RELIABILITY REPORT
FOR
MAX44009EDT+T
PLASTIC ENCAPSULATED DEVICES

January 14, 2011

MAXIM INTEGRATED PRODUCTS
120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by

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Quality Assurance
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Conclusion

The MAX44009EDT+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 MAX44009 ambient light sensor features an I²C digital output that is ideal for a number of portable applications such as smartphones, notebooks, and industrial sensors. At less than 1µA operating current, it is the lowest power ambient light sensor in the industry and features an ultra-wide 22-bit dynamic range from 0.045 lux to 188,000 lux. Low-light operation allows easy operation in dark-glass applications. The on-chip photodiode's spectral response is optimized to mimic the human eye's perception of ambient light and incorporates IR and UV blocking capability. The adaptive gain block automatically selects the correct lux range to optimize the counts/lux. The IC is designed to operate from a 1.7V to 3.6V supply voltage range and consumes only 0.65µA in full operation. It is available in a small, 2mm x 2mm x 0.6mm UTDFN-Opto package. The architecture, applications, and benefits of Maxim's MAX44009 ambient light sensor.
II. Manufacturing Information

A. Description/Function: Industry's Lowest-Power Digital Ambient Light Sensor
B. Process: S4
C. Number of Device Transistors: 12841
D. Fabrication Location: California, Texas or Japan
E. Assembly Location: Thailand
F. Date of Initial Production: December 22, 2010

III. Packaging Information

A. Package Type: 6-pin TDFN
B. Lead Frame: Copper
C. Lead Finish: NiPd
D. Die Attach: Conductive
E. Bondwire: Au (1 mil dia.)
F. Mold Material: Epoxy with silica filler
G. Assembly Diagram: #
H. Flammability Rating: Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C
J. Single Layer Theta Ja: 83.9°C/W
K. Single Layer Theta Jc: 37°C/W
L. Multi Layer Theta Ja: N/A
M. Multi Layer Theta Jc: N/A

IV. Die Information

A. Dimensions: 58 X 38 mils
B. Passivation: Si₃N₄/SiO₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect: Al with Ti/TiN Barrier
D. Backside Metallization: None
E. Minimum Metal Width: Meta1 = 0.5 / Meta2 = 0.6 / Meta3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing: Meta1 = 0.45 / Meta2 = 0.5 / Meta3 = 0.6 microns (as drawn)
G. Bondpad Dimensions: 5 mil. Sq.
H. Isolation Dielectric: SiO₂
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:

\[
\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 236 \times 2}
\]

(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 0.05 @ 25°C and 0.83 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SFOXBU003B4, D/C 1020)

The OY44-4 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
MAX44009EDT+T

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Life Test</td>
<td>Ta = 135°C</td>
<td>DC Parameters</td>
<td>80</td>
<td>0</td>
<td>SF0XBA004BF, DC 1019</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td>&amp; functionality</td>
<td>79</td>
<td>0</td>
<td>SF0XB003AJ, DC 1018</td>
</tr>
<tr>
<td></td>
<td>Time=1000 hrs.</td>
<td></td>
<td>77</td>
<td>0</td>
<td>SF0XB003BJ, DC 1020</td>
</tr>
</tbody>
</table>

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

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