

RELIABILITY REPORT  
FOR  
MAX144A/BEUA+  
PLASTIC ENCAPSULATED DEVICES

July 2, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

<b>Approved by</b>
Ken Wendel
Quality Assurance
Director, Reliability Engineering

## Conclusion

The MAX144A/BEUA+ 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	V. ....Quality Assurance Information
II. ....Manufacturing Information	VI. ....Reliability Evaluation
III. ....Packaging Information	IV. ....Die Information
.....Attachments	

### I. Device Description

#### A. General

The MAX144/MAX145 low-power, 12-bit analog-to-digital converters (ADCs) are available in 8-pin  $\mu$ MAX® and DIP packages. Both devices operate with a single +2.7V to +5.25V supply and feature a 7.4 $\mu$ s successive-approximation ADC, automatic power-down, fast wake-up (2.5 $\mu$ s), an on-chip clock, and a high-speed, 3-wire serial interface. Power consumption is only 3.2mW ( $V_{DD} = +3.6V$ ) at the maximum sampling rate of 108ksps. At slower throughput rates, the automatic shutdown (0.2 $\mu$ A) further reduces power consumption. The MAX144 provides 2-channel, single-ended operation and accepts input signals from 0 to  $V_{REF}$ . The MAX145 accepts pseudo-differential inputs ranging from 0 to  $V_{REF}$ . An external clock accesses data through the 3-wire serial interface, which is SPI<sup>®</sup>, QSPI<sup>®</sup>, and MICROWIRE<sup>®</sup>-compatible. Excellent dynamic performance and low power, combined with ease of use and small package size, make these converters ideal for battery-powered and data-acquisition applications, or for other circuits with demanding power-consumption and space requirements. For pin-compatible 10-bit ADCs, see the MAX157 and MAX159 data sheets.

## II. Manufacturing Information

A. Description/Function:	+2.7V, Low-Power, 2-Channel, 108ksps, Serial 12-Bit ADCs in 8-Pin $\mu$ MAX
B. Process:	S12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	ATP Philippines, UTL Thailand, Unisem Malaysia
F. Date of Initial Production:	October 22, 1998

## III. Packaging Information

A. Package Type:	8-pin uMAX
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0101-0465
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	221°C/W
K. Single Layer Theta Jc:	41.9°C/W
L. Multi Layer Theta Ja:	206.3°C/W
M. Multi Layer Theta Jc:	41.9°C/W

## IV. Die Information

A. Dimensions:	61 X 87 mils
B. Passivation:	$\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu
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:	$\text{SiO}_2$
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

A. Quality Assurance Contacts:	Jim Pedicord (Manager, Rel 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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 240 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 4.5 \times 10^{-9}$$

$$\lambda = 4.5 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the S12 Process results in a FIT Rate of 12.5 @ 25C and 192.25 @ 55C, data limited (0.8 eV, 60% UCL)

### B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The AD70 die type has been found to have all pins able to withstand a HBM transient pulse of 2500 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of 250 mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX144BEUA+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	240	0
<b>Moisture Testing</b> (Note 2) 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