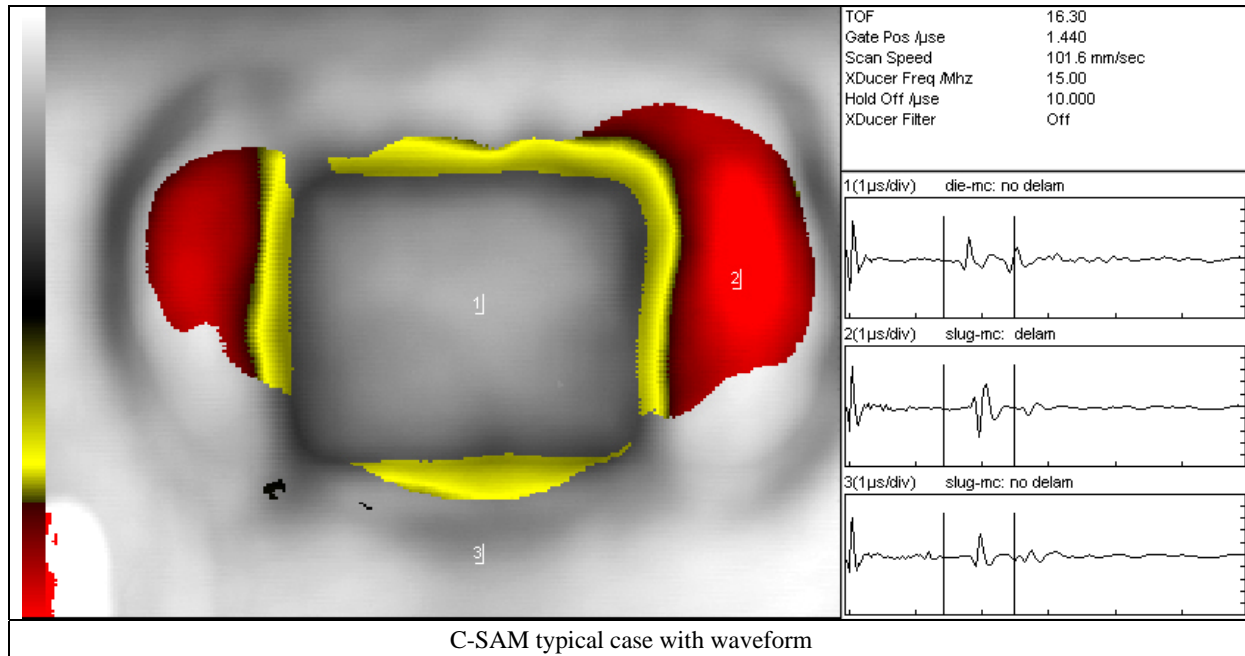
TEST EQUIPMENT: SONOSCAN D9000 (Scanning Acoustic Microscope)



Lot	Sample size	Defective parts (delamination)			
		die-mold (C-scan)	die-attach (C-scan)	l/f-mold (C-scan)	diepad-mold (C-scan)
CZ6160630-1	5	0/5	0/5	0/5	5/5
CZ6160630-2	5	0/5	0/5	0/5	5/5
Transducer frequency (MHz)		15	50	15	15

TECHNICAL CODE	PACKAGE	ANALYSIS ITEM	STRESS TEST
K87E*L540DAX	PENTAWATT	SAM inspection	1000 TC (65/+150°C)

TEST EQUIPMENT: SONOSCAN D9000 (Scanning Acoustic Microscope)



Lot	Sample size	Defective parts (delamination)			
		die-mold (C-scan)	die-attach (C-scan)	l/f-mold (C-scan)	diepad-mold (C-scan)
CZ61605PZY	5	0/5	0/5	0/5	5/5
Transducer frequency (MHz)		15	50	15	15

TECHNICAL CODE	PACKAGE	LOTS	ANALYSIS ITEM
L570TOX - L540DAX	HW - PW	CZ6160630-1, CZ6160630-2, CZ61605PZY	Internal visual

ANALYSIS SUMMARY:

