Reliability Evaluation Report

QUALIFICATION of NEW RESIN on TO220

Shenzhen

General Information	
Product Lines	*TV1: XL05* *TV2: L317* *TV3: LTAD* *TV4: LF05*
P/N Positive voltage regulators	*TV1: L7805* *TV2: LM217* *TV3: LD1086* *TV4: LF50*
Product Group	*AMG*
Product division	*General Purpose Analog & RF Division*
Package	*TO220DG / TO220SG*
Silicon Process technology	*TV1: HBIP40V* *TV2: BIPOLAR* *TV3: BIPOLAR* *TV4: BIPOLAR*

Locations	
Wafer fab	*Singapore 6*
Assembly plant	*SHENZHEN*
Reliability Lab	*Catania Reliability LAB*

DOCUMENT INFORMATION

Version	Date	Pages	Handled by	Comment
1	August 2019	8	Antonio Russo Giuseppe Giacopello	Final Report

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1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD47	Stress-Test-Driven Qualification of Integrated Circuits

2 GLOSSARY

DUT	Device Under Test
SS	Sample Size

3 RELIABILITY EVALUATION OVERVIEW OBJECTIVES

In order to qualify new molding compound for TO220DG and TO220SG assembled in SHENZHEN, three assy lots of TO220SG and three assy lots of TO220DG have been requested.

4 CONCLUSION

Qualification plan has been fulfilled without exception. Reliability tests have shown that those devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests demonstrates the robustness of those products and safe operation, which is consequently expected during their lifetime.

5 DEVICE CHARACTERISTIC

5.1 Change description

Qualification of new supplier of Halogen-Free Molding Compound for TO220 package in SHENZHEN in replacement of current resin.

5.2 Construction note

P/N	L7805	LM217	LD1086	LF50
Wafer/Die fab. information				
Wafer fab manufacturing location	Ang Mo Kio 6”			
Technology	HBIP40V	BIPOLAR	BIPOLAR	BIPOLAR
Die finishing back side	Lapped Silicon			
Die size	1.320 X 1.630	2.410 X 1.920	2.320 X 2.340	2.230 X 2.190
Passivation type	SiN (nitride)			
Assembly information				
Assemby Site	SHENZHEN			
Package description	TO220			
Molding compound	Epoxy			
Die attach material	Epoxy			
Wires bonding materials/diameters	Cu 2mil			

6 TEST VEHICLE & TEST PLAN

Lot #	T.V.	Process/ Package	Product Line	Comments
1	L7805	TO220	XL05	
2	LM217		L317	
3	LD1086		LTAD	
4	LF50		LF05	

AMG (Analog & MEMS Group)
General Purpose Analog & RF Division
Signal Conditioning& Interface

Quality and Reliability

REL.6088-749-2019

Test	PC	Std ref.	Conditions	SS	Steps h=hours cy=cycles	Failure/SS					
						L7805 TO220DG	L7805 TO220SG	LM217 TO220DG	LM217 TO220SG	LD1086 TO220DG	LF50 TO220SG
Die Oriented Tests											
HTOL		JESD22 A-108	Ta=125°C Vbias= Vmax	231	168 h		0/77		0/77	0/77	
					500 h		0/77		0/77	0/77	
HTSL		JESD22 A-103	Ta=150°C	462	168 h	0/77	0/77	0/77	0/77	0/77	0/77
					500 h	0/77	0/77	0/77	0/77	0/77	0/77
					1000 h	0/77	0/77	0/77	0/77	0/77	0/77
Package Oriented Tests											
THB		JESD22 A-101	Ta = 85°C, RH=85%, BIAS +24V	75	168 h		0/25		0/25	0/25	
					500 h		0/25		0/25	0/25	
TC		JESD22 A-104	Ta = -65°C to +150°C	462	100 cy	0/77	0/77	0/77	0/77	0/77	0/77
					500 cy	0/77	0/77	0/77	0/77	0/77	0/77
					1000 cy	0/77	0/77	0/77	0/77	0/77	0/77
AC		JESD22 A-102	Pa=2Atm / Ta=121°C	462	96h	0/77	0/77	0/77	0/77	0/77	0/77
					168h	0/77	0/77	0/77	0/77	0/77	0/77

NOTE:

7 ANNEXES

7.1 Devices details

7.1.1 Pin connections

Refer to products datasheet

7.1.2 Package Mechanical data

Refer to products datasheet

8 TEST DESCRIPTION

Test name	Description	Purpose
Die Oriented		
HTOL High Temperature Operative Life	The device is stressed in static or dynamic configuration, approaching the operative max. absolute ratings in terms of junction temperature and bias condition.	To determine the effects of bias conditions and temperature on solid state devices over time. It simulates the devices' operating condition in an accelerated way. The typical failure modes are related to, silicon degradation, wire-bonds degradation, oxide faults.
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.
THB Temperature Humidity Bias	The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature and relative humidity.	To evaluate the package moisture resistance with electrical field applied, both electrolytic and galvanic corrosion are put in evidence.