RELIABILITY REPORT

FOR

MAX5441ACUA+

PLASTIC ENCAPSULATED DEVICES

July 16, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX5441ACUA+ 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 MAX5441-MAX5444 are serial-input, voltage-output, 16-bit digital-to-analog converters (DACs) in tiny µMAX® packages, 50% smaller than comparable DACs in 8-pin SOs. They operate from low +3V (MAX5443/MAX5444) or +5V (MAX5441/MAX5442) single supplies. They provide 16-bit performance (±2LSB INL and ±1LSB DNL) over temperature without any adjustments. Unbuffered DAC outputs result in a low supply current of 120µA and a low offset error of 2LSB. The DAC output ranges from 0 to VREF. For bipolar operation, matched scaling resistors are provided in the MAX5442/MAX5444 for use with an external precision op amp (such as the MAX400), generating a ±VREF output swing. A 16-bit serial word is used to load data into the DAC latch. The 25MHz, 3-wire serial interface is compatible with SPI™/QSPI(tm)/MICROWIRE™, and can interface directly with optocouplers for applications requiring isolation. A power-on reset circuit clears the DAC output to code 0 (MAX5441/MAX5443) or code 32768 (MAX5442/MAX5444) when power is initially applied. A logic low on active-low CLR asynchronously clears the DAC output to code 0 (MAX5441/MAX5443) or code 32768 (MAX5442/MAX5444) independent of the serial interface. The MAX5441/MAX5443 are available in 8-pin µMAX packages. The MAX5442/MAX5444 are available in 10-pin µMAX packages.

II. Manufacturing Information

A. Description/Function:	+3V/+5V, Serial-Input, Voltage-Output, 16-Bit DACs
B. Process:	C6Y
C. Number of Device Transistors:	2778
D. Fabrication Location:	Japan
E. Assembly Location:	Malaysia, Thailand
F. Date of Initial Production:	October 22, 2000

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:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	62 X 83 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
C. Interconnect:	Al/0.5%Cu
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_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering) 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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 79 \times 2} \quad \text{(Chi square value for MTTF upper limit)}$$

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

$\lambda = 13.6 \times 10^{-9}$

λ = 13.6 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 C6Y Process results in a FIT Rate of 0.82 @ 25C and 14.21 @ 55C (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 DA82-1 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

MAX5441ACUA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	79	0
Moisture Testing (Note 2)				
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 & functionality	77	0

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

Note 2: Generic Package/Process data