RELIABILITY REPORT

FOR

MAX16932BATIS+

PLASTIC ENCAPSULATED DEVICES

February 29, 2016

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX16932BATIS+ 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.

Table of Contents

I. Device Description

A. General

The MAX16932/MAX16933 offer two high-voltage, synchronous step-down controllers that use only 20µA of quiescent current with no load. They operate with an input voltage supply from 3.5V to 42V and can operate in drop-out condition by running at 95% duty cycle. The devices are intended for applications with mid- to high-power requirements and requiring two independently controlled output supplies, such as automotive applications. The MAX16932/MAX16933 step-down controllers operate 180° out-of-phase for reduced input ripple. The devices also operate with switching frequencies up to 2.2MHz to allow use of small external components and to guarantee no AM band interference. The FSYNC input programmability enables three frequency modes for optimized performance: forced fixed-frequency operation, skip mode with ultra-low quiescent current (20µA), and synchronization to an external clock. The devices provide a spread-spectrum option to minimize EMI interference. The devices also feature a power-OK monitor and overvoltage and undervoltage lockout. Protection features include cycle-by-cycle current limit and thermal shutdown. The devices are available in a 28-pin TQFN-EP package and are specified for operation over the -40°C to +125°C automotive temperature range.

II. Manufacturing Information

A. Description/Function:	2.2MHz, 36V, Dual Buck with 20µA Quiescent Current
B. Process:	S45
C. Number of Device Transistors:	24795
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Taiwan
F. Date of Initial Production:	June 28, 2013

III. Packaging Information

A. Package Type:	28-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:	#05-9000-5176
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:	48°C/W
K. Single Layer Theta Jc:	2.7°C/W
L. Multi Layer Theta Ja:	35°C/W
M. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	80X102 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

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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 77 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 14.3 \times 10^{-9}$

$\lambda = 14.3$ 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 3.2 @ 25C and 55.4 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TAKR0Q002F, D/C 1249)

The AP32-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V 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

MAX16932BATIS/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	77	0	TAKQ9Q002, D/C 1306

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