

RELIABILITY REPORT  
FOR  
MAX16952AUE+  
PLASTIC ENCAPSULATED DEVICES

April 25, 2013

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

<b>Approved by</b>
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## Conclusion

The MAX16952AUE+ 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 MAX16952 is a current-mode, synchronous PWM step-down controller designed to operate with input voltages from 3.5V to 36V while using only 50 $\mu$ A of quiescent current at no load. The switching frequency is adjustable from 1MHz to 2.2MHz by an external resistor and can be synchronized to an external clock up to 2.4MHz. The MAX16952 output voltage is pin programmable to be either 5V fixed or adjustable from 1V to 10V. The wide input voltage range, along with its ability to operate in dropout during undervoltage transients, makes it ideal for automotive and industrial applications. The MAX16952 operates in fixed-frequency PWM mode and low quiescent current skip mode. It features an enable logic input, which is compatible up to 42V to disable the device and reduce its shutdown current to 10 $\mu$ A. Protection features include overcurrent limit, overvoltage, undervoltage, and thermal shutdown with automatic recovery. The device also features a power-good monitor to ease power-supply sequencing. The MAX16952 is available in a thermally enhanced 16-pin TSSOP package with exposed pad and is specified for operation over the -40°C to +125°C automotive temperature range.

## II. Manufacturing Information

A. Description/Function:	36V, 2.2MHz Step-Down Controller with Low Operating Current
B. Process:	S45
C. Number of Device Transistors:	11623
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Philippines or Thailand
F. Date of Initial Production:	September 29, 2012

## 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:	#05-9000-4017
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:	80 X 74 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (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 <sub>2</sub>
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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 2.6 \times 10^{-9}$$

$$\lambda = 2.6 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 (lot TF9YGQ003B, D/C 1108)

The AP24-1 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

**MAX16952AUE/V+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 1000 hrs.	DC Parameters & functionality	80	0	TF9YG003C, D/C 1151

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