RELIABILITY REPORT

FOR

MAX146AEAP+

PLASTIC ENCAPSULATED DEVICES

June 8, 2015

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX146AEAP+ 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 MAX146/MAX147 12-bit data-acquisition systems combine an 8-channel multiplexer, high-bandwidth track/hold, and serial interface with high conversion speed and low power consumption. The MAX146 operates from a single +2.7V to +3.6V supply; the MAX147 operates from a single +2.7V to +5.25V supply. Both devices' analog inputs are software configurable for unipolar/bipolar and single-ended/differential operation. The 4-wire serial interface connects directly to SPI™/ QSPI™ and MICROWIRE™ devices without external logic. A serial strobe output allows direct connection to TMS320-family digital signal processors. The MAX146/MAX147 use either the internal clock or an external serial-interface clock to perform successive-approximation analog-to-digital conversions. The MAX146 has an internal 2.5V reference, while the MAX147 requires an external reference. Both parts have a reference-buffer amplifier with a ±1.5% voltage-adjustment range. These devices provide a hard-wired SHDN-bar pin and a software-selectable power-down, and can be programmed to automatically shut down at the end of a conversion. Accessing the serial interface automatically powers up the MAX146/MAX147, and the quick turn-on time allows them to be shut down between all conversions. This technique can cut supply current to under 60μA at reduced sampling rates. The MAX146/MAX147 are available in 20-pin DIP and SSOP packages. For 4-channel versions of these devices, see the MAX1246/MAX1247 data sheet.

II. Manufacturing Information

A. Description/Function:	+2.7V, Low-Power, 8-Channel, Serial 12-Bit ADCs
B. Process:	B12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	June 27, 1997

III. Packaging Information

A. Package Type:	20-pin SSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-2101-0010
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:	125°C/W
K. Single Layer Theta Jc:	33°C/W
L. Multi Layer Theta Ja:	84°C/W
M. Multi Layer Theta Jc:	32°C/W

IV. Die Information

A. Dimensions:	85X106 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 160 \times 2} \quad \text{(Chi square value for MTTF upper limit)}$$

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

$\lambda = 6.87 \times 10^{-9}$

λ = 6.87 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 B12 Process results in a FIT Rate of 0.05 @ 25C and 0.92 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NIZECX002D, D/C 9748)

The AC18-4 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

MAX146AEAP+

TEST ITEM	**TEST CONDITION**	**FAILURE IDENTIFICATION**	**SAMPLE SIZE**	**NUMBER OF FAILURES**	**COMMENTS**
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	80	0	BIZEAA023D, 9715
	Biased	& functionality	80	0	BIZEAV017D, 9713
	Time = 192 hrs.				

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