RELIABILITY REPORT

FOR

MAX5917xESE

PLASTIC ENCAPSULATED DEVICES

July 23, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX5917A/B 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 MAX5917A/B is fully integrated hot-swap switches for positive supply rails. This device allows the safe insertion and removal of circuit cards into live backplanes or ports without causing glitches on the backplane power-supply rail. It also monitors various circuit parameters and disconnect the load if a fault condition occurs, alerting the host with a logic-level IFAULT-bar output. The MAX5917A/B operates over a +10V to +65V input voltage range. It is designed to permit hot plugging of an Internet appliance such as an IP phone but is not limited to that application.

During startup, an internal power FET regulates the current between the backplane power source and the load to 567mA for the MAX5917A and 420mA for the MAX5917B. f After startup, the FET is fully enhanced to reduce its on-resistance. To ensure robust operation, the MAX5917A/B contains built-in safety features that prevent damage to the internal FET. It includes an enable input, which responds to positive logic signals (+3.3V or +5V), allowing the host system to disconnect the load.

The MAX5917A/B Simple Swapper™ hot-swap IC monitors four parameters for fault conditions: undervoltage lockout (UVLO), power-not-good, zero-current detection, and thermal shutdown. This device is available in the extended temperature range, -40°C to +85°C. The MAX5917A/B is available in a 16-pin SO package.

B. Absolute Maximum Ratings

Item	Rating
VIN, VOUT to GND	-0.3V to +70.0V
ENABLE to GND	-0.3V to +12.0V
PGOOD, IFAULT to GND	-0.3V to +12.0V
UVLO to GND	-0.3V to (VIN + 0.3V)
PGOOD, IFAULT Sink Current	10mA
Operating Temperature Range	-40°C to +85°C
Maximum Junction Temperature	+150°C
Storage Temperature Range	-60°C to +150°C
Lead Temperature (soldering 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
16-Pin SO	1039mW
Derates above +70°C	
16-Pin SO	12.9mW/°C

II. Manufacturing Information

A. Description/Function:	+65V Simple Swapper Hot-Swap Switches
B. Process:	S3 (Standard 3 micron silicon gate CMOS)
C. Number of Device Transistors:	1003
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Philippines
F. Date of Initial Production:	July, 2001

III. Packaging Information

A. Package Type:	**16-Lead SO**
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Silver-filled Epoxy
E. Bondwire:	Gold (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	# 05-1301-0034
H. Flammability Rating:	Class UL94-V0

I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112: Level 1

IV. Die Information

A. Dimensions:	145 x 85 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	3 microns (as drawn)
F. Minimum Metal Spacing:	3 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 (Reliability Lab Manager)
Bryan Preeshl (Executive Director)
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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4389 \times 79 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 13.75 \times 10^{-9}$

$\lambda = 13.75$ F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability monitor program. In addition to routine production Burn-In, Maxim pulls a sample from every fabrication process three times per week and subjects it to an extended Burn-In prior to shipment to ensure its reliability. The reliability control level for each lot to be shipped as standard product 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 any lot that exceeds this reliability control level. Attached Burn-In Schematic (Spec. # 06-5620) shows the static Burn-In circuit. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1M**).

B. Moisture Resistance Tests

Maxim pulls pressure pot samples from every assembly process three times per week. Each lot sample must meet an LTPD = 20 or less before shipment as standard product. Additionally, the industry standard 85°C/85%RH testing is done per generic device/package family once a quarter.

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

The NP13-1 die type has been found to have all pins able to withstand a transient pulse of ± 2000V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA and/or ±20V.

Table 1
Reliability Evaluation Test Results

MAX5917xESE

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		79	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 96hrs.	DC Parameters & functionality	SO	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 lots.
Note 2: Generic package/process 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

