RELIABILITY REPORT

FOR

MAX16012TT+T

PLASTIC ENCAPSULATED DEVICES

June 10, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX16012TT+T 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 MAX16010-MAX16014 is a family of ultra-small, low-power, overvoltage protection circuits for high-voltage, high-transient systems such as those found in automotive, telecom, and industrial applications. These devices operate over a wide 5.5V to 72V supply voltage range, making them also suitable for other applications such as battery stacks, notebook computers, and servers. The MAX16010 and MAX16011 offer two independent comparators for monitoring both undervoltage and overvoltage conditions. These comparators offer open-drain outputs capable of handling voltages up to 72V. The MAX16010 features complementary enable inputs (EN/active-low EN), while the MAX16011 features an active-high enable input and a selectable active-high/low OUTB output. The MAX16012 offers a single comparator and an independent reference output. The reference output can be directly connected to either the inverting or noninverting input to select the comparator output logic. The MAX16013 and MAX16014 are overvoltage protection circuits that are capable of driving two p-channel MOSFETs to prevent reverse-battery and overvoltage conditions. One MOSFET (P1) eliminates the need for external diodes, thus minimizing the input voltage drop. The second MOSFET (P2) isolates the load or regulates the output voltage during an overvoltage condition. The MAX16014 keeps the MOSFET (P2) latched off until the input power is cycled. The MAX16010 and MAX16011 are available in small 8-pin TDFN packages, while the MAX16012/MAX16013/MAX16014 are available in small 6-pin TDFN packages. These devices are fully specified from -40°C to +125°C.

II. Manufacturing Information

A. Description/Function:	Ultra-Small, Overvoltage Protection/Detection Circuits
B. Process:	BCD8
C. Number of Device Transistors:	369
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	April 23, 2005

III. Packaging Information

A. Package Type:	6-pin TDFN 3x3
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:	#05-9000-1823
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:	55°C/W
K. Single Layer Theta Jc:	9°C/W
L. Multi Layer Theta Ja:	42°C/W
M. Multi Layer Theta Jc:	9°C/W

IV. Die Information

A. Dimensions:	61 X 62 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:	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:	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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 96 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 11.5 \times 10^{-9}$

λ = 11.5 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. E.S.D. and Latch-Up Testing (lot NVDCAQ001A D/C 0511)

The MS94-2 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

MAX16012TT+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	48	0	NVDAAQ001D, D/C 0511
	Biased	& functionality	48	0	N0000Q004B, D/C 0542
	Time = 192 hrs.				

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