RELIABILITY REPORT

FOR

MAX4951CCTP+T

PLASTIC ENCAPSULATED DEVICES

October 21, 2012

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Conclusion

The MAX4951CCTP+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX4951C dual-channel buffer with input equalization and preemphasis is ideal to redrive internal serial-ATA (SATA) 1i, 2i, and 3i signals as well as eSATA 1m and 2m signals. The device features high electrostatic discharge (ESD) ±8kV Human Body Model (HBM) protection. The device can be placed near a SATA connector on the motherboard to overcome board losses and guarantee SATA compliance. The device is SATA specification version 3.0 (gold standard) compliant and can also be pin-configured for SATA specification version 2.6 (gold standard) compliance. The device features hardware SATA-drive cable detection that automatically places the device into a standby mode that consumes less than 20µA (typ) standby current when no drive is connected. In addition, the device features an independent channel dynamic power-down mode where power consumption is reduced when no input signal is present. The device maintains output common-mode levels to meet internal SATA version 3.0 standards and prevent delays when coming out of low-power mode. The device preserves signal integrity at the receiver by reestablishing full output levels and reducing the total system jitter (TJ) by providing equalization. The device features channel-independent digital preemphasis controls to drive SATA outputs over longer trace lengths to meet internal SATA specifications. SATA out-of-band (OOB) signaling is supported using high-speed out-of-band signal detection on the inputs and squelch on the corresponding outputs. Inputs and outputs are all internally 50 terminated and must be AC-coupled to the SATA controller IC and SATA device. The MAX4951C operates from a single +3.3V (typ) supply, is available in a small, 4mm x 4mm, TQFN package with flow-through traces for ease of layout, and is specified over the commercial 0°C to +70°C operating temperature range. The MAX4951C is also pin compatible with the MAX4951BE SATA 6.0Gbps redriver.

II. Manufacturing Information

A. Description/Function:	6Gbps SATA Bidirectional Redriver with Input Equalization, Preemphasis, and Advanced Power Management
B. Process:	MB3
C. Number of Device Transistors:	7459
D. Fabrication Location:	USA
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	March 25, 2011

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 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4347
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:	6°C/W
L. Multi Layer Theta Ja:	39°C/W
M. Multi Layer Theta Jc:	6°C/W

IV. Die Information

A. Dimensions:	40.94 X 56.30 mils
B. Passivation:	BCB
C. Interconnect:	Al with top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.23 microns (as drawn)
F. Minimum Metal Spacing:	0.23 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 47 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.4 \times 10^{-9}$

$\lambda = 23.4$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the MB3 Process results in a FIT Rate of 0.08 @ 25C and 1.33 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SX0ZAQ001B, D/C 1052)

The AK26 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

MAX4951CCTP+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	47	0	SX0ZAQ001C, D/C 1052

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