MAX16800ATE
Rev. A

RELIABILITY REPORT

FOR

MAX16800ATE

PLASTIC ENCAPSULATED DEVICES

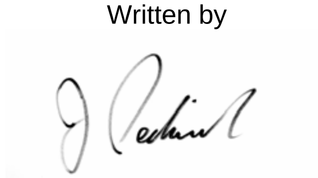
August 24, 2006

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by



Jim Pedicord
Quality Assurance
Manager, Reliability Operations

Conclusion

The MAX16800 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 MAX16800 current regulator operates from a 6.5V to 40V input voltage range and delivers up to a total of 350mA to one or more strings of high-brightness LEDs. The output current of the MAX16800 is adjusted by using an external current-sense resistor in series with the LEDs. An enable input allows wide-range "pulsed" dimming. Wave-shaping circuitry reduces EMI. The differential current-sense input increases noise immunity. The MAX16800 is well suited for applications requiring high-voltage input and is able to withstand automotive load-dump events up to 40V. An on-board pass element minimizes external components while providing ±3.5% output current accuracy. Additional features include a 5V regulated output and short-circuit and thermal protection.

The MAX16800 is available in a thermally enhanced, 5mm x 5mm, 16-pin TQFN package and is specified over the automotive -40°C to +125°C temperature range.

B. Absolute Maximum Ratings

Item	Rating
IN, OUT, and EN to GND	-0.3V to +45V
CS+, V5 to GND	-0.3V to +6V
CS- to GND	-0.3V to +0.3V
OUT Short Circuited to GND Duration	
(at VIN = +16V)	60 minutes
Maximum Current Into Any Pin (except VIN and OUT)	±20mA
Continuous Power Dissipation (TA = +70°C)	
16-Pin TQFN 5mm x 5mm	
(derate 33.3mW/°C above +70°C)	2666.7mW
Operating Junction Temperature Range	-40°C to +125°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: High-Voltage, 350mA, Adjustable Linear High-Brightness LED (HB LED) Driver

B. Process: BCD 80

C. Number of Device Transistors:

D. Fabrication Location: Oregon, USA

E. Assembly Location: Malaysia

F. Date of Initial Production: July, 2005

III. Packaging Information

A. Package Type: 16-Lead TQFN (5x5)

B. Lead Frame: Copper

C. Lead Finish: Solder Plate or 100% Matte Tin (all packages)

D. Die Attach: Silver-filled Epoxy

E. Bondwire: Gold (1 mil dia.)

F. Mold Material: Epoxy with silica filler

G. Assembly Diagram: # 05-9000-1947

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: 136 x 60 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: 3 microns (as drawn)

F. Minimum Metal Spacing: 3 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (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 qualification and monitor programs. Maxim also performs weekly Burn-In on samples from production to assure reliability of its processes. The reliability required for lots which receive a burn-in qualification 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 rejects from lots exceeding this level. The attached Burn-In Schematic (Spec. # 06-6566) shows the static circuit used for this test. Maxim also performs 1000 hour life test monitors quarterly for each process. This data is published in the Product Reliability Report (**RR-1N**). Current monitor data for the BCD80 Process results in a FIT Rate of 0.38 @ 25C and 6.67 @ 55C (0.8 eV, 60% UCL)

B. Moisture Resistance Tests

Maxim evaluates pressure pot stress from every assembly process during qualification of each new design. Pressure Pot testing must pass a 20% LTPD for acceptance. Additionally, industry standard 85°C/85%RH or HAST tests are performed quarterly per device/package family.

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

The SP01 die type has been found to have all pins able to withstand a transient pulse of ±1000V, 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

MAX16800ATE

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 150°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

