RELIABILITY REPORT

FOR

MAX4951BECTP+

PLASTIC ENCAPSULATED DEVICES

May 19, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX4951BECTP+ 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 MAX4951BE dual-channel buffer is ideal to redrive serial ATA (SATA) I, SATA II, and SATA III signals and features high electrostatic discharge (ESD) ±8kV Human Body Model (HBM) protection. The MAX4951BE can be placed nearly anywhere on the motherboard to overcome board losses and produce an eSATA-compatible signal level. This device is SATA specification v.2.6 (gold standard)-compliant, while overcoming losses in the PCB and eSATA connector. The MAX4951BE features very low standby current for power-sensitive applications. This device features hardware SATA-drive cable detection, keeping the power low in standby mode. The device also features an independent channel, dynamic power-down mode where power consumption is reduced when no input signal is present. The MAX4951BE preserves signal integrity at the receiver by reestablishing full output levels and can reduce the total system jitter (TJ) by providing input equalization. This device features channel-independent digital preemphasis controls to drive SATA outputs over longer trace lengths or to meet eSATA specifications. SATA Out-Of-Band (OOB) signaling is supported using high-speed OOB 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 MAX4951BE operates from a single +3.3V (typ) supply, and is available in a small, 4mm × 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.

II. Manufacturing Information

A. Description/Function:	SATA I/II/III Bidirectional Redriver with Input Equalization and Preemphasis
B. Process:	MB3
C. Number of Device Transistors:	2553
D. Fabrication Location:	California
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	February 10, 2010

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:	#05-9000-3878
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:	40.9 X 56.3 mils
B. Passivation:	BCB
C. Interconnect:	Al with top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35µm
F. Minimum Metal Spacing:	0.35µm
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Don Lipps (Manager, 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 46 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.9 \times 10^{-9}$

$\lambda = 23.9$ 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 MB3 Process results in a FIT Rate of 0.08 @ 25C and 1.33 @ 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 AJ91 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.

Table 1
Reliability Evaluation Test Results

MAX4951BECTP+

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	46	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