RELIABILITY REPORT

FOR

MAX1607ESA

PLASTIC ENCAPSULATED DEVICES

October 24, 2003

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX1607 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.

Table of Contents

I. Device Description

A. General

The MAX1607 is a current-limited 60mΩ switch with built-in fault blanking. Its accurate, preset 0.7A to 1.0A current limit makes it ideal for USB applications. Its low quiescent supply current (14µA) and standby current (1µA) conserve battery power in portable applications. The MAX1607 operates with inputs from +2.7V to +5.5V, making it ideal for both 3V and 5V systems.

An overcurrent signal (OC-bar) notifies the microprocessor that the internal current limit has been reached. A 10ms overcurrent-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 blanking also prevents an OC-bar signal from being issued when the device is powering up.

The MAX1607 has several safety features to ensure that the USB port is protected. Built-in thermal-overload protection limits power dissipation and junction temperature. The device also has accurate internal current- limiting circuitry to protect the input supply against overload.

The MAX1607 is a pin-compatible upgrade to Texas Instruments' TPS2014, TPS2015, and TPS2041 for USB applications. The same die is available in a space-saving 10-pin µMAX package (MAX1693) and can be used for next-generation designs. The MAX1694 is similar to the MAX1693, but it has a built-in latch that turns off the power switch in case of a long-term short-circuit condition.

B. Absolute Maximum Ratings

Item	Rating
IN, EN , OC to GND	-0.3 to +6V
OUT to GND	-0.3V to (VIN + 0.3V)
Maximum Switch Current	1.2A (internally limited)
OUT Short-Circuit to GND	Continuous
Operating Temperature Range (extended)	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
8-Pin SO	471mW
Derates above +70°C	
8-Pin SO	5.88mW/°C

II. Manufacturing Information

A. Description/Function:	USB Current-Limited Switchin Pin-Compatible Package
B. Process:	S8 - Standard .8 micron silicon gate CMOS
C. Number of Device Transistors:	715
D. Fabrication Location:	California, USA
E. Assembly Location:	Malaysia, Thailand or Philippines
F. Date of Initial Production:	September, 1999

III. Packaging Information

A. Package Type:	**8-Lead SO**
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Silver-filled Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	Buildsheet # 05-1101-0134
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	87 x 58 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Copper/Si
D. Backside Metallization:	None
E. Minimum Metal Width:	.8 microns (as drawn)
F. Minimum Metal Spacing:	.8 microns (as drawn)
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: Jim Pedicord (Manager, Reliability Operations)
Bryan Preeshl (Executive Director of QA)
Kenneth Huening (Vice President)

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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 319 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 3.40 \times 10^{-9}$ $\lambda = 3.40$ F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability qualification and monitor programs. Maxim also performs weekly Burn-In on samples from production to assure reliability of its processes. The reliability required for lots which receive a burn-in qualification is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Maxim performs failure analysis on rejects from lots exceeding this level. The attached Burn-In Schematic (Spec. # 06-6010) shows the static circuit used for this test. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Report (**RR-1M**).

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

C. E.S.D. and Latch-Up Testing

The PX70 die type has been found to have all pins able to withstand a transient pulse of ±2500V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1
Reliability Evaluation Test Results

MAX1607ESA

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	319	0
Moisture Testing (Note 2)				
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	77	0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters	77	0

Note 1: Life Test Data may represent plastic D.I.P. qualification lot.
Note 2: Generic Process/Package data

Attachment #1

TABLE II. Pin combination to be tested. 1/ 2/

	Terminal A (Each pin individually connected to terminal A with the other floating)	Terminal B (The common combination of all like-named pins connected to terminal B)
1.	All pins except V_{PS1} 3/	All V_{PS1} pins
2.	All input and output pins	All other input-output pins

1/ Table II is restated in narrative form in 3.4 below.
2/ No connects are not to be tested.
3/ Repeat pin combination I for each named Power supply and for ground

