

RELIABILITY REPORT
FOR
MAX1258BETM+T
PLASTIC ENCAPSULATED DEVICES

September 24, 2013

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Richard Aburano
Quality Assurance
Manager, Reliability Engineering

Conclusion

The MAX1258BETM+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.

Table of Contents

I.Device Description	IV.Die Information
II.Manufacturing Information	V.Quality Assurance Information
III.Packaging Information	VI.Reliability Evaluation
.....Attachments	

I. Device Description

A. General

The MAX1220/MAX1257/MAX1258 integrate a 12-bit, multichannel, analog-to-digital converter (ADC), and a 12-bit, octal, digital-to-analog converter (DAC) in a single IC. These devices also include a temperature sensor and configurable general-purpose I/O ports (GPIOs) with a 25MHz SPI-/QSPI(tm)-/MICROWIRE®-compatible serial interface. The ADC is available in 8 and 16 input-channel versions. The octal DAC outputs settle within 2.0µs and the ADC has a 225ksps conversion rate. All devices include an internal reference (2.5V or 4.096V) for both the ADC and DAC. Programmable reference modes allow the use of an internal reference, an external reference, or a combination of both. Features such as an internal ±1°C accurate temperature sensor, FIFO, scan modes, programmable internal or external clock modes, data averaging, and AutoShutdown(tm) allow users to minimize power consumption and processor requirements. The low glitch energy (4nV × s) and low digital feedthrough (0.5nV × s) of the integrated octal DACs make these devices ideal for digital control of fast-response closed-loop systems. The devices are guaranteed to operate with a supply voltage from +2.7V to +3.6V (MAX1257) and from +4.75V to +5.25V (MAX1220/MAX1258). These devices consume 2.5mA at 225ksps throughput, only 22µA at 1ksps throughput, and under 0.2µA in the shutdown mode. The MAX1257/MAX1258 feature 12 GPIOs, while the MAX1220 offers four GPIOs that can be configured as inputs or outputs. The MAX1220 is available in a 36-pin TQFN package. The MAX1257/MAX1258 are available in 48-pin TQFN package. All devices are specified over the -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	12-Bit, Multichannel ADCs/DACs with FIFO, Temperature Sensing, and GPIO Ports
B. Process:	C6
C. Number of Device Transistors:	58131
D. Fabrication Location:	Japan or USA
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	April 24, 2004

III. Packaging Information

A. Package Type:	48-pin TQFN 7x7
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:	#05-9000-0626
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:	36°C/W
K. Single Layer Theta Jc:	1°C/W
L. Multi Layer Theta Ja:	25°C/W
M. Multi Layer Theta Jc:	1°C/W

IV. Die Information

A. Dimensions:	164 X 166 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.9 microns (as drawn)
F. Minimum Metal Spacing:	0.9 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:

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

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 C6 Process results in a FIT Rate of 0.17 @ 25C and 2.9 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SEQ0GA013A, D/C 0608)

The CO01 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of 250mA.

Table 1
Reliability Evaluation Test Results

MAX1258BETM+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	IEQ0FQ003A, D/C 0523

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