RELIABILITY REPORT

FOR

MAX3861EGG

PLASTIC ENCAPSULATED DEVICES

August 23, 2002

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX3861 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 MAX3861 is a low-power amplifier with automatic gain control (AGC), designed for WDM transmission systems employing optical amplifiers and requiring a vertical threshold adjustment after the post amp. Operating from a single 3.3V supply, this AGC amplifier linearly amplifies/attenuates the input signal while maintaining a fixed output-voltage swing at data rates up to 2.7Gbps. Both the input and output are on-chip terminated to match 50Ω interfaces.

This amplifier has a small-signal bandwidth of 3.4GHz and an input-referred noise of $0.26mV_{RMS}$. Over an input signal range of $6mV_{P-P}$ to $1200mV_{P-P}$ (46dB), the MAX3861 delivers a constant output amplitude that is adjustable from $400mV_{P-P}$ to $920mV_{P-P}$. Variation in output swing is controlled within 0.2dB over a 16dB input range. The MAX3861 provides a received-signal-strength indicator (RSSI) that is linear, within 2.5%, for input signal levels up to $100mV_{P-P}$ and an input signal detect (SD) with programmable threshold.

B. Absolute Maximum Ratings

Item	Rating
Supply Voltage	-0.5V to +4.0V
Voltage at IN+, IN-	(VCC - 1.5V) to (VCC + 0.5V)
Voltage at CZ+, CZ-, CG+, CG-, CD+, CD-	(VCC - 3.5V) to (VCC + 0.5V)
Voltage at SC, SD, EN, TH, OSM, VREF, and RSSI	-0.5V to (VCC + 0.5V)
CML Input Current at IN+, IN-	25mA
CML Output Current at OUT+, OUT-	25mA
Storage Temperature Range	-55°C to +150°C
Operating Junction Temperature Range	-55°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = 70°C)	
24-Pin QFN	1667mW
Derates above +70°C	
24-Pin QFN	20.8mW/°C

II. Manufacturing Information

A. Description/Function:	2.7Gbps Post Amp with Automatic Gain Control
B. Process:	GST4-F60
C. Number of Device Transistors:	952
D. Fabrication Location:	Oregon, USA
E. Assembly Location:	Korea
F. Date of Initial Production:	October, 2000

III. Packaging Information

A. Package Type:	**24-Pin QFN**
B. Lead Frame:	Copper
C. Lead Finish:	Solder Plate
D. Die Attach:	Silver-filled epoxy
E. Bondwire:	Gold (1.2 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	Buildsheet # 05-7001-0521
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1

IV. Die Information

A. Dimensions:	79 x 79 mils
B. Passivation:	Si_3N_4/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:	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 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 150°C biased (static) life test are shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 9823 \times 44 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 11.03 \times 10^{-8}$ $\lambda = 11.03$ 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. Burn-In is performed using the attached spec (06-7060). 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 HF83 die type has been found to have all pins able to withstand a transient pulse of ± 1500V, 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

MAX3861EGG

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	44	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 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} 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

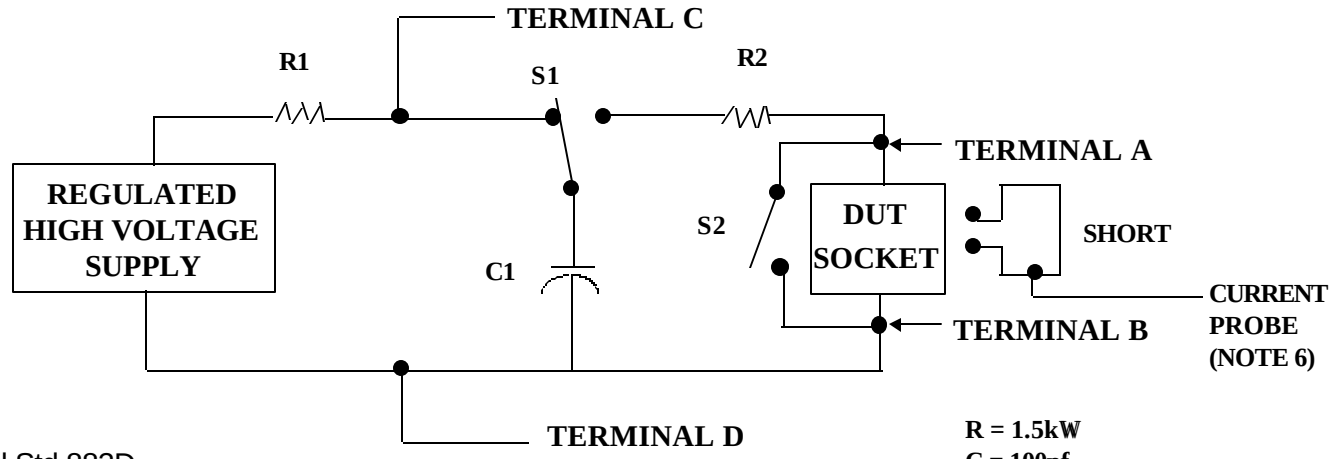
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

