RELIABILITY REPORT

FOR

MAX44298EWE+T

PLASTIC ENCAPSULATED DEVICES

February 11, 2016

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
Reliability Engineer

Conclusion

The MAX44298EWE+T successfully met 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.

Table of Contents

I. Device Description

A. General

The MAX44298 is a low-side current, voltage, and power monitoring circuit that provides an analog output current proportional to the measured current, voltage, and the internally calculated instantaneous power.

Instantaneous power is calculated internally by multiplying the load current and a fraction of the load voltage set by an external resistive divider. All three outputs are scaled to a full-scale current of either 100µA or 50µA. This full-scale current option is set with a simple pin-strap, ISET. An additional output current of either 100µA or 50µA is available at the reference (REF) output; this current can be used to create a reference voltage for the ADC that is being used to measure the power, voltage, and current signals.

By providing the ADC with both the measured signals and the input reference voltage, the ADC can make a ratio- metric measurement, allowing improved accuracy. The use of currents, rather than voltage, to convey the measured signals to the ADC eliminates any errors caused by voltage drops across the parasitic resistance of PCB, which can be significant for high-current systems. To allow full-system calibration, the CAL bump provides a way to calibrate gain and offset for the ADC.

The MAX44298 measures load current by using a precision, auto-zeroed current-sense amplifier (CSA), which due to its ultra-low offset voltage allows precise measurement of full-scale voltages of 5mV, 10mV, and 20mV. The load voltage is measured via a user-selectable resistive network, dividing the input voltage down to a full scale of 1.00V.

The wide supply voltage range of 3V to 5.5V allows the simple sharing of supplies with either the ADC or a micro-controller. The MAX44298 can be powered down and the outputs will then go high impedance. The device is avail- able in a 2.4mm x 2.4mm, 16-bump WLP package and is specified for the 0°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Current and Voltage Sense with Power Measurement
B. Process:	S18
C. Number of Device Transistors:	14072
D. Fabrication Location:	USA
E. Assembly Location:	USA
F. Date of Initial Production:	December 4, 2015

III. Packaging Information

A. Package Type:	16-bump WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	None
E. Bondwire:	N/A (N/A mil dia.)
F. Mold Material:	None
G. Assembly Diagram:	#05-9000-5962
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:	N/A°C/W
K. Single Layer Theta Jc:	N/A°C/W
L. Multi Layer Theta Ja:	49°C/W
M. Multi Layer Theta Jc:	N/A°C/W

IV. Die Information

A. Dimensions:	94.0945X94.0945 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. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Eric Wright (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 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)

$\lambda = 22.9 \times 10^{-9}$

$\lambda = 22.9$ 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 S18 Process results in a FIT Rate of 0.40 @ 25°C and 6.96 @ 55°C (0.8 eV, 60% UCL)

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

The OZ05-0 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 +/-250mA and overvoltage per JEDEC JESD78.

Table 1

Reliability Evaluation Test Results

MAX44298EWE+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	

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