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

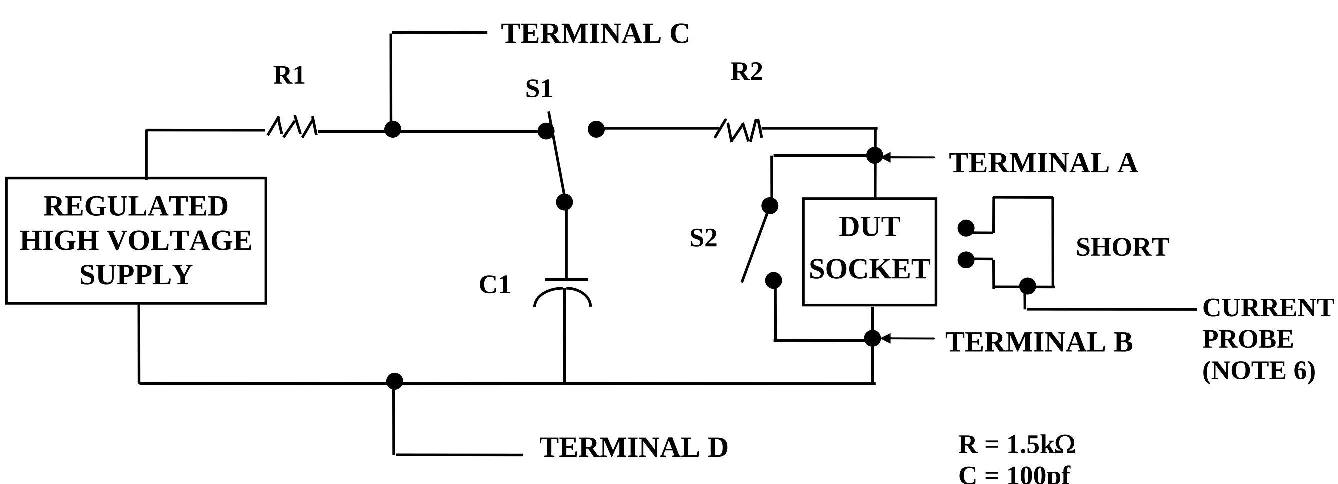
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_{S}$, $-V_{S}$, V_{REF}, etc).

3.4 Pin combinations to be tested.

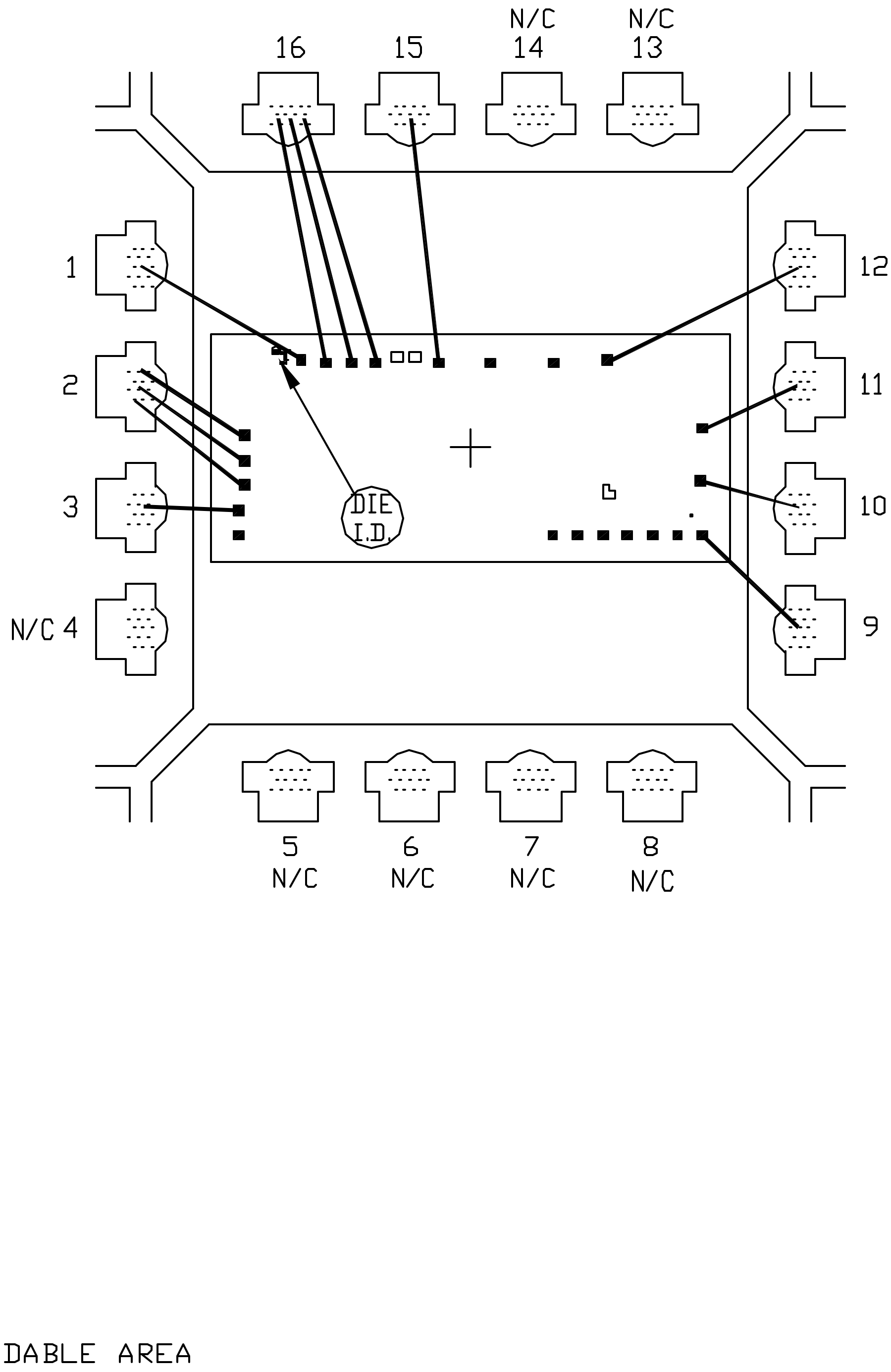
a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

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.

