RELIABILITY REPORT

FOR

MAX1416EUE+

PLASTIC ENCAPSULATED DEVICES

June 23, 2009

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX1416EUE+ 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.

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I. Device Description

A. General

The MAX1415/MAX1416 low-power, 2-channel, serial-output analog-to-digital converters (ADCs) use a sigma-delta modulator with a digital filter to achieve 16-bit resolution with no missing codes. These ADCs are pin-compatible upgrades to the MX7705/AD7705. The MAX1415/MAX1416 feature an internal oscillator (1MHz or 2.4576MHz), an on-chip input buffer, and a programmable gain amplifier (PGA). The devices offer an SPI™-/QSPI™-/MICROWIRE™-compatible serial interface. The MAX1415 requires a single 2.7V to 3.6V supply, and the MAX1416 requires a single 4.75V to 5.25V supply. The operating supply current is 400µA (max) with a 3V supply. Power-down mode reduces the supply current to 2µA (typ). When operating with a supply of 3V, the power dissipation is less than 1.44mW, making the MAX1415 ideal for battery-powered applications. Self-calibration and system calibration allow the MAX1415/MAX1416 to correct for gain and offset errors. Excellent DC performance (±0.0015% FSR INL) and low noise (700nV in unbuffered mode) make the MAX1415/ MAX1416 ideal for measuring low-frequency signals with a wide dynamic range. These devices accept fully differential bipolar/unipolar inputs. An internal input buffer allows for input signals with high source impedances. An on-chip digital filter, with a programmable cutoff and output data rate, processes the output of the sigma-delta modulator. The first notch frequency of the digital filter is chosen to provide 150dB rejection of common-mode 50Hz or 60Hz noise and 98dB rejection of normal-mode 50Hz or 60Hz noise. A PGA and digital filtering allow signals to be directly acquired with little or no signal-conditioning requirements. The MAX1415/MAX1416 are available in 16-pin PDIP, SO, and TSSOP packages.

II. Manufacturing Information

A. Description/Function:	16-Bit, Low-Power, 2-Channel, Sigma-Delta ADCs
B. Process:	C6Y
C. Number of Device Transistors:	38087
D. Fabrication Location:	Japan
E. Assembly Location:	Philippines, Thailand
F. Date of Initial Production:	January 24, 2004

III. Packaging Information

A. Package Type:	16-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 1
J. Single Layer Theta Ja:	106°C/W
K. Single Layer Theta Jc:	27°C/W
L. Multi Layer Theta Ja:	90°C/W
M. Multi Layer Theta Jc:	27°C/W

IV. Die Information

A. Dimensions:	100 X 107 mils
B. Passivation:	SiO2/SiN3
C. Interconnect:	Al/Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.6um
F. Minimum Metal Spacing:	0.6um
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO2
I. Die Separation Method:	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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 45 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.9 \times 10^{-9}$

$\lambda = 23.9$ 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 C6Y Process results in a FIT Rate of 0.82 @ 25C and 14.21 @ 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 AC40 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX1416EUE+

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	45	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