PRODUCT/PROCESS CHANGE NOTIFICATION

PCN APM-IPC/11/6840
Notification Date 10/26/2011

Implementation of Cu wire and Halogen Free compliant epoxy resin on PowerSO-20/36 at Muar assembly site (BCD1, BCD2, BCD3 & BCD3S products)

Table 1. Change Implementation Schedule

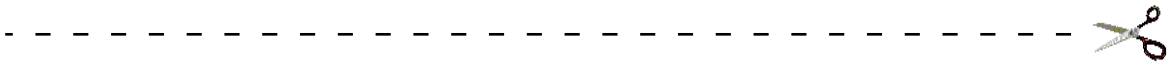
Forecasted implementation date for change	15-Dec-2011
Forecasted availabillity date of samples for customer	15-Dec-2011
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	19-Oct-2011
Estimated date of changed product first shipment	25-Jan-2012

Table 2. Change Identification

Product Identification (Product Family/Commercial Product)	See attached list
Type of change	Package assembly material change
Reason for change	Company roadmap and manufacturing process rationalization
Description of the change	Following the Company roadmap in order to improve and to rationalize the manufacturing process, we are going to implement in Muar (Malaysia) the copper wire bonding and the Halogen Free (Ecopack 2) molding compound. This change will affect the BCD1, BCD2, BCD3 and BCD3S products housed in PowerSO 20/36 package.
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	By Finished Goods code
Manufacturing Location(s)	1]St Muar - Malaysia

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt	**PCN APM-IPC/11/6840**
Please sign and return to STMicroelectronics Sales Office	**Notification Date 10/26/2011**

☐ Qualification Plan Denied	Name:
☐ Qualification Plan Approved	Title:
	Company:
☐ Change Denied	Date:
☐ Change Approved	Signature:

Remark

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DOCUMENT APPROVAL

Name	Function
Arrigo, Domenico Massimo	Division Marketing Manager
Pioppo, Sergio Franco	Division Marketing Manager
Arrigo, Domenico Massimo	Division Product Manager
Pioppo, Sergio Franco	Division Product Manager
Motta, Antonino	Division Q.A. Manager

ATTACHMENT TO PCN APM-IPC/11/6840

WHAT*:*
Progressing with the aim to improve and to rationalize our manufacturing processes, we are going to replace the actual 2 mils gold (Au) bonding wires with 2 mils copper (Cu) bonding wires and to implement the Halogen Free (ECOPACK 2) molding compound. This change will affect the BCD1, BCD2, BCD3 and BCD3S products housed in PowerSO 20/36 package.

For the complete list of the part numbers affected, please refer to the attachment.

WHY*:*
As per our Corporate package roadmap.

The implementation of the Copper (Cu) wire will produce :
- Improvement in maximum available current
- Improved solder joint resistance
- Improved reliability in longer life-time at high temperature.

The implementation of the HF molding compound will meet the latest market and environmental requirements in terms of halogen-free products.

HOW*:*
As per the attached Reliability Report.
The change to copper (Cu) wire and to the HF molding compound will be identified internally by a new finished goods code. ST standard labels will show the new FG code and the Ecopack2 classification category.

WHEN*:*
We are ready to implement the change from mid-December 2011 onward.
Samples could be delivered upon request in 6 weeks A.R.O.

RELIABILITY EVALUATION COPPER WIRE BONDING ON PowerSO 20/24/28/36L ST-MUAR (MALAYSIA)

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
1.1	18-Oct-2011		F.VENTURA I&PC QA&R / B/E	A.MOTTA I&PC QA&R DIR.	Qualification by extension

Document reference	Short description
AEC-Q100	Stress test qualification for automotive grade integrated circuits
JESD47	Stress-Test-Driven Qualification of Integrated Circuits

1 GLOSSARY

DUT	Device Under Test
SS	Sample Size

2 RELIABILITY EVALUATION OVERVIEW

2.1 Objectives

To qualify the 2.0 mils Cu wire on IMS/APM- I&PC Div PowerSo products.

