



RELIABILITY REPORT
FOR
MAX16822BASA+
PLASTIC ENCAPSULATED DEVICES

July 30, 2012

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX16822BASA+ 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 MAX16822A/MAX16822B 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 MAX16822A/MAX16822B operate from a +6.5V to +65V input-voltage range and can provide an output current up to 350mA, if operated up to a temperature of +125°C, or up to 500mA, 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 MAX16822A allows 10% current ripple and the MAX16822B allows 30% current ripple. Both devices operate up to a switching frequency of 2MHz, thus allowing the use of small-sized components. The MAX16822A/MAX16822B 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 μ 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. An additional feature includes thermal-shutdown protection that turns off the LX driver when the junction temperature exceeds +165°C. The MAX16822A/MAX16822B operate over the -40°C to +125°C automotive temperature range and are available in an 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:	S4
C. Number of Device Transistors:	542
D. Fabrication Location:	Texas
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	June 13, 2008

III. Packaging Information

A. Package Type:	150 mil 8L SOIC
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:	#05-9000-3256 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	136°C/W
M. Multi Layer Theta Jc:	38°C/W

IV. Die Information

A. Dimensions:	61 X 65 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:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)
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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 226 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 0.9 \times 10^{-9}$$

$$\lambda = 0.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S4 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 TABB0Q001D D/C 1150)

The SP19-1 1 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

MAX16822BASA+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	71	0	TNCYC2026G, D/C 1107
	Biased	& functionality	77	0	TNCZBZ003J, D/C 0934
	Time = 1000 hrs.		78	0	SNCAQ003B, D/C 0851

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