

RELIABILITY REPORT
FOR
MAX8952EWE+T
WAFER LEVEL PRODUCTS

October 13, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX8952EWE+T 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 MAX8952 high-efficiency DC-to-DC step-down switching regulator delivers up to 2.5A of output current. The device operates from a 2.5V to 5.5V input voltage range, supporting commonly-used battery technologies in handsets. The output voltage is I²C programmable from 0.77V to 1.40V. Fully differential remote sense ensures precise DC regulation at the load. Total output error is less than $\pm 1.5\%$ over load, line, and temperature. The IC operates at a 3.25MHz fixed frequency. The high operating frequency minimizes the size of external components. The switching frequency of the converter can be synchronized to the master clock of the application. When synchronizing to an external clock, the IC measures the frequency of the external clock to ensure that the clock is stable before changing the switching frequency to the external clock frequency. An on-board DAC allows adjustment of the output voltage in 10mV steps. The output voltage can be programmed directly through the I²C interface, or by preloading a set of on-board registers and using the two VID logic signals to select the appropriate register. Other features include internal soft-start control circuitry to reduce inrush current, output overvoltage, overcurrent, and overtemperature protection.

II. Manufacturing Information

A. Description/Function:	2.5A Step-Down Regulator with Differential Remote Sense in 2mm x 2mm WLP
B. Process:	S45
C. Number of Device Transistors:	21169
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Japan
F. Date of Initial Production:	June 24, 2010

III. Packaging Information

A. Package Type:	16-bump WLP 4x4 array
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:	N/A
G. Assembly Diagram:	#05-9000-3348
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:	°C/W
K. Single Layer Theta Jc:	°C/W
L. Multi Layer Theta Ja:	49°C/W
M. Multi Layer Theta Jc:	9°C/W

IV. Die Information

A. Dimensions:	80 X 80 mils
B. Passivation:	Si ₃ N 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:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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:	Richard Aburano (Manager, Reliability Operations) 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:

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

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

$$\lambda = 22.9 \times 10^{-9}$$
$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot TPPYAA006J, D/C 1017)

The PR20-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 200mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX8952EWE+T

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

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