2.2 Conclusion

Basis on Positive full Reliability result:

1)**ER000809AG6053** qualifying 2.0 mil Cu wire on PowerSO-20/36 packages (BCD4/4s and BCD5/5s front end technology)

2)**ER002610AG6053** qualifying 2.0 mil Cu wire on HiQuad-64 package(BCD3/3s front end technology)

And Basis on Positive workability and testing results on:
L6234PD-LF1/ (A677*U513DD6)
L6206PD013TR (A98C*UF36AJ6)

We can considered qualified by extension all **IMS/APM-I&PC BCD1/BCD2/BCD3/s,BCD4/s,BCD5/s** Products assembled in PowerSo 20/24/28/36L using 2.0 mils Cu wire.

RR:ER000809AG6053

Reliability test conditions and results vs AEC-Q100 requirement

TEST NAME / TYPE* (AEC-Q100 NAME)	CONDITIONS [SPEC]	UH27	UK43	UT29 REJ./S.S.	NOTES
TC / R (TC)	Ta=-50/+150℃,1000 cycles (PC before test according to JEDEC-020D)	Lot LL: 0/60 Lot HH: 0/60	Lot LL: 0/60 Lot HH: 0/60	Lot LL: 0/60 Lot HH: 0/60	1
ES / R (AC)	100 TC (-50/+150℃) + 96h PPT (2atm, 121℃) (PC before test according to JEDEC-020D)	Lot LL: 0/40 Lot HH: 0/40	Lot LL: 0/40 Lot HH: 0/40	Lot: 0/40 Lot: 0/40	-
HTS / R (HTSL)	Ta=150℃, 1000h	Lot LL: 0/60 Lot HH: 0/60	Lot LL: 0/60 Lot HH: 0/60	Lot: 0/60 Lot: 0/60	-
PTC / R (PTC)	Ta=-40/+95℃,1000 h Ts =121 ℃	NA	NA	Lot LL: 0/25 Lot HH: 0/25	-
WBS / A (WBS)	30 wrs / 5 dev. / C_{PK}>1.33	PASSED	PASSED	PASSED	-
WBP / A (WBP)	30 wrs / 5 dev. / C_{PK}>1.33	PASSED	PASSED	PASSED	-
SD / A (SD)	15 dev. / Wetting >95%	PASSED	PASSED	PASSED	-
PD / A (PD)	10 dev/lot / C_{PK}>1.33	PASSED	PASSED	PASSED	-

***Type legenda:** R=Reliability, A=Assembly

NOTES:

1 Wire pull and ball shear test performed after 1000 TC according to AEC-Q100 requirements

The present report includes results from three different test vehicle each of those split into LL (Low bonding force and Low ultrasonic power) and HH (High bonding force and High ultrasonic power) for the wire bonding process conditions.

Construction note

Technical code :	G8CD*UH27BF1	G9ZS*UK43BCH	G977*UT29BCM
Diffusion process :	BCD4	BCD5S	BCD5S
Wafer diameter :	8”	6”	8”
Diffusion site :	AGRATE AG8	CARROLLTON	AGRATE AG8
Die size (mm^2) :	2.98 x 4.17	3.75 x 4.89	3.13 x 3.61
Metal levels :	M1, Ti/TiN/Ti/AlCu/TiN M2, Ti/AlSiCu/TiN M3, Ti/AlSiCu	3, Ti/AlSiCu/TiN	3, AlCu
Passivation :	USG-PSG-SiON-PIX	PSG+SiON+Polyimide	Teos + PTeos + SiOn + PIX
Back finishing :	Cr/Ni/Au	Cr/Ni/Au	Cr/Ni/Au
Package name :	PowerSO 20 SLUG UP	PowerSO 36 .43 SLUG UP	PowerSO 20 SLUG DOWN
Assembly site :	MUAR	MUAR	MUAR
Leadframe :	FRAME PSO19+1 20u RIVETED SINGLE P/N # 5FT24146	FRAME PSO 36L OptB MAT RIVETED P/N # 5FT03474	FRAME PSO-20 20L Matrix SpAg Wdg P/N # 5FT81181
Die attach :	Pb/Ag/Sn 97.5/1.5/1 P/N # 5XP91862	Pb/Ag/Sn 97.5/1.5/1 P/N # 5XP91862	Pb/Ag/Sn 97.5/1.5/1 P/N # 5XP91862
Wire bonding :	Cu, 2 mil P/N # 5XC92680	Cu, 2 mil P/N # 5XC92680	Cu, 2 mil P/N # 5XC92680
Molding compound :	HITACHI CEL 9240HF10 P/N # 5ST65400	HITACHI CEL 9240HF10 P/N # 5ST65399	HITACHI CEL 9240HF10 P/N # 5ST65399
Lead finishing :	Matte Sn	Matte Sn	Matte Sn
Lot (s)_id* :	# 9982509X01(LL) # 9982509X01(HH)	# 9982509W01(LL) # 9982509W02 (HH)	# 998250DU02 (LL) # 998250DU03 (HH)

