RELIABILITY REPORT

FOR

MAX16948AGTE+

PLASTIC ENCAPSULATED DEVICES

April 19, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Reliability Engineer

Conclusion

The MAX16948AGTE 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 MAX16948 is a dual high-voltage, current-sensing low dropout linear regulator (LDO)/switch designed to operate with an input voltage range from 4.5V to 28V (45V load dump tolerant). The device provides phantom power over coax cable to remote radio frequency low-noise amplifiers (LNAs) in automotive systems with a maximum current of 300mA per channel. The device also provides a fixed regulated output voltage of 8.5V or an adjustable 1V to 12V output voltage. The device can also be configured as a switch. The device monitors the load current and provides an analog output current proportional to the sensed load current. Accurate internal current limits protect the input supply against both overcurrent and short-circuit conditions. The device features an open-drain error output for each channel to indicate to the microcontroller (µC) when a fault has occurred. The device features short-to-battery protection to latch off the internal LDO/switch during a short-to-battery event. During a thermal overload, the device reduces power dissipation by going into thermal shutdown. It includes two independent active-low, high-voltage-compatible shutdown inputs to place each channel in a low-power shutdown mode. The device is available in a 16-pin TQFN package with exposed pad, a 16-pin QSOP package with exposed pad, or a 16-pin QSOP package and is fully specified over the -40°C to +105°C temperature range.

II. Manufacturing Information

A. Description/Function:	Automotive Dual Remote Antenna Current-Sense LDO/Switch
B. Process:	S4
C. Number of Device Transistors:	7785
D. Fabrication Location:	San Antonio
E. Assembly Location:	China
F. Date of Initial Production:	September 23, 2011

III. Packaging Information

A. Package Type:	16L TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4297 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	59.3°C/W
K. Single Layer Theta Jc:	6°C/W
L. Multi Layer Theta Ja:	40°C/W
M. Multi Layer Theta Jc:	6°C/W

IV. Die Information

A. Dimensions:	70 X 80 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:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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:	Richard Aburano (Manager, Reliability Engineering) 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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 80 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 13.7 \times 10^{-9}$

$\lambda = 13.7$ 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 S4 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TAAO0Q002C D/C 1134)

The AP26 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 +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX16948AGTE/V+

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	80	0	TAAO0Q002C, D/C 1134

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