RELIABILITY REPORT
FOR
MAX6795TPLD2+
PLASTIC ENCAPSULATED DEVICES

July 15, 2010

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

Approved by
Don Lipps
Quality Assurance
Manager, Reliability Engineering
Conclusion

The MAX6795TPLD2+ 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 MAX6791-MAX6796 ultra-low-quiescent-current, single-/dual-output linear regulators are ideal for automotive applications. The devices offer a wide 5V to 72V operating input range, allowing them to withstand automotive load-dump conditions while consuming only 68µA. The MAX6791-MAX6794 are dual-output regulators capable of supplying up to 150mA per output. The MAX6795/MAX6796 offer a single output capable of delivering up to 300mA. These devices offer standard output-voltage options (5V, 3.3V, 2.5V, or 1.8V) and can be adjusted to any voltage from 1.8V to 11V. The MAX6791-MAX6794 also offer a fixed 5V output. All devices feature a push-pull or open-drain, active-low RESET output with a fixed output reset threshold that is 92.5%/87.5% of the regulator output OUT/OUT1. The reset output asserts low when OUT/OUT1 drops below the reset threshold and remains low for the fixed or capacitor-adjustable reset timeout period after OUT/OUT1 exceeds the reset threshold. The MAX6791-MAX6796 provide a watchdog input that monitors a pulse train from the microprocessor (µP) and generates reset pulses if the watchdog input remains high or low for a duration longer than the watchdog timeout period. All devices are available with either a fixed watchdog timeout period of 280ms (min) or a period adjustable with an external capacitor. The MAX6791/MAX6792 feature a windowed watchdog timeout period with selectable window ratio. The watchdog feature can be disabled. The MAX6791-MAX6794 provide dual enable inputs (ENABLE1 and ENABLE2) that control each regulator independently. The single-output MAX6795/MAX6796 feature one enable input (ENABLE). All devices include a hold input (active-low HOLD) that aids the implementation of a self-holding circuit without requiring external components. Once the regulator is enabled, setting active-low HOLD low forces the regulator to remain on even if ENABLE/ENABLE1 is subsequently set low. Releasing active-low HOLD shuts down the regulator. The MAX6791-MAX6796 are available in a small, thermally enhanced TQFN package. The 5mm x 5mm package dissipates up to 2.7W, supporting continuous regulator operation during high ambient temperatures, high battery voltage, and high load-current conditions. The MAX6791-MAX6796 are specified for a -40°C to +125°C operating temperature range.
II. Manufacturing Information

A. Description/Function: High-Voltage, Micropower, Single/Dual Linear Regulators with Supervisory Functions

B. Process: BCD8

C. Number of Device Transistors: 1617

D. Fabrication Location: Oregon

E. Assembly Location: China, Thailand

F. Date of Initial Production: October 22, 2005

III. Packaging Information

A. Package Type: 20-pin TQFN 5x5

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: #05-9000-1924

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: 48°C/W

K. Single Layer Theta Jc: 2.1°C/W

L. Multi Layer Theta Ja: 30°C/W

M. Multi Layer Theta Jc: 2.1°C/W

IV. Die Information

A. Dimensions: 100 X 115 mils

B. Passivation: Si3N4/SiO2 (Silicon nitride/ Silicon dioxide)

C. Interconnect: Al/0.5%Cu with Ti/TiN Barrier

D. Backside Metallization: None

E. Minimum Metal Width: 3.0 microns (as drawn)

F. Minimum Metal Spacing: 3.0 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 (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:

\[
\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2} = 22.9 \times 10^{-9}
\]

\( \lambda = 22.9 \text{ F.i.T.} \) (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 BCD8 Process results in a FIT Rate of 0.06 @ 25C and 1.08 @ 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 MS97-4 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.
# Table 1
Reliability Evaluation Test Results

## MAX6795TPLD2+

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>TEST CONDITION</th>
<th>FAILURE IDENTIFICATION</th>
<th>SAMPLE SIZE</th>
<th>NUMBER OF FAILURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static Life Test</strong></td>
<td>Ta = 135°C Biased</td>
<td>DC Parameters &amp; functionality</td>
<td>48</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Time = 192 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moisture Testing</strong></td>
<td>Ta = 130°C RH = 85%</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Biased</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time = 96hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Stress</strong></td>
<td>-65°C/150°C Cycle</td>
<td>DC Parameters &amp; functionality</td>
<td>77</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1000 Cycles Method 1010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data