RELIABILITY REPORT

FOR

MAX4951AECTP+

PLASTIC ENCAPSULATED DEVICES

January 13, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Conclusion

The MAX4951AECTP+ 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 MAX4951AE dual-channel buffer is designed to redrive serial-ATA (SATA) I and SATA II signals and can survive ESD events up to ±8kV Human Body Model (HBM). The MAX4951AE can be placed near an eSATA connector to overcome board losses and produce an eSATA-compliant signal level. This device is Serial ATA Revision 2.6 (gold standard)-compliant, while overcoming losses in the PCB and eSATA connector. The MAX4951AE features low standby current for power-sensitive applications. This device features hardware SATA-drive cable detection, keeping the power low in standby mode. The MAX4951AE preserves signal integrity at the receiver by reestablishing full output levels. It reduces the total system jitter (TJ) by squaring up the signal and providing excellent return loss match to the source. This device features channel-independent digital boost controls to drive SATA outputs over normal trace lengths and eSATA connector. SATA Out-Of-Band (OOB) signaling is supported using high-speed amplitude detection on the inputs, and squelch on the corresponding outputs. Inputs and outputs are all internally 50 terminated. The MAX4951AE operates from a single +3.3V (typ) supply and is available in a small, 4mm x 4mm, TQFN package with flow-through traces for ease of layout. This device is specified over the 0°C to +70°C operating temperature range.

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II. Manufacturing Information

A. Description/Function:	SATA I/II Bidirectional Redriver with High ESD and Cable Detect
B. Process:	G4
C. Number of Device Transistors:	1920
D. Fabrication Location:	Oregon
E. Assembly Location:	Philippines, Thailand
F. Date of Initial Production:	1/2/2009

III. Packaging Information

A. Package Type:	20-pin TQFN 4x4
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:	#05-9000-3714
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:	59°C/W
K. Single Layer Theta Jc:	5.7°C/W
L. Multi Layer Theta Ja:	39°C/W
M. Multi Layer Theta Jc:	5.7°C/W

IV. Die Information

A. Dimensions:	46.8 X 74.1 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 150°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)

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

λ = 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 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. 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 AJ95-1 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

MAX4951AECTP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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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