

RELIABILITY REPORT  
FOR  
MAX16832CASA+  
PLASTIC ENCAPSULATED DEVICES

December 3, 2009

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX16832CASA+ 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 MAX16832A/MAX16832C step-down constant-current high-brightness LED (HB LED) drivers provide a cost-effective design solution for automotive interior/exterior lighting, architectural and ambient lighting, LED bulbs, and other LED illumination applications. The MAX16832A/MAX16832C operate from a +6.5V to +65V input voltage range and can provide an output current up to 700mA, if operated up to a temperature of +125°C, or up to a 1A if operated up to a temperature of +105°C. A high-side current-sense resistor adjusts the output current, and a dedicated pulse-width modulation (PWM) input enables pulsed LED dimming over a wide range of brightness levels. These devices are well suited for applications requiring a wide input voltage range. The high-side current sensing and an integrated current-setting circuitry minimize the number of external components while delivering an average output current with  $\pm 3\%$  accuracy. A hysteretic control method ensures excellent input supply rejection and fast response during load transients and PWM dimming. The MAX16832A allows 10% current ripple, and the MAX16832C allows 30% current ripple. Both devices operate up to a 2MHz switching frequency, thus allowing the use of small-sized components. The MAX16832A/MAX16832C offer an analog dimming feature that reduces the output current by applying an external DC voltage below the internal 2V threshold voltage from TEMP\_I to GND. TEMP\_I also sources 25 $\mu$ A to a negative temperature coefficient (NTC) thermistor connected between TEMP\_I and GND, thus providing an analog thermal-foldback feature that reduces the LED current when the temperature of the LED string exceeds a specified temperature point. Additional features include thermal-shutdown protection. The MAX16832A/MAX16832C operate over the -40°C to +125°C automotive temperature range and are available in a thermally enhanced 8-pin SO package.

## II. Manufacturing Information

A. Description/Function:	2MHz, High-Brightness LED Drivers with Integrated MOSFET and High-Side Current Sense
B. Process:	S45
C. Number of Device Transistors:	542
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	Philippines, Thailand
F. Date of Initial Production:	2/2/2009

## III. Packaging Information

A. Package Type:	8-pin SOIC (N)
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:	#05-9000-3257
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:	53°C/W
K. Single Layer Theta Jc:	7°C/W
L. Multi Layer Theta Ja:	43°C/W
M. Multi Layer Theta Jc:	7°C/W

## IV. Die Information

A. Dimensions:	61 X 65 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (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 <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering) 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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 80 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.4 \times 10^{-9}$$
$$\lambda = 13.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

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

The SP19-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX16832CASA+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	80	0
<b>Moisture Testing</b> (Note 2)				
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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