

RELIABILITY REPORT  
FOR  
MAX548AEUA+T  
PLASTIC ENCAPSULATED DEVICES

June 26, 2013

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

<b>Approved by</b>
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## Conclusion

The MAX548AEUA+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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### I. Device Description

#### A. General

The MAX548A/MAX549A/MAX550A serial, 8-bit voltage-output digital-to-analog converters (DACs) operate from a single +2.5V to +5.5V supply. Their  $\pm 1$ LSB TUE specification is guaranteed over temperature. Operating current (supply current plus reference current) is typically 75 $\mu$ A per DAC with  $V_{DD} = 2.5V$ . In shutdown, the DAC is disconnected from the reference, reducing current drain to less than 1 $\mu$ A. The MAX548A/MAX549A allow each DAC to be shut down independently. The 10MHz, 3-wire serial interface is compatible with SPI<sup>®</sup>;/QSPI<sup>®</sup>;/ and Microwire<sup>®</sup>;/ interface standards. Double-buffered inputs provide flexibility when updating the DACs; the input and DAC registers can be updated individually or simultaneously. The MAX548A is a dual DAC with an asynchronous load input; it uses  $V_{DD}$  as the reference input. The MAX549A is a dual DAC with an external reference input. The MAX550A is a single DAC with an external reference input and an asynchronous load input. The MAX548A/MAX549A/MAX550A's low power consumption and small  $\mu$ MAX<sup>®</sup> and DIP packages make these devices ideal for portable and battery-powered applications.

## II. Manufacturing Information

A. Description/Function:	+2.5V to +5.5V, Low-Power, Single/Dual, 8-Bit Voltage-Output DACs in $\mu$ MAX Package
B. Process:	S12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	Philippines, Thailand, or Malaysia
F. Date of Initial Production:	April 04, 1997

## III. Packaging Information

A. Package Type:	8-pin uMAX
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-0401-0468
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:	64 X 54 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
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:	
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)  
Don Lipps (Manager, Reliability Engineering)  
Bryan Preeshl (Vice President 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.7 \times 10^{-9}$$

$$\lambda = 13.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the S12 Process results in a FIT Rate of 0.02 @ 25C and 0.33 @ 55C (0.8 eV, 60% UCL).

### B. E.S.D. and Latch-Up Testing (lot NMVACB004C, D/C 9826)

The DA62 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX548AEUA+T**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	NMVBC2024F, D/C 0017

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