

RELIABILITY REPORT
FOR
MAX16841ASA+T
PLASTIC ENCAPSULATED DEVICES

March 15, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

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| Approved by |
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| Quality Assurance |
| Manager, Reliability Engineering |

Conclusion

The MAX16841ASA+T 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 MAX16841 is an LED driver for AC line (100V, 120V, 220V, and 230V AC) input lamps. It features proprietary control of the input current, which allows lamps to dim smoothly from full to zero light intensity, while providing active power factor correction. It is a very flexible product that can be used in isolated (e.g., flyback) and nonisolated (e.g., buck) configurations, providing in both cases accurate setting of the output current with no need for opto-couplers. The constant frequency-control technique of the device allows maximization of the conversion efficiency at both low and high AC line, by operating at the conduction mode that minimizes the total of conduction and switching losses. The device can be configured for universal input (90V to 264V AC) dimmable applications, allowing the design of an LED lamp that operate and can be dimmed worldwide. This product can be used without electrolytic capacitors, thus maximizing the lamp lifetime; in this case, the LED current is a rectified sinusoid, with a frequency that is twice the AC line frequency. The device also features thermal shutdown, current limit, open-LED protection and VCC undervoltage lockout. It operates over the -40°C to 125°C temperature range and is available in an 8-pin SO package.

II. Manufacturing Information

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|----------------------------------|--|
| A. Description/Function: | Controller IC for Dimmable Offline LED Lamps |
| B. Process: | S18 |
| C. Number of Device Transistors: | 1191 |
| D. Fabrication Location: | USA |
| E. Assembly Location: | Malaysia, Philippines and Thailand |
| F. Date of Initial Production: | September 13, 2011 |

III. Packaging Information

| | |
|--|--------------------------|
| A. Package Type: | 8-pin SOIC |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive |
| E. Bondwire: | Au (0.8 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-9000-4468 |
| 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: | 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: | 42.13X52.76 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 = 0.23 / Metal2-3 = 0.28 / Metal 4 = 2.6 microns (as drawn) |
| F. Minimum Metal Spacing: | Metal1 = 0.23 / Metal2-3 = 0.28 / Metal 4 = 3.0 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 158 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 6.96 \times 10^{-9}$$

$$\lambda = 6.96 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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 S18 Process results in a FIT Rate of 0.06 @ 25C and 1.04 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SAAO2Q002B, D/C 1134)

The PF80 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

MAX16841ASA+T

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|----------------------------------|-----------------|------------------------|-------------|--------------------|----------------------|
| Static Life Test (Note 1) | Ta = 135C | DC Parameters | 80 | 0 | SAAO2Q002C, D/C 1134 |
| | Biased | & functionality | 78 | 0 | SZ4ZBQ001C, D/C 1109 |
| | Time = 192 hrs. | | | | |

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