

RELIABILITY REPORT
FOR
MAX5944ESE+
PLASTIC ENCAPSULATED DEVICES

December 16, 2008

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX5944ESE+ 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.

Table of Contents

I.Device Description	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX5944 is a dual, current limiter/low-drop ORing, switch controller power-management IC for FireWire® applications. Each independent channel controls two external power MOSFETs to regulate current from the input power supply to the load and performs low-voltage drop power-supply ORing. The MAX5944 operates over the 7.5V to 37V input range and provides inrush and output current limit in addition to diode ORing functions suitable for FireWire applications. The MAX5944 allows the safe insertion and removal of FireWire peripherals into a live FireWire port by providing inrush current control and output current-limiting functions. The MAX5944 features a current-limit function that actively limits the current drawn by the load with a 2ms timeout. Its autoretry function then automatically restarts after the 259ms autoretry delay time. The ORing feature provides a very efficient way to protect the FireWire port when connected to another FireWire peripheral that sources a higher voltage. By turning off the external MOSFETs, the MAX5944 provides a true bidirectional load disconnect. Each channel has an independent ON/OFF control that results in less than 10µA supply current per channel. The MAX5944 operates over the -40°C to +85°C extended temperature range and is available in a 16-pin SO package.

II. Manufacturing Information

A. Description/Function:	Dual FireWire Current Limiter and Low-Drop ORing Switch Controller
B. Process:	BCD8
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	ATP Philippines, UTL Thailand
F. Date of Initial Production:	September 29, 2004

III. Packaging Information

A. Package Type:	16-pin SOIC (N)
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:	#31-4781
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1

IV. Die Information

A. Dimensions:	80 X 135 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:	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 biased (static) life test are complete. 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)

$$\lambda = 22.4 \times 10^{-9}$$

$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 NP76 die type has been found to have all pins able to withstand a HBM transient pulse of +/-200 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

MAX5944ESE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)	Ta = 135 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