RELIABILITY REPORT

FOR

MAX16904SAUE50+

PLASTIC ENCAPSULATED DEVICES

February 11, 2014

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX16904SAUE50+ successfully meets 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.

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I. Device Description

A. General

The MAX16904 is a small, synchronous buck converter with integrated high-side and low-side switches. The device is designed to deliver 600mA with input voltages from +3.5V to +28V while using only 25µA quiescent current at no load. Voltage quality can be monitored by observing the PGOOD signal. The MAX16904 can operate in dropout by running at 97% duty cycle, making it ideal for automotive and industrial applications. The MAX16904 operates at a 2.1MHz frequency, allowing for small external components and reduced output ripple. It guarantees no AM band interference. SYNC input programmability enables three frequency modes for optimized performance: forced fixed-frequency operation, SKIP mode (ultra-low quiescent current of 25µA), and synchronization to an external clock. The MAX16904 can be ordered with spread-spectrum frequency modulation, designed to minimize EMI-radiated emissions due to the modulation frequency. The MAX16904 is available in a thermally enhanced, 3mm x 3mm, 10-pin TDFN package or a 16-pin TSSOP package. The MAX16904 operates over the -40°C to +125°C automotive temperature range.

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II. Manufacturing Information

A. Description/Function:	2.1MHz, High-Voltage, 600mA Mini-Buck Converter
B. Process:	S45
C. Number of Device Transistors:	9115
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Thailand
F. Date of Initial Production:	September 24, 2010

III. Packaging Information

A. Package Type:	16-pin TSSOP
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:	#05-9000-3519
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:	3°C/W
L. Multi Layer Theta Ja:	38.3°C/W
M. Multi Layer Theta Jc:	3°C/W

IV. Die Information

A. Dimensions:	63X70 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 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

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

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000 \times 4340 \times 252 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 0.84 \times 10^{-9}$

λ = 0.84 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 S45 Process results in a FIT Rate of 0.13 @ 25C and 2.31 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (TTDZGQ002C, D/C 1025)

The AP08 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM: +/- 2500V per JEDEC JESD22-A114
ESD-CDM: +/- 750V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of+/- 50mA and overvoltage per JEDEC JESD78.

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Table 1

Reliability Evaluation Test Results

MAX16904SAUE50+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	80	0	TTDZIA004B, D/C 1131
	Biased	& functionality	172	0	TTDYCQ003F, D/C 1105
	Time = 1000 hrs.				

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

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