RELIABILITY REPORT

FOR

MAX4376HAUK+

PLASTIC ENCAPSULATED DEVICES

December 3, 2009

MAXIM INTEGRATED PRODUCTS

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SUNNYVALE, CA 94086

Approved by
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Conclusion

The MAX4376HAUK+ 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 MAX4376/MAX4377/MAX4378 single, dual, and quad precision high-side current-sense amplifiers are available in space-saving packages. They feature buffered voltage outputs that eliminate the need for gain-setting resistors and are ideal for today's notebook computers, cell phones, and other systems where current monitoring is critical. These precision devices are offered in three fixed-gain versions of 20, 50, and 100:

GAIN	SUFFIX
20	T
50	F
100	H

For example, MAX4376TAUK is a single high-side amplifier with a gain of 20. High-side current monitoring is especially useful in battery-powered systems since it does not interfere with the ground path of the battery charger. The input common-mode range of 0 to +28V is independent of the supply voltage and ensures that the current-sense feedback remains viable even when connected to a battery pack in deep discharge. The full-scale current reading can be set by choosing the appropriate voltage gain and external-sense resistor. This capability offers a high level of integration and flexibility, resulting in a simple and compact current-sense solution. The MAX4376/MAX4377/MAX4378 operate over a supply voltage range of +3V to +28V, draw 1mA of supply current per amplifier, and operate over the full automotive temperature range of -40°C to +125°C. These devices have a wide bandwidth of 2MHz, making them suitable for use inside battery-charger control loops. The buffered outputs drive up to 2mA of output current into a ground-referenced load. The MAX4376 is available in a tiny 5-pin SOT23 package. The MAX4377/MAX4378 are available in space-saving 8-pin µMAX® and 14-pin TSSOP packages, respectively.

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II. Manufacturing Information

A. Description/Function:	Single/Dual/Quad High-Side Current-Sense Amplifiers with Internal Gain
B. Process:	B12
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon, California or Texas
E. Assembly Location:	Malaysia, Thailand
F. Date of Initial Production:	July 22, 2000

III. Packaging Information

A. Package Type:	5-pin SOT23
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:	#05-9000-3647
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:	324.3°C/W
K. Single Layer Theta Jc:	82°C/W

IV. Die Information

A. Dimensions:	53 X 38 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:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

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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:

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

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

$\lambda = 13.4 \times 10^{-9}$

λ = 13.4 F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim"s reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maxim-ic.com/qa/reliability/monitor. Cumulative monitor data for the B12 Process results in a FIT Rate of 0.06 @ 25C and 1.06 @ 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 OX18-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

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Table 1

Reliability Evaluation Test Results

MAX4376HAUK+

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	80	0
Moisture Testing (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	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

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