Reliability Report

BE Change

New frame TO220 SG

T.V: L7805

General Information	
Product Line	*LX05*
Product Description	*POSITIVE VR 1.5A 5V*
P/N	*L7805*
Product Group	*IPG*
Product division	*IND.& POWER CONV* *Linear Voltage Regulators & Vref*
Packages	*TO220 SG*
Silicon Process technology	*HBiP40*

Locations	
Wafer fab	*SINGAPORE Ang Mo Kio*
Assembly plant	*SHENZHEN B/E*
Reliability Lab	*IPG CATANIA*
Reliability assessment	*Pass*

DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
1.0	Nov.2014	7	Giuseppe Failla	Giovanni Presti	Final report

TABLE OF CONTENTS

1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD47I	Stress Test Driven Qualifivation of Integrated Circuit

2 GLOSSARY

DUT	Device Under Test
SS	Sample Size
PC	Preconditioning

3 RELIABILITY EVALUATION OVERVIEW

3.1 Objectives

New Enhanced TO220 Single Gauge Frame.
To optimize the overall package robustness and in particular to improve the crimping resin / frame.

3.2 Conclusion

Qualification Plan requirements have been fulfilled without exception. It is stressed that reliability tests have shown that the devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests demonstrates the ruggedness of the products and safe operation, which is consequently expected during their lifetime.

4 DEVICE CHARACTERISTICS

4.1 Device description

The L78 series of three-terminal positive regulators is available in TO-220, TO-220FP, D²PAK and DPAK packages and several fixed output voltages, making it useful in a wide range of applications.These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type embeds internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

4.2 Construction note

P/N	L7805CV / L7805ABV		
	1st Lot	2nd Lot	3rd Lot
Wafer/Die fab. information			
Wafer fab manufacturing location	SINGAPORE Ang Mo Kio		
Technology	HBiP40		
Die finishing back side	Cr/Ni/Au		
Die size	1320, 1630 micron		
Passivation type	P-VAPOX/NITRIDE		
Wafer Testing (EWS) information			
Electrical testing manufacturing location	Ang Mo Kio EWS		
Tester	ETS300		
Test program	LX05B6D01		
Assembly information			
Assembly site	SHENZHEN B/E		
Package description	TO220 - SINGLE GAUGE		
Molding compound	Epoxy		
Frame material	FRAME TO220 SG Ve3 OptD Bare copper		
Die attach material	Epoxy		
Wires bonding materials/diameters	WIRE Cu D2		
Final testing information			
Testing location	SHENZHEN B/E		
Tester	QT200		
Test program	L78FA05.CTS		

5 TESTS RESULTS SUMMARY

5.1 Test vehicle

Lot #	Process/ Package	Product	Comments
1	TO220 SG	L7805CV - L7805ABV	
2			
3			

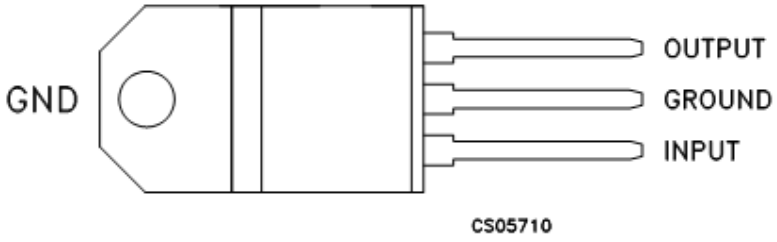
5.2 Test plan and results summary

Test	PC	Std ref.	Conditions		Steps	Failure/SS			Note
						1st Lot	2nd Lot	3rd Lot	
Die Oriented Tests									
HTSL	N	JESD22 A-103	Ta = 150°C		168h	0/45	0/45	0/45	
					500h	0/45	0/45	0/45	
					1000h	0/45	0/45	0/45	
HTSL	N	JESD22 A-103	Ta = 175°C		168h	0/45	0/45	0/45	Engineering evaluation
					500h	0/45	0/45	0/45	
					1000h	0/45	0/45	0/45	
Package Oriented Tests									
AC	N	JESD22 A-102	Pa=2Atm / Ta=121°C		96h	0/77	0/77	0/77	
					168h	0/77	0/77	0/77	Engineering evaluation
TC	N	JESD22 A-104	Ta = -65°C to 150°C		100cy	0/77	0/77	0/77	
					200cy	0/77	0/77	0/77	
					500cy	0/77	0/77	0/77	

6 ANNEXES

6.1 Device details

6.1.1 Pin connection



TO-220

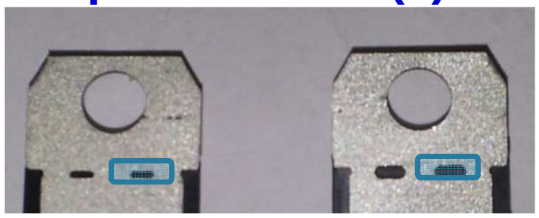
6.2 Tests Description

Test name	Description	Purpose
Die Oriented		
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.
Package Oriented		
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.

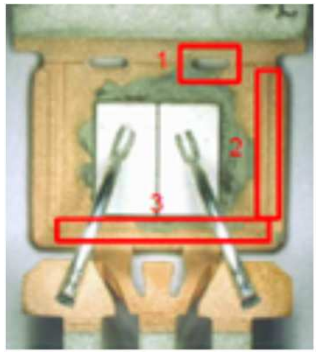
PACKAGE ROBUSTNESS

With the aim to improve the Package Robustness, **in particular the crimping resin/frame**, we changed some mechanical parameter related to the frame. In particular we worked on the Holes, Grooves and Downset characteristics implementing:

- **Larger Ovoid Holes (1)**
- **Deeper Grooves (2)**
- **Deeper Downset (3)**



(1)



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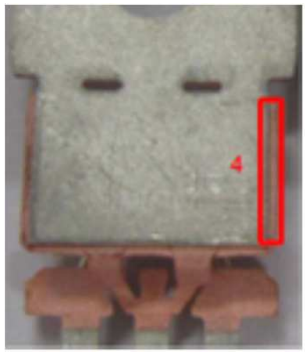
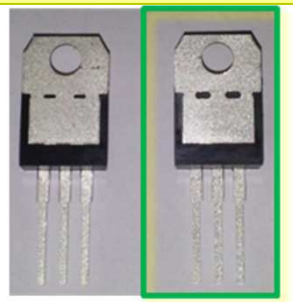
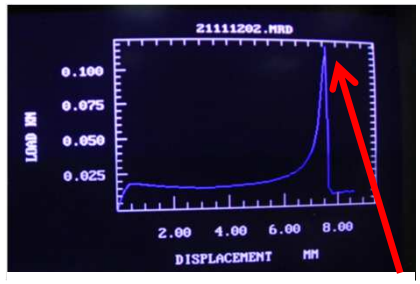


(3)

In order to verify the effectiveness of the above changes we performed, in collaboration with the CCR (Research Center at the Catania University), the ***Body Crack Test***. According to the test results we found out a significant improvement vs the first version **(60N vs. 28N)**



First and Last Version



Max Load=60N

life.augmented

PART NUMBER	STD MARKING	TEMPORARY MARKING
L7805CV	L7805CV	L7805CV3
L7805ABV	L7805ABV	L7805ABV3
L7905CV	L7905CV	L7905CV3
LF50ABV	LF50ABV	LF50ABV3
L78M05ABV	L78M05ABV	L78M05ABV3