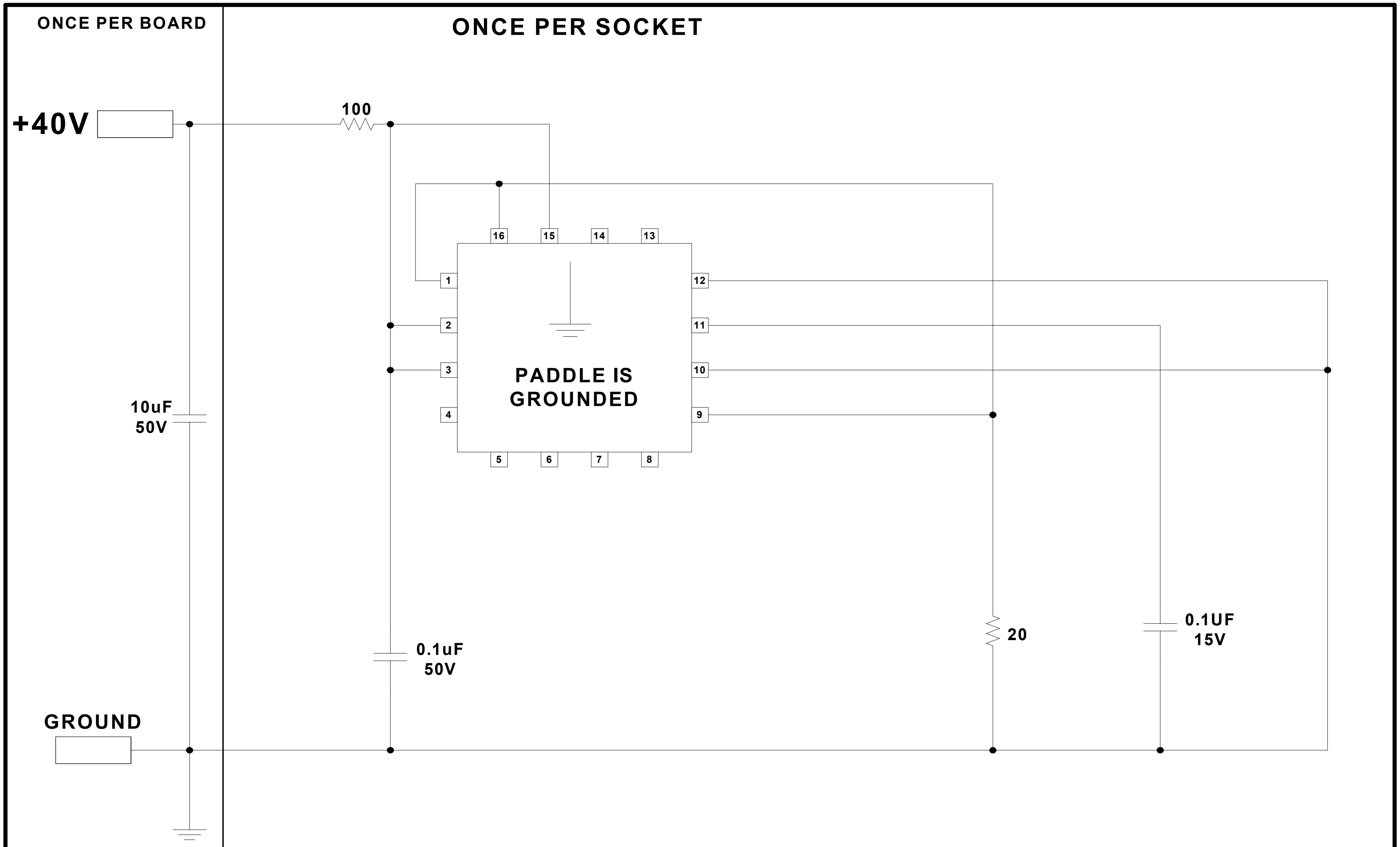
c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



5x5x0.8mm THIN QFN PKG. EXPOSED PAD PKG.



PKG. CODE: T1655-3		SIGNATURES	DATE	MAXIM CONFIDENTIAL & PROPRIETARY	
CAV./PAD SIZE: 146x146	PKG.			BOND DIAGRAM #: 05-9000-1947	REV: A
	DESIGN				



DEVICE: MAX16800 (SP01)
PACKAGE: 16-TQFN 5x5
MAX EXPECTED CURRENT: 15mA

NOTES: