RELIABILITY REPORT

FOR

MAX6680MEE+T

PLASTIC ENCAPSULATED DEVICES

May 10, 2017

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Eric Wright Reliability Engineer	Brian Standley Manager, Reliability

Conclusion

The MAX6680MEE+T 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.

Table of Contents

I. Device Description

A. General

The MAX6680/MAX6681 are precise, two-channel digital thermometers. Each accurately measures the temperature of its own die and one remote PN junction and reports the temperature on a 2-wire serial interface. The remote junction can be a diode-connected transistor like the low-cost NPN type 2N3904 or PNP type 2N3906. The remote junction can also be a common-collector PNP, such as a substrate PNP of a microprocessor. The MAX6680/MAX6681 include pin-programmable default temperature thresholds for the active-low OVERT output, which provides fail-safe clock throttling or system shutdown. In addition, the devices are pin programmable to select whether the active-low OVERT output responds to either the local, remote, or both temperatures. The 2-wire serial interface accepts standard System Management Bus (SMBus(tm)) commands such as Write Byte, Read Byte, Send Byte, and Receive Byte to read the temperature data and program the alarm thresholds and conversion rate. The MAX6680/MAX6681 can function autonomously with a programmable conversion rate, which allows the control of supply current and temperature update rate to match system needs. For conversion rates of 4Hz or less, the remote sensor temperature can be represented in extended mode as 10 bits + sign with a resolution of 0.125°C. When the conversion rate is 8Hz, output data is 7 bits + sign with a resolution of 1°C. The MAX6680/MAX6681 also include an SMBus timeout feature to enhance system reliability. The MAX6681 is an upgrade to the MAX6654. The MAX6680/MAX6681 remote accuracy is ±1°C with no calibration needed. They are available in a 16-pin QSOP package and operate throughout the -55°C to +125°C temperature range.

II. Manufacturing Information

A. Description/Function:	±1°C Fail-Safe Remote/Local Temperature Sensors with SMBus Interface
B. Process:	B8
C. Fabrication Location:	USA
D. Assembly Location:	Philippines, Malaysia, Thailand
E. Date of Initial Production:	April 27, 2002

III. Packaging Information

A. Package Type:	16-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:	#05-2901-0040
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:	120°C/W
K. Single Layer Theta Jc:	37°C/W
L. Multi Layer Theta Ja:	103.7°C/W
M. Multi Layer Theta Jc:	37°C/W

IV. Die Information

A. Dimensions:	83X106 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:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Isolation Dielectric:	SiO_2
H. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Eric Wright (Reliability Engineering) Brian Standley (Manager, Reliability) 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 (λ) is calculated as follows:

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

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

$\lambda = 24.43 \times 10^{-9}$

$\lambda = 24.43$ 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 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The TS35 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1

Reliability Evaluation Test Results

MAX6680MEE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	45	0	

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