RELIABILITY REPORT

FOR

MAX6644LBAAEE+

PLASTIC ENCAPSULATED DEVICES

October 1, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX6644LBAAEE+ 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.

Table of Contents

I. Device Description

A. General

The MAX6643/MAX6644/MAX6645 monitor temperature and automatically adjust fan speed to ensure optimum cooling while minimizing acoustic noise from the fan. Each device measures two temperature locations. The MAX6643/MAX6644/MAX6645 generate a PWM waveform that drives an external power transistor, which in turn modulates the fan's power supply. The MAX6643/MAX6644/MAX6645 monitor temperature and adjust the duty cycle of the PWM output waveform to control the fan's speed according to the cooling needs of the system. The MAX6643 monitors its own die temperature and an optional external transistor's temperature, while the MAX6644 and MAX6645 each monitor the temperatures of one or two external diode-connected transistors. The MAX6643 and MAX6644 have nine selectable trip temperatures (in 5°C increments). The MAX6645 is factory programmed and is not pin selectable. All versions include an overtemperature output (active-low OT). Active-low OT can be used for warning or system shutdown. The MAX6643 also features a FULLSPD input that forces the PWM duty cycle to 100%. The MAX6643/MAX6644/MAX6645 also feature a active-low FANFAIL output that indicates a failed fan. See the *Selector Guide* in the full data sheet for a complete list of each device's functions. The MAX6643 and MAX6644 are available in a small 16-pin QSOP package and the MAX6645 is available in a 10-pin µMAX® package. All versions operate from 3.0V to 5.5V supply voltages and consume 500µA (typ) supply current.

II. Manufacturing Information

A. Description/Function:	Automatic PWM Fan-Speed Controllers with Overtemperature Output
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	Malalysia, Philippines, Thailand
F. Date of Initial Production:	July 24, 2004

III. Packaging Information

A. Package Type:	16-pin QSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1043
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:	62 X 79 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. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, 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:

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

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

$\lambda = 22.4 \times 10^{-9}$

λ = 22.4 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. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The TS56-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1

Reliability Evaluation Test Results

MAX6644LBAAEE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data