

RELIABILITY REPORT  
FOR  
**MAX1162xxxB**  
PLASTIC ENCAPSULATED DEVICES

April 1, 2004

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



Jim Pedicord  
Quality Assurance  
Manager, Reliability Operations

Reviewed by



Bryan J. Preeshl  
Quality Assurance  
Managing Director

## Conclusion

The MAX1162 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 MAX1162 low-power, 16-bit analog-to-digital converter (ADC) features a successive-approximation ADC, automatic power-down, fast 1.1 $\mu$ s wakeup, and a high-speed SPI™/QSPI™/MICROWIRE™-compatible interface. The MAX1162 operates with a single +5V analog supply and features a separate digital supply, allowing direct interfacing with +2.7V to +5.25V digital logic.

At the maximum sampling rate of 200ksps, the MAX1162 consumes only 2.5mA. Power consumption is only 12.5mW ( $AV_{DD} = DV_{DD} = +5V$ ) at a 200ksps (max) sampling rate. AutoShutdown™ reduces supply current to 130 $\mu$ A at 10ksps and to less than 10 $\mu$ A at reduced sampling rates.

Excellent dynamic performance and low power, combined with ease of use and small package size (10-pin  $\mu$ MAX and 10-pin DFN) make the MAX1162 ideal for battery-powered and data-acquisition applications or for other circuits with demanding power consumption and space requirements.

#### B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
AVDD to AGND	-0.3V to +6V
DVDD to DGND	-0.3V to +6V
DGND to AGND	-0.3V to +0.3V
AIN, REF to AGND	-0.3V to (AVDD + 0.3V)
SCLK, CS to DGND	-0.3V to +6V
DOUT to DGND	-0.3V to (DVDD + 0.3V)
Maximum Current Into Any Pin	50mA
Operating Temperature Ranges	
MAX1162_CUB	0°C to +70°C
MAX1162_EUB	-40°C to +85°C
Maximum Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C
Continuous Power Dissipation (TA = +70°C)	
10-Pin $\mu$ MAX	444mW
Derates above +70°C	
10-Pin $\mu$ MAX	5.6mW/°C

## II. Manufacturing Information

A. Description/Function:	16-Bit, +5V, 200ksps ADC with 10µA Shutdown
B. Process:	S6 (Standard 0.6 micron silicon gate CMOS)
C. Number of Device Transistors:	12,100
D. Fabrication Location:	California, USA
E. Assembly Location:	Malaysia, Philippines or Thailand
F. Date of Initial Production:	July, 2002

## III. Packaging Information

A. Package Type:	10-Pin uMAX	10-Pin DFN
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Solder Plate	Solder Plate
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:	#05-2101-0039	#05-9000-0405
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-A:	Level 1	Level 1

## IV. Die Information

A. Dimensions:	62 x 78 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.6 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Jim Pedicord (Manager, Reliability Operations)  
Bryan Preeshl (Managing 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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4389 \times 157 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

▲  
Temperature Acceleration factor assuming an activation energy of 0.8eV

$$\lambda = 6.92 \times 10^{-9}$$

$$\lambda = 6.92 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. Maxim performs failure analysis on any lot that exceeds this reliability control level. Attached Burn-In Schematic (Spec. # 06-5715) 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 AC23 die type has been found to have all pins able to withstand a transient pulse of  $\pm 2500\text{V}$  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

**MAX1162xxxB**

<b>TEST ITEM</b>	<b>TEST CONDITION</b>	<b>FAILURE IDENTIFICATION</b>	<b>PACKAGE</b>	<b>SAMPLE SIZE</b>	<b>NUMBER OF FAILURES</b>
<b>Static Life Test</b> (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		157	0
<b>Moisture Testing</b> (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	SOT	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 & 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.

