

RELIABILITY REPORT
FOR
MAX6581TG9A+
PLASTIC ENCAPSULATED DEVICES

September 20, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX6581TG9A+ 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 MAX6581 precision multichannel temperature sensor monitors its own temperature and the temperatures of up to seven external diode-connected transistors. All temperature channels have programmable alert and overtemperature thresholds. When the measured temperature of a channel crosses the respective threshold, a status bit is set in one of the status registers. Two open-drain alarm outputs (active-low ALERT and active-low OVERT) assert corresponding to these bits in the status register(s). Resistance cancellation is available for all channels and compensates for high series resistance in circuit-board traces and thermal diodes. The 2-wire serial interface accepts SMBus(tm) protocols (write byte, read byte, send byte, and receive byte) for reading the temperature data and programming the alarm thresholds. The MAX6581 is specified for an operating temperature range of -40°C to +125°C and is available in a 24-pin, 4mm × 4mm thin QFN package with an exposed pad.

II. Manufacturing Information

A. Description/Function:	±1°C Accurate 8-Channel Temperature Sensor
B. Process:	S4
C. Number of Device Transistors:	50747
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Thailand
F. Date of Initial Production:	June 16, 2010

III. Packaging Information

A. Package Type:	24-pin TQFN 4x4
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:	#05-9000-3565
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:	48°C/W
K. Single Layer Theta Jc:	2.7°C/W
L. Multi Layer Theta Ja:	36°C/W
M. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	89 X 89 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al 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:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Don Lipps (Manager, 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 (λ) is calculated as follows:

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

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

$$\lambda = 22.9 \times 10^{-9}$$

$\lambda = 22.9$ 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 S4 Process results in a FIT Rate of 0.05 @ 25C and 0.83 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TTYZDA021F, D/C 1030)

The TT01 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

MAX6581TG9A+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	TTYZDQ002DQ, D/C 0932

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