*NOTE: TESTING WITH DATALOG PERFORMED AT 25℃

RR :ER002610AG6053

Reliability test conditions and results vs AEC-Q100 requirement

TESTNAME/ TYPE* (AEC-Q100 NAME)	CONDITIONS [SPEC]	UD05 REJ./S.S.	UG02 REJ./S.S	UF39 REJ./S.S	NOTES
TC/ R (TC)	Ta=-50/+150℃, 1000 cycles	0/77	0/77	0/77	1, 2
ES/ R (AC)	100cycles (-50/150℃) + 96h PPT (2atm, 121℃)	0/77	0/77	0/77	-
HTS /R (HTSL)	Ta=150℃, 1000h	0/77	0/77	0/77	-
PTC /R (PTC)	-	N.A.	N.A.	N.A.	3
WBP / A (WBP)	30 wrs / 5 dev. / C_{PK}>1.33	PASSED	PASSED	PASSED	4
WBS / A (WBS)	30 wrs / 5 dev. / C_{PK}>1.33	PASSED	PASSED	PASSED	4

***Type legenda:** R= Reliability, A= Assembly

NOTES:

1. SAM analysis after JL3 preconditioning and TC shows no critical delamination.
2. Wire bonding strength after the stress has been successfully verified through wire-pull and ball-shear test
3. PTC not performed as no decrease of wire diameter and Cu electrical conductivity higher than Au (less self-heating in the wires).
4. Data extracted from assembly reports of qualification lots.

Construction note

Technical code	:	G99M*UD05EA1	G99M*UG02DA1	G99M*UF39BD6
Diffusion process	:	BCD5CS	BCD4	BCD3SW
Wafer diameter	:	8”	8”	6”
Diffusion site	:	Agrate AG8	Agrate AG8	Ang Mo Kio
Die size (mm^2)	:	5,98 x 7,13	6,06 x 7,59	8,25 x 7,70
Metal levels	:	3, AlCu	3, AlCu	3, AlSiCu
Passivation	:	USG+SiON+Polyimide	USG+SiON+Polyimide	SiN/POLYIMIDE
Back finishing	:	Cr/Ni/Au	Cr/Ni/Au	Cr/Ni/Au
Package name	:	HI-QUAD 64 14x14	HI-QUAD 64 14x14	HI-QUAD 64 14x14
Assembly site	:	MUAR	MUAR	MUAR
Leadframe	:	Hi QUAD 64L Mat riveted	Hi QUAD 64L Mat riveted	Hi QUAD 64L Mat riveted
Die attach	:	PREFORM Pb/Ag/Sn	PREFORM Pb/Ag/Sn	PREFORM Pb/Ag/Sn
Wire bonding	:	Cu, 2 mils	Cu, 2 mils	Cu, 2 mils
Molding compound	:	HITACHI CEL 9240HF10	HITACHI CEL 9240HF10	HITACHI CEL 9240HF10
Lead finishing	:	Pure Tin	Pure Tin	Pure Tin
Lot _id	:	9995018F	9995003D	999461F401

ANNEXES.

