RELIABILITY REPORT

FOR

MAX15011ATJ+T

PLASTIC ENCAPSULATED DEVICES

July 7, 2015

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Eric Wright
Quality Assurance
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Conclusion

The MAX15011ATJ+T successfully met the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

Table of Contents

I. Device Description

A. General

The MAX15009 includes a 300mA LDO regulator, a switched output, and an overvoltage protection (OVP) controller to protect downstream circuits from high-voltage load dump. The MAX15011 includes only the 300mA LDO regulator and switched output. Both devices operate over a wide supply voltage range from 5V to 40V and are able to withstand load-dump transients up to 45V. The MAX15009/MAX15011 feature short-circuit and thermal shutdown protection. The 300mA LDO regulator consumes 67µA quiescent current at light loads and is well suited to power battery applications. The LDO features independent enable and hold inputs, as well as a microprocessor (µP) reset output with adjustable reset timeout period. The switched output of the MAX15009/MAX15011 incorporates a low R_{DS}(ON) (0.28, typ) pass transistor switch internally connected to the output of the LDO regulator. This switch features accurate current-limit sensing circuitry and is capable of controlling remote loads. The MAX15009/MAX15011 features an adjustable current limit and a programmable delay timer to set the overcurrent detection blanking time of the switch and autoretry timeout. The MAX15009 OVP controller operates with an external enhancement mode n-channel MOSFET. While the monitored voltage remains below the adjustable threshold, the MOSFET stays on. When the monitored voltage exceeds the OVP threshold, the OVP controller quickly turns off the external MOSFET. The OVP controller is configurable as a load-disconnect switch or a voltage limiter. The MAX15009/MAX15011 are available in a thermally enhanced, 32-pin (5mm x 5mm), TQFN package and are fully specified over the -40°C to +125°C automotive operating temperature range.

II. Manufacturing Information

A. Description/Function:	300mA LDO Regulators with Switched Output and Overvoltage Protector
B. Process:	BCD8
C. Number of Device Transistors:	1219
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan, China, Thailand
F. Date of Initial Production:	January 25, 2008

III. Packaging Information

A. Package Type:	32-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2491
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	47°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	1.7°C/W

IV. Die Information

A. Dimensions:	128 X 130 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	2.0 microns (as drawn)
F. Minimum Metal Spacing:	1.0 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Don Lipps (Manager, Reliability Engineering) Bryan Preeshl (Vice President of QA)
B. Outgoing Inspection Level:	0.1% for all electrical parameters guaranteed by the Datasheet. 0.1% for all Visual Defects.
C. Observed Outgoing Defect Rate:	< 50 ppm
D. Sampling Plan:	Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad \text{(Chi square value for MTTF upper limit)}$$

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 22.9 \times 10^{-9}$

λ = 22.9 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the BCD8 Process results in a FIT Rate of 0.07 @ 25°C and 1.29 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The NP97-3 die type has been found to have all pins able to withstand an HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX15011ATJ+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	

Note 1: Life Test Data may represent plastic DIP qualification lots.