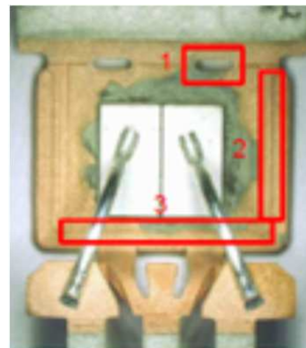
PACKAGE ROBUSTNESS

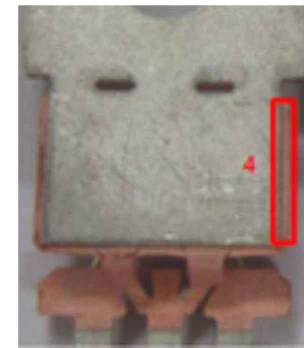
With the aim to improve the Package Robustness we changed some mechanical parameter related to the frame. In particular we worked on the Holes, Grooves and Downset characteristics implementing:

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

(1)

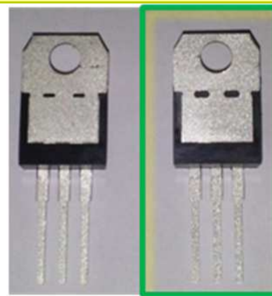


(2)

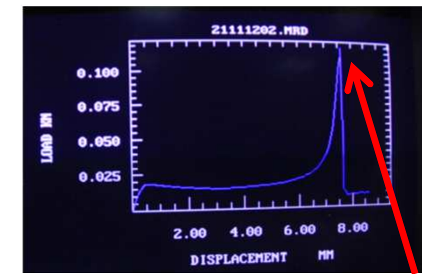


(3)

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



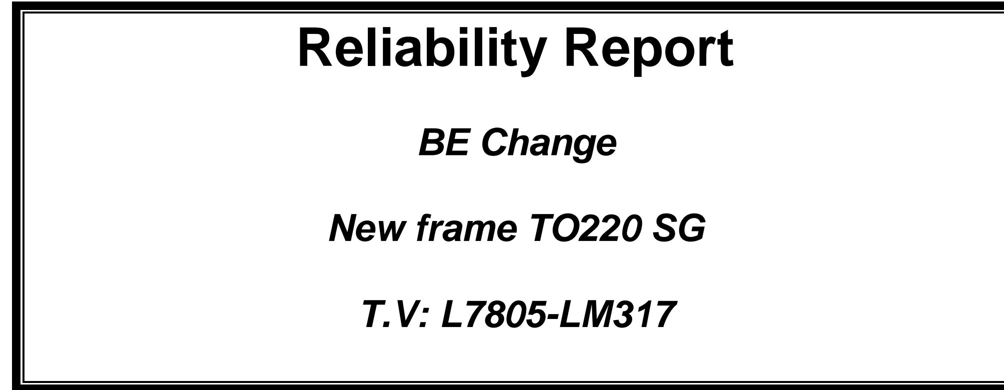
Max Load=60N

life.augmented

Marking Information

Part Number	STD Marking	Temporary Marking
LM317T	LM317T	LM317T3
LM317BT	LM317BT	LM317BT3
LM217T	LM217T	LM217T3

life.augmented



Reliability Report

BE Change

New frame TO220 SG

T.V: L7805-LM317

General Information	
Product Line	*LX05- L317*
Product Description	*Positive Voltage Regulator* *Adjustable Voltage Regulator*
P/N	*L7805* *LM317T-*
Product Group	*IPG* *IND.& POWER CONV*
Product division	*Linear Voltage Regulators & Vref*
Packages	*TO220 SG*
Silicon Process technology	*HBiP40* *BiP >6um*

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	March.2015	7	Cesario De Luca	Giovanni Presti	Final report

Note: This report is a summary of the reliability trials performed in good faith by STMicroelectronics in order to evaluate the potential reliability risks during the product life using a set of defined test methods.
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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD47I	Stress Test Driven Qualification of Integrated Circuit
REL 6088-306-W-14	TO220 SG-T.V L7805

2 GLOSSARY

DUT	Device Under Test
SS	Sample Size

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

L7805 Positive voltage regulator ICs
LM317T 1.2 V to 37 V adjustable voltage regulators

4.2 Construction note

P/N	L7805CV / L7805ABV			LM317T
	1st Lot	2nd Lot	3rd Lot	4rd Lot
Wafer/Die fab. information				
Wafer fab manufacturing location	SINGAPORE Ang Mo Kio			
Technology	HBiP40			BiP >6um
Die finishing back side	Cr/Ni/Au			
Die size	1320, 1630 micron			2410, 1920 micron
Passivation type	P-VAPOX/NITRIDE			SiN (Nitride)
Wafer Testing (EWS) information				
Electrical testing manufacturing location	Ang Mo Kio EWS			
Tester	ETS300			
Test program	LX05B6D01			L317QAE01
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	Preform			
Wires bonding materials/diameters	WIRE Cu D2			
Final testing information				
Testing location	SHENZHEN B/E			
Tester	QT200			
Test program	L78FA05.CTS			LX17FC.CTS

5 TESTS RESULTS SUMMARY

5.1 Test vehicle

Lot #	Process/ Package	Product	Comments
1	TO220 SG	L7805CV - L7805ABV	
2			
3			
4		LM317T	

5.2 Test plan and results summary

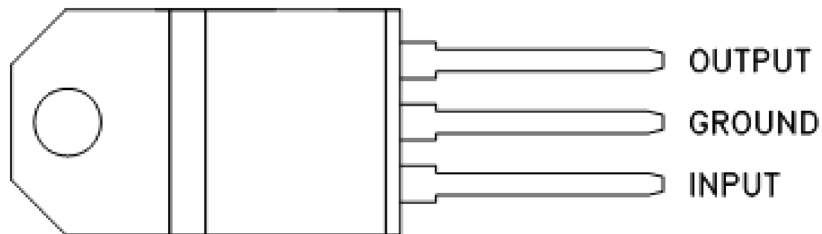
Test	PC	Std ref.	Conditions	Steps	Failure/SS				Note
					1st Lot	2nd Lot	3rd Lot	4rd Lot	
Die Oriented Tests									
HTSL	N	JESD22 A-103	Ta = 150°C	168h	0/45	0/45	0/45	0/45	
				500h	0/45	0/45	0/45	0/45	
				1000h	0/45	0/45	0/45	0/45	
HTSL	N	JESD22 A-103	Ta = 175°C	168h	0/45	0/45	0/45	0/45	Engineering evaluation
				500h	0/45	0/45	0/45	0/45	
				1000h	0/45	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	0/77	
				168h	0/77	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	0/77	
				200cy	0/77	0/77	0/77	0/77	
				500cy	0/77	0/77	0/77	0/77	

6 ANNEXES

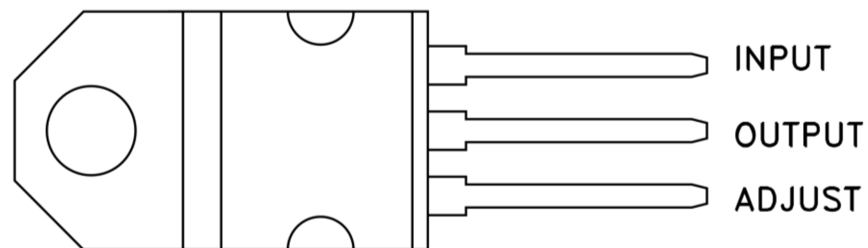
6.1 Device details

6.1.1 Pin connection

L7805



LM317



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.