2.2.1 Bonding diagram

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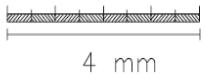
L6234PD-LF1/ (A677*U513DD6)	L6206PD013TR (A98C*UF36AJ6)

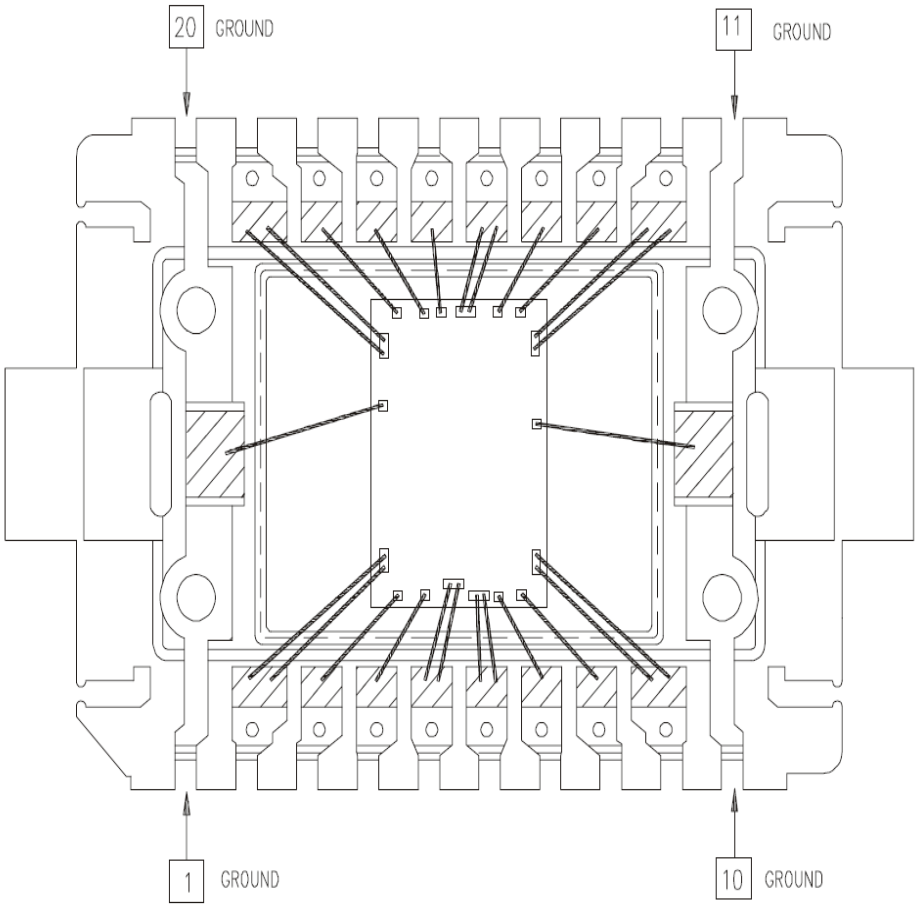
See below attached docs.

TITLE: BOND DIAGRAM FOR LINE U513 PKG. 77 POWER SO 20 LEADS MATRIX.

