

RELIABILITY REPORT
FOR
MAX4984EEVB+T
PLASTIC ENCAPSULATED DEVICES

March 22, 2012

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX4984EEVB+T 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 MAX4983E/MAX4984E are high ESD-protected analog switches that combine the low on-capacitance and low on-resistance necessary for high-performance switching applications. COM1 and COM2 are protected against $\pm 15\text{kV}$ ESD without latchup or damage. The devices are ideal for USB 2.0 Hi-Speed applications at 480Mbps. The switches also handle all the requirements for USB low- and full-speed signaling. The MAX4983E/MAX4984E double-pole/double-throw (DPDT) switches are fully specified to operate from a single +2.8V to +5.5V power supply and are protected against a +5.5V short to COM1 and COM2. This feature makes the MAX4983E/MAX4984E fully compliant with the USB 2.0 specification of VBUS fault protection. The devices feature low-threshold-voltage logic inputs, permitting them to be used with low I/O voltage systems. The MAX4983E features an active-low enable input (active-low EN) that when driven high sets the device in shutdown mode. The MAX4984E features an active-high enable input (EN) that when driven low sets the device in shutdown mode. When the device is in shutdown mode, the quiescent supply current is reduced to 0.1 μA . The MAX4983E/MAX4984E are available in a space-saving, 10-pin, 1.4mm x 1.8mm UTQFN package, and operate over a -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	High-Speed USB 2.0 Switches with $\pm 15\text{kV}$ ESD
B. Process:	S45
C. Number of Device Transistors:	636
D. Fabrication Location:	USA
E. Assembly Location:	Thailand
F. Date of Initial Production:	April 26, 2008

III. Packaging Information

A. Package Type:	10-pin uTQFN
B. Lead Frame:	Copper
C. Lead Finish:	NiPdAu
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3046
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:	$^{\circ}\text{C/W}$
K. Single Layer Theta Jc:	$^{\circ}\text{C/W}$
L. Multi Layer Theta Ja:	143.2 $^{\circ}\text{C/W}$
M. Multi Layer Theta Jc:	20.1 $^{\circ}\text{C/W}$

IV. Die Information

A. Dimensions:	31 X 44 mils
B. Passivation:	$\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) 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)

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

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

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 S45 Process results in a FIT Rate of 0.06 @ 25C and 1.00 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SIGYBQ001A, D/C 0743)

The AJ38-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of 250mA.

Table 1
Reliability Evaluation Test Results

MAX4984EEVB+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	SIGZBQ001A, D/C 0743

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