

RELIABILITY REPORT  
FOR  
MAX5963UTL+  
PLASTIC ENCAPSULATED DEVICES

March 6, 2009

**MAXIM INTEGRATED PRODUCTS**

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<b>Approved by</b>
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## Conclusion

The MAX5963UTL+ 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 MAX5963 dual hot-swap and diode ORing controller provides complete protection for dual-supply high availability systems. The device operates from 7.5V to 76V and provides hot-swap and low voltage-drop diode ORing functionality for two 7.5V to 76V outputs. The MAX5963 allows for the safe insertion and removal of system line cards and FireWire® peripherals into a live backplane by providing inrush current control and active current limiting. The device controls external n-channel power MOSFETs to perform low-voltage-drop ORing, inrush current control, and current limiting functions. The current-limit function actively limits the current drawn by the load, protecting the load from a short-circuit condition. The MAX5963 also features a circuit-breaker function that disconnects the power to the load if the load current exceeds the circuit-breaker limit for a programmable circuit-breaker timeout. The MAX5963 features an autoretry/latchoff input. In autoretry mode, the MAX5963 automatically restarts the turned-off channel after a programmable delay. In latchoff mode, the MAX5963 latches the channel off. The MAX5963 consumes less than 10µA from the PWR supply in system power-off mode. The MAX5963 is available in a 40-pin TQFN package (6mm x 6mm) and operates over the 0°C to +85°C upper commercial temperature range.

## II. Manufacturing Information

A. Description/Function:	Dual, 7.5V to 76V, Hot-Swap and Diode ORing Controller
B. Process:	BCD8
C. Number of Device Transistors:	8798
D. Fabrication Location:	Oregon
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	October 20, 2008

## III. Packaging Information

A. Package Type:	40-pin TQFN 6x6
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	38°C/W
K. Single Layer Theta Jc:	1.4°C/W
L. Multi Layer Theta Ja:	27°C/W
M. Multi Layer Theta Jc:	1.4°C/W

## IV. Die Information

A. Dimensions:	172 X 175 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
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 <sub>2</sub>
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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 47 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.8 \times 10^{-9}$$

$$\lambda = 22.8 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 BCD8 Process results in a FIT Rate of 2.3 @ 25C and 39.6 @ 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 NQ14 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX5963UTL+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	47	0
<b>Moisture Testing</b> (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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