RELIABILITY REPORT

FOR

MAX1693EUB+

PLASTIC ENCAPSULATED DEVICES

April 30, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX1693EUB+ 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 MAX1693/(MAX1693H)/MAX1694 are current-limited, 60m switches with built-in fault blanking. Their accurate preset current limit of 0.7A to 1.0A makes them ideally suited for USB applications. Their low quiescent supply current (14µA) and shutdown current (1µA) conserve battery power in portable applications. The MAX1693/(MAX1693H)/MAX1694 operate with inputs from +2.7V to +5.5V, making them 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 MAX1693/(MAX1693H), an output overcurrent condition causes the switch to current limit at 0.7A to 1.0A 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. In the MAX1694, any overcurrent longer than 10ms will latch the switch open and set active-low FAULT low. The latch is cleared by cycling the active-low ON input or by powering up the device again. This feature saves power by preventing the device from thermally cycling on and off in case of a persistent short-circuit condition. The MAX1693/(MAX1693H)/MAX1694 have several safety features to ensure that the USB port is protected. Built-in thermal-overload protection limits power dissipation and junction temperatures. Both devices have accurate internal current-limiting circuitry to protect the input supply against overload. They are available in space-saving 10-pin µMAX® packages.

II. Manufacturing Information

A. Description/Function:	USB Current-Limited Switches with Fault Blanking
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	July 24, 1999

III. Packaging Information

A. Package Type:	10L 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 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	180°C/W
K. Single Layer Theta Jc:	36°C/W
L. Multi Layer Theta Ja:	113.1°C/W
M. Multi Layer Theta Jc:	36°C/W

IV. Die Information

A. Dimensions:	87 X 58 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:	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 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)

$\lambda = 0.4 \times 10^{-9}$

$\lambda = 0.4$ 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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot I9DDA3170C D/C 0141)

The PX70 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V 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

MAX1693EUB+

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

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