NUMBER OF WIRES: 25

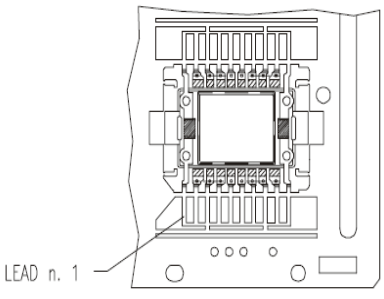
PACKAGE: P013U PAD SIZE: 8.06 x 6.17 mm





PowerSO-20 MATRIX: BLANK BONDING DIAGRAM REF. : 7098225

REMARK: E.S.D. PROGRAM IS MANDATORY

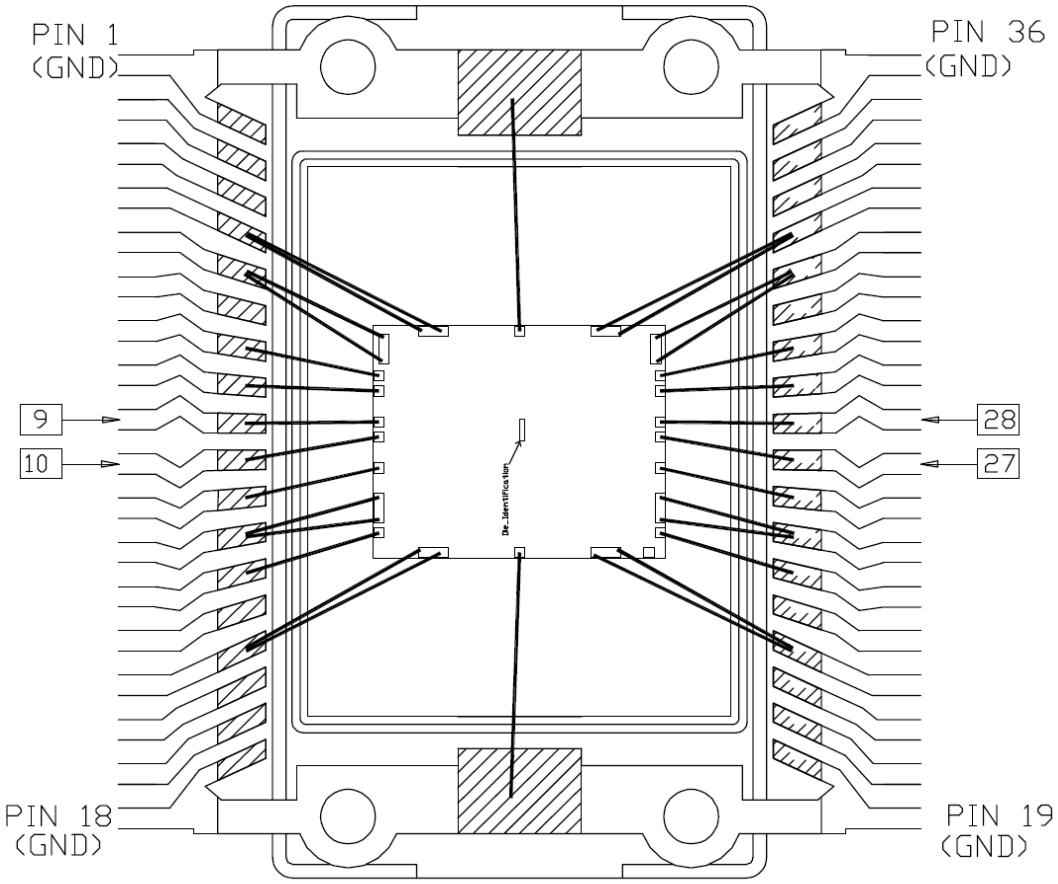


U513_PSO20L_Matrix

MOUNT & BONDING DIAGRAM FOR A58C*UF36AJ6

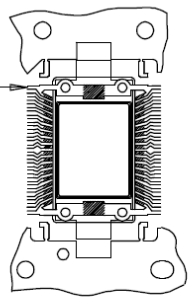
PAD SIZE: 6.17 x 8.06 mm

2 mm



WELDING AREA

PIN N.1



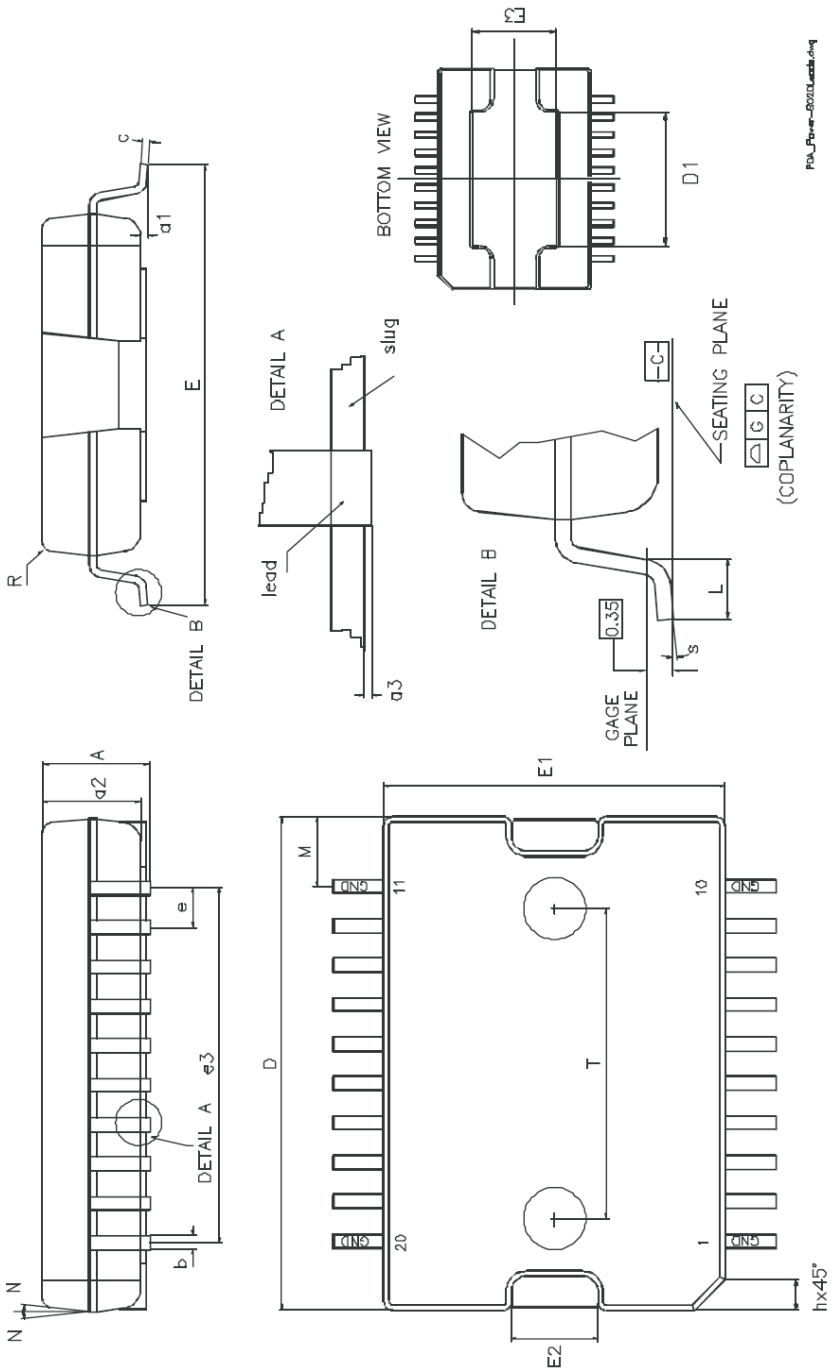
POWER SO 36L:BLANK BOND DIAGR. REF.:0102545
(32+4) Option A

REMARK: E.S.D. PROGRAM IS MANDATORY

L6206_POWERSO36AGR.dwg

2.2.2 Package outline/Mechanical data

FIGURE 1:



TITLE: PACKAGE OUTLINE (POA) FOR POWER-SO 20 LEADS OUTLINE PACKAGE.

PACKAGE TYPE: P013U
PACKAGE CODE: 77

DIMENSIONS

REF.	DATA BOOK mm			DRAWING mm			DRAWING inc.			NOTES