WHAT	WHEN	SAMPLE SIZE /LOTS	RESULT
Passivation and metal	ES(100TC+168PP)	5pcs /Lot1	Minor passivation crack (photo 1-3)
Passivation and metal	ES(100TC+168PP)	5pcs /Lot2	Minor passivation crack (photo 4-6)
Passivation and metal	ES(100TC+168PP)	5pcs /Lot3	Minor passivation crack (photo 7-9)

DOCUMENTATION:

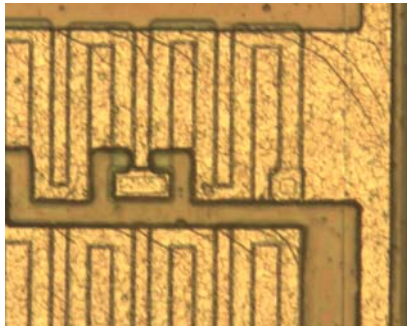


Photo 1

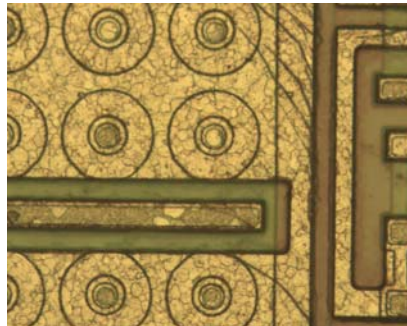


Photo 2

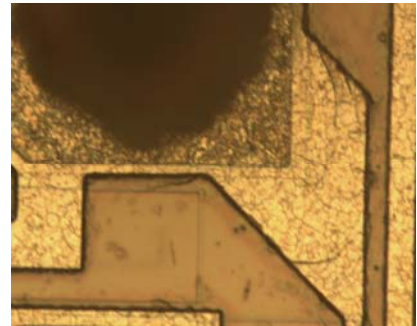


Photo 3

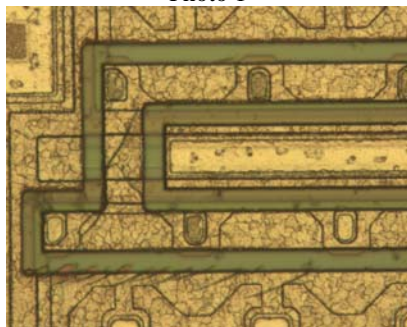


Photo 4

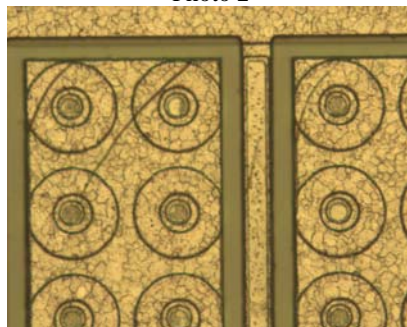


Photo 5



Photo 6

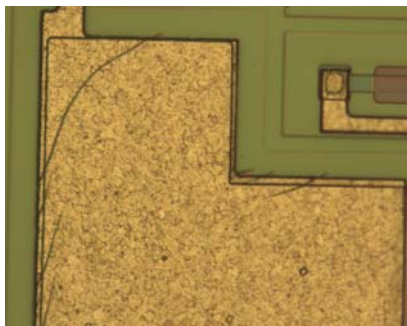


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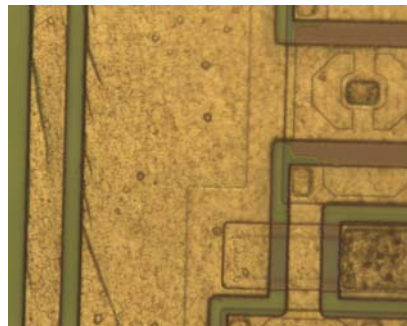


Photo 8

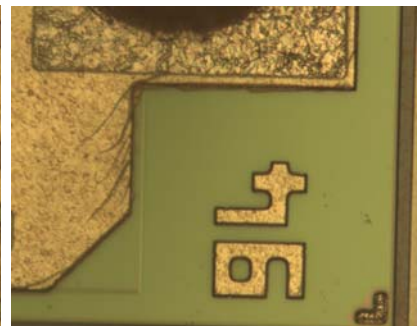


Photo 9

TEST EQUIPMENT: LEICA (Optical Microscope)

