RELIABILITY REPORT

FOR

MAX4950CTO+

PLASTIC ENCAPSULATED DEVICES

May 20, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Director, Reliability Engineering

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Conclusion

The MAX4950CTO+ 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

A. General

The MAX4950 PCI Express (PCIe®) quad equalizer/redriver operates from a single +3.3V supply. This device improves signal integrity at the receiver through programmable input equalization and programmable redrive circuitry. The output circuitry reestablishes deemphasis lost on the board, compensating for circuit board loss. This device permits optimal placement of key PCIe components and longer runs of stripline, microstrip, or cable. The MAX4950 contains four identical buffers capable of equalizing differential signals at data rates up to 5GT/s, and features electrical idle and receiver detection on each channel. The MAX4950 is ideal for use with PCIe Gen I (2.5GT/s) and Gen II (5.0GT/s) data rates and features a power-saving mode. The MAX4950 is available in a small, lead-free, 42-pin (3.5mm x 9.0mm) TQFN package for optimal layout and minimal space requirements. The board traces are flow-through for ease of layout. The MAX4950 is specified over the 0°C to +70°C operating temperature range.

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II. Manufacturing Information

A. Description/Function:	Quad PCI Express Equalizer/Redriver
B. Process:	G4
C. Number of Device Transistors:	12261
D. Fabrication Location:	Oregon
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	December 5, 2008

III. Packaging Information

A. Package Type:	42-pin TQFN 3.5x9
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:	40°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	69 X 270 mils
B. Passivation:	Si_3N_4
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:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

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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 (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)

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

$\lambda = 22.4$ 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 G4 Process results in a FIT Rate of 0.2 @ 25C and 3.6 @ 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 AJ42 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

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Table 1
Reliability Evaluation Test Results

MAX4950CTO+

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

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