

Reliability Qualification Report

**ST Muar PowerSO 20 Genealogy creation for product with
PowerSO-20/36 and New Green Molding Compound
[From SUMITOMO 7307A to HITACHI CEL 9240HF10]**

General Information	
Product Line	L298P-3LF/
Product From	AR77*L693EA6
Process Plan	T93-F3RPSO2006-TU
Package Technology	PowerSO 20 .43 SLUG DOWN

Locations	
Wafer Fab Location	AM6F - Singapore 6"
Assembly Plant Location	MU1A ST MUAR - MALAYSIA
Testing Plant	MU1T ST MUAR - MALAYSIA
Reliability Assessment	ST MUAR (QA RELIABILITY LAB)

Issued By: Mohd Ibrahim GHAZALI

Approved By: Francesco VENTURA

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1 APPLICABLE AND REFERENCE DOCUMENTS

Document Reference	Short Description
AEC-Q100	Stress test qualification for integrated circuits
SOP 2.6.11	Project management for product development
SOP 2.6.19	Front-end technology platform development & qualification
SOP 2.6.2	Internals change management
SOP 2.6.7	Product maturity level
SOP 2.6.9	Package and process maturity management in Back End
SOP 2.7.5	Automotive products definition and status
0061692	Reliability tests and criteria for product qualification
8160601	Internal reliability evaluation report template
8161393	General specification for product development
7512807	Delamination analysis for plastic packages in reliability

2 TEST GLOSSARY

TEST NAME	DESCRIPTION
PC (JL3)	Preconditioning (Solder Simulation)
TC	Temperature Cycling
AC or PPT	Autoclave or Pressure Pot Test
HTSL	High Temperature Storage Life

RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

The aim of this report is to present the results of the reliability assessment evaluation performed on L298P-3LF/ (AR77*L693EA6) – ST Muar PowerSO 20 (SLUG DOWN), Genealogy creation for product with PowerSO-20/36 and new Green Molding Compound.

The main purpose is to qualify Resin HITACHI CEL 9240HF10 - Green Compound (to replace existing Resin SUMITOMO 7307A type S - Non-Green Compound).

L298P-3LF/ is processed in T93-F3RPSO2006-TU, diffused in AM6F - Singapore 6" and assembled in MU1A ST MUAR - MALAYSIA.

For the reliability assessment evaluation the following test were carried out:

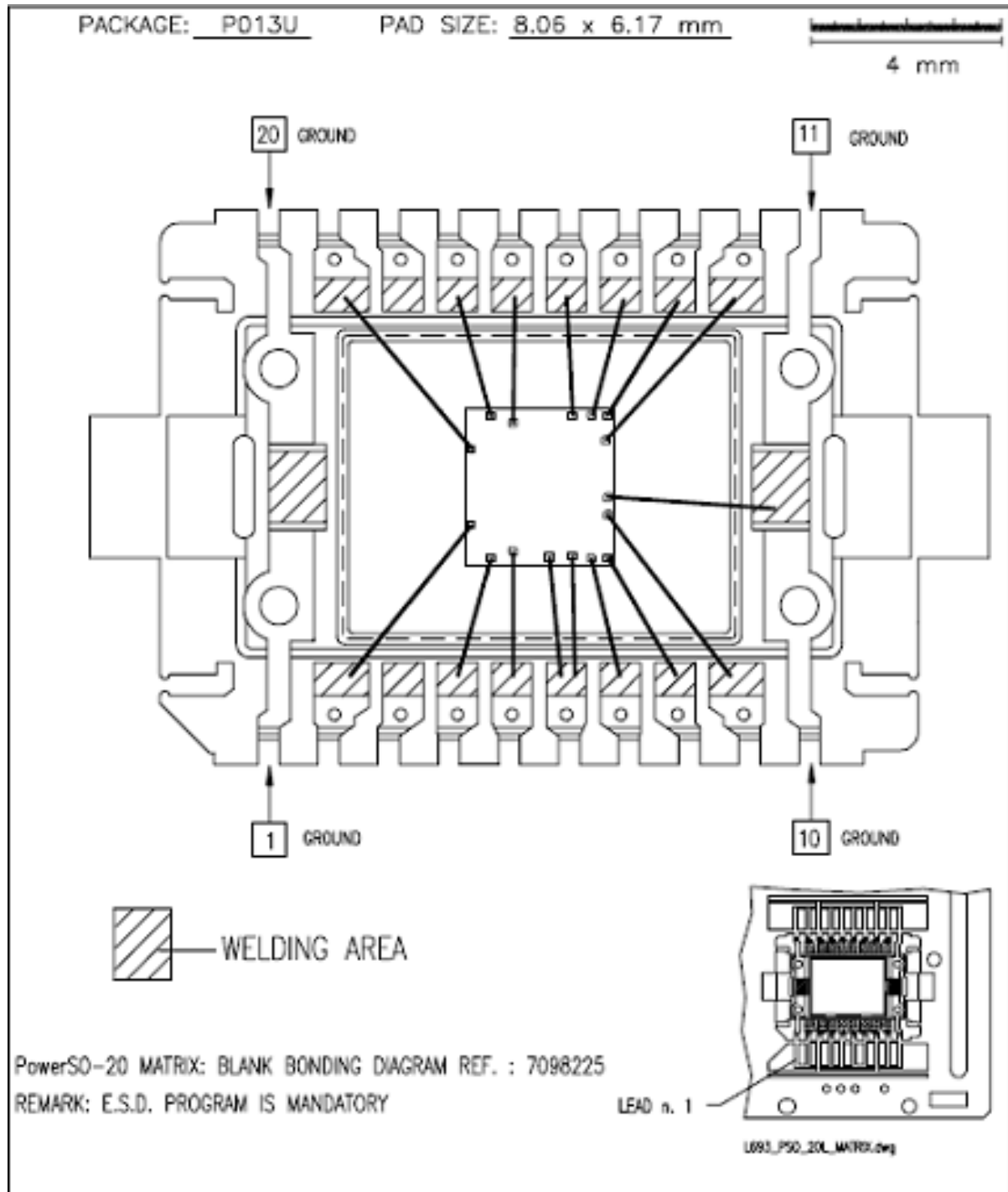
- Preconditioning JL3 (3X Reflow)
- Thermal Cycle Test (TCT)
- Autoclave / Pressure Pot Test (PPT)
- High Temperature Storage Life (HTSL)