TECHNICAL CODE	PACKAGE	LOT	ANALYSIS ITEM
L570TOX - L540DAX	HW - PW	CZ6160630-1, CZ6160630-2, CZ61605PZY	SEM inspection

ANALYSIS SUMMARY:

WHAT	WHEN	SAMPLE SIZE	RESULT
Stitch-bond on lead	JL3+1000TC (-55/+150°C)	5pcs/lot	No visible degradation
Stitch-bond on lead	JL3+1000TC (-55/+150°C)	5pcs/lot	No visible degradation
Stitch-bond on lead	JL3+1000TC (-55/+150°C)	5pcs/lot	No visible degradation

DOCUMENTATION:



Photo 1

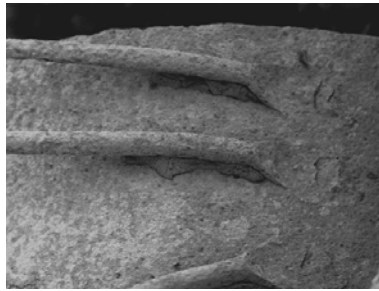


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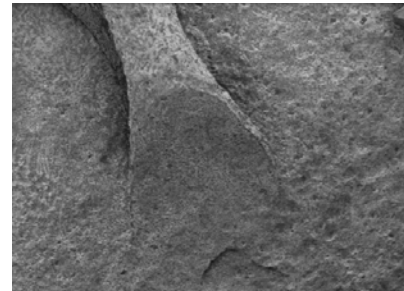


Photo 3

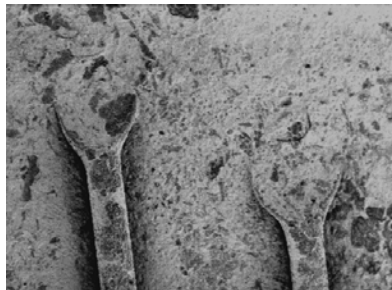
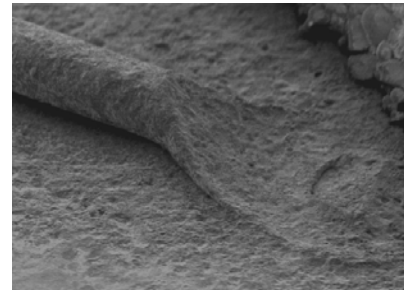
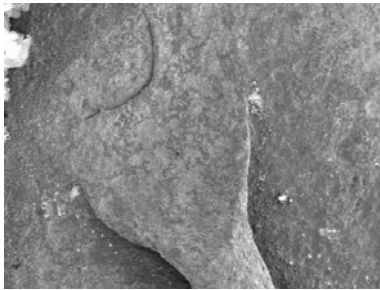
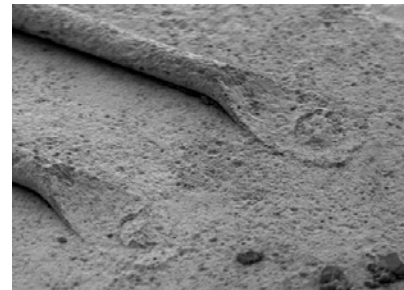


Photo 4

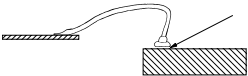
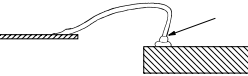
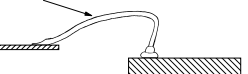



TEST EQUIPMENT: HITACHI (Scanning Electron Microscope)

