

RELIABILITY REPORT  
FOR  
**MAX3980UGH**  
PLASTIC ENCAPSULATED DEVICES

September 13, 2007

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



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## Conclusion

The MAX3980 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 MAX3980 quad equalizer provides compensation for transmission medium losses for four "lanes" of digital NRZ data at a 3.125Gbps data rate in one package. It is tailor-made for 10-Gigabit Ethernet (10GbE) backplane applications requiring attenuation of noise and jitter that occur in communicating from MAC to PMD or from MAC to Switch. In support of the IEEE-802.3ae for the XAUI interface, the MAX3980 adaptively allows XAUI lanes to reach up to 40in (1.0m) on FR4 board material.

The equalizer has 100 $\Omega$  differential CML data inputs and outputs.

The MAX3980 is available in a 44-pin exposed-pad QFN package. The MAX3980 consumes only 700mW at +3.3V or 175mW per channel.

#### B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
Supply Voltage, VCC	-0.5V to +4.0 V
Voltage at SDET, IN <sub>±</sub>	+0.5V to (VCC + 0.5V)
Current Out of OUT <sub>±</sub>	-25mA to +25mA
Operating Ambient Temperature Range	0°C to +85°C
Storage Temperature Range	-55°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
44-Pin QFN-EP	2105mW
Derates above +70°C	
44-Pin QFN-EP	26.3mW/°C

## II. Manufacturing Information

A. Description/Function:	3.125Gbps XAUI Quad Equalizer
B. Process:	GST4-F60
C. Number of Device Transistors:	3669
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Thailand
F. Date of Initial Production:	September, 2001

## III. Packaging Information

A. Package Type:	<b>44-Pin QFN-EP (7x7)</b>
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate or 100% Matte Tin
D. Die Attach:	Silver-filled epoxy
E. Bondwire:	Gold (1.2 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	Buildsheet # 05-7001-0592
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

## IV. Die Information

A. Dimensions:	125 x 102 mils
B. Passivation:	$\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1: 1.2; Metal2: 1.2; Metal3: 1.2; Metal4: 5.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1: 1.6; Metal2: 1.6; Metal3: 1.6; Metal4: 4.2 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	$\text{SiO}_2$
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Jim Pedicord (Reliability Lab Manager)  
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 150°C biased (static) life test are shown in **Table 1**. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 9823 \times 44 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

└ Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 11.03 \times 10^{-8} \quad \lambda = 11.03 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Reports (**RR-1M & RR-B3A**).

### 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 HF99 die type has been found to have all pins able to withstand a transient pulse of +/-1000V, 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

**MAX3980UGH**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)				
	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	44	0
<b>Moisture Testing</b> (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
<b>Mechanical Stress</b> (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters	77	0

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

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 $V_{PS1}$ <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.

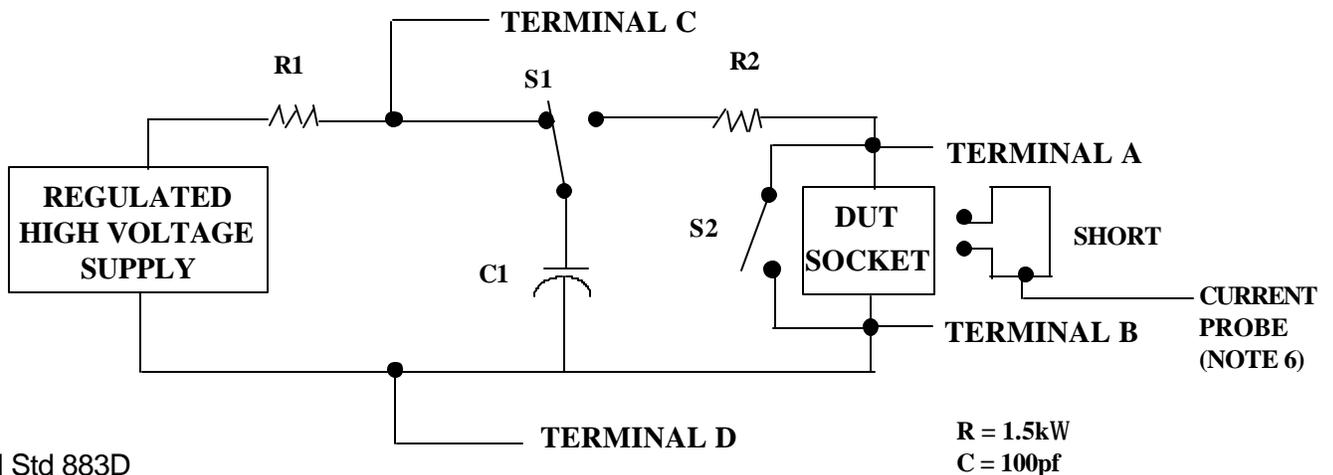
2/ No connects are not to be tested.

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

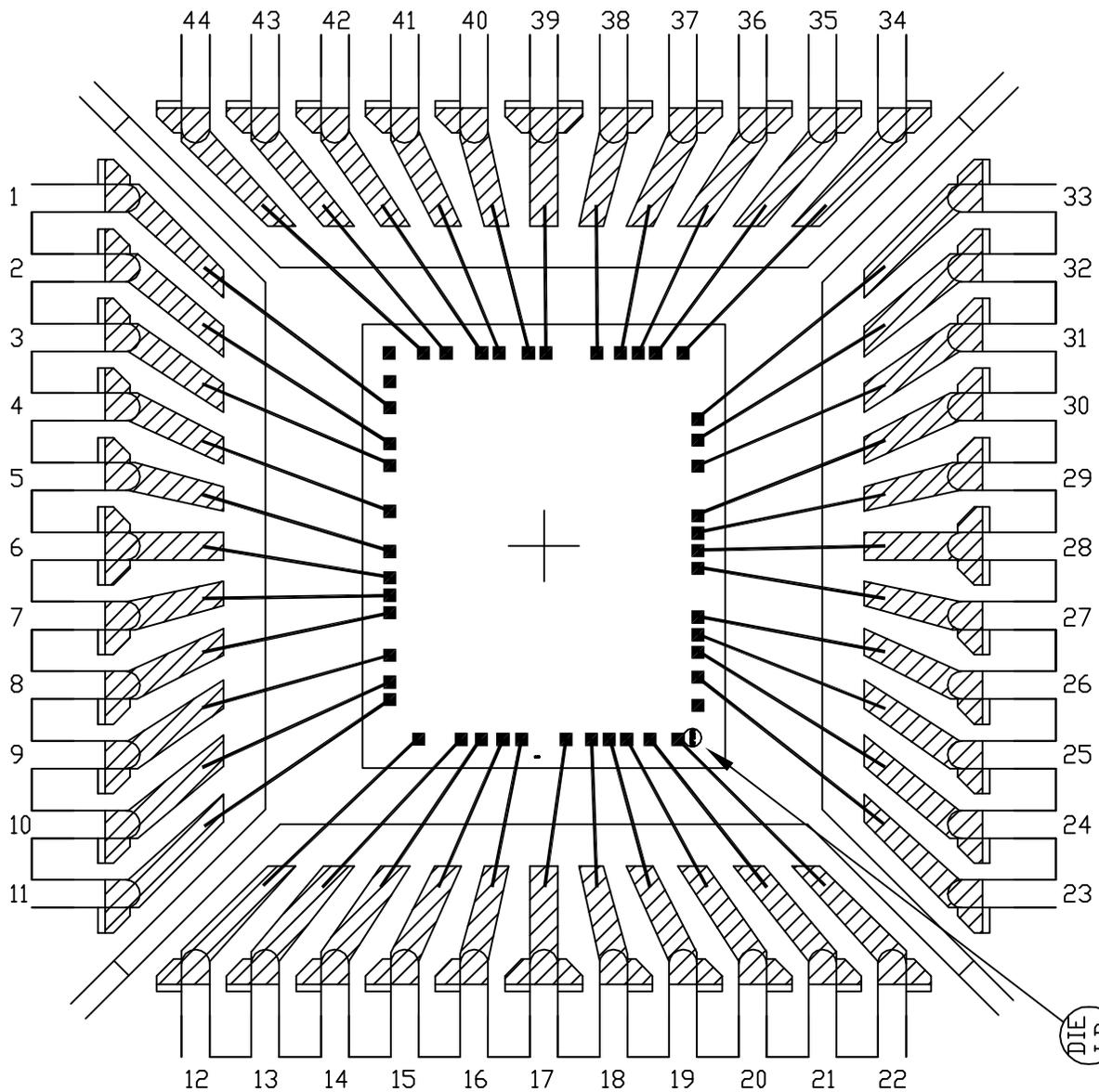
(e.g., where  $V_{PS1}$  is  $V_{DD}$ ,  $V_{CC}$ ,  $V_{SS}$ ,  $V_{BB}$ ,  $GND$ ,  $+V_S$ ,  $-V_S$ ,  $V_{REF}$ , etc).

3.4 Pin combinations to be tested.

- 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.



EXPOSED PAD PKG.



 BONDABLE AREA

PKG. BODY SIZE: 7x7 mm

PKG. CODE: G4477-1		SIGNATURES	DATE	<b>MAXIM</b> CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 157x157	PKG. DESIGN			BOND DIAGRAM #: 05-7001-0592	REV: A