3.2 Conclusions

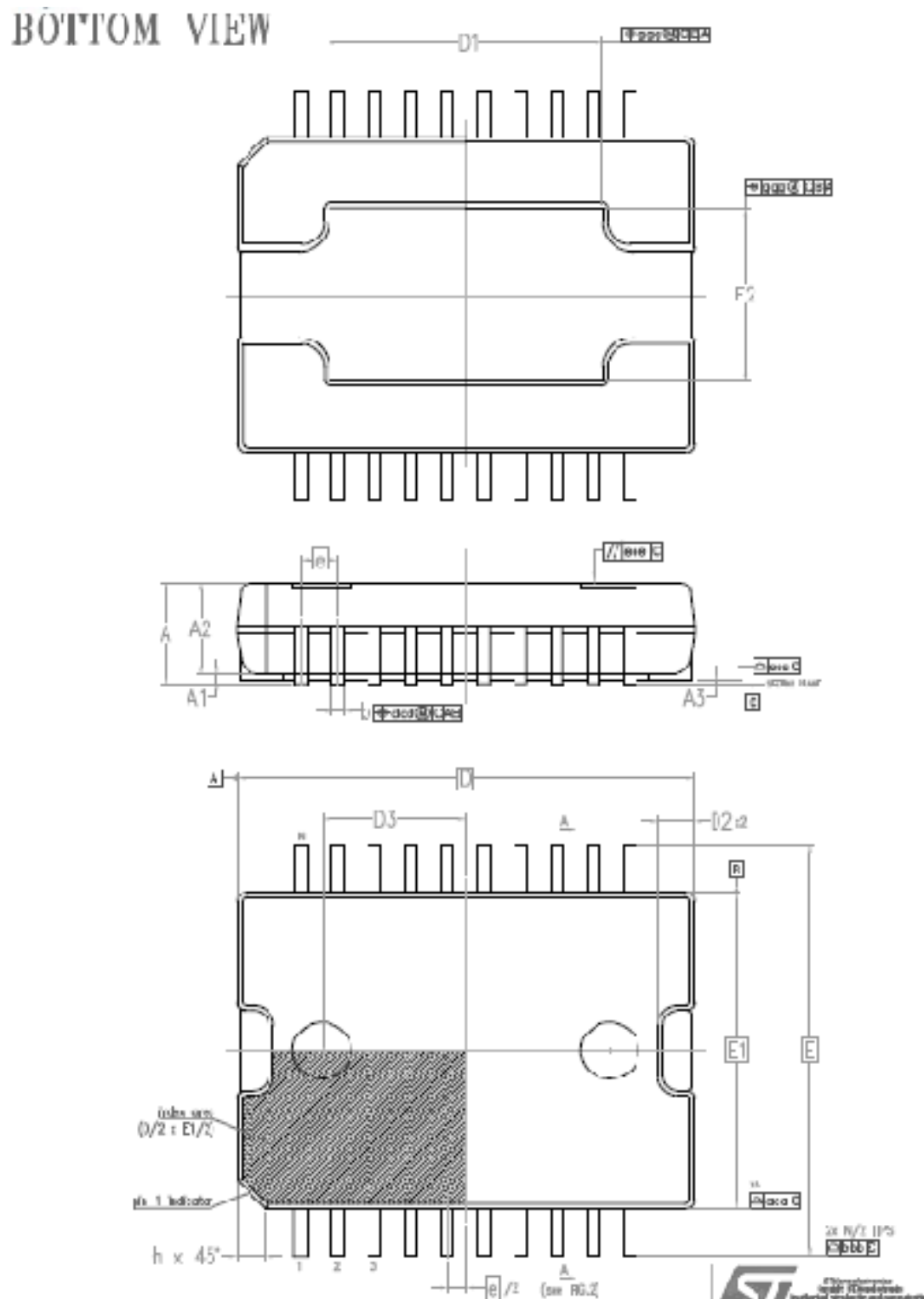
All reliability tests have been completed with positive results. Package oriented test and destructive physical analysis (SAM) also have not put in evidence any criticality to package robustness.