	TYP	MIN	MAX	TYP	MIN	MAX	TYP	MIN	MAX	
A			3.60			3.50			.138	
a1		0.10	0.30		0.20	0.275		.008	.011	
a2			3.30		3.10	3.20		.122	.126	
a3		0	0.10		0	0.075		0	.003	
b		0.40	0.53		0.42	0.50		.0165	.020	
c		0.23	0.32		0.24	0.28		.009	.011	
D(1)		15.80	16.00		15.85	15.95		.624	.628	
D1(2)		9.40	9.80		9.45	9.75		.372	.384	
E		13.90	14.50	14.20	14.10	14.35	.559	.555	.565	
e	1.27			1.27			.050			
e3	11.43			11.43			.450			
E1(1)		10.90	11.10		10.95	11.05		.431	.435	
E2			2.90			2.85			.112	
E3		5.80	6.20		5.85	6.15		.230	.242	
G		0	0.10		0	0.075		0	.003	
H		15.50	15.90		15.55	15.85		.612	.624	
h			1.10	1			.039			
L		0.80	1.10		0.85	1.05		.033	.041	
M					2.10	2.30		.083	.090	
N	8d.									
R				0.30			.012			
S			8d.	5d.	3d.	7d.	5d.	3d.	7d.	
T	10.00			10.00			.394			

