

**PRODUCT / PROCESS CHANGE NOTIFICATION**

**1. PCN basic data**

<b>1.1 Company</b>		STMicroelectronics International N.V
<b>1.2 PCN No.</b>	IPD/15/9234	
<b>1.3 Title of PCN</b>	Linear Voltage Regulator and Reference BU: New Enhanced TO220 Single Gauge Frame	
<b>1.4 Product Category</b>	Linear Voltage Regulator	
<b>1.5 Issue date</b>	2015-05-11	

**2. PCN Team**

<b>2.1 Contact supplier</b>	
<b>2.1.1 Name</b>	SETTLES JEFF
<b>2.1.2 Phone</b>	+44 1628896222
<b>2.1.3 Email</b>	jeff.settles@st.com
<b>2.2 Change responsibility</b>	
<b>2.2.1 Product Manager</b>	Lorenzo NASO
<b>2.1.2 Marketing Manager</b>	Antonio RIVIERA
<b>2.1.3 Quality Manager</b>	Paolo MORETTI

**3. Change**

<b>3.1 Category</b>	<b>3.2 Type of change</b>	<b>3.3 Manufacturing Location</b>
Materials	New direct material part number (same supplier, different supplier or new supplier), lead frame, resin, wire, ...)	Shenzhen

**4. Description of change**

	<b>Old</b>	<b>New</b>
<b>4.1 Description</b>	TO220 Single Gauge Frame vers.2	Following Divisional Commitments towards a continuous improvement philosophy an enhanced frame has been introduced for the TO220 Single Gauge Frame package vers. 3. Some mechanical parameters related to the frame have been changed compared to the version currently in production. The changes are related to the back Holes of the frame, Grooves and Downset characteristics (see attached slide for better understanding). This PCN is an extension of IPG/14/9008 for products reported in products list
<b>4.2 Anticipated Impact on form, fit, function, quality, reliability or processability?</b>	no impact	

**5. Reason / motivation for change**

<b>5.1 Motivation</b>	To optimize the overall package robustness and in particular to improve the crimping resin / frame
<b>5.2 Customer Benefit</b>	QUALITY IMPROVEMENT

**6. Marking of parts / traceability of change**

<b>6.1 Description</b>	Adding "3" at the end of first row marking.. See attached examples This special marking will be valid for 6months only during the transition time. Once the production will be 100% switched to the new frame version (ver3) the marking will come back to the STD one.
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**7. Timing / schedule**

<b>7.1 Date of qualification results</b>	2015-05-07
<b>7.2 Intended start of delivery</b>	2015-08-07
<b>7.3 Qualification sample available?</b>	Upon Request

**8. Qualification / Validation**

<b>8.1 Description</b>	REL 6088-088-W-15_TO220 SG T.V L7805_LM317.pdf		
<b>8.2 Qualification report and qualification results</b>	Available (see attachment)	<b>Issue Date</b>	2015-05-11

**9. Attachments (additional documentations)**

9234PpPrdtLst.pdf  
REL 6088-088-W-15\_TO220 SG T.V L7805\_LM317.pdf  
TO220 Single Gauge v3 info.pdf

**10. Affected parts**

<b>10. 1 Current</b>		<b>10.2 New (if applicable)</b>
<b>10.1.1 Customer Part No</b>	<b>10.1.2 Supplier Part No</b>	<b>10.1.2 Supplier Part No</b>
LM217T	LM217T	
LM317T	LM317T	

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# 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
JESD471	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
	1 <sup>st</sup> Lot	2 <sup>nd</sup> Lot	3 <sup>rd</sup> Lot	4 <sup>rd</sup> Lot
<b>Wafer/Die fab. information</b>				
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)	
<b>Wafer Testing (EWS) information</b>				
Electrical testing manufacturing location	Ang Mo Kio EWS			
Tester	ETS300			
Test program	LX05B6D01		L317QAE01	
<b>Assembly information</b>				
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			
<b>Final testing information</b>				
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		LM317T	
4			