TECHNICAL CODE	PACKAGE	LOT	ANALYSIS ITEM
L570TOX - L540DAX	HW - PW	CZ6160630-1, CZ6160630-2, CZ61605PZY	Wire pull-test

Wire type : Cu, 2 mil
 LSL (g) : 10.50

Sample size (pcs) : 5
 Sample size (wires) : 60

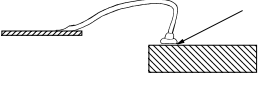
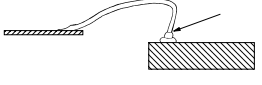
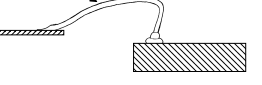
Failure mode	1000 TC (-65+150°C)			
		L570 lot1	L570 lot2	L540 lot3
1: BALL LIFT 	mean (g)	-	-	-
	stdev (g)	-	-	-
	min (g)	-	-	19.07
	max (g)	-	-	19.07
	occurrence	-	-	3%
2: BALL NECK 	mean (g)	34.28	30.88	30.63
	stdev (g)	2.30	5.16	2.75
	min (g)	32.65	22.92	27.10
	max (g)	35.90	36.51	35.29
	occurrence	3%	14%	30%
3: LOOP CENTRE 	mean (g)	30.32	30.27	35.51
	stdev (g)	6.22	4.68	6.07
	min (g)	11.68	19.13	23.95
	max (g)	44.42	44.08	47.02
	occurrence	95%	86%	64%
4: BROKEN WELD 	mean (g)	-	-	-
	stdev (g)	-	-	-
	min (g)	22.86	-	36.65
	max (g)	22.86	-	36.65
	occurrence	2%	-	3%

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

TECHNICAL CODE	PACKAGE	LOT	ANALYSIS ITEM
L570TOX - L540DAX	HW - PW	CZ6160630-1, CZ6160630-2, CZ61605PZY	Wire pull-test

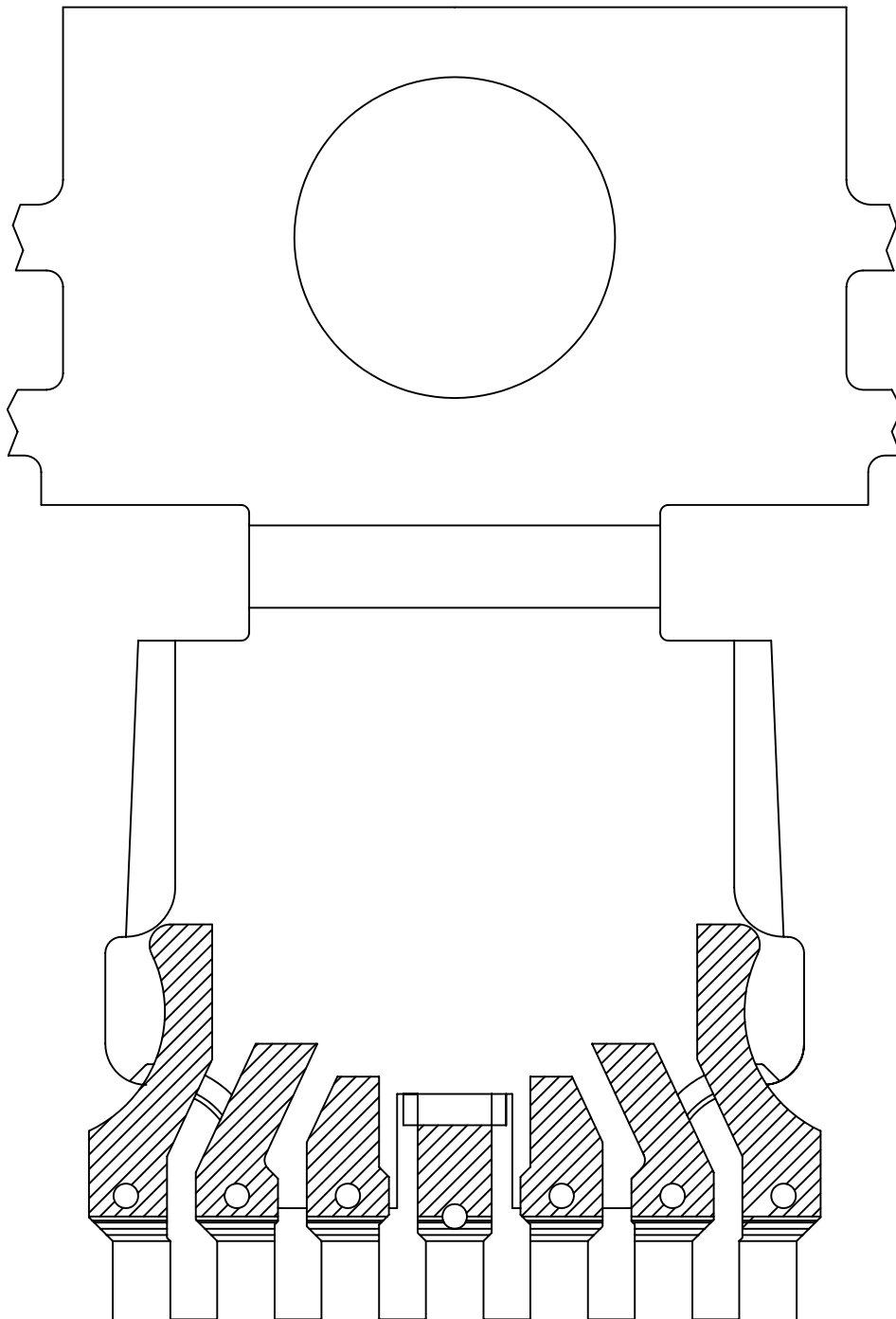
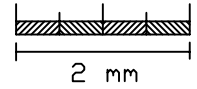
Wire type : Cu, 2 mil
 LSL (g) : 10.50