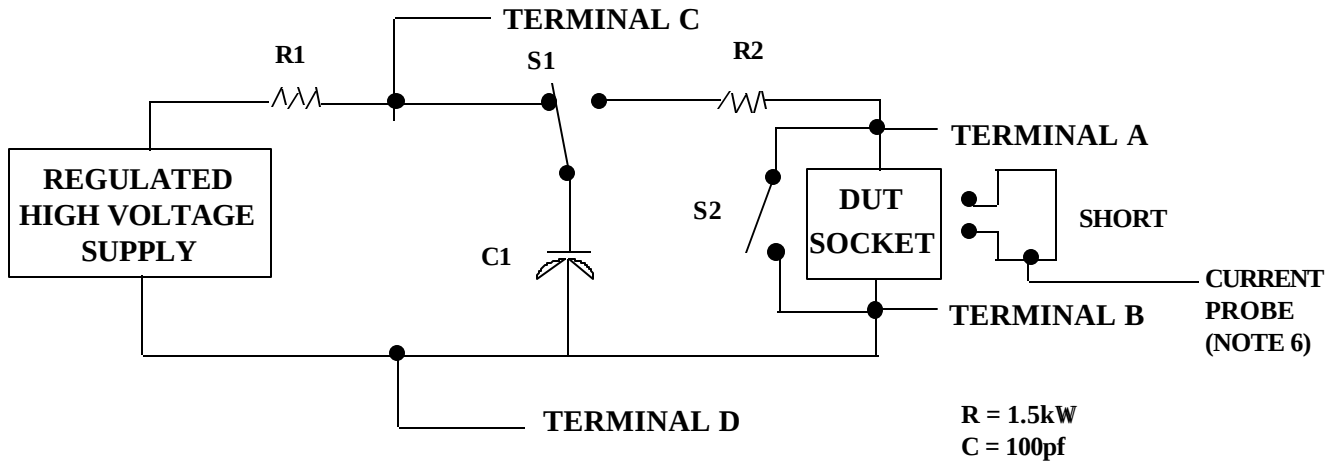
1/ Table II is restated in narrative form in 3.4 below.
2/ No connects are not to be tested.
3/ Repeat pin combination I for each named Power supply and for ground (e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

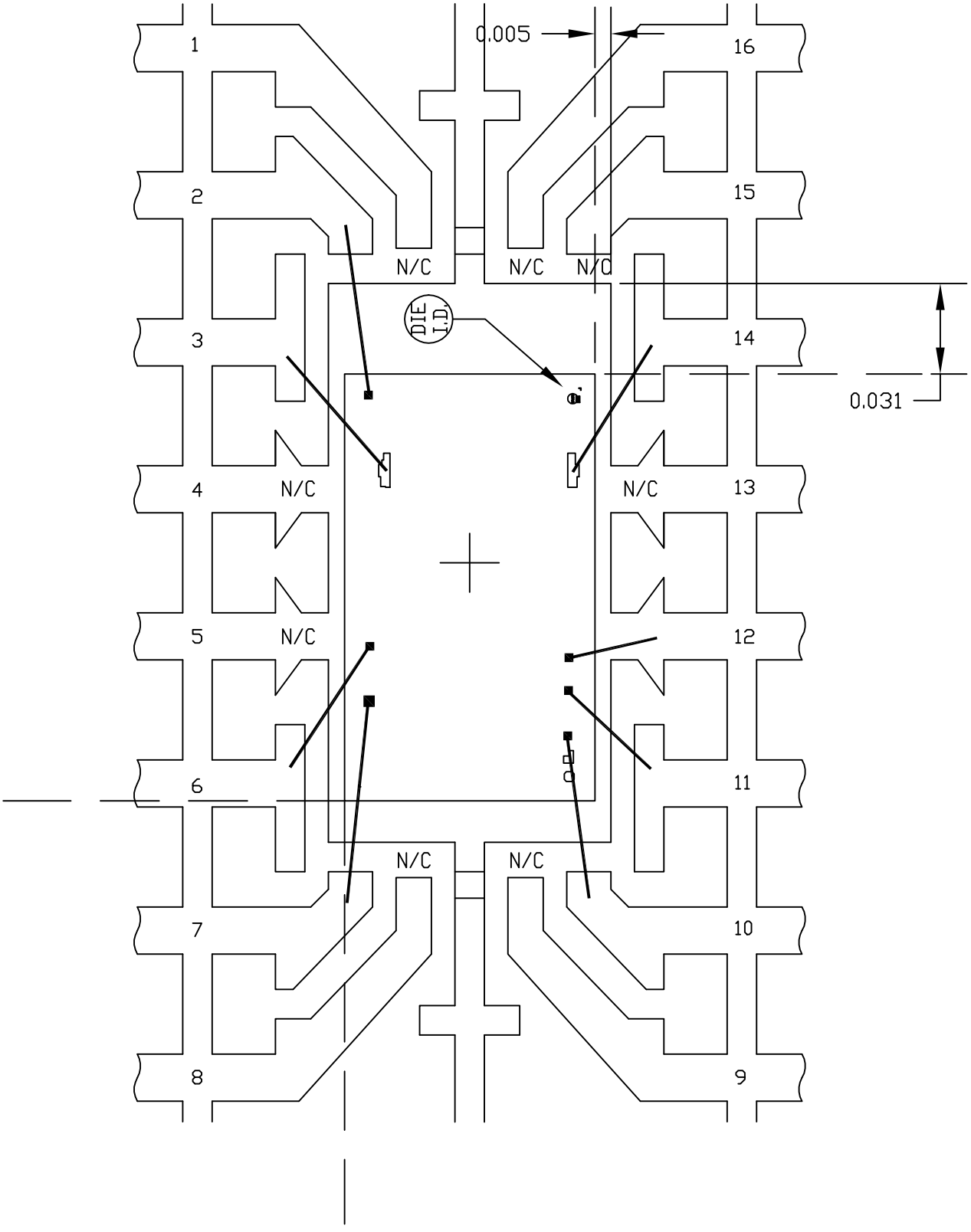
3.4 Pin combinations to be tested.

