RELIABILITY REPORT

FOR

MAX77301EWA+T

WAFER LEVEL PRODUCTS

January 29, 2013

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX77301EWA+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 MAX77691 is a JEITA-compliant* lithium-ion linear battery charger that operates from a USB port, a dedicated charger, or universal adapter. The IC provides automatic adapter-type detection and enumeration with a USB host or hub. The IC integrates independent battery charge switch, current sense circuit, MOSFET pass elements, thermal regulation circuitry, and eliminates the external reverse-blocking Schottky diode to create the simplest and smallest USB-compliant charging solution.

The IC includes automated detection of charge adapter type, making it possible to distinguish USB 2.0 device, USB charger, dedicated charger devices as well as standard input adapters. When enumeration is enabled, the IC automatically negotiates with a USB host, making it possible to achieve the highest-charging current available from a USB 2.0 device or USB charger without processor intervention. The adapter type detection is compliant with USB 2.0 as well as battery charging Specification Revision 1.1.

The IC controls the charging sequence for single-cell Li+ batteries from battery detection, prequalification, fast charge, top-off, and charge termination. Charging is controlled using constant current, constant voltage and constant die-temperature (CCCVCTj) regulation for safe operation under all conditions. The IC is also compliant with JEITA battery charging requirements.

The Smart Power Selector feature makes the best use of limited USB or adapter power. Battery charge current is set independent of the input current limit. Power not used by the system charges the battery. The battery assists the input source when needed. System voltage is maintained by allowing the application to operate without a battery, a discharged battery, or a dead battery. Automatic input selection switches the system from battery to external power.

The I2C interface provides full programmability of battery charge characteristics, input current limit, and protection features. This provides flexibility for use with a wide range of adapter and battery sizes. Other features include undervoltage lockout (UVLO), overvoltage protection (OVP), charge status flag, charge fault flag, input power-OK monitor, battery detection, JEITA-compliant charging, charge timer, 3.3V/10mA auxiliary output, and an external power-on switch.

II. Manufacturing Information

A. Description/Function:	JEITA-Compliant, Li+ Charger with Smart Power Selector, Automatic Detection, and USB Enumeration
B. Process:	S18
C. Number of Device Transistors:	115686
D. Fabrication Location:	Japan
E. Assembly Location:	Japan
F. Date of Initial Production:	2013

III. Packaging Information

A. Package Type:	25-bump WLP 5x5 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:	None
G. Assembly Diagram:	#05-9000-4746
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:	52°C/W
M. Multi Layer Theta Jc:	°C/W

IV. Die Information

A. Dimensions:	96.8504X96.8504 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:	Metal1 = 0.23 / Metal2-3 = 0.28 / Metal 4 = 2.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.23 / Metal2-3 = 0.28 / Metal 4 = 3.0 microns (as drawn)
G. Isolation Dielectric:	SiO_2
H. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Engineering) Don Lipps (Manager, 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 100C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 516 \times 96 \times 2}$$ (Chi square value for MTTF upper limit)

(where 516 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 96.3 \times 10^{-9}$

λ = 96.3 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 S18 Process results in a FIT Rate of 0.40 @ 25C and 6.89 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot E2LZDQ001B, D/C 1131)

The PQ90-1 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 2500V per JEDEC JESD22-A114
	+/- 8000V D+/D-/BUS bumps to ground per JEDEC JESD22-A114
ESD-CDM:	+/- 750V per JEDEC JESD22-C101 (lot E2LZDQ001B, D/C 1128)

Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX77301EWA+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 100C	DC Parameters	48	0	E2LZDQ001B, D/C 1128
	Biased	& functionality	48	0	S2LZCQ001A, D/C 1130
	Time = 192 hrs.				

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