

RELIABILITY REPORT
FOR
MAX16051ETI+
PLASTIC ENCAPSULATED DEVICES

October 24, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Approved by
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Conclusion

The MAX16051ETI+ 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 MAX16051 monitors up to 5 voltages and sequences up to 4 voltages, while the MAX16051 monitors up to 6 voltages and sequences up to 5 voltages. These devices provide an adjustable delay as each supply is turned on and they monitor each power-supply voltage. When all of the voltages reach their final values and the reset delay timer expires, a power-on-reset (POR) output deasserts allowing the microcontroller (μC) to operate. If any voltage falls below its threshold, the reset output asserts and all voltage supplies are turned off. The MAX16051/MAX16051 can be daisy-chained to control a higher number of voltages in a system. During a power-down event, the MAX16051/MAX16051 can reverse sequence the outputs. In this situation, each voltage is turned off sequentially until it reaches a 250mV level, at which point, the next supply is turned off. The MAX16051/MAX16051 also provide internal pulldown circuitry that turns on during power-down, to help discharge large output capacitors. The MAX16051/MAX16051 feature a charge-pump supply output that can be used as a pullup voltage for driving external n-channel MOSFETs and an overvoltage output that indicates when any of the monitored voltages exceeds its overvoltage threshold. The MAX16051 also provides three sequence control inputs for changing the sequence order, while the MAX16051 has a fixed sequence order. The MAX16051/MAX16051 are available in a 28-pin (4mm x 4mm) thin QFN package and are fully specified over the -40°C to $+85^{\circ}\text{C}$ extended operating temperature range.

II. Manufacturing Information

A. Description/Function:	Voltage Monitors/Sequencer Circuits with Reverse-Sequencing Capability
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	Texas
E. Assembly Location:	UTL (NSEB) UTAC Thailand, ASAT-DongGuan (China) DongGuan
F. Date of Initial Production:	2007

III. Packaging Information

A. Package Type:	28-pin TQFN 4x4
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Ag Filled Epoxy
E. Bondwire:	(1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Flammability Rating:	Class UL94-V0
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
I. Single Layer Theta Ja:	48°C/W
J. Single Layer Theta Jc:	2.7°C/W
K. Multi Layer Theta Ja:	35°C/W
L. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	85 X 85 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

$$\lambda = 22.37 \times 10^{-9}$$

$$\lambda = 22.37 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 B8 Process results in a FIT Rate of 2.71 @ 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 MT09 die type has been found to have all pins able to withstand a HBM transient pulse of 2500 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of 250 mA.

Table 1
Reliability Evaluation Test Results

MAX16051ETI+

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) 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