DEVICE CHARACTERISTICS

4.1 Bond Diagram



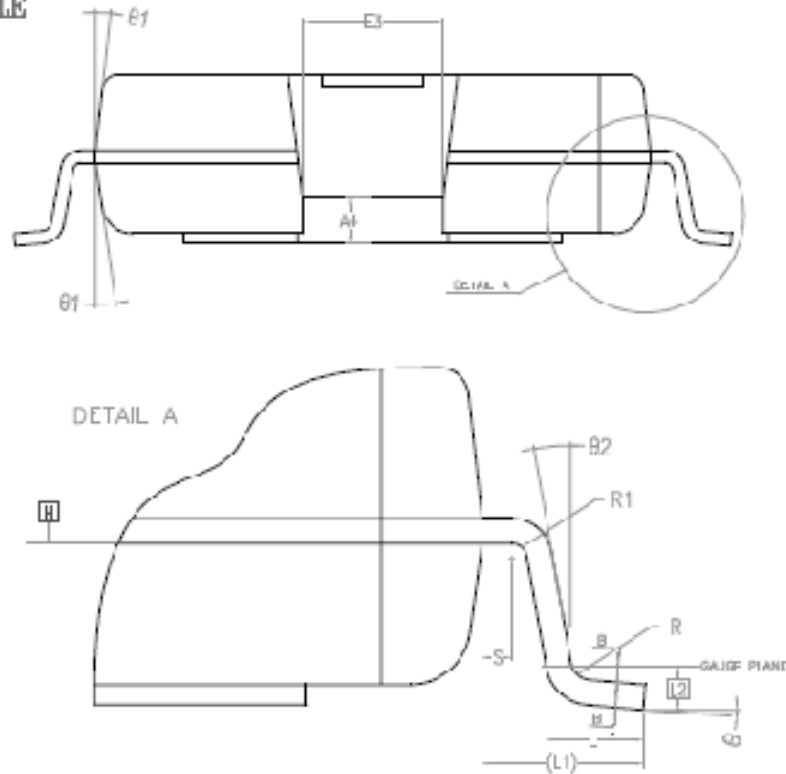
4.2 Package Outline / Mechanical Data



4.3 Package Outline / Mechanical Data

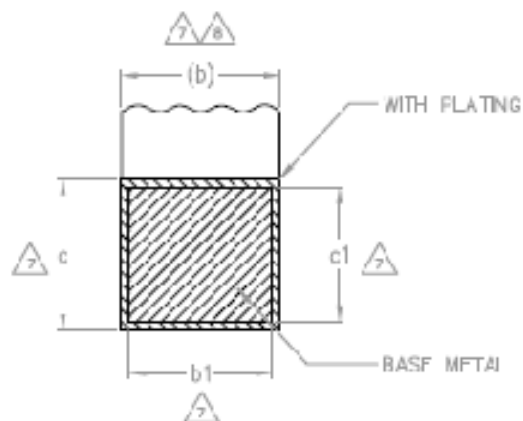
SECTION A-A

NOT TO SCALE



SECTION B-B

NOT TO SCALE



4.4 Package Outline / Mechanical Data

TITLE: POWER SO 20L

PACKAGE CODE: 77

PACKAGE TYPE: P013U

JEDEC REFERENCE NUMBER: MO-166D

PACKAGE DIMENSIONS

DATABOOK				
SYMBOL	MIN.	NOM.	MAX.	NOTE
Ø	0°	-	8°	
Ø1	5°	-	10°	
Ø2	0°	-	-	
A	-	-	3.60	
A1	0.10	-	-	
A2	3.00	3.15	3.30	
A3	0.00	-	0.10	
A4	0.80	-	1.00	
b	0.40	-	0.53	
b1	0.40	0.45	0.50	
c	0.23	-	0.32	
c1	0.23	0.25	0.29	
D	15.90 BSC			
D1	VARIATION			
D2	-	-	1.10	
D3	-	5.00	-	
e	1.27 BSC			
E	14.20 BSC			
E1	11.00 BSC			
E2	VARIATION			
E3	-	-	2.90	
h	-	-	1.10	
L	0.80	-	1.10	
L1	1.60 REF			
L2	0.35 BSC			
N	20			
R	0.20	-	-	
R1	0.20	-	-	
S	0.25	-	-	

SYMBOL		TOLERANCE OF FORM AND POSITION
		DATABOOK
aaa		0.10
bbb		0.30
ccc		0.10
ddd		0.25
eee		0.10
ggg		0.25
NOTE		1,2
REF		

VARIATIONS			
SYMBOL	MIN.	NOM.	MAX.
D1	9.00	-	13.00
E2	5.60	-	6.20

4.5 Traceability

Wafer Fab Information	
Wafer fab manufacturing location	AM6F - Singapore 6"
Wafer diameter	6 inch
Wafer thickness	280+/-25 UM
Silicon process technology	C4 - BIP (>6um)
Die finishing back side	CHROMIUM / NICKEL / GOLD
Die finishing front side	SiN (nitride)
Stepping Die Size(X,Y)	3280,3080 UM
Sawing Street Width(X,Y)	60,60 UM
Min Bond Pad Pitch	188 UM
No of Metal Layer	1

Assembly Information	
Assembly plant location	MU1A ST MUAR - MALAYSIA
Package description	PowerSO 20 .43 SLUG DOWN
Molding compound	RESIN HITACHI CEL 9240HF10 (Green)
Wire bonding materials/diameters	Au 2.0 Mils
Die attach material	PREFORM Pb/Ag/Sn
Lead frame material	FRAME PSO-20 20L Mtx

Final Testing Information	
Electrical testing location	Plant MU1T ST MUAR - MALAYSIA
Tester	A530

