



RELIABILITY REPORT  
FOR  
MAX6459UTB+  
PLASTIC ENCAPSULATED DEVICES

August 31, 2009

**MAXIM INTEGRATED PRODUCTS**

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

The MAX6459UTB+ 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 MAX6457-MAX6460 high supply voltage, low-power voltage monitors operate over a 4V to 28V supply voltage range. Each device includes a precision bandgap reference, one or two low-offset voltage comparators, internal threshold hysteresis, power-good or reset timeout options, and one or two high-voltage open-drain outputs. Two external resistors (three for window detection) set the trip threshold voltages. The MAX6457 is a single voltage monitor for undervoltage or overvoltage detection. A logic-based clear input either latches the output for overvoltage applications or allows the device to operate in transparent mode. The MAX6458 includes two comparators (one overvoltage and one undervoltage) for window detection and a single output to indicate if the monitored input is within an adjustable voltage window. The MAX6459 includes dual overvoltage/undervoltage comparators with two independent comparator outputs. Use the MAX6459 as a window comparator with separate undervoltage and overvoltage outputs or as two independent, single voltage monitors. The MAX6460 includes a single comparator and an internal reference, and can also accept an external reference. The inverting and noninverting inputs of the comparator are externally accessible to support positive or negative voltage monitors and to configure the device for active-high or active-low output logic. The MAX6457/MAX6458 offer fixed timing options as a voltage detector with a 50 $\mu$ s typical delay or as a reset circuit with a 90ms minimum reset timeout delay. The monitored input must be above the adjusted trip threshold (or within the adjusted voltage window for the MAX6458) for the selected timeout period before the output changes state. The MAX6459/MAX6460 offer only a fixed 50 $\mu$ s timeout period. Internal threshold hysteresis options (0.5%, 5%, and 8.3% for the MAX6457/MAX6458/MAX6459, and 0.5% for the MAX6460) reduce output chatter in noise-sensitive applications. Each device is available in a small SOT23 package and specified over the extended temperature range of -40°C to +125°C.

## II. Manufacturing Information

A. Description/Function:	High-Voltage, Low-Current Voltage Monitors in SOT Packages
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	July 27, 2002

## III. Packaging Information

A. Package Type:	6-pin SOT23
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-1601-0190
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Jb:	115°C/W
K. Single Layer Theta Jc:	80°C/W

## IV. Die Information

A. Dimensions:	53 X 35 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:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Ken Wendel (Director, Reliability Engineering)  
Bryan Preeshl (Managing Director 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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 45 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.9 \times 10^{-9}$$

$$\lambda = 23.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the B3 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

### B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

### C. E.S.D. and Latch-Up Testing

The MS80-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-200 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX6459UTB+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	45	0
<b>Moisture Testing</b> (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data