

RELIABILITY REPORT
FOR
MAX4889ETO+
(MAX4888)
PLASTIC ENCAPSULATED DEVICES

November 11, 2008

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX4889ETO+ 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 MAX4888/MAX4889 high-speed passive switches route PCI Express® (PCIe) data between two possible destinations. The MAX4888 is a quad single-pole/double-throw (4 x SPDT) switch ideally suited for switching two half lanes of PCIe data between two destinations. The MAX4889 is an octal single-pole/double-throw (8 x SPDT) switch ideal for switching four half lanes of PCIe data between four destinations. The MAX4888/MAX4889 feature a single digital control input (SEL) to switch signal paths.

The MAX4888/MAX4889 are fully specified to operate from a single 3.0V to 3.6V power supply and also operate down to +1.65V. The MAX4888 is available in a 3.5mm x 5.5mm, 28-pin TQFN package. The MAX4889 is available in a 3.5mm x 9.0mm, 42-pin TQFN package. Both devices operate over the -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	2.5 Gbps PCI Express Passive Switches
B. Process:	0.18um 1 Poly 6 Metal CMOS
C. Number of Device Transistors:	
D. Fabrication Location:	Taiwan
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	1/15/2007

III. Packaging Information

A. Package Type:	42-pin TQFN 3.5x9
B. Lead Frame:	Cu Alloy
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:	#31-4809
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:	39°C/W
K. Single Layer Theta Jc:	1.5°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	1.5°C/W

IV. Die Information

A. Dimensions:	37 X 86 mils
B. Passivation:	Laser/TEOS Ox - Pass/Nit -PreLP+GenLP
C. Interconnect:	Al/Cu 0.5%
D. Backside Metallization:	None
E. Minimum Metal Width:	0.18um
F. Minimum Metal Spacing:	0.18um
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO2
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 biased (static) life test are shown in Table 1. 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)

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

$\lambda = 22.4$ 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 TSMC 0.18um Process results in a FIT Rate of 0.8 @ 25C and 13.1 @ 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 AS83 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

MAX4889ETO+

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