COMPONENTS CROSS REFERENCE

COMPONENT	DOCUMENT NUMBER	NOTE
RIVETTED FRAME	CDA 0062922	(1)
SLUG	0062923	
FRAME	0062924	
MOLDED FRAME	0004493	

NOTE: (1)"D"and"E1"do not include mold flash or protrusions
-Mold flash or protrusions shall not exceed 0.15mm(.006inc.)
-Critical dimensions: "E", "G" and "a3"
(2) For subcontractors, the limit is the one quoted in jedec MO-166

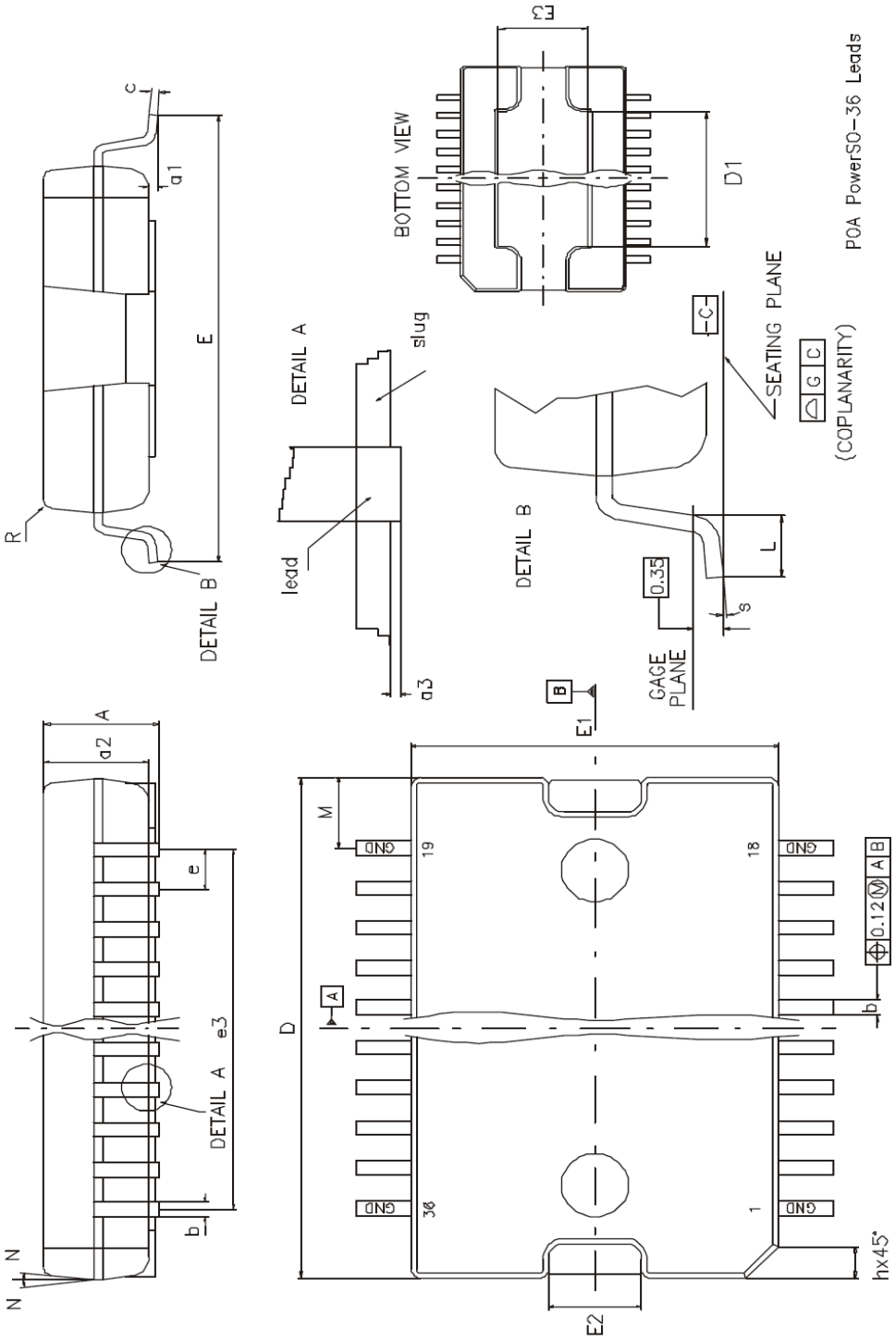

E3
BOTTOM VIEW
D1
PQA PowerSO-36 Leads
c
a1
E
R
DETAIL B
DETAIL A
slug
lead
a3
SEATING PLANE
C
G C
(COPLANARITY)
DETAIL B
L
0.35
s
GAGE PLANE
B
E1
a2
A
e
DETAIL A
e3
b
N
M
GND
19
18
36
1
A
D
0.12 M A B
b
hx45°
E2

FIGURE 1:

PACKAGE OUTLINE

TITLE: PowerSO-36 LEADS
PACKAGE TYPE: P013-W
PACKAGE CODE: 8C

D I M E N S I O N S

Reference Dimension	DATA BOOK mm			DRAWING mm			DRAWING inc			NOTES
	TYP	MIN	MAX	TYP	MIN	MAX	TYP	MIN	MAX	
A			3.60			3.50			0.138	
a1		0.10	0.30		0.20	0.275		.008	.011	
a2			3.30		3.10	3.20		0.122	0.126	
a3		0	0.10		0	0.075		0	.003	
b		0.22	0.38		0.25	0.35		0.01	0.014	
c		0.23	0.32		0.24	0.3		0.009	0.012	
D		15.80	16.00		15.83	15.97		0.623	0.629	Note1
D1		9.40	9.80		9.45	9.75		0.372	0.384	
E		13.90	14.5	14.2	14.1	14.35	0.559	0.555	0.565	
E1		10.90	11.10		10.95	11.05		0.431	0.435	Note1
E2			2.90			2.85			0.112	
E3		5.80	6.20		5.9	6.1		0.232	0.24	
e	0.65			0.65	0.55	0.75	0.026	0.022	0.03	
e3	11.05			11.05			0.435			
G		0	0.10		0	0.075		0	0.003	
H		15.50	15.90		15.55	15.85		0.612	0.624	
h			1.10	1			0.039			
L		0.8	1.10		0.85	1.05		0.033	0.041	
M					2.3	2.55		0.09	0.1	
N			10deg			9deg			9deg	
R				0.3			0.012			
s			8deg	5deg	3deg	7deg	5 deg	3deg	7deg	

NOTE: (1)"D"and"E1"do not include mold flash or protrusions
-Mold flash or protrusions shall not exceed 0.15mm(.006inc.)
