

RELIABILITY REPORT  
FOR  
MAX77818EWZ+T  
WAFER LEVEL DEVICES

April 26, 2014

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

<b>Approved by</b>
Eric Wright
Quality Assurance
Reliability Engineering

## Conclusion

The MAX77818EWZ+T 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.

## Table of Contents

<b>I. ....Device Description</b>	<b>IV. ....Die Information</b>
<b>II. ....Manufacturing Information</b>	<b>V. ....Quality Assurance Information</b>
<b>III. ....Packaging Information</b>	<b>VI. ....Reliability Evaluation</b>
<b>.....Attachments</b>	

### I. Device Description

#### A. General

The MAX77818 is a high performance companion PMIC for latest SmartPhones and Tablet computers. The PMIC includes Dual Input, Smart Power Path™ 3.0A switch mode charger with reverse Boost capability and adapter input protection up to 16VDC with proprietary Model Gauge™ (mg5) fuel gauge technology. The switch mode battery charger's operating frequency is 4MHz and includes integrated, low loss switches - providing the smallest L/C size, lowest heat and fastest battery charging programmable up to 3.0A. The charger has two inputs which accept Adapter/USB (CHIN) and/or Wireless type inputs (WCIN). The Wireless input can simultaneously charge the battery while powering USB-OTG type accessories. The USB-OTG output provides true-load disconnect and is protected by an adjustable output current limit. The battery charger includes Smart Power Path™ and I2C adjustable settings to accommodate a wide range of battery sizes and system loads. When external power is applied from either input, battery charging is enabled. With a valid input power source (adapter or wireless charger), the BYP pin voltage is equal to the input voltage minus resistive voltage drop. During Battery only reverse Boost operation, the BYP output may be regulated with the reverse Boost feature and provides up to 5V at 1.25A and requires no additional inductor— allowing the MAX77818 to power USB OTG accessories. The switching charger is designed with a special CC, CV, and die temperature regulation algorithm. Model Gauge mg5 provides accurate battery fuel gauging without calibration and operates with extremely low battery current. The Safeout LDO drive system USB interfaces devices. The MAX77818 features a I2C revision 3.0 compatible serial interface consisting of a bidirectional serial data line (SDA) and a serial clock line (SCL).

## II. Manufacturing Information

A. Description/Function:	HV Charger with FG for Smartphones
B. Process:	S18
C. Number of Device Transistors:	380584
D. Fabrication Location:	Taiwan, USA
E. Assembly Location:	Taiwan, USA
F. Date of Initial Production:	January 27, 2014

## III. Packaging Information

A. Package Type:	72-bump WLP 8x9
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:	#05-9000-5540
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:	37°C/W
M. Multi Layer Theta Jc:	N/A°C/W

## IV. Die Information

A. Dimensions:	143.3071 X 153.5433 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	
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 <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- |                                   |   |
|-----------------------------------|---|
| A. Quality Assurance Contacts:    | Don Lipps (Manager, Reliability Engineering)<br>Bryan Preeshl (Vice President of QA)            |
| B. Outgoing Inspection Level:     | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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 ( $\lambda$ ) is calculated as follows:

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

(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 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 0.05 @ 25°C and 0.93 @ 55°C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot TARY0Z001B, D/C 1408)

The CL23-0 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

**MAX77818EWZ+T**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	VAQQ5Q001B, D/C 1403

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