

RELIABILITY REPORT  
FOR  
MAX6616AEG+T / MAX6616BEG+T  
PLASTIC ENCAPSULATED DEVICES

September 28, 2010

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX6616AEG+T/MAX6616BEG+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 MAX6615/MAX6616 monitor two temperature channels, either the internal die temperature and the temperature of an external thermistor, or the temperatures of two external thermistors. The temperature data controls a PWM output signal to adjust the speed of a cooling fan, thereby minimizing noise when the system is running cool, but providing maximum cooling when power dissipation increases. The fans' tachometer output signals are monitored by the MAX6615/MAX6616 to detect fan failure. If a fan failure is detected, the active-low FAN\_FAIL output is asserted. The 2-wire serial interface accepts standard system management bus (SMBus(tm)) write byte, read byte, send byte, and receive byte commands to read the temperature data and program the alarm thresholds. The programmable alarm output can be used to generate interrupts, throttle signals, or overtemperature shutdown signals. The MAX6616 features six GPIOs to provide additional flexibility. All of the GPIOs power-up as inputs, with the exception of GPIO0, which powers up as either an input or an output as determined by connecting the PRESET pin to ground or VCC. The MAX6616 is available in a 24-pin QSOP package, while the MAX6615 is available in a 16-pin QSOP package. Both devices operate from a single-supply voltage range of 3.0V to 5.5V, have operating temperature ranges of -40°C to +125°C, and consume just 500µA of supply current.

## II. Manufacturing Information

A. Description/Function:	Dual-Channel Temperature Monitors and Fan-Speed Controllers with Thermistor Inputs
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:	April 23, 2005

## III. Packaging Information

A. Package Type:	24-pin QSOP
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:	#05-9000-1545
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:	105°C/W
K. Single Layer Theta Jc:	34°C/W
L. Multi Layer Theta Ja:	88°C/W
M. Multi Layer Theta Jc:	34°C/W

## IV. Die Information

A. Dimensions:	84 X 102 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:	Richard Aburano (Manager, Reliability Operations) 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 22.9 \times 10^{-9}$$
$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot SK1ABQ001C, D/C 0502)

The TS68 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 600V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of 250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX6616**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	SK1ABQ001C, D/C 0502

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