RELIABILITY REPORT

FOR

MAX11609EEE+

PLASTIC ENCAPSULATED DEVICES

November 2, 2012

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX11609EEE+ 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.

Table of Contents

I. Device Description

A. General

The MAX11606-MAX11611 low-power, 10-bit, multichannel analog-to-digital converters (ADCs) feature internal track/hold (T/H), voltage reference, clock, and an I²C-compatible 2-wire serial interface. These devices operate from a single supply of 2.7V to 3.6V (MAX11607/MAX11609/MAX11611) or 4.5V to 5.5V (MAX11606/MAX11608/MAX11610) and require only 670µA at the maximum sampling rate of 94.4ksps. Supply current falls below 230µA for sampling rates under 46ksps. AutoShutdown(tm) powers down the devices between conversions, reducing supply current to less than 1µA at low throughput rates. The MAX11606/MAX11607 have 4 analog input channels each, the MAX11608/MAX11609 have 8 analog input channels each, while the MAX11610/MAX11611 have 12 analog input channels each. The fully differential analog inputs are software configurable for unipolar or bipolar, and single ended or differential operation. The full-scale analog input range is determined by the internal reference or by an externally applied reference voltage ranging from 1V to VDD. The MAX11607/MAX11609/MAX11611 feature a 2.048V internal reference and the MAX11606/MAX11608/MAX11610 feature a 4.096V internal reference. The MAX11606/MAX11607 are available in an 8-pin µMAX® package. The MAX11607 is also available in an ultra-small 1.9mm x 2.2mm WLP package. The MAX11608-MAX11611 are available in a 16-pin QSOP package. The MAX11606-MAX11611 are guaranteed over the extended temperature range (-40°C to +85°C). For pin-compatible 12-bit parts, refer to the MAX11612-MAX11617 data sheet. For pin-compatible 8-bit parts, refer to the MAX11600-MAX11605 data sheet.

II. Manufacturing Information

A. Description/Function:	2.7V to 3.6V and 4.5V to 5.5V, Low-Power, 4-/8-/12-Channel, 2-Wire Serial 10-Bit ADCs
B. Process:	C6Y
C. Number of Device Transistors:	12956
D. Fabrication Location:	Japan
E. Assembly Location:	Texas, Malaysia, Philippines, Thailand
F. Date of Initial Production:	July 25, 2009

III. Packaging Information

A. Package Type:	16-pin QSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3728
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:	120°C/W
K. Single Layer Theta Jc:	37°C/W
L. Multi Layer Theta Ja:	103.7°C/W
M. Multi Layer Theta Jc:	37°C/W

IV. Die Information

A. Dimensions:	86 X 80 mils
B. Passivation:	Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
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:	
H. Isolation Dielectric:	SiO_2
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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

$\lambda = 4.6 \times 10^{-9}$

$\lambda = 4.6$ 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 C6Y Process results in a FIT Rate of 0.90 @ 25C and 15.55 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot E3N9FA011A D/C 0922)

The AC31-9 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1

Reliability Evaluation Test Results

MAX11609EEE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	48	0	E3N5FA009A, D/C 0922
	Biased	& functionality	48	0	E3N3HA004A, D/C 0850
	Time = 192 hrs.		50	0	I3N1FA015A, D/C 0513
			50	0	S3N2EQ001C, D/C 0517
			44	0	I3N1DQ002B, D/C 0229

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