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.



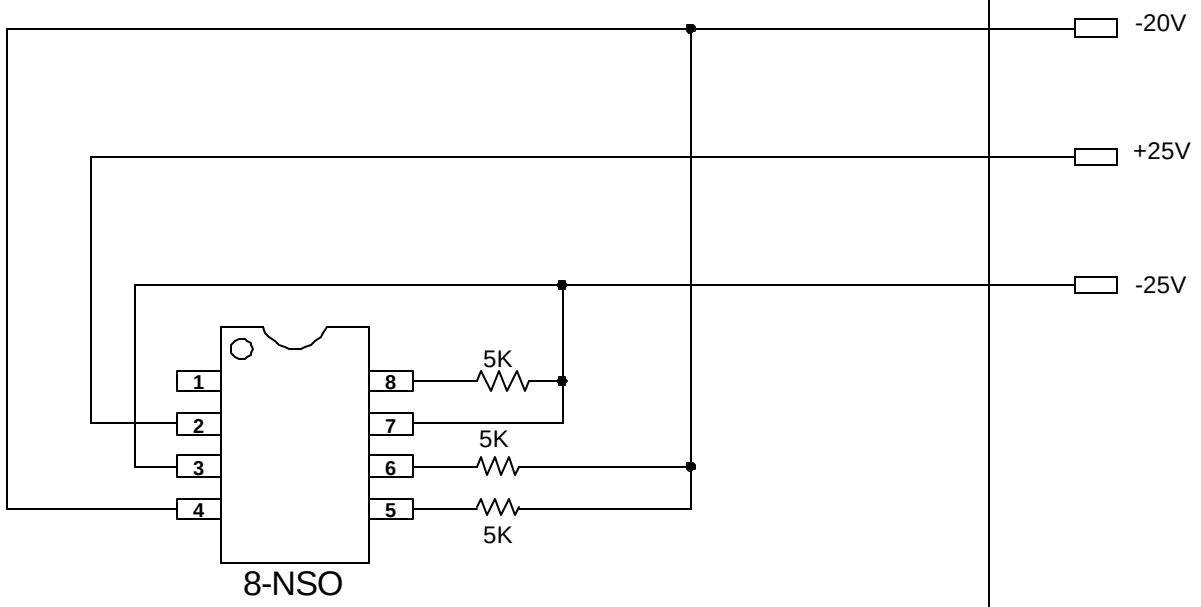


FUSED LEADS

PKG. CODE: S16-9F		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 96x190	PKG.		2/9/01	BOND DIAGRAM #: 05-1301-0034	REV: A
	DESIGN		2/12/01		

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 5910
MAX. EXPECTED CURRENT = 14 mA (-25V), 13mA(+25V), 1mA(-20V)

DRAWN BY: HAK TAN
NOTES: