RELIABILITY REPORT

FOR

MAX11128ATI+T

PLASTIC ENCAPSULATED DEVICES

June 29, 2017

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

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Conclusion

The MAX11128ATI+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 MAX11120-MAX11128 are 12-/10-/8-bit with external reference and industry-leading 1.5MHz, full linear bandwidth, high speed, low-power, serial output successive approximation register (SAR) analog-to-digital converters (ADCs). The MAX11120-MAX11128 include both internal and external clock modes. These devices feature scan mode in both internal and external clock modes. The internal clock mode features internal averaging to increase SNR. The external clock mode features the SampleSet(tm) technology, a user-programmable analog input channel sequencer. The SampleSet approach provides greater sequencing flexibility for multichannel applications while alleviating significant microcontroller or DSP (controlling unit) communication overhead. The internal clock mode features an integrated FIFO allowing data to be sampled at high speeds and then held for readout at any time or at a lower clock rate. Internal averaging is also supported in this mode improving SNR for noisy input signals. The devices feature analog input channels that can be configured to be single-ended inputs, fully differential pairs, or pseudo-differential inputs with respect to one common input. The MAX11120-MAX11128 operate from a 2.35V to 3.6V supply and consume only 5.4mW at 1Msps. The MAX11120-MAX11128 include AutoShutdown(tm), fast wake-up, and a high-speed 3-wire serial interface. The devices feature full power-down mode for optimal power management. The 16MHz, 3-wire serial interface directly connects to SPI, QSPI™, and MICROWIRE® devices without external logic. Excellent dynamic performance, low voltage, low power, ease of use, and small package size make these converters ideal for portable battery-powered data-acquisition applications, and for other applications that demand low power consumption and small space. The MAX11120-MAX11128 are available in 28-pin, 5mm x 5mm, TQFN packages and operate over the -40°C to +125°C temperature range.

II. Manufacturing Information

A. Description/Function:	1Msps, Low-Power, Serial 12-/10-/8-Bit, 4-/8-/16-Channel ADCs
B. Process:	TS18
C. Number of Device Transistors:	158486
D. Fabrication Location:	Taiwan
E. Assembly Location:	Taiwan, China, Thailand
F. Date of Initial Production:	December 15, 2011

III. Packaging Information

A. Package Type:	28-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Bondwire:	Au (1 mil dia.)
E. Mold Material:	Epoxy with silica filler
F. Assembly Diagram:	#05-9000-4373
G. Flammability Rating:	Class UL94-V0
H. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
I. Single Layer Theta Ja:	47°C/W
J. Single Layer Theta Jc:	2.1°C/W
K. Multi Layer Theta Ja:	29°C/W
L. Multi Layer Theta Jc:	2.1°C/W

IV. Die Information

A. Dimensions:	65X87 mils
B. Passivation:	Si_3N_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. Isolation Dielectric:	SiO_2
H. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Eric Wright (Reliability Engineering) Brian Standley (Manager, Reliability) 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 80 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 13.7 \times 10^{-9}$

$\lambda = 13.7$ 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 0.24 @ 25C and 4.14 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The AC86 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 +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX11128ATI+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	80	0	

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