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.

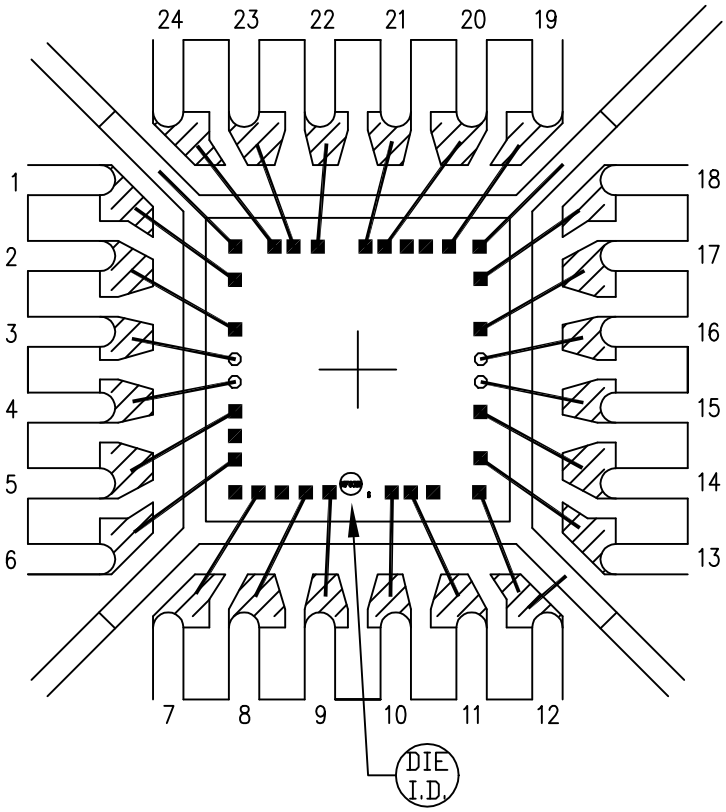
b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall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



Mil Std 883D
Method 3015.7
Notice 8

EXPOSED PAD PKG.



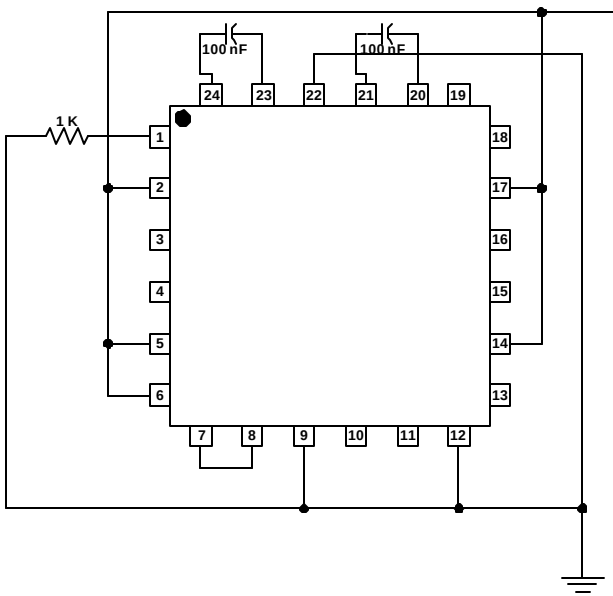
BONDABLE AREA

PKG. BODY SIZE: 4x4 mm

PKG. CODE: G2444-1		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 91x91	PKG.			BOND DIAGRAM #: 05-7001-0521	REV: B
	DESIGN				

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 3861
PACKAGE: 24-QFN 4X4mm
MAX. EXPECTED CURRENT = 112mA

DRAWN BY: HAK TAN

NOTES: