

RELIABILITY REPORT
FOR
MAX11904ETP+T
PLASTIC ENCAPSULATED DEVICES

March 13, 2015

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

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Conclusion

The MAX11904ETP+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 MAX11904 is a 20-bit, 1Msps, single-channel, fully differential SAR ADC with internal reference buffers. The MAX11904 provides excellent static and dynamic performance with best-in-class power consumption that directly scales with throughput. The device has a unipolar differential $\pm V_{REF}$ input range. Supplies include a 3.3V supply for the reference buffers, a 1.8V analog supply, a 1.8V digital supply, and a 1.5V to 3.6V digital interface supply. This ADC achieves 99.2dB SNR and -123dB THD, guarantees 20-bit resolution with no-missing codes and 6 LSB INL (max). The MAX11904 communicates data using a SPI compatible serial interface. The MAX11904 is offered in a 20-pin, 4mm x 4mm, TQFN package and is specified over the -40°C to +85°C operating temperature range.

II. Manufacturing Information

A. Description/Function:	20-Bit, 1Msps, Low-Power, Fully Differential SAR ADC
B. Process:	TS18
C. Number of Device Transistors:	201572
D. Fabrication Location:	Taiwan
E. Assembly Location:	USA, Taiwan
F. Date of Initial Production:	December 8, 2014

III. Packaging Information

A. Package Type:	20-pin TQFN
B. Lead Frame:	Copper
C. Lead Finish:	100% Matte Sn
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-5308
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:	48°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	33°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	100 X 100 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.23 microns (as drawn)
F. Minimum Metal Spacing:	0.23 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: | 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:

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

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

$$\lambda = 13.9 \times 10^{-9}$$

$$\lambda = 13.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 TS18 Process results in a FIT Rate of 0.1 @ 25°C and 1.9 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot QAOL6A029C, D/C 1335)

The AC90-0 die type has been found to have all pins able to withstand an 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

MAX11904ETP+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	79	0	QAOL6A029C, D/C 1335

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