-Critical dimensions: "E", "G" and "a3"

COMPONENTS CROSS REFERENCE:

RIVETED FRAME 0100951 Single Strand
FRAME 0100947 Single Strand
SLUG 0062923

RIVETED FRAME 7214418 Matrix
FRAME 7220996 Matrix

RIVETED FRAME 7104740 Small Window
FRAME 7104735 Small Window

Tests Description

Test name	Description	Purpose
Package Oriented		
PC Preconditioning	The device is submitted to a typical temperature profile used for surface mounting devices, after a controlled moisture absorption.	As stand-alone test: to investigate the moisture sensitivity level. 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.
AC Auto Clave (Pressure Pot)	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.
TC Temperature Cycling	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, molding compound delamination, wire-bonds failure, die-attach layer degradation.
HTSL High Temperature Storage Life	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.
THS Thermal Humidity Storage	The THS is performed for the purpose of evaluating the reliability of non-hermetic packaged solid state devices in humidity environments. Test employs temperature and humidity under non –condensed conditions to accelerate the penetration of moisture trough the external protective material and the metallic conductor which pass trough it.	This test is used to identify failure mechanism internal to the package and is desctructive.
ES: Environmental Sequence	The device is submitted in sequence to TCT and PPT, sometimes preceded by JLn preconditioning.	To simulate the actual combination of environmental stresses interacting in the field application. The typical failure modes are those reported for JLn, TCT and PPT.
Other		

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