



RELIABILITY REPORT
FOR
MAX16833AUE+
PLASTIC ENCAPSULATED DEVICES

January 26, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX16833AUE+ 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	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX16833/MAX16833B/MAX16833C/MAX16833D are peak current-mode-controlled LED drivers for boost, buck-boost, SEPIC, flyback, and high-side buck topologies. A dimming driver designed to drive an external p-channel in series with the LED string provides wide-range dimming control. This feature provides extremely fast PWM current switching to the LEDs with no transient overvoltage or undervoltage conditions. In addition to PWM dimming, the ICs provide analog dimming using a DC input at ICTRL. The ICs sense the LED current at the high side of the LED string. A single resistor from RT/SYNC to ground sets the switching frequency from 100kHz to 1MHz, while an external clock signal capacitively coupled to RT/SYNC allows the ICs to synchronize to an external clock. In the MAX16833/MAX1833C, the switching frequency can be dithered for spread-spectrum applications. The MAX16833B/MAX16833D instead provide a 1.64V reference voltage with a 2% tolerance. The ICs operate over a wide 5V to 65V supply range and include a 3A sink/source gate driver for driving a power MOSFET in high-power LED driver applications. Additional features include a fault-indicator output (active-low FLT) for short or overtemperature conditions and an overvoltage-protection sense input (OVP) for overvoltage protection. High-side current sensing combined with a p-channel dimming MOSFET allow the positive terminal of the LED string to be shorted to the positive input terminal or to the negative input terminal without any damage. This is a unique feature of the ICs.

II. Manufacturing Information

A. Description/Function:	High-Voltage HB LED Drivers with Integrated High-Side Current Sense
B. Process:	S45
C. Number of Device Transistors:	6300
D. Fabrication Location:	California
E. Assembly Location:	Thailand
F. Date of Initial Production:	June 25, 2010

III. Packaging Information

A. Package Type:	16-pin TSSOP
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3720
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Single Layer Theta Ja:	47°C/W
K. Single Layer Theta Jc:	3°C/W
L. Multi Layer Theta Ja:	38.3°C/W
M. Multi Layer Theta Jc:	3°C/W

IV. Die Information

A. Dimensions:	80 X 71 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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:	Don Lipps (Manager, Reliability Engineering) Bryan Preeshl (Vice President 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 144 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 4340 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 7.6 \times 10^{-9}$$

$$\lambda = 7.6 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the S45 Process results in a FIT Rate of 0.49 @ 25C and 8.49 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SWRZCQ003B D/C 1019)

The SP24 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX16833AUE+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C	DC Parameters	48	0	SWRZCQ002B, D/C 0946
	Biased	& functionality	48	0	SWRYBQ002B, D/C 0942
	Time = 192 hrs.		48	0	SWRYBQ002A, D/C 0942

Note 1: Life Test Data may represent plastic DIP qualification lots.