RELIABILITY REPORT

FOR

MAX4893BETB+T

PLASTIC ENCAPSULATED DEVICES

December 16, 2011

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| Approved by |
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| Sokhom Chum |
| Quality Assurance |
| Reliability Engineer |

**Conclusion**

The MAX4893BETB+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.

**Table of Contents**



**I. Device Description**

A. General

The MAX4881–MAX4884 overvoltage protection (OVP) controllers with built-in current-limited switch, protect low voltage systems against voltages of up to 28V. When the input voltage exceeds the overvoltage trip level of 5.6V (MAX4881/MAX4883) or 4.5V (MAX4882/MAX4884), the external n-channel MOSFET is turned off to prevent damage to the protected components. An undervoltage/overvoltage flag indicator (OV-bar) notifies the processor that an undervoltage/overvoltage fault condition is present. The MAX4881/MAX4882 feature an internal 1.1A current-limited switch, while the MAX4883B/MAX4883C/MAX4884B/MAX4884C include an internal 0.7A current-limited switch. When the load current is at the current limit for longer than the blanking time, the switch of the MAX4881/MAX4882/MAX4883B/MAX4884B latches off and does not turn back on until Active-Low EN, CB, or IN is cycled. A current-limit flag (Active-Low FLAGI) asserts to indicate a current fault condition. The MAX4883C/MAX4884C limit the current to 0.7A indefinitely until the thermal protection trips. An overcurrent flag output asserts to indicate a current fault condition after the blanking time has elapsed. The MAX4881–MAX4884 have a control input (CB) that is used to turn on and off the internal current-limited switch. Other features include a shutdown function (Active-Low EN) to disable the external n-channel MOSFET, and a built-in startup delay to allow the adapter voltage to settle down before turning on the MOSFET. The MAX4881–MAX4884 is offered in a space-saving 10-pin TDFN package and is specified for operation over the extended -40°C to +85°C temperature range.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Overvoltage Protection Controllers with Current Limit in TDFN |
| B. Process: | B8 |
| C. Number of Device Transistors: | 2391 |
| D. Fabrication Location: | Oregon |
| E. Assembly Location: | Thailand |
| F. Date of Initial Production: | October 21, 2006 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 10L TDFN 3x3 |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive |
| E. Bondwire: | Au (1.3 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-9000-1565 / 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: | 54°C/W |
| K. Single Layer Theta Jc: | 9°C/W |
| L. Multi Layer Theta Ja: | 41°C/W |
| M. Multi Layer Theta Jc: | 9°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 63 X 73 mils |
| B. Passivation: | $Si_3N_4/SiO_2$ (Silicon nitride/ Silicon dioxide) |
| C. Interconnect: | Al/0.5%Cu with Ti/TiN Barrier |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 0.8 microns (as drawn) |
| F. Minimum Metal Spacing: | 0.8 microns (as drawn) |
| G. Bondpad Dimensions: | |
| H. Isolation Dielectric: | $SiO_2$ |
| I. Die Separation Method: | Wafer Saw |

## V. Quality Assurance Information

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|---|---|
| A. Quality Assurance Contacts: | Richard Aburano (Manager, Reliability Engineering)<br>Don Lipps (Manager, Reliability Engineering)<br>Bryan Preeshl (Vice President of QA) |
| B. Outgoing Inspection Level: | 0.1% for all electrical parameters guaranteed by the Datasheet.<br>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 ($\lambda$) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 47 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.3 \times 10^{-9}$

$\lambda = 23.3$ 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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SXT5AQ002D D/C 0637)

The AS31-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**
Reliability Evaluation Test Results

**MAX4893BETB+T**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES | COMMENTS |
|---|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | | |
| | Ta = 135°C<br>Biased<br>Time = 192 hrs. | DC Parameters & functionality | 47 | 0 | N/A |

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