

RELIABILITY REPORT  
FOR  
MAX4952ACTI+  
PLASTIC ENCAPSULATED DEVICES

August 3, 2011

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

<b>Approved by</b>
Sokhom Chum
Quality Assurance
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## Conclusion

The MAX4952ACTI+ 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 MAX4952A dual-channel redriver is designed to redrive one full lane of SAS or SATA signals up to 6.0GT/s (gigatransfers per second) and operates from a single +3.3V supply. The MAX4952A features independent input equalization and output preemphasis. The MAX4952A enhances signal integrity at the receiver by equalizing the signal at the input and establishing preemphasis at the output of the device. SAS and SATA OOB (Out-of-Band) signaling is supported using high-speed amplitude detection on the inputs and squelch on the corresponding outputs. Inputs and outputs are all internally 50  $\Omega$  terminated and must be AC-coupled to the SAS/SATA controller IC and SAS/SATA device. The MAX4952A is available in a small 28-pin, 3.5mm x 5.5mm TQFN package with flowthrough traces for ease of layout. This device is specified over the 0°C to +70°C operating temperature range.

**II. Manufacturing Information**

A. Description/Function:	Dual Equalized 1.5/3.0/6.0GT/s SAS/SATA Redriver
B. Process:	G4
C. Number of Device Transistors:	5474
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	July 6, 2009

**III. Packaging Information**

A. Package Type:	28-pin TQFN 3.5x5.5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3609
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:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	35°C/W
M. Multi Layer Theta Jc:	2.7°C/W

**IV. Die Information**

A. Dimensions:	69 X 117 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub>
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	1.2 microns (as drawn) Metal 1, 2 & 3 5.6 microns (as drawn) Metal 4
F. Minimum Metal Spacing:	1.6 microns (as drawn) Metal 1, 2 & 3, 4.2 microns (as drawn) Metal 4
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)  
Don Lipps (Manager, Reliability Engineering)  
Bryan Preeshl (Vice President 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 150°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

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

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the G4 Process results in a FIT Rate of 0.02 @ 25C and 0.37 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot NUTZBQ001B D/C 0924)

The AJ17 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX4952ACTI+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)					
	Ta = 135°C	DC Parameters	24	0	NUTZBQ001B, D/C 0924
	Biased Time = 192 hrs.	& functionality	24	0	NUTZBQ001C, D/C 0924

Note 1: Life Test Data may represent plastic DIP qualification lots.