Sample size (pcs) : 5
 Sample size (wires) : 60

Failure mode	1000h HTS			
	L570 lot1	L570 lot2	L540 lot3	
1: BALL LIFT	mean (g)	-	-	19.96
	stdev (g)	-	-	0.15
	min (g)	-	-	19.85
	max (g)	-	-	20.07
	occurrence	-	-	5%
2: BALL NECK	mean (g)	58.54	61.49	36.36
	stdev (g)	6.81	11.80	3.10
	min (g)	53.21	49.40	34.73
	max (g)	66.22	72.97	41.01
	occurrence	8%	4%	9%
3: LOOP CENTRE	mean (g)	38.93	38.06	38.26
	stdev (g)	11.22	11.48	11.15
	min (g)	12.15	24.52	26.80
	max (g)	66.92	78.25	73.51
	occurrence	92%	96%	86%

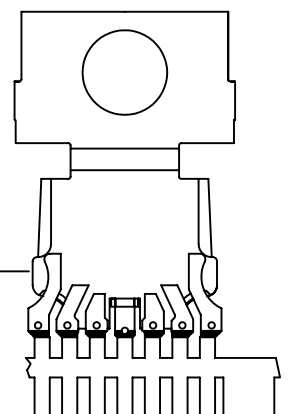
BOND DIAGRAM FOR BICOMPONENT FRAME

PACKAGE: P023 PAD SIZE: $\frac{5.90 \times 4.90 \text{ mm}}{232 \times 193 \text{ mils}}$



