

RELIABILITY REPORT
FOR
MAX968ExA
PLASTIC ENCAPSULATED DEVICES

August 3, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Written by

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Quality Assurance
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Conclusion

The MAX968 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 MAX968 single/dual/quad micropower comparator features Rail-to-Rail inputs and outputs, and fully specified single-supply operation down to +1.6V. This device draws less than 5 μ A per comparator and has open-drain outputs that can be pulled beyond V_{CC} to 6V (max) above ground. In addition, its rail-to-rail input common-mode voltage range makes this comparator suitable for ultra-low-voltage operation.

A +1.6V to +5.5V single-supply operating voltage range makes the MAX968 comparator ideal for 2-cell battery-powered applications. The MAX968 offers programmable hysteresis and an internal 1.235V \pm 1.5% reference. This device is available in a space-saving 8-pin μ MAX package.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
Supply Voltage (VCC)	+6V
Voltages	
IN ₋ , IN ₊ , REF, HYST	-0.3V to (VCC + 0.3V)
OUT ₋	-0.3V to +6.0V
Duration of OUT ₋ Short Circuit to GND or VCC	Continuous
Continuous Power Dissipation	
8-Pin SO (derate 5.88mW/°C above +70°C)	471mW
8-Pin μ MAX (derate 4.10mW/°C above +70°C)	330mW
Operating Temperature Range	-40°C to +85°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C

II. Manufacturing Information

- A. Description/Function: Single/Dual/Quad, Micropower, Ultra-Low-Voltage, Rail-to-Rail I/O Comparators
- B. Process: B12 (Standard 1.2 micron silicon gate CMOS)
- C. Number of Device Transistors: 299
- D. Fabrication Location: Oregon, USA
- E. Assembly Location: Malaysia, Philippines or Thailand
- F. Date of Initial Production: July, 1996

III. Packaging Information

- | | | |
|---|----------------------------------|--------------------------------|
| A. Package Type: | 8-Pin μMAX | 8-Pin SO |
| B. Lead Frame: | Copper | Copper |
| C. Lead Finish: | Solder Plate or 100% Matte Tin | Solder Plate or 100% Matte Tin |
| D. Die Attach: | Silver-filled Epoxy | Silver-filled Epoxy |
| E. Bondwire: | Gold (1 mil dia.) | Gold (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler | Epoxy with silica filler |
| G. Assembly Diagram: | # 05-1501-0117 | # 05-1501-0116 |
| H. Flammability Rating: | Class UL94-V0 | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C: | Level 1 | Level 1 |

IV. Die Information

- A. Dimensions: 50 x 62 mils
- B. Passivation: $\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide)
- C. Interconnect: Aluminum/Si (Si = 1%)
- D. Backside Metallization: None
- E. Minimum Metal Width: 1.2 microns (as drawn)
- F. Minimum Metal Spacing: 1.2 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 (Managing Director 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 135°C biased (static) life test are shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 320 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

△ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 3.44 \times 10^{-9}$$

$$\lambda = 3.44 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. Attached Burn-In Schematic (Spec. # 06-5241) shows the static Burn-In circuit. Maxim performs failure analysis on any lot that exceeds this reliability control level. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1N**). Current monitor data for the B8/S8 Process results in a FIT rate of 0.10 @ 25°C and 1.78 @ 55°C (eV = 0.8, UCL = 60%).

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 CM32-3 die type has been found to have all pins able to withstand a transient pulse of $\pm 1500\text{V}$, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$.

Table 1
Reliability Evaluation Test Results

MAX968ExA

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		320	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	μMAX SO	77 77	0 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 & functionality		77	0

Note 1: Life Test Data may represent plastic DIP 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} <u>3/</u>	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.

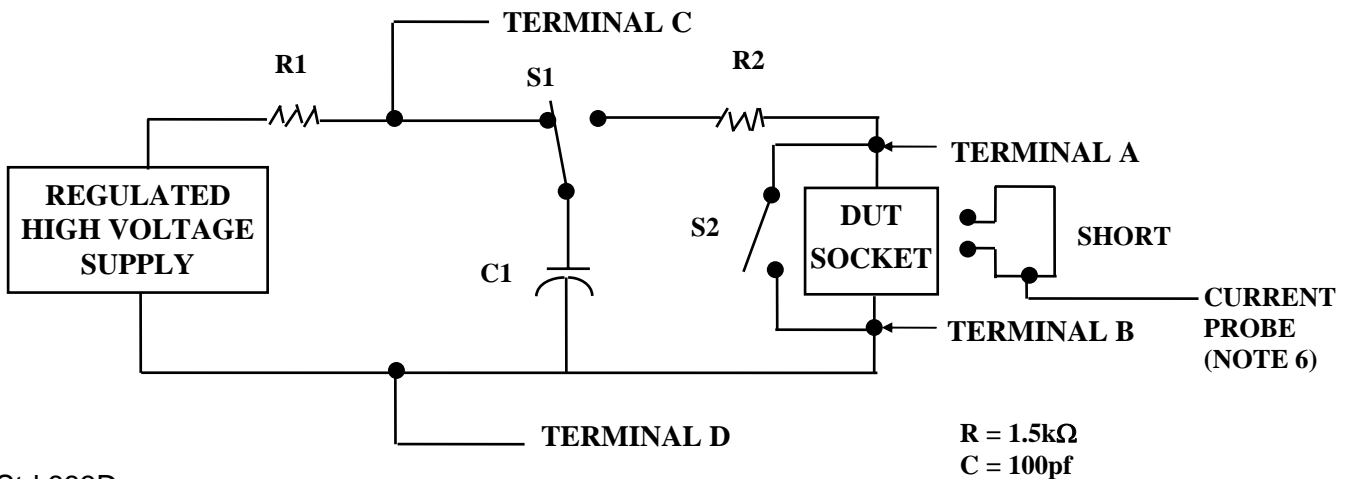
2/ No connects are not to be tested.

