

RELIABILITY REPORT
FOR
MAX1707ETG
PLASTIC ENCAPSULATED DEVICES

July 27, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Written by

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Conclusion

The MAX1707 has completed qualification testing except for product level Burn-In. Package and Process qualification has been completed for the device.

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I. Device Description

A. General

The MAX1707 provides complete light management for main display backlight, subdisplay backlight (or RGB indicator), and white LED camera flash with regulated constant current up to 610mA total. By utilizing adaptive 1x/1.5x/2x charge-pump modes and very-low-dropout current regulators, it achieves high efficiency over the full 1-cell Li+ battery input voltage range. The 1MHz fixed-frequency switching allows for tiny external components while the regulation scheme is optimized to ensure low EMI and low input ripple. An integrated derating function protects the LEDs from overheating during high ambient temperatures.

The MAX1707 features an internally trimmed reference to set the maximum LED current. An I²C[†] serial port is used for on/off control and setting the LED currents in 32 linear steps. When using the RGB indicator, the I²C port provides 32k colors and programmable rampup/ down rates. The camera flash may be turned on/off by the I²C port or a separate digital logic input.

B. Absolute Maximum Ratings

<u>Item</u>	<u>Rating</u>
VDD, IN, PIN, SCK, SDA, STB, OUT to GND	-0.3V to +6.0V
M ₋ , S ₋ , F ₋ to GND	-0.3V to (VOUT + 0.3V)
C1N, C2N to GND	-0.3V to (VIN + 0.3V)
C1P, C2P to GND ..-0.3V to greater of (VOUT + 0.3V) or (VIN + 0.3V)	
PGND to GND	-0.3V to +0.3V
OUT Short Circuit to GND	Continuous
Continuous Power Dissipation (TA = +70°C)	1666mW
24-Pin Thin QFN (derate 20.8mW/°C above +70°C)	
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:	Light-Management IC with Efficient 1x/1.5x/2x Charge Pump for Backlight/Flash/RGB LEDs
B. Process:	S4
C. Number of Device Transistors:	15,600
D. Fabrication Location:	California, USA
E. Assembly Location:	Thailand
F. Date of Initial Production:	December, 2005

III. Packaging Information

A. Package Type:	24-Pin TQFN (4x4)
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:	#05-9000-1525
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:	100 x 88 mils
B. Passivation:	Si ₃ N 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, Rel Operations)
Bryan Preeshl (Managing Director 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 135°C biased (static) life test are pending. Using these results, the Failure Rate (λ) is calculated as follows:

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

Δ Temperature Acceleration factor assuming an activation energy of 0.8eV

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

$$\lambda = 22.91 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. # 06-6441) 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 0.37 @ 25C and 6.28 @ 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 PN70 die type has been found to have all pins able to withstand a transient pulse of $\pm 500\text{V}$ per Mil-JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of $\pm 250\text{mA}$.

Table 1
Reliability Evaluation Test Results

MAX1707ETG

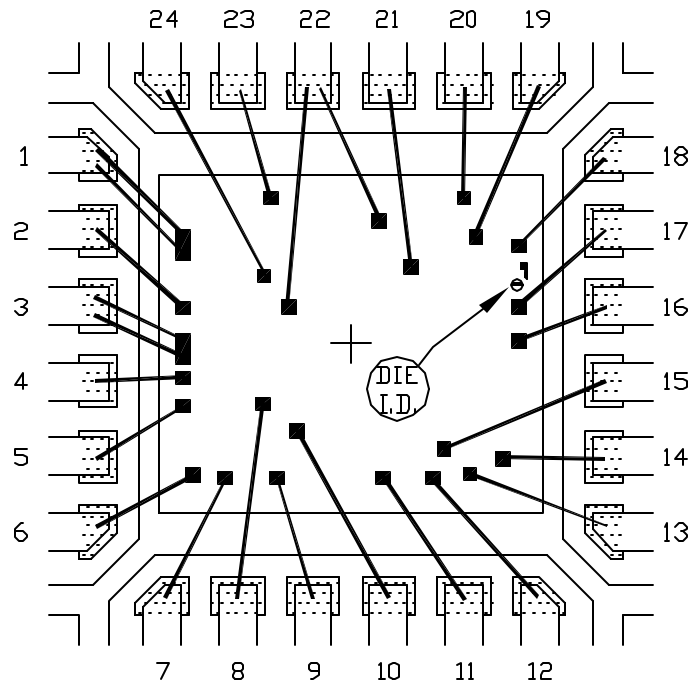
TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		48	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	TQFN	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

4x4x0.8mm THIN QFN PKG.

EXPOSED PAD PKG.



BONDABLE AREA

PKG. CODE: T2444-4		SIGNATURES	DATE	 CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 110x110	PKG. DESIGN			BOND DIAGRAM #: 05-9000-1525	REV: A