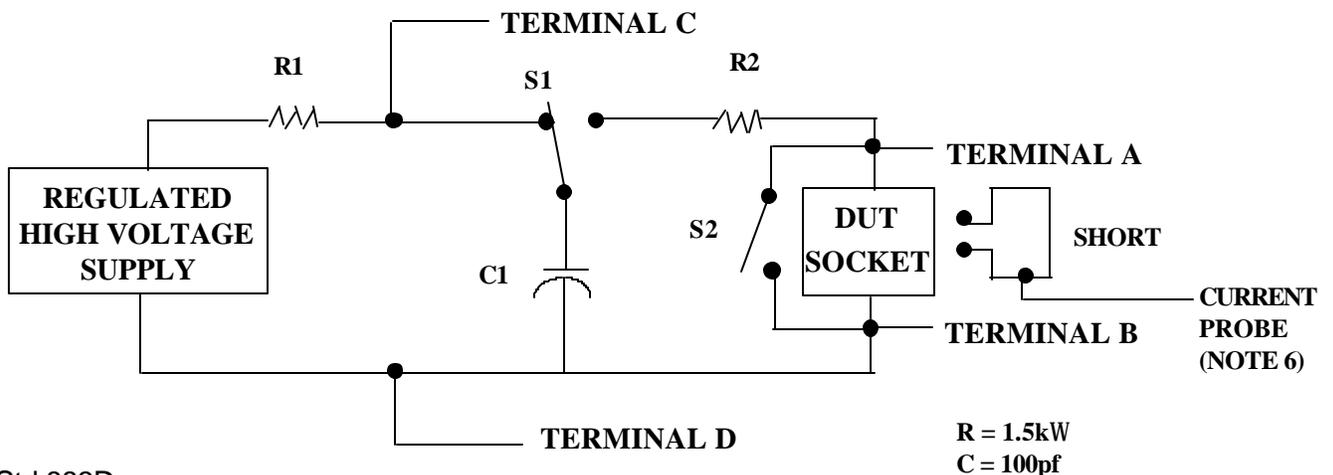
2/ No connects are not to be tested.

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).

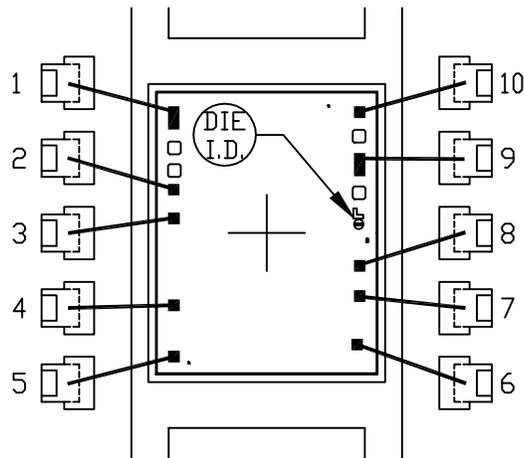
3.4 Pin combinations to be tested.

- 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.

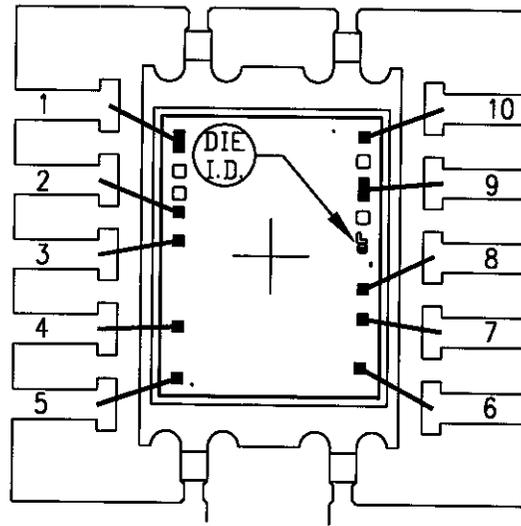


3x3x0.8 MM QFN THIN PKG.

EXPOSED PAD PKG.



