RELIABILITY REPORT

FOR

MAX6652AUB+

PLASTIC ENCAPSULATED DEVICES

March 7, 2013

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

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Conclusion

The MAX6652AUB+ 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.

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I. Device Description

A. General

The MAX6652 system supervisor monitors multiple power-supply voltages, including its own, and also features an on-board temperature sensor. Voltages and temperature are converted to an 8-bit code using an analog-to-digital converter (ADC). A multiplexer automatically sequences through the voltage and temperature measurements. The digitized signals are then stored in registers and compared to the over/under threshold limits programmed over the 2-wire serial interface. When a temperature measurement exceeds the programmed threshold, or when an input voltage falls outside the programmed voltage limits, the MAX6652 generates a latched interrupt output active-low ALERT. Three interrupt modes are available for temperature excursions: default mode, one-time interrupt mode, and comparator mode. The active-low ALERT output is cleared, except for temperature interrupts generated in comparator mode, by reading the interrupt status register (Table 5). The active-low ALERT output can also be masked by writing to the appropriate bits in the interrupt mask register (Table 6) or by setting bit 1 of the configuration register (Table 4) to 0. The MAX6652 I²C*-compatible/SMBus(tm) interface also responds to the SMB alert response address. The 2-wire serial interface accepts both I²C and standard system management bus (SMBus) write byte, read byte, send byte, and receive byte commands to program the alarm thresholds and to read voltage and temperature data. Voltage data is scaled so that when the nominal voltage is present at a pin (e.g., 3.3V for the 3.3VIN pin), the conversion result is equal to 3/4 of the ADC full-scale range or a decimal count of 192 (Table 3). The temperature data format is 7 bits plus sign, with each data bit representing 1°C, in two's complement format (Table 2). The MAX6652 has only one address pin, ADD. One of four different address codes can be selected by connecting the ADD pin to GND, VCC, SDA, or SCL. Whenever an I²C-compatible/SMBus transaction is initiated, the two LSBs of the slave address register are determined by connection, setting the chip address to one of four possible values. In addition, an address code can also be directly written to the serial address register. This code will overwrite the code set by connection of the ADD pin, until the MAX6652 is taken through a power-on reset cycle. The MAX6652 features 60Hz or 50Hz line-frequency rejection for optimal performance. The device operates from +2.7V to +5.5V and is specified for operation from -40°C to +125°C. It is available in a tiny 10-pin µMAX® package.

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II. Manufacturing Information

A. Description/Function:	Temperature Sensor and System Monitor in a 10-Pin µMAX
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	Philippines, Thailand, Malaysia
F. Date of Initial Production:	January 27, 2001

III. Packaging Information

A. Package Type:	10-pin uMAX
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:	#05-2901-0002
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:	180°C/W
K. Single Layer Theta Jc:	41.9°C/W
L. Multi Layer Theta Ja:	113.1°C/W
M. Multi Layer Theta Jc:	41.9°C/W

IV. Die Information

A. Dimensions:	87 X 61 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:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

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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 135¿C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 130 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 8.4 \times 10^{-9}$

$\lambda = 8.4$ 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 0.04 @ 25C and 0.73 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot I1UAAQ001F D/C 0048, Latch-Up lot S1UACQ001A D/C 0502)

The TS12 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

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Table 1
Reliability Evaluation Test Results

MAX6652AUB+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	50	0	D1UAEA006B, D/C 0815
	Biased	& functionality	80	0	I1UABQ001B, D/C 0114
	Time = 192 hrs.				

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

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