Conclusion

The MAX1931EUB+ 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.

Table of Contents

I. Device Description

A. General

The MAX1931 is a current-limited, 60m switch with built-in fault blanking. Its accurate preset current limit of 0.64A to 1.06A makes it ideally suited for USB applications. The device's low quiescent supply current (14µA) and shutdown current (1µA) conserve battery power in portable applications. The MAX1931 operates with inputs from 2.7V to 5.5V, making it ideal for both 3V and 5V systems. A fault signal notifies the microprocessor that the internal current limit has been reached. A 10ms fault-blanking feature allows momentary faults (such as those caused when hot-swapping into a capacitive load) to be ignored, thus preventing false alarms to the host system. This fault blanking also prevents a fault signal from being issued when the device is powering up. In the MAX1931, an output overcurrent condition causes the switch to current limit at 0.64A to 1.06A and active-low FAULT to go low after the 10ms blanking period. When the overcurrent condition is removed, active-low FAULT returns to its high-impedance state. The MAX1931 has several safety features to ensure that the USB port is protected. Built-in thermal overload protection limits power dissipation and junction temperatures. The device has an accurate internal current-limiting circuitry to protect the input supply against overload. The MAX1931 is available in a space-saving 10-pin µMAX package.

II. Manufacturing Information

A. Description/Function:	Current-Limited Switch for Single USB Port
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	Philippines, Thailand, or Malaysia
F. Date of Initial Production:	April 22, 2002

III. Packaging Information

A. Package Type:	10-pin uMAX
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:	#05-1101-0101
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:	180°C/W
K. Single Layer Theta Jc:	41.9°C/W
L. Multi Layer Theta Ja:	113.1°C/W
M. Multi Layer Theta Jc:	41.9°C/W

IV. Die Information

A. Dimensions:	87X58 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 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:	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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000 \times 4340 \times 477 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 0.44 \times 10^{-9}$

$\lambda = 0.44$ 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 B8 Process results in a FIT Rate of 0.01 @ 25C and 0.26 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot I9DAEA202B)

The PX70 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1

Reliability Evaluation Test Results

MAX1931EUB+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 1000 hrs.	DC Parameters & functionality	80	0	T9DAKA030E, D/C 0733
			80	0	T9DAKA028B, D/C 0721
			80	0	D9DAJA090A, D/C 0627
			80	0	D9DAJA073F, D/C 0601
			80	0	D9DAJ3067G, D/C 0547
			77	0	D9DAJA059B, D/C 0511

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