RELIABILITY REPORT

FOR

MAX9610HELT+

PLASTIC ENCAPSULATED DEVICES

January 18, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX9610HELT+ 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 MAX9610 high-side current-sense amplifier offers precision accuracy specifications of VOS less than 500µV (max) and gain error less than 0.5% (max). This device features an ultra-low 1µA quiescent supply current. The MAX9610 fits in a tiny, 1mm x 1.5mm µDFN package or a 5-pin SC70 package, making this part ideal for applications in notebook computers, cell phones, cameras, PDAs, and all lithium-ion battery-operated portable devices where accuracy, low quiescent current, and small size are critical. The MAX9610 features an input voltage range (common mode) from 1.6V to 5.5V. This input range is excellent for monitoring the current of a single-cell, lithium-ion battery (Li+), which at full charge is 4.2V, typically 3.6V in normal use, and less than 2.9V when ready to be recharged. These current-sense amplifiers have a voltage output and are offered in three gain versions: 25V/V (MAX9610T), 50V/V (MAX9610F), and 100V/V (MAX9610H). The three gain versions offer flexibility in the choice of the external current-sense resistor. The very low 500µV (max) input offset voltage allows small 25mV to 50mV full-scale VSENSE voltage for very low voltage drop at full-load current measurement. The MAX9610 is offered in tiny 6-pin µDFN, (1mm x 1.5mm x 0.8mm footprint) and 5-pin SC70 packages, specified for operation over the -40°C to +85°C temperature range. For a very similar 1.6V to 28V input voltage device in a 4-bump UCSP(tm) package (1mm x 1mm x 0.6mm), refer to the MAX9938 data sheet.

II. Manufacturing Information

A. Description/Function:	1µA, µDFN/SC70, Lithium-Ion Battery, Precision Current-Sense Amplifier
B. Process:	B8
C. Number of Device Transistors:	30
D. Fabrication Location:	California or Texas
E. Assembly Location:	Thailand
F. Date of Initial Production:	10/25/2008

III. Packaging Information

A. Package Type:	6-pin uDFN
B. Lead Frame:	Substrate
C. Lead Finish:	Gold
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3408
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Multi Layer Theta Ja:	477°C/W

IV. Die Information

A. Dimensions:	30 X 28 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:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.4 \times 10^{-9}$

λ = 22.4 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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 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 OY45-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 Volts per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

Table 1

Reliability Evaluation Test Results

MAX9610HELT+

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	48	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	-55ºC/125ºC 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