5. TEST RESULTS SUMMARY

5.1 Lot Information

Lot #	Diffusion Lot	Lot Details / Trace Code	Assy Lot Id	Testing Lot Id
1	V6648J3T	9971012101/ 99710121 (HITACHI CEL 9240HF10)	9971012101	9971012101

5.2 Test Plan and Results Summary (Electrical Test)

Reliability Test Status						
No	Test Name	Prec.	Condition/ Method	Steps	Fails/SS	Notes
					Lot 1	
1	PC (JL3)		Bake 24hrs @ 125°C Soak 192hrs @ 30°C/60%RH Reflow Profile = J-STD-020D (Peak Tmax = 260°C)	Final	0 / 154	Pass
2	TC	Yes	Test Conditions = -65°C / +150°C	200cyc	0 / 77	Pass
				500cyc	0 / 77	Pass
3	AC	Yes	Test Conditions = Ta = 121°C / 2 ATM	96hrs	0 / 77	Pass
4	HTSL	No	Test Conditions = Ta = 150°C (without Bias)	500hrs	0 / 77	Pass
				1000hrs	0 / 77	Pass

NOTES

All units electrically tested good after each reliability test readout.

5.3 Test Plan and Results Summary (SAM Analysis)

Reliability Test Status						
No	Test Name	Prec.	Condition/ Method	Steps	Fails/SS	Notes
					Lot 1	
1	PC (JL3)		Bake 24hrs @ 125°C Soak 192hrs @ 30°C/60%RH Reflow Profile = J-STD-020D (Peak Tmax = 260°C)	Final	0 / 40	No Delam
2	TC	Yes	Test Conditions = -65°C / +150°C	200cyc	0 / 20	No Delam
				500cyc	0 / 20	No Delam
3	AC	Yes	Test Conditions = Ta = 121°C / 2 ATM	96hrs	0 / 20	No Delam
4	HTSL	No	Test Conditions = Ta = 150°C (without Bias)	500hrs	0 / 20	No Delam
				1000hrs	0 / 20	No Delam

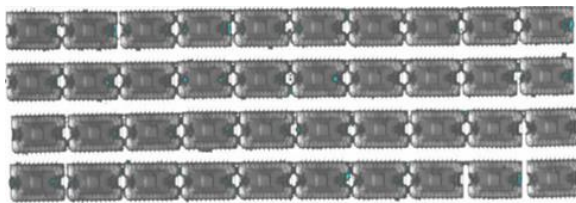
NOTES

No any delamination issue on Die Attach Material (DAM) & also on Die / Molding Compound (Die Top).

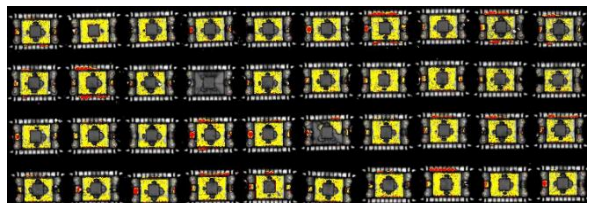
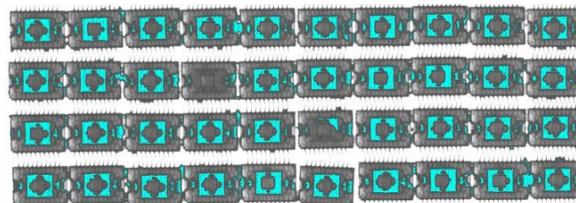
5.3.1 SAM IMAGES

Lot 1: 9971012101 ([HITACHI CEL 9240HF10](#))

Time-0 (Before Preconditioning)



After Preconditioning (MSL3 & 3X Reflow)



TESTS DESCRIPTION

6.1 Package tests description

TEST NAME	DESCRIPTION	PURPOSE
PC (JL3) Preconditioning MSL3 (solder simulation)	The device is submitted to a typical temperature profile used for surface mounting after storage in a control 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.
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 link to metal displacement, dielectric cracking, molding compound delamination, wire bonds failure, die crack.
AC or PPT Autoclave / 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. To point out critical water entry paths with consequent electrochemical and galvanic corrosion.
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