 WELDING AREA

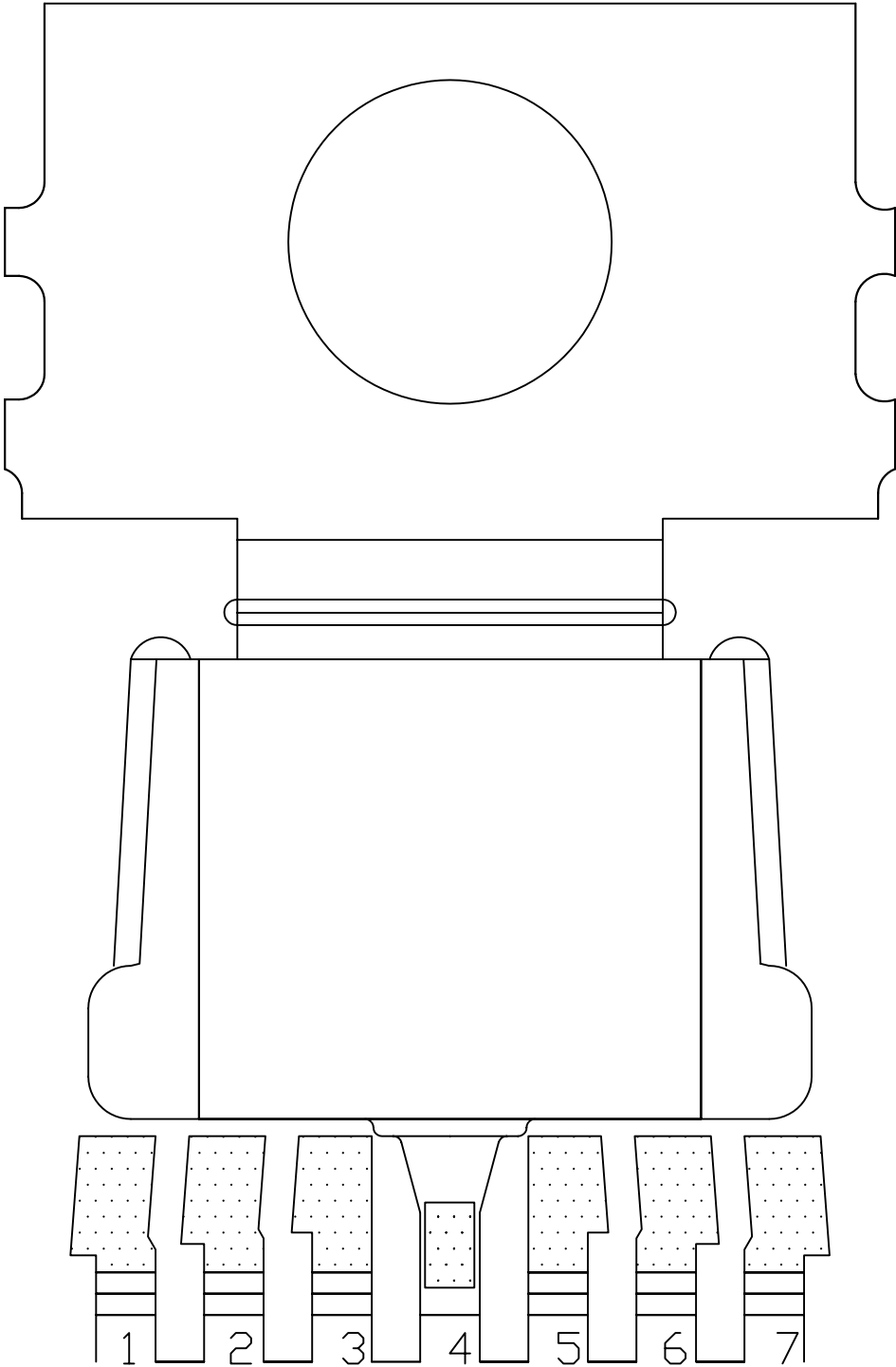
PIN N.1



HWATT 7L, BLANK BOND DIAGRAM REF. 7085438
REMARK : E.S.D. PROGRAM IS MANDATORY

BONDING DIAGRAM FOR MONOCOMPONENT

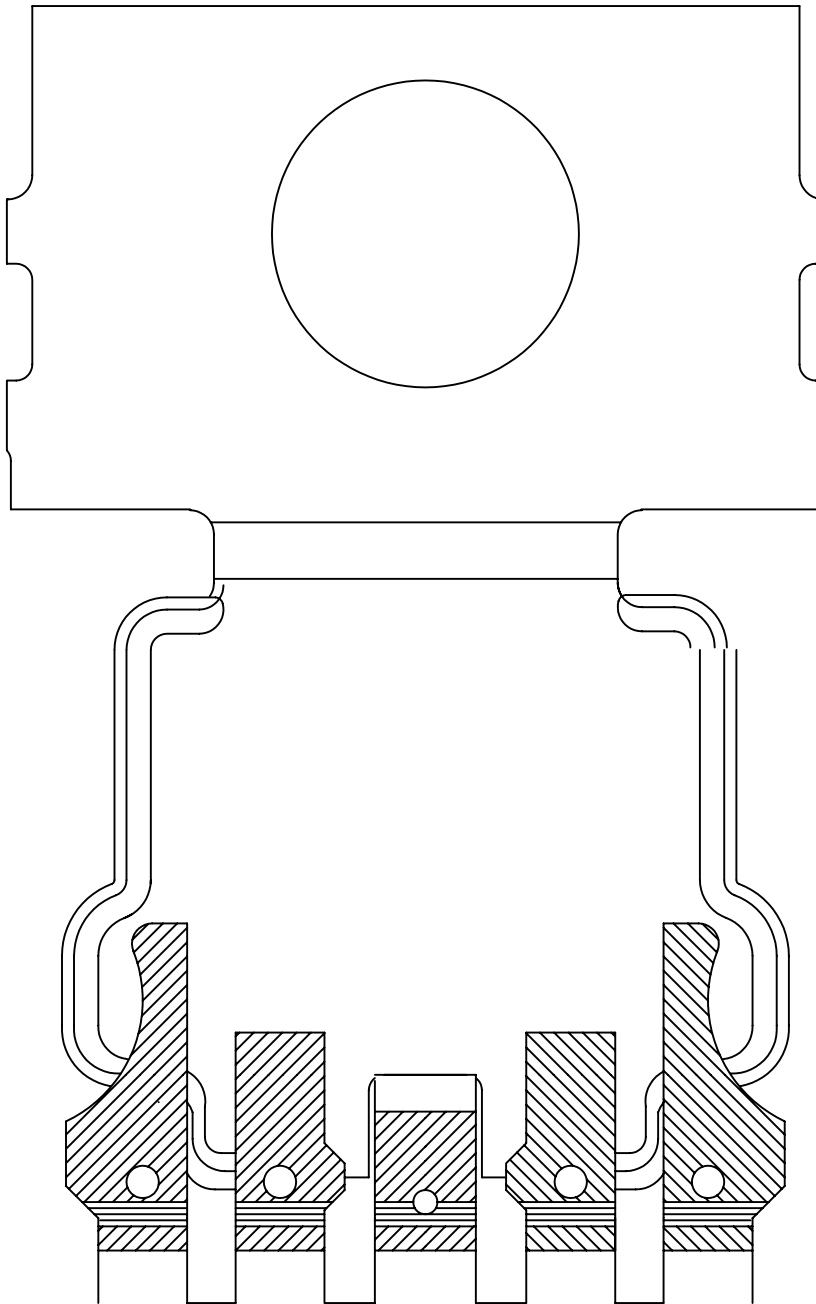
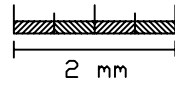
PAD SIZE: $\frac{232 \times 212 \text{ mils}}{5.90 \times 5.40 \text{ mm}}$



HWATT 7L, BLANK BOND DIAGRAM REF.: 7X BSK
REMARK : E.S.D. PROGRAM IS MANDATORY

BOND DIAGRAM FOR BICOMPONENT FRAME

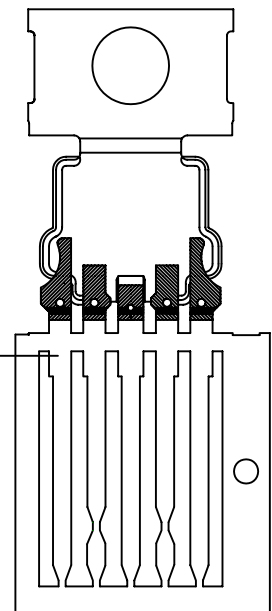
PACKAGE: P023 PAD SIZE: $\frac{5.90 \times 4.90 \text{ mm}}{232 \times 193 \text{ mils}}$