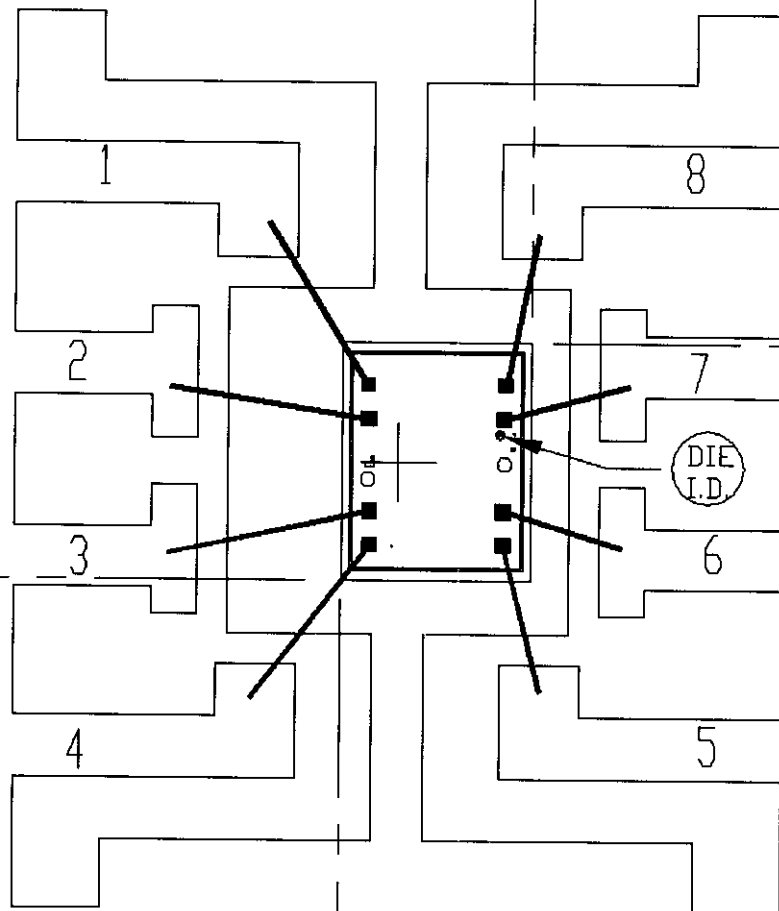
3/ Repeat pin combination I for each named Power supply and for ground

(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.

- 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.
- 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.
- 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: S8-2

