RELIABILITY REPORT

FOR

MAX5961ETM+

PLASTIC ENCAPSULATED DEVICES

December 18, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX5961ETM+ 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 MAX5961 0 to 16V, quad, hot-swap controller provides complete protection for systems with up to four distinct supply voltages. The device allows the safe insertion and removal of circuit cards into live backplanes. The MAX5961 is an advanced hot-swap controller that monitors voltage and current with an internal 10-bit ADC. The device provides two levels of overcurrent circuit-breaker protection; a fast-trip threshold for a fast turn-off, and a lower slow-trip threshold for a delayed turn-off. The maximum overcurrent circuit-breaker threshold range is set independently for each channel with a trilevel input (ILIM_) or by programming though an I²C interface. The internal 10-bit ADC is multiplexed to monitor the output voltage and current of each hot-swap channel. The total time to cycle through all the eight measurements is 100µs (typ). Each 10-bit value is stored in an internal circular buffer so that 50 past samples of each signal can be read back through the I²C interface at any time or after a fault condition. The MAX5961 can be configured as four independent hot-swap controllers, hot-swap controllers operating in pairs, or as a group of four hot-swap controllers. The device also includes five digital comparators per hot-swap channel to implement overcurrent warning, two levels of overvoltage detection, and two levels of undervoltage detection. The limits for overcurrent, overvoltage, and undervoltage are user-programmable. When any of the measured values violates the programmable limits, an external active-low ALERT signal is asserted. In addition to the active-low ALERT signal, depending on the selected operating mode, the MAX5961 can deassert a power-good signal and/or turn-off the external MOSFET. The MAX5961 is available in a 48-pin thin QFN package and operates over the -40°C to +85°C extended temperature range.

II. Manufacturing Information

A. Description/Function:	0 to 16V, Quad, Hot-Swap Controller with 10-Bit Current and Voltage Monitor
B. Process:	B8
C. Number of Device Transistors:	156582
D. Fabrication Location:	California, Texas, or Oregon
E. Assembly Location:	China, Philippines, and Thailand
F. Date of Initial Production:	2008

III. Packaging Information

A. Package Type:	48-pin TQFN 7x7
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Ablestick 8200
E. Bondwire:	Au (.001 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2905
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:	216 X 191 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:	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:

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

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

$\lambda = 22.91 \times 10^{-9}$

$\lambda = 22.91$ 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 NQ09 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current pulse of +/-100mA and an over voltage of 1.5xVcc Max.

Table 1
Reliability Evaluation Test Results

MAX5961ETM+

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