 WELDING AREA

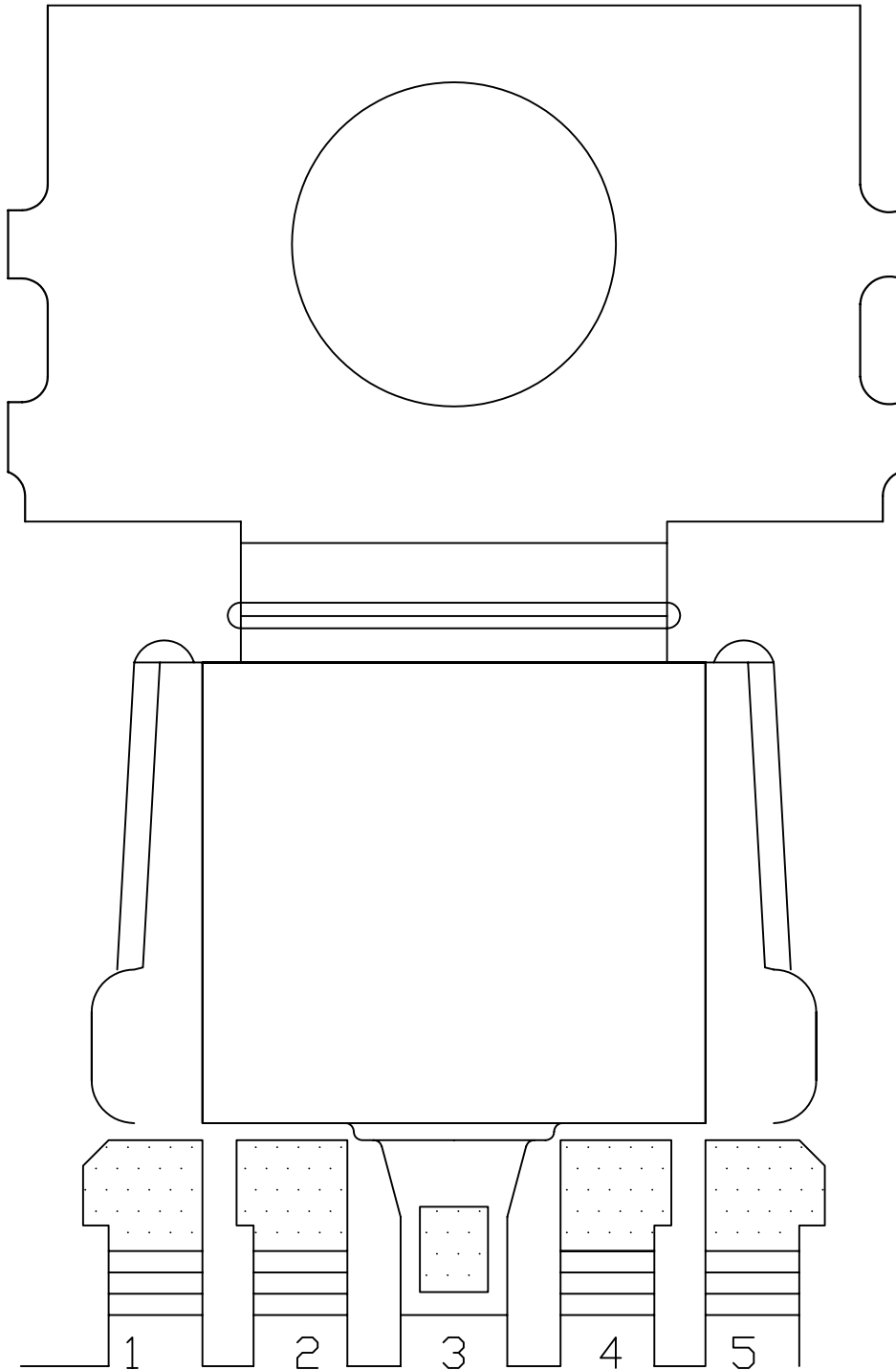
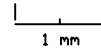
PIN N.1

PWATT 5L, BLANK BOND DIAGRAM REF. 7190575
REMARK : E.S.D. PROGRAM IS MANDATORY



BONDING DIAGRAM FOR MONOCOMPONENT

PAD SIZE: $\frac{232 \times 212 \text{ mils}}{5.90 \times 5.40 \text{ mm}}$



PWATT 5L, BLANK BOND DIAGRAM REF.: 7E-7Q BSK
REMARK : E.S.D. PROGRAM IS MANDATORY

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