

RELIABILITY REPORT  
FOR  
MAX4835ETT18BD2+  
PLASTIC ENCAPSULATED DEVICES

July 27, 2010

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

|                                  |
|----------------------------------|
| <b>Approved by</b>               |
| Don Lipps                        |
| Quality Assurance                |
| Manager, Reliability Engineering |

## Conclusion

The MAX4835ETT18BD2+ 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 MAX4834/MAX4835 family of low-dropout linear regulators (LDOs) feature an accurate current-limiting switch with an integrated active-low FLAG or active-low RESET function. These devices operate from 2.5V to 5.5V and deliver up to 250mA of load current at a preset output voltage. Preset output voltage levels are 1.8V/2.5V/2.8V/3.0V/3.3V. The MAX4834/MAX4835 offer a programmable soft-start control function to eliminate false reset during startup. The MAX4834 provides an active-low FLAG function to notify the system when the load current exceeds the limit. The MAX4835 provides an active-low RESET function to notify the system when the output drops below the threshold. Additionally, reverse-current protection prevents current flowing from the output to the input. Other features include a low 90 $\mu$ A quiescent current, a 0.1 $\mu$ A shutdown current. The MAX4834/MAX4835 are available in space-saving 6-pin SOT23 and TDFN packages. Each device is specified over the -40°C to +85°C extended temperature range. Contact factory for other programmed output voltage versions from 1.5V to 3.3V in 100mV increments. For pin-compatible 100mA versions of this device, refer to the MAX4832/MAX4833. For pin-compatible 500mA versions of this device, refer to the MAX4836/MAX4837.

**II. Manufacturing Information**

|                                  |  |
|----------------------------------|--|
| A. Description/Function:         | 250mA LDO Linear Regulators with Current-Limiting Switch |
| B. Process:                      | B8   |
| C. Number of Device Transistors: | 1575   |
| D. Fabrication Location:         | California or Texas                                      |
| E. Assembly Location:            | Philippines  |
| F. Date of Initial Production:   | July 24, 2004  |