RELIABILITY REPORT

FOR

MAX8808xETA

PLASTIC ENCAPSULATED DEVICES

February 7, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

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Written by

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Conclusion

The MAX8808 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 MAX8808X/MAX8808Y/MAX8808Z intelligent, stand-alone constant-current/constant-voltage (CCCV), thermally regulated linear chargers are designed for charging a single-cell lithium-ion (Li+) battery. The MAX8808X/MAX8808Y/MAX8808Z integrate the current- sense circuit, MOS pass element, and thermal-regulation circuitry, and eliminate the reverse-blocking Schottky diode to create the simplest and smallest charging solution for handheld equipment.

The MAX8808X functions as a stand-alone charger to control the charging sequence from the prequalification state through fast-charge, top-off charge, and fullcharge indication. The MAX8808Y and MAX8808Z eliminate the prequalification state to allow startup into a load without a battery. Proprietary thermal-regulation circuitry limits the die temperature when fast-charging or while exposed to high ambient temperatures, allowing maximum charging current without damaging the IC.

The MAX8808X/MAX8808Y/MAX8808Z achieve high flexibility by providing an adjustable fast-charge current with an external resistor. Other features include a battery charging-status indicator (CHG-bar), an active-low control input (EN) for the MAX8808X and MAX8808Z (active-high control input for the MAX8808Y), and an active-low input power-source detection output (ACOK-bar).

The MAX8808X/MAX8808Y/MAX8808Z accept a +4.25V to +15V supply, but disable charging when the input voltage exceeds +7V to protect against unqualified or faulty AC adapters. The MAX8808X/MAX8808Y/MAX8808Z operate over the extended temperature range (-40°C to +85°C) and are available in a compact 8-pin thermally enhanced 2mm x 2mm TDFN package with 0.8mm (max) height.

B. Absolute Maximum Ratings

Item	Rating
IN to GND	-0.3V to +16V
VL, BATT, EN, ACOK, CHG to GND	-0.3V to +6V
VL, ISET to GND	-0.3V to +4V
VL to IN	-16.3V to +0.3V
IN to BATT Continuous Current	1.5A
Continuous Power Dissipation (TA = +70°C)	
8-Pin 2mm x 2mm TDFN (derate 15.4mW/°C above +70°C)	1234mW
BATT Short-Circuit Duration	Continuous
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (soldering, 10s)	+300°C

II. Manufacturing Information

A. Description/Function: 1A Linear Li+ Battery Chargers with Integrated Pass FET and Thermal Regulation in 2mm x 2mm TDFN

B. Process: S4

C. Number of Device Transistors: 1958

D. Fabrication Location: California, USA

E. Assembly Location: Thailand or USA

F. Date of Initial Production: April, 2005

III. Packaging Information

A. Package Type: **8-Pin TDFN (2x2)**

B. Lead Frame: Copper

C. Lead Finish: Solder Plate or 100% Matte Tin

D. Die Attach: Silver-Filled Epoxy

E. Bondwire: Gold (1.0 mil dia.)

F. Mold Material: Epoxy with silica filler

G. Assembly Diagram: # 05-9000-1711

H. Flammability Rating: Class UL94-V0

I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C: Level 1

IV. Die Information

A. Dimensions: 30 x 54 mils

B. Passivation: Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide)

C. Interconnect: Aluminum/Si (Si = 1%)

D. Backside Metallization: None

E. Minimum Metal Width: Metal1, Metal2 & Metal3 = 0.6 microns (as drawn)

F. Minimum Metal Spacing: Metal1, Metal2 & Metal3 = 0.4 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: Jim Pedicord (Manager, Reliability Operations)
Bryan Preeshl (Managing Director**)**

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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{1000 \times 4340 \times 132 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 1.60 \times 10^{-9}$

λ = 1.60 F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability monitor program. In addition to routine production Burn-In, Maxim pulls a sample from every fabrication process three times per week and subjects it to an extended Burn-In prior to shipment to ensure its reliability. The reliability control level for each lot to be shipped as standard product is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Maxim performs failure analysis on any lot that exceeds this reliability control level. Attached Burn-In Schematic (Spec. # 06-6472) shows the static Burn-In circuit. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1N**). Current monitor data for the S4 Process results in a FIT Rate of 0.56 @ 25C and 9.60 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

Maxim pulls pressure pot samples from every assembly process three times per week. Each lot sample must meet an LTPD = 20 or less before shipment as standard product. Additionally, the industry standard 85°C/85%RH testing is done per generic device/package family once a quarter.

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

The PN92/PN92-2 die type has been found to have all pins able to withstand a transient pulse of ±1500V, per JESD22-A114C. Latch-Up testing has shown that this device withstands a current of ±250mA.

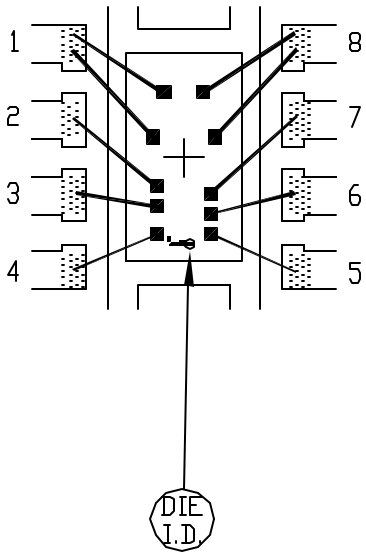
Table 1
Reliability Evaluation Test Results

MAX8808xETA

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 1000 hrs.	DC Parameters & functionality		132	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	TDFN	77	0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality		77	0
Mechanical Stress (Note 2)					
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality		77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data

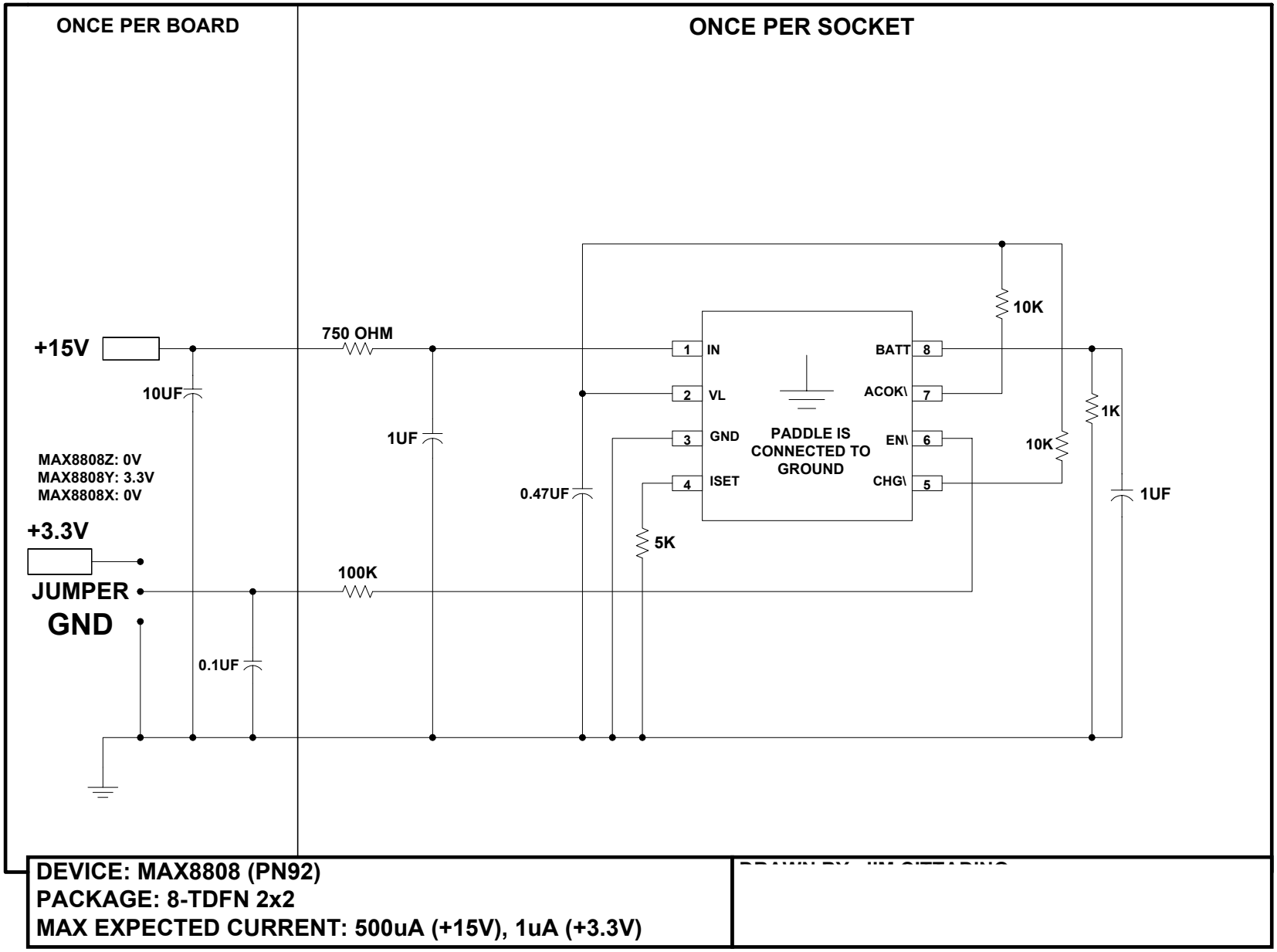
2x2x0.8 MM TDFN PKG. EXPOSED PAD PKG.



FOR ENGINEERING BUILD ONLY

BONDABLE AREA

PKG. CODE: T822-1		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY
CAV./PAD SIZE: 39x65	PKG.			BOND DIAGRAM #: 05-9000-1711 REV: A
	DESIGN			



DEVICE: MAX8808 (PN92)
PACKAGE: 8-TDFN 2x2
MAX EXPECTED CURRENT: 500uA (+15V), 1uA (+3.3V)