CAV./PAD SIZE: 90 X 90

APPROVALS

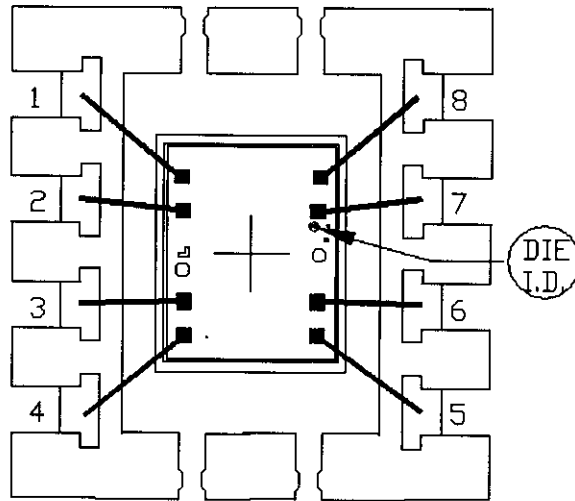
DATE


MAXIM

BUILDSHEET NUMBER:
05-1501-0116

REV.:
A

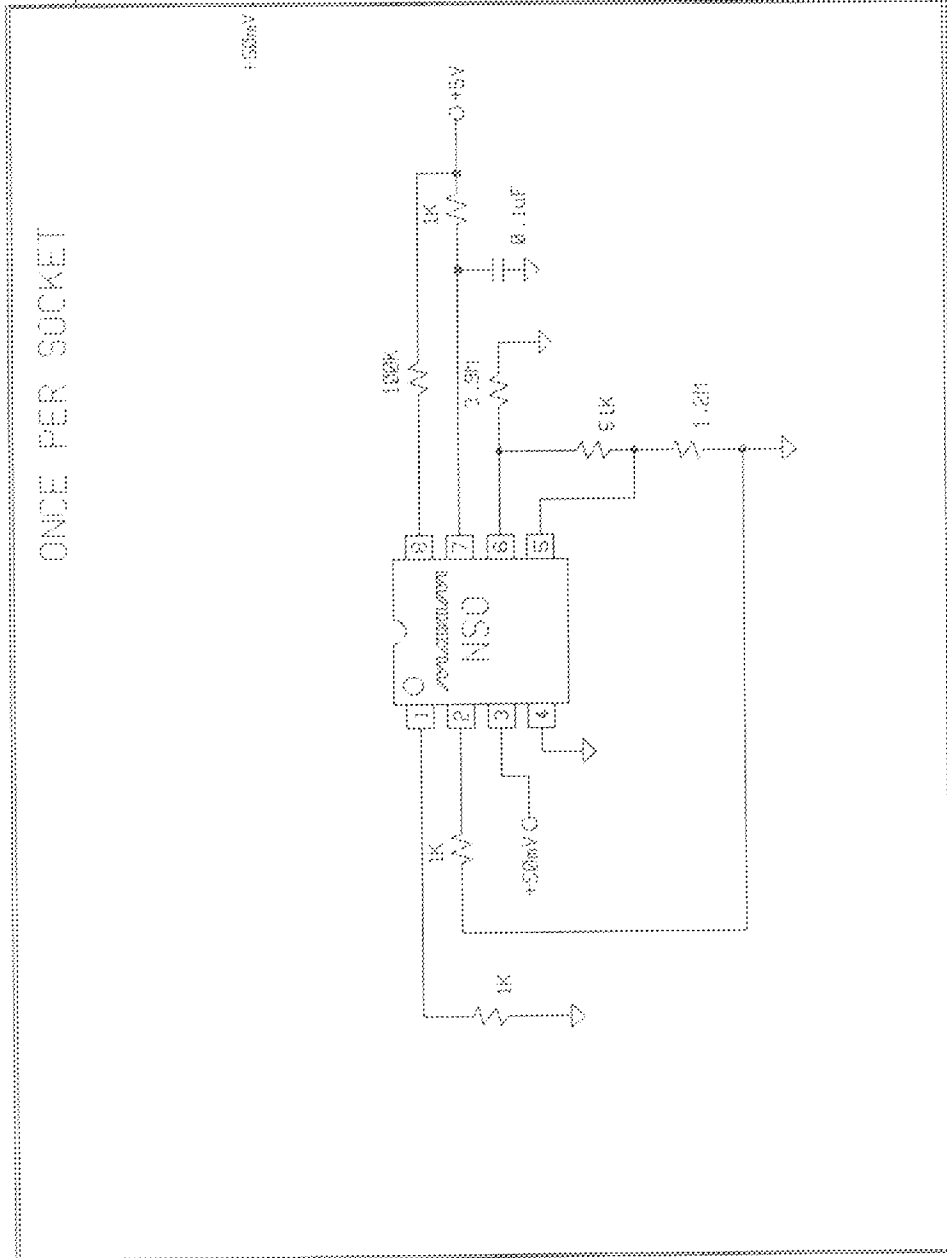
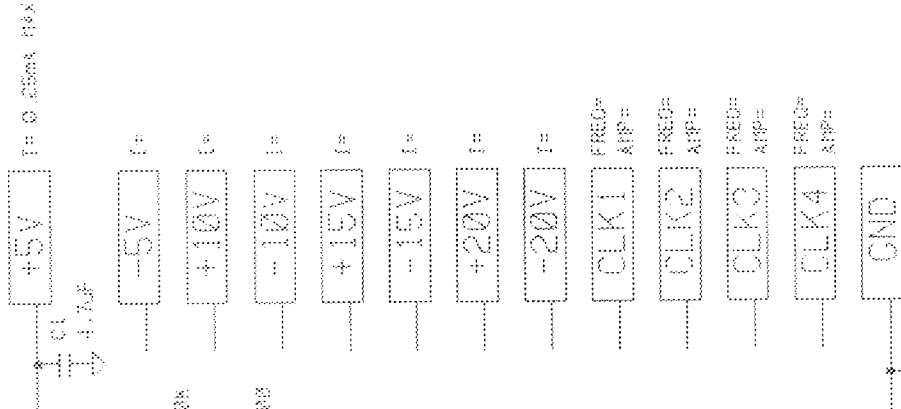
PKG.
DESIGN



PKG.CODE:	U8-1	APPROVALS	DATE		
CAV./PAD SIZE:	68X94				
				05-1501-0117	A

ONCE PER BOARD

ONCE PER SOCKET



-- STEADY STATE LIFE TEST IS PER MIL-STD-883 METHOD 1005.
 -- BURN-IN IS PER MIL-STD-883 METHOD 1015. COND. B

NOTES:

1. TEMPERATURE : 125C OR EQUIVALENT
2. TIME : 168 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 155C CONTINUOUS
4. APPROVED FOR (X) COMMERCIAL (X) HR/983

SPEC. NO. 06-5241 REV. A

MINIMUM BURN-IN SCHEMATIC

DATE: 12/23/95

DEVICE TYPE:
 MAX665/965/667/968