

RELIABILITY REPORT
FOR
MAX8971EWP+T
WAFER LEVEL PRODUCTS

April 14, 2015

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX8971EWP+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.

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I. Device Description

A. General

The MAX8971 is a compact, high-frequency, high-efficiency switch-mode charger for a one-cell lithium-ion (Li+) battery. It delivers up to 1.55A of current to the battery from inputs up to 7.5V and withstands transient inputs up to 22V. The 4MHz switch-mode charger is ideally suited for small portable devices, such as headsets and ultra-portable media players. It minimizes component size and heat. Battery-protection features include: low-voltage prequalification, charge fault timer, die temperature monitoring, and battery temperature monitoring. The battery temperature monitoring adjusts the charge current and termination voltage for safe use of secondary lithium-ion batteries. The IC accepts either a general DC input or USB. It has programmable automatic input-current limiting to protect upstream charging sources such as USB. Charge parameters are easily adjustable through an I²C interface. Charge is terminated based on user-selectable minimum current level. A safety timer with reset control provides a safety backup for I²C interface. Charge status is provided to the application processor through an interrupt pin. The IC is available in a space-saving, 20-bump, 2.18mm x 1.62mm WLP package.

II. Manufacturing Information

A. Description/Function:	Industry's Smallest 1.55A 1-Cell Li+ DC-DC Charger
B. Process:	S18
C. Number of Device Transistors:	48618
D. Fabrication Location:	California
E. Assembly Location:	Taiwan, Japan
F. Date of Initial Production:	January 24, 2004

III. Packaging Information

A. Package Type:	20 bmp WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	N/A
E. Bondwire:	N/A
F. Mold Material:	N/A
G. Assembly Diagram:	#05-9000-4470
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	N/A
K. Single Layer Theta Jc:	N/A
L. Multi Layer Theta Ja:	46°C/W
M. Multi Layer Theta Jc:	N/A

IV. Die Information

A. Dimensions:	87.0079X64.9606 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.18um
F. Minimum Metal Spacing:	0.18um
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 96 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 11.4 \times 10^{-9}$$

$$\lambda = 11.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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

B. E.S.D. and Latch-Up Testing (lot VADFGA005B, D/C 1149)

The PQ81 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA.

Table 1
Reliability Evaluation Test Results

MAX8971EWP+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	48	0	VADF6A005A, D/C 1149
	Biased	& functionality	48	0	VAAU8A006A, D/C 1143
	Time = 192 hrs.				

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