RELIABILITY REPORT

FOR

MAX6651EEE+T

PLASTIC ENCAPSULATED DEVICES

July 24, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Reliability Engineer

Conclusion

The MAX6651EEE+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 MAX6650/MAX6651 fan controllers use an SMBus(tm)/I²C-compatible interface to regulate and monitor the speed of 5VDC/12VDC brushless fans with built-in tachometers. They automatically force the fan's tachometer frequency (fan speed) to match a preprogrammed value in the Fan-Speed Register by using an external MOSFET or bipolar transistor to linearly regulate the voltage across the fan. The MAX6650 regulates the speed of a single fan by monitoring its tachometer output. The MAX6651 also regulates the speed of a single fan, but it contains additional tachometer inputs to monitor up to four fans and control them as a single unit when they are used in parallel. The MAX6650/MAX6651 provide general-purpose input/output (GPIO) pins that serve as digital inputs, digital outputs, or various hardware interfaces. Capable of sinking 10mA, these open-drain inputs/outputs can drive an LED. To add additional hardware control, configure GPIO1 to fully turn on the fan in case of software failure. To generate an interrupt when a fault condition is detected, configure GPIO0 to behave as an active-low alert output. Synchronize multiple devices by setting GPIO2 (MAX6651 only) as an internal clock output or an external clock input. The MAX6650 is available in a space-saving 10-pin µMAX® package, and the MAX6651 is available in a small 16-pin QSOP package.

II. Manufacturing Information

A. Description/Function:	Fan-Speed Regulators and Monitors with SMBus(tm)/I²C-Compatible Interface
B. Process:	TS60
C. Number of Device Transistors:	
D. Fabrication Location:	Taiwan
E. Assembly Location:	Malaysia, Thailand, Philippines
F. Date of Initial Production:	July 22, 2000

III. Packaging Information

A. Package Type:	0.150 16L 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:	#05-1601-0098 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	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:	60 X 86 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal 1 - 0.9 microns / Metal 2 - 0.9 microns (as drawn)
F. Minimum Metal Spacing:	Metal 1 - 0.9 microns / Metal 2 - 0.9 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Engineering) 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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 160 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 6.9 \times 10^{-9}$

$\lambda = 6.9$ 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 TS60 Process results in a FIT Rate of 0.5 @ 25C and 8.57 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot KONBCQ005D D/C 0219)

The MS34-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-100mA.

Table 1
Reliability Evaluation Test Results

MAX6651EEE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	80	0	KONBCQ005D, D/C 0219
	Biased	& functionality	80	0	NONBBQ002B, D/C 0023
	Time = 192 hrs.				

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