### 5.2 Test plan and results summary

Test	PC	Std ref.	Conditions	Steps	Failure/SS				Note
					1 <sup>st</sup> Lot	2 <sup>nd</sup> Lot	3 <sup>rd</sup> Lot	4 <sup>rd</sup> Lot	
<b>Die Oriented Tests</b>									
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	
<b>Package Oriented Tests</b>									
AC	N	JESD22 A-102	Pa=2Atm / Ta=121°C	96h	0/77	0/77	0/77	0/77	Engineering evaluation
				168h	0/77	0/77	0/77	0/77	
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	

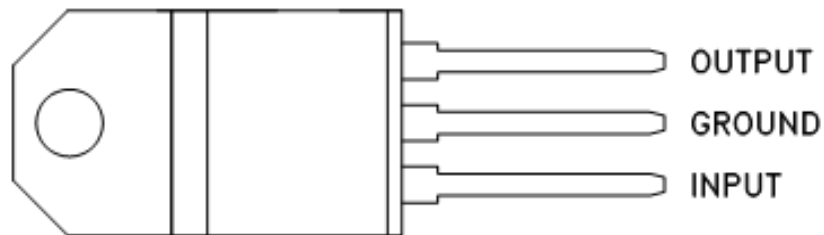


## 6 ANNEXES

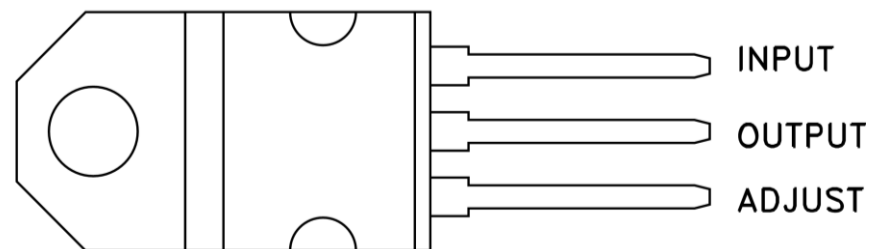
### 6.1 Device details

#### 6.1.1 Pin connection

**L7805**



**LM317**



## 6.2 Tests Description

Test name	Description	Purpose
<b>Die Oriented</b>		
<b>HTSL</b> 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.
<b>Package Oriented</b>		
<b>AC</b> 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.
<b>TC</b> 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.



## Public Products List

**PCN Title** : Linear Voltage Regulator and Reference BU:

New Enhanced TO220 Single Gauge Frame

**PCN Reference** : IPD/15/9234

**PCN Created on** : 05-May-2015

**Subject** : Public Product List

Dear Customer,

Please find below the Standard Public Products List impacted by the change.

LM317T	LM217T	
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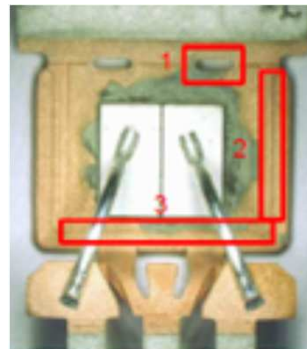
# PACKAGE ROBUSTNESS

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:

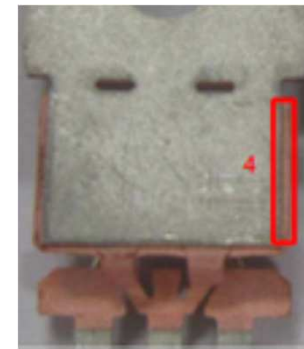
- ❖ Larger Ovoid Holes (1)
- ❖ Deeper Grooves (2)
- ❖ Deeper Downset (3)



(1)

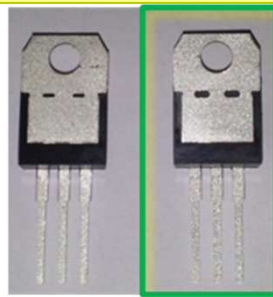


(2)

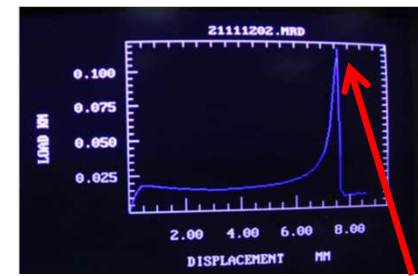


(3)

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

# Marking Information

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