

RELIABILITY REPORT
FOR
MAX15010ATJ+
PLASTIC ENCAPSULATED DEVICES

May 28, 2010

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX15010ATJ+ successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

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I. Device Description

A. General

The MAX15008 features a 300mA LDO regulator, a voltage tracker, and an overvoltage protection (OVP) controller to protect downstream circuits from high-voltage load dump. The MAX15010 includes only the 300mA LDO voltage regulator and voltage tracker. Both devices operate over a wide 5V to 40V supply voltage range and are able to withstand load-dump transients up to 45V. The MAX15008/MAX15010 feature short-circuit and thermal-shutdown protection. These devices offer highly integrated power-management solutions for automotive applications such as instrument clusters, climate control, and a variety of automotive power-supply circuits. The 300mA LDO regulator consumes less than 67 μ A quiescent current at light loads and is well suited to power always-on circuits during "key off" conditions. The LDO features independent enable and hold inputs as well as a microprocessor (μ P) reset output with an adjustable reset timeout period. The voltage tracker accurately (\pm 3mV) tracks a voltage applied to its input from either the LDO output or an external source. It can supply up to 50mA of current to a remote sensor, allowing for precise ratiometric tracking in automotive applications. A separate enable input turns the tracker on or off, reducing supply current when the tracker is unused. The voltage tracker also features protection against battery reversal, an output short circuit to the battery, or an output-voltage excursion below ground potential to as much as -5V. The MAX15008 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 MAX15008/MAX15010 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:	Automotive 300mA LDO Voltage Regulators with Tracker Output and Overvoltage Protector
B. Process:	BCD8
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Malaysia, 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:	#05-9000-2490
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 ₃ N 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
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 (Managing Director 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 0 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

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

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the BCD8 Process results in a FIT Rate of 0.06 @ 25C and 1.08 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The NP97-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX15010ATJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data