PKG. CODE: T1033-1		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 71x102	PKG. DESIGN			BOND DIAGRAM #: 05-9000-0405	REV: A



PKG. CODE:	U10-2
CAV./PAD SIZE:	68x94
	PKG. DESIGN

SIGNATURES  
A

DATE

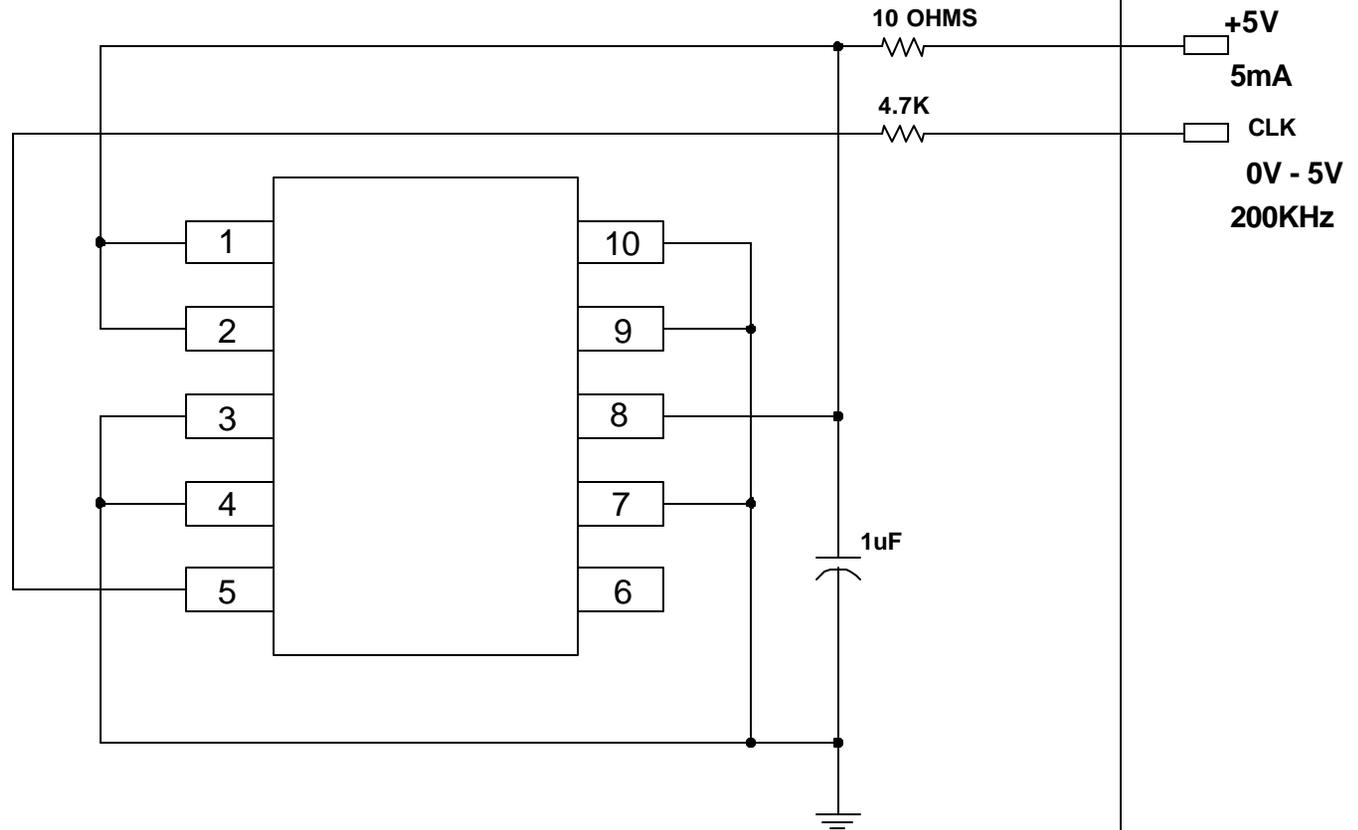
**MAXIM**  
CONFIDENTIAL & PROPRIETARY

BOND DIAGRAM #:  
05-2101-0039

REV:  
A

ONCE PER SOCKET

ONCE PER BOARD



DEVICES: MAX 1062 AND 1162  
PACKAGE: 10uMAX  
MAX. EXPECTED CURRENT = 5mA