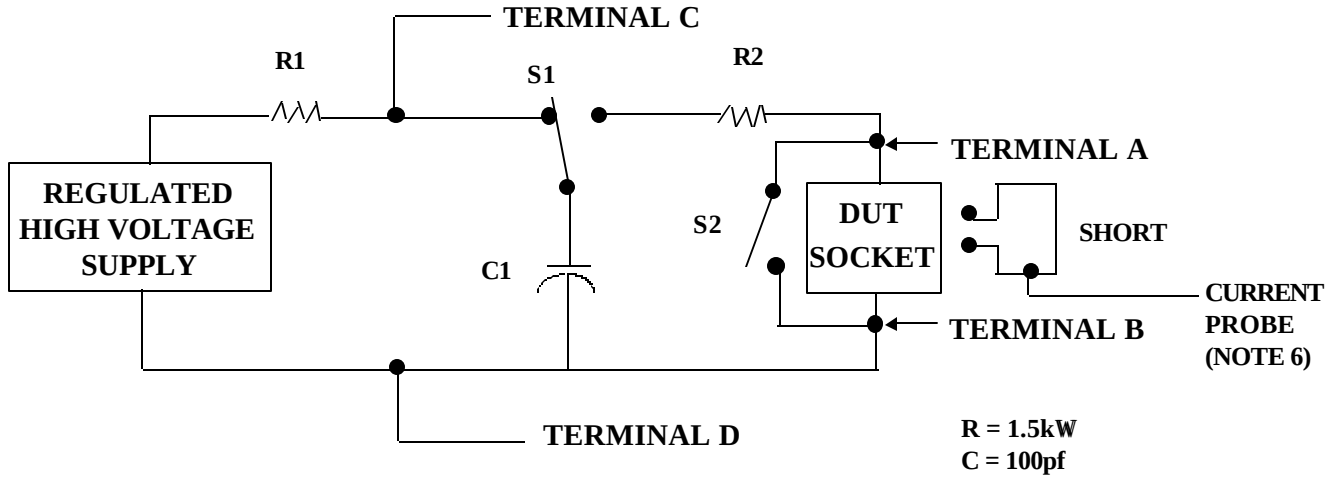
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

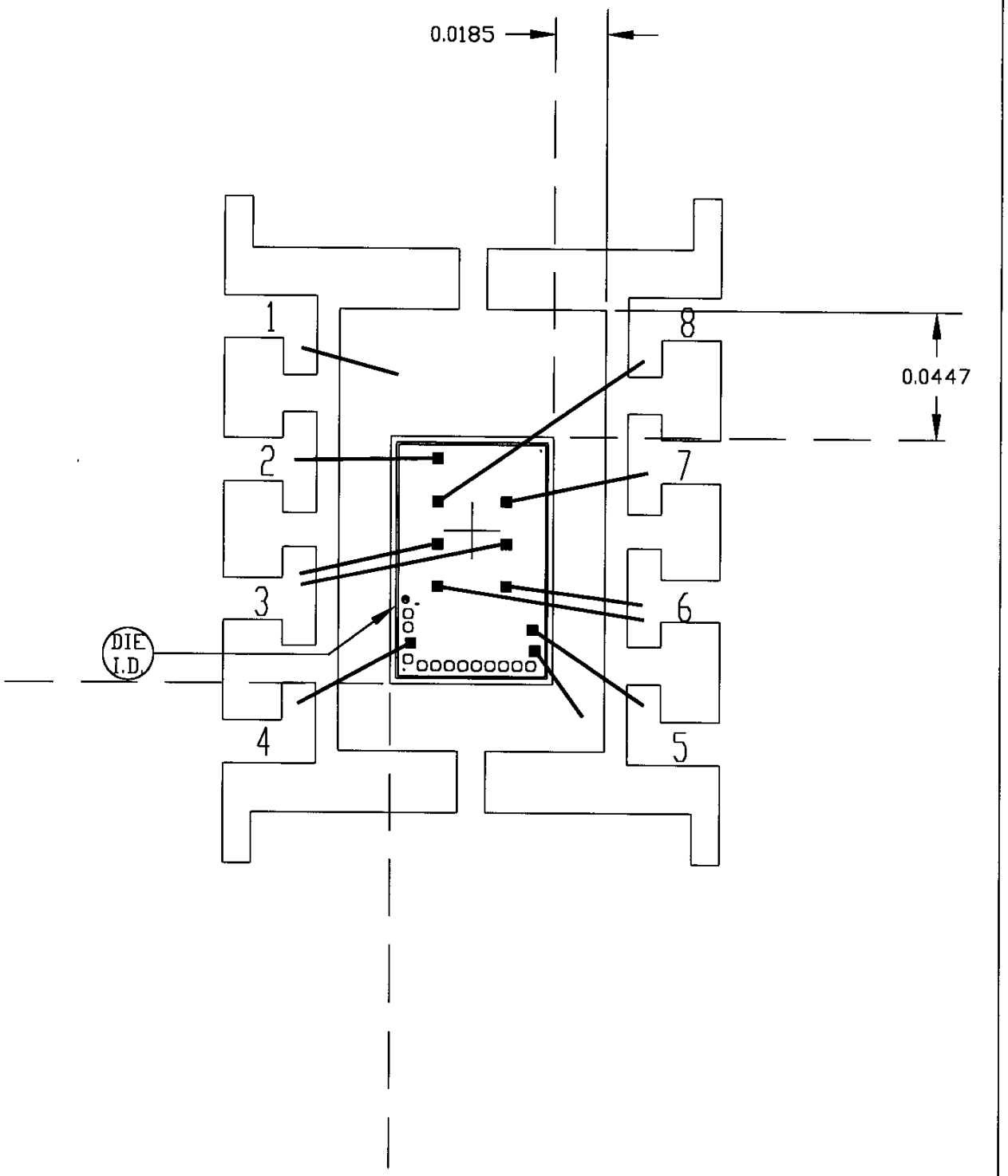
3.4 Pin combinations to be tested.

a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

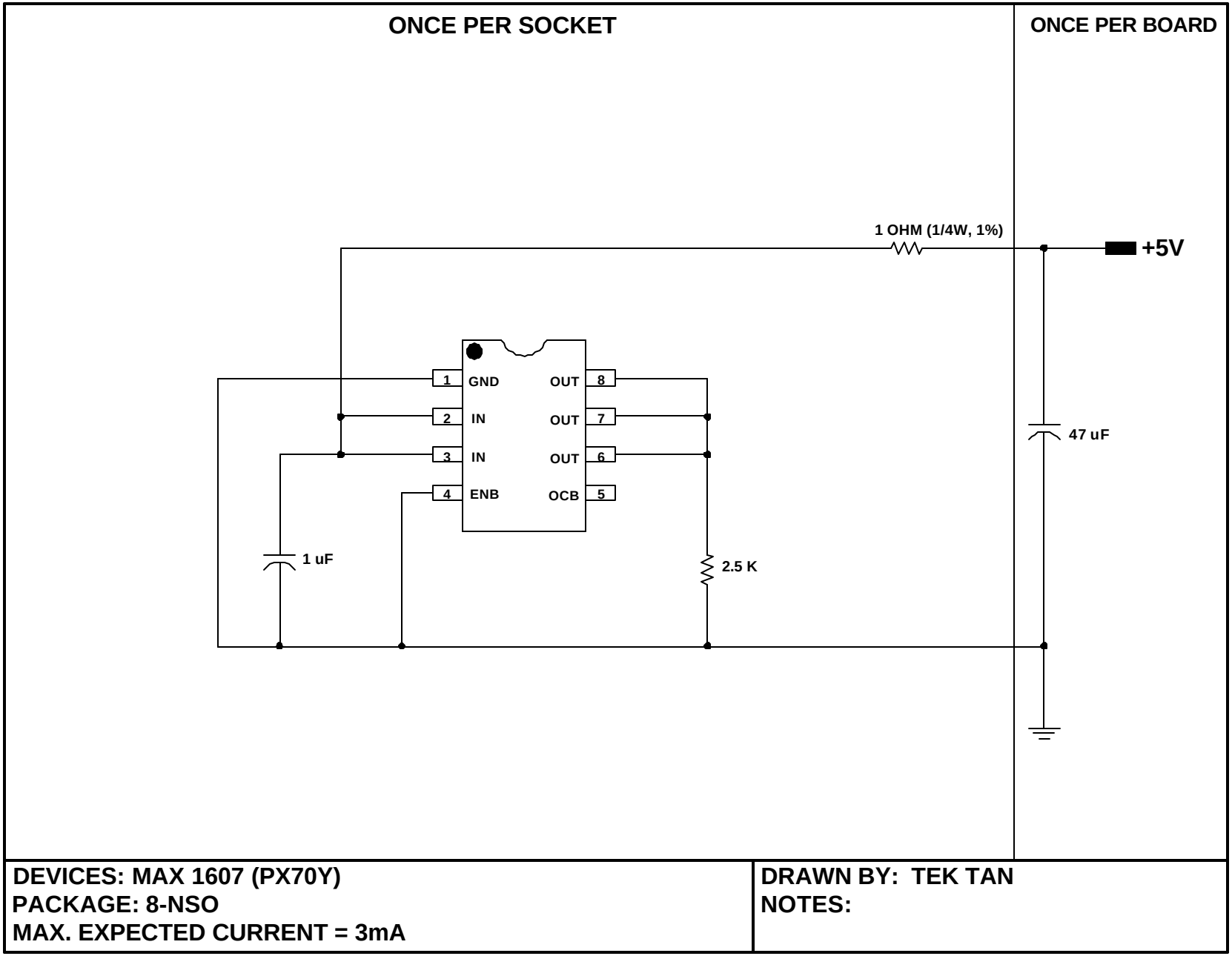
b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.

c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.





PKG.CODE: S8-5		APPROVALS	DATE	MAXIM
CAV./PAD SIZE: 95 X 155	PKG. DESIGN		BUILDSHEET NUMBER: 05-1101-0134	REV.: A



DEVICES: MAX 1607 (PX70Y)
PACKAGE: 8-NSO
MAX. EXPECTED CURRENT = 3mA

DRAWN BY: TEK TAN
NOTES: