MAX1698EUB
Rev. A

RELIABILITY REPORT

FOR

MAX1698EUB

PLASTIC ENCAPSULATED DEVICES

July 14, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Quality Assurance
Manager, Reliability Operations

Conclusion

The MAX1698 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.

Table of Contents

I. Device Description

A. General

The MAX1698 is an efficient driver for white or color LEDs. It is ideal for large LED backlit displays in PDAs and laptop computers. Numerous benefits include greater simplicity, lower cost, higher efficiency, longer bulb life, and greater reliability when compared to fluorescent (CCFL) and electroluminescent (EL) lamps.

The MAX1698 is a switch-mode boost controller in which LED current, rather than output voltage, is regulated The device drives series-connected LEDs with a controlled current that is measured with a typically 15Ω sense resistor, not an expensive fractional-ohm value. LED current control and dimming are accomplished with an adjust input (ADJ). For larger light output, multiple LED banks can be connected in parallel with up to 5W total output power.

This device is supplied in a space-saving 10-pin µMAX® package that occupies half the space of an 8-pin SO. An evaluation kit (MAX1698EVKIT) is available to speed designs.

B. Absolute Maximum Ratings

Item	Rating
VCC, SHDN to GND	-0.3V to +6V
EXT, FB, CS, ADJ, REF to GND	-0.3V to (VCC + 0.3V)
GND to PGND	±0.3V
Continuous Power Dissipation (TA = +70°C)	
10-Pin µMAX (derate 5.6mW/°C above +70°C)	444mW
Operating Temperature Range	-40°C to +85°C
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature Range (soldering, 10s)	+300°C

II. Manufacturing Information

A. Description/Function:	High-Efficiency Step-Up Current Regulator for LEDs
B. Process:	B12 (Standard 1.2 micron silicon gate CMOS)
C. Number of Device Transistors:	2,180
D. Fabrication Location:	Oregon or California, USA
E. Assembly Location:	Malaysia, Philippines or Thailand
F. Date of Initial Production:	January, 2000

III. Packaging Information

A. Package Type:	**10-Pin µMAX**
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:	# 05-2301-0016
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:	61 x 87 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:	1.2 microns (as drawn)
F. Minimum Metal Spacing:	1.2 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 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 shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 49 \times 2}$$

(Chi square value for MTTF upper limit)

Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 22.44 \times 10^{-9}$

λ = 22.44 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. Attached Burn-In Schematic (Spec. # 06-5473) shows the static Burn-In circuit. Maxim performs failure analysis on any lot that exceeds this reliability control level. 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 B8/S8 Process results in a FIT rate of 0.10 @ 25°C and 1.78 @ 55°C (eV = 0.8, UCL = 60%).

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 PY10 die type has been found to have all pins able to withstand a transient pulse of ±600V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA.

Table 1
Reliability Evaluation Test Results

MAX1698EUB

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		49	0
Moisture Testing (Note 2)					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 168hrs.	DC Parameters & functionality	uMAX	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

Attachment #1

TABLE II. Pin combination to be tested. 1/ 2/

	Terminal A (Each pin individually connected to terminal A with the other floating)	Terminal B (The common combination of all like-named pins connected to terminal B)
1.	All pins except V_{PS1} 3/	All V_{PS1} pins
2.	All input and output pins	All other input-output pins

1/ Table II is restated in narrative form in 3.4 below.
2/ No connects are not to be tested.
3/ Repeat pin combination I for each named Power supply and for ground

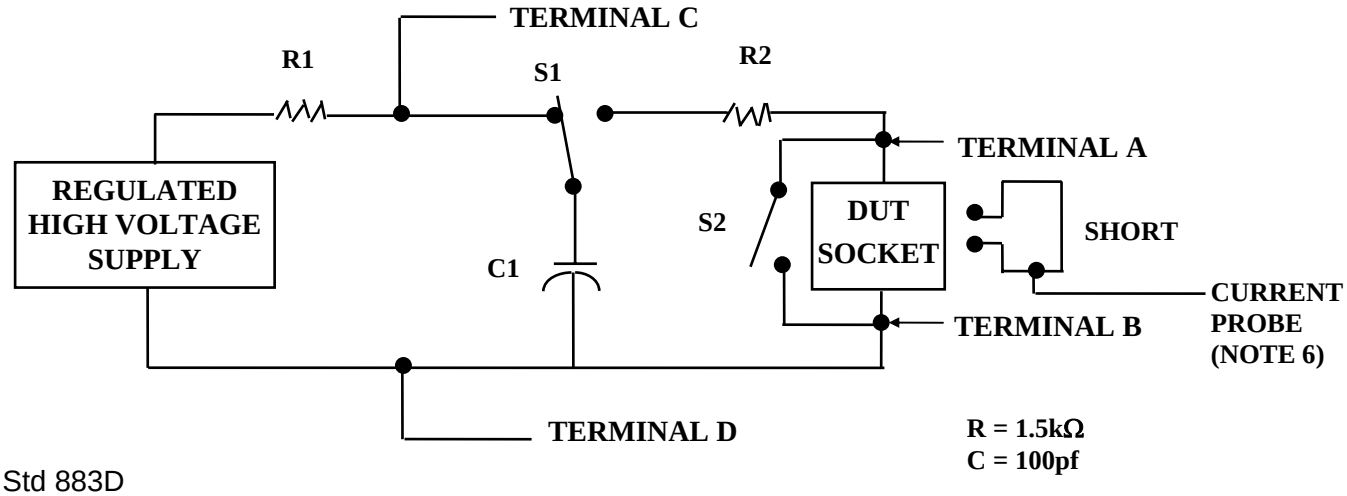
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_S$, $-V_S$, V_{REF}, etc).

3.4 Pin combinations to be tested.

a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

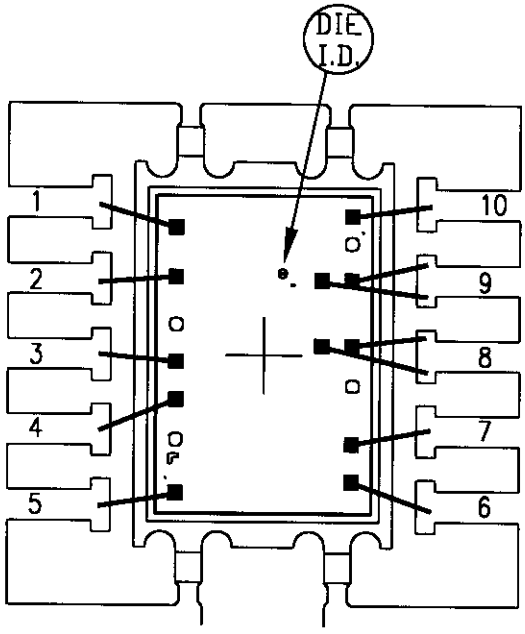
b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.

c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.

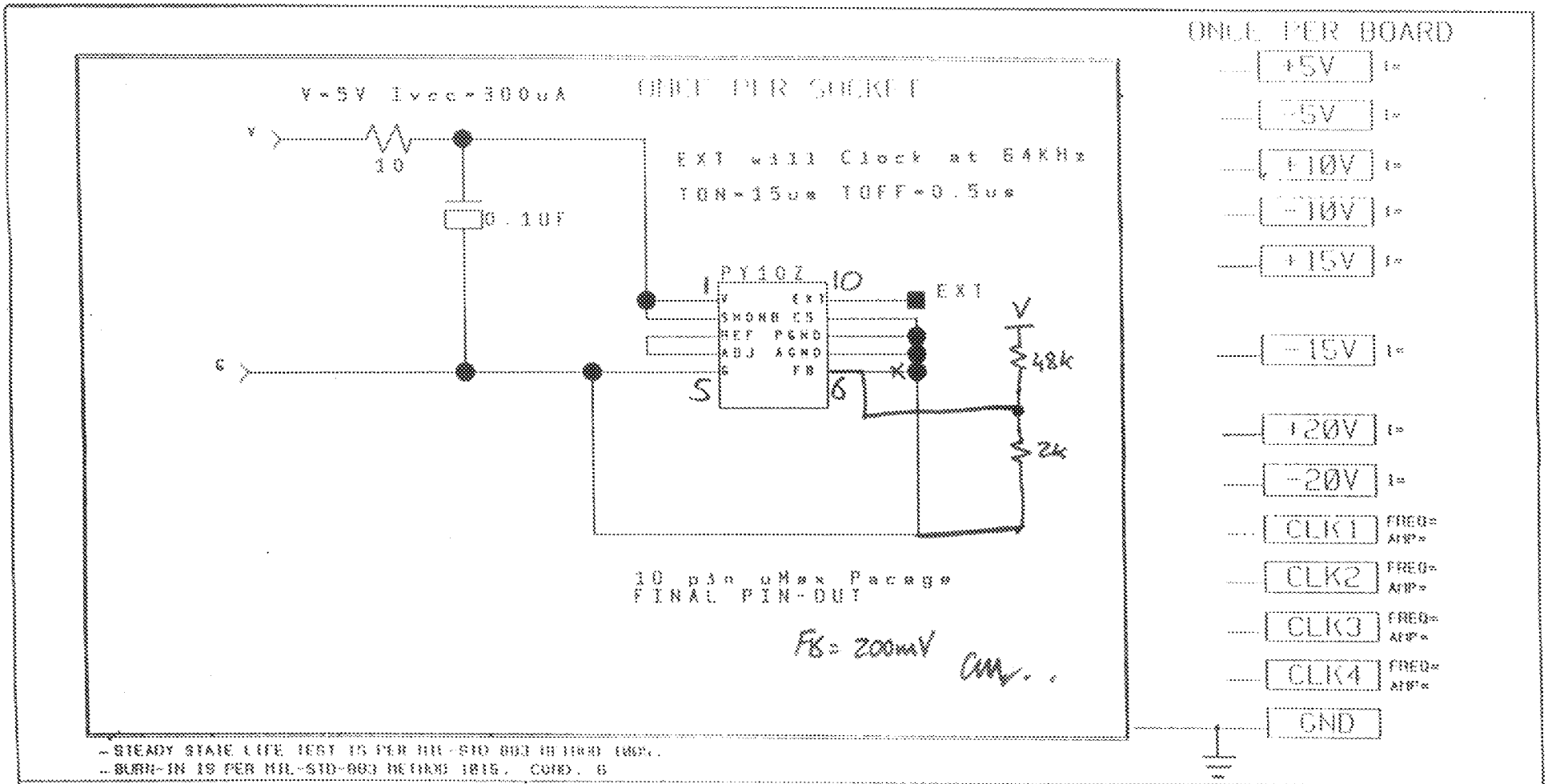


NOTES:

1. MAX DIE SIZE: 61x87
2. MIN. WIRE LENGTH: 21 MILS.



PKG.CODE: U10-2		APPROVALS	DATE	MAXIM	
CAV./PAD SIZE: 68X94	PKG. DESIGN			BUILDSHEET NUMBER: 05-2301-0016	REV.: A



-STEADY STATE LIFE TEST IS PER MIL-STD 883 METHOD 1005.
-BURN-IN IS PER MIL-STD-883 METHOD 1015, COND. G

NOTES:

1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 160 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 150C CONTINUOUS
4. APPROVED FOR [X] COMMERCIAL
   [ ] MR/883

SPEC. 06-5473 REV. A

DATE: 6/11/99

MAXIM BURN-IN SCHEMATIC

DEVICE TYPE:
MAX 1698