RELIABILITY REPORT

FOR

MAX16031ETM+
Revision 6F0D

PLASTIC ENCAPSULATED DEVICES

June 4, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX16031ETM+ 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 MAX16031/MAX16032 EEPROM-configurable system monitors feature an integrated 10-bit analog-to-digital converter (ADC) designed to monitor voltages, temperatures, and current in complex systems. These EEPROM-configurable devices allow enormous flexibility in selecting operating ranges, upper and lower limits, fault output configuration, and operating modes with the capability of storing these values within the device. The MAX16031 monitors up to eight voltages, three temperatures (one internal/two external remote temperature diodes), and a single current. The MAX16032 monitors up to six voltages and two temperatures (one internal/one remote temperature diode). Each of these monitored parameters is muxed into the ADC and written to its respective register that can be read back through the SMBus(tm) and JTAG interface. Measured values are compared to the user-configurable upper and lower limits. For voltage measurements, there are two undervoltage and two overvoltage limits. For current and temperature, there are two sets of upper limits. Whenever the measured value is outside its limits, an alert signal is generated to notify the processor. Independent outputs are available for overcurrent, overtemperature, and undervoltage/overvoltage that are configured to assert on assigned channels. There are also undedicated fault outputs that are configured to offer a secondary limit for temperature, current, or voltage fault or provide a separate overvoltage output. During a major fault event, such as a system shutdown, the MAX16031/MAX16032 automatically copy the internal ADC registers into the nonvolatile EEPROM registers that then are read back for diagnostic purposes. The MAX16031/MAX16032 offer additional GPIOs that are used for voltage sequencing, additional fault outputs, a manual reset input, or read/write logic levels. A separate current-sense amplifier with an independent output allows for fast shutoff during overcurrent conditions. The MAX16031/MAX16032 are available in a 7mm x 7mm TQFN package and are fully specified from -40°C to +85°C.

II. Manufacturing Information

A. Description/Function:	EEPROM-Based System Monitors with Nonvolatile Fault Memory
B. Process:	EB8
C. Number of Device Transistors:	1700
D. Fabrication Location:	Texas
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	July 28, 2007

III. Packaging Information

A. Package Type:	48-pin TQFN 7x7
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:	#05-9000-2390
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:	36°C/W
K. Single Layer Theta Jc:	0.8°C/W
L. Multi Layer Theta Ja:	25°C/W
M. Multi Layer Theta Jc:	0.8°C/W

IV. Die Information

A. Dimensions:	184 X 213 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Aluminum/0.5% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 80 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 13.1 \times 10^{-9}$

λ = 13.1 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com/. Current monitor data for the EB8 Process results in a FIT Rate of 0.28 @ 25C and 17.30 @ 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 MS99 die type has been found to have all pins able to withstand a HBM transient pulse of <+/-500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX16031ETM+

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	80	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	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