

RELIABILITY REPORT  
FOR  
MAX7501MSA+  
PLASTIC ENCAPSULATED DEVICES

April 27, 2015

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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

The MAX7501MSA+ 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 MAX7500-MAX7504 temperature sensors accurately measure temperature and provide an overtemperature alarm/interrupt/shutdown output. These devices convert the temperature measurements to digital form using a high-resolution, sigma-delta, analog-to-digital converter (ADC). Communication is through an I<sup>2</sup>C-compatible 2-wire serial interface. The MAX7500/MAX7501/MAX7502 integrate a timeout feature that offers protection against I<sup>2</sup>C bus lockups. The MAX7503/MAX7504 do not include the timeout feature. The 2-wire serial interface accepts standard write byte, read byte, send byte, and receive byte commands to read the temperature data and configure the behavior of the open-drain overtemperature shutdown output. The MAX7500 features three address select lines, while the MAX7501-MAX7504 feature two address select lines and an active-low RESET input. The MAX7500/MAX7501/MAX7502s' 3.0V to 5.5V supply voltage range, low 250μA supply current, and a lockup-protected I<sup>2</sup>C-compatible interface make them ideal for a wide range of applications, including personal computers (PCs), electronic test equipment, and office electronics. The MAX7500-MAX7504 are available in 8-pin μMAX® and SO packages and operate over the -55°C to +125°C temperature range.

## II. Manufacturing Information

A. Description/Function:	Digital Temperature Sensors and Thermal Watchdog with Bus Lockup Protection
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:	October 23, 2004

## III. Packaging Information

A. Package Type:	8-pin SOIC (N)
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:	#05-9000-1253
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:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	136°C/W
M. Multi Layer Theta Jc:	38°C/W

## IV. Die Information

A. Dimensions:	58X58 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:	
H. Isolation Dielectric:	SiO <sub>2</sub>
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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 4.40 \times 10^{-9}$$

$\lambda = 4.40$  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 B8 Process results in a FIT Rate of 0.01 @ 25C and 0.26 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot SRT1CQ001B, D/C 0514)

The TS61-1 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 +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX7501MSA+**

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	48	0	SRTOCA006N, D/C 0727

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