

RELIABILITY REPORT
FOR
MAX11040GUU+
PLASTIC ENCAPSULATED DEVICES

June 12, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX11040GUU+ 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 MAX11040 is a 24-bit, 4-channel, simultaneous-sampling, sigma-delta analog-to-digital converter (ADC). The device allows simultaneous sampling of as many as 32 channels using a built-in cascade feature to synchronize as many as eight devices. The serial interface of the MAX11040 allows reading data from all the cascaded devices using a single command. Four modulators simultaneously convert each fully differential analog input with a programmable data output rate ranging from 0.25ksps to 64ksps. The device achieves 106dB SNR at 16ksps and 117dB SNR at 1ksps. The MAX11040 operates from a single +3V supply. The differential analog input range is $\pm 2.2V$ when using the internal reference, an external reference is optional. Each input is overvoltage protected up to $\pm 6V$ without damage. The device uses an internal crystal oscillator or an external source for clock.

The MAX11040 is compatible with SPI(tm), QSPI(tm), MICROWIRE(tm), and DSP-compatible 4-wire serial interfaces. An on-board interface logic allows one serial interface (with a single chip select) to control up to eight cascaded devices or 32 simultaneous sampling analog input channels.

The MAX11040 is ideally suited for power-management systems. Each channel includes an adjustable sampling phase enabling internal compensation for phase shift due to external dividers, transformers, or filters at the inputs. The output data rate is adjustable with a 0.065% resolution (at 16ksps or below) to track the varying frequency of a periodic input. An active-low SYNC input allows periodic alignment of the conversion timing of multiple devices with a remote timing source.

The MAX11040 is available in a 38-pin TSSOP package specified over the $-40^{\circ}C$ to $+105^{\circ}C$ industrial temperature range.

II. Manufacturing Information

A. Description/Function:	24-Bit, 4-Channel, Simultaneous-Sampling, Cascadable, Sigma-Delta ADC
B. Process:	S45C
C. Number of Device Transistors:	254508
D. Fabrication Location:	California
E. Assembly Location:	ATP Philippines
F. Date of Initial Production:	April 25, 2009

III. Packaging Information

A. Package Type:	38-pin TSSOP
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 3
J. Single Layer Theta Ja:	73°C/W
K. Single Layer Theta Jc:	11°C/W
L. Multi Layer Theta Ja:	62.5°C/W
M. Multi Layer Theta Jc:	11°C/W

IV. Die Information

A. Dimensions:	108 X 246 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 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 shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.4 \times 10^{-9}$$

$\lambda = 22.4$ 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 S45C Process results in a FIT Rate of 2.47 @ 25C and 29.89 @ 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 AC73 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

Table 1
Reliability Evaluation Test Results

MAX11040GUU+

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	48	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