MAX8901xETA
Rev. A

RELIABILITY REPORT

FOR

MAX8901xETA

PLASTIC ENCAPSULATED DEVICES

March 4, 2008

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX8901 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 MAX8901A/MAX8901B step-up converters drive from two to six series-connected white LEDs (WLEDs) with constant current to provide uniform WLED intensity for LCD backlighting in cell phones, PDAs, and other handheld devices. The MAX8901_ operate at a fixed 750kHz (typ) switching frequency, allowing for tiny external components, and are optimized for the highest possible efficiency over the full 1-cell Li+/Li-Poly battery range.

These converters use a single input (ON) to enable the IC and to control WLED intensity. The MAX8901A requires a direct PWM input to regulate WLED intensity with the WLED current proportional to the PWM duty cycle. The MAX8901B uses single-wire, serial-pulse dimming that reduces the WLED intensity in 32 linear steps. Full-scale WLED current for serial-pulse dimming is 24.75mA (MAX8901B, 0.75mA/step).

The MAX8901_ features an internal soft-start to eliminate inrush currents during startup, input overvoltage protection, WLED overvoltage protection, and a shutdown mode with 0.01µA (typ) shutdown current. No WLED current is present in shutdown provided the WLED forward voltage is greater than the input supply voltage. Additional features include undervoltage lockout (UVLO) and thermal shutdown.

The MAX8901_ are available in tiny 8-pin, 2mm x 2mm TDFN-EP packages (0.8mm max height).

B. Absolute Maximum Ratings

Item	Rating
IN to GND	-0.3V to +7V
CS, COMP, ON to GND	-0.3V to (VIN+ 0.3V)
OVP, LX to GND	-0.3V to +28V
PGND to GND	-0.3V to +0.3V
LX Current	770mARMS
Continuous Power Dissipation (multilayer board at +70°C)	
8-pin, 2mm x 2mm TDFN (derate above +70°C by 11.9mW/°C)	953mW
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: Highest Efficiency Supply for 2 to 6Series WLEDs in a 2mm x 2mm TDFN Package

B. Process: S45

C. Number of Device Transistors:

D. Fabrication Location: California, USA

E. Assembly Location: Thailand

F. Date of Initial Production: July, 2007

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 (1.3 mil dia.)

F. Mold Material: Epoxy with silica filler

G. Assembly Diagram: # 05-9000-2772

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: 36 x 57 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{135 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 22.91 \times 10^{-9}$

λ = 22.91 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. # 06-0204) 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 0.14 @ 25C and 2.42 @ 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 PQ04 die type has been found to have all pins able to withstand a transient ESD pulse of ±1500V HBM per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1
Reliability Evaluation Test Results

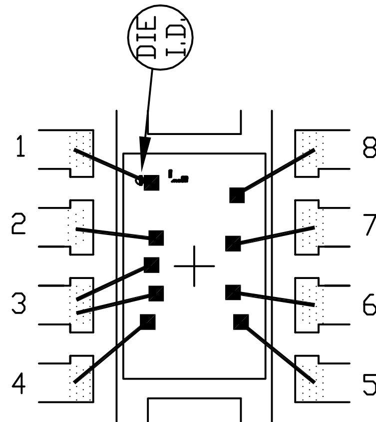
MAX8901xETA

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		48	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

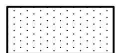
Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data

2x2x0.8 MM TDFN PKG.

EXPOSED PAD PKG.

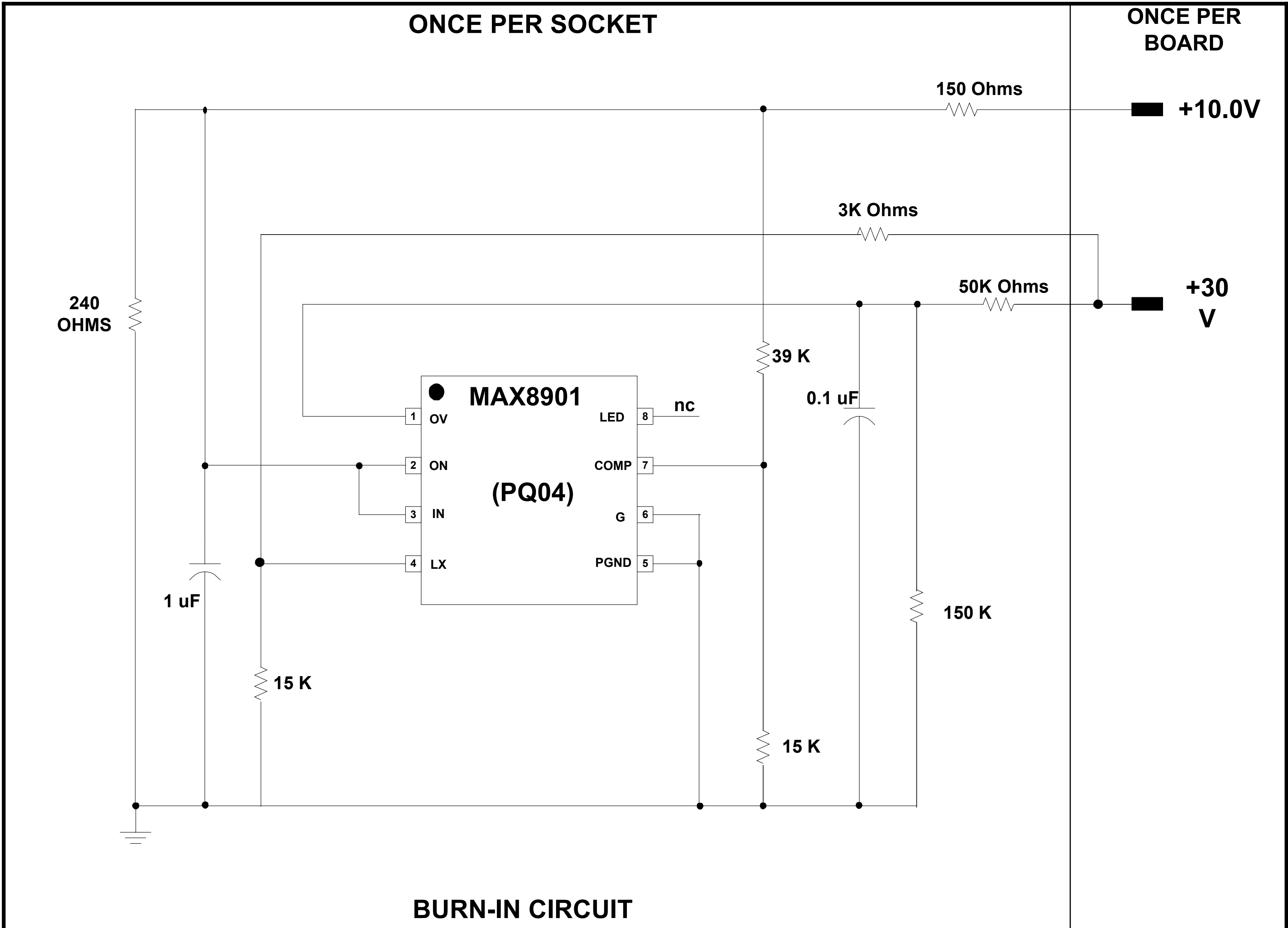


USE NON-CONDUCTIVE EPOXY



BONDABLE AREA

PKG. CODE: T822-1		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 39x65	PKG.			BOND DIAGRAM #: 05-9000-2772	REV: A
	DESIGN				



DEVICES: MAX8901 (PQ04)

PACKAGE: 8-TDFN (T822)

MAX. EXPECTED CURRENT = 30mA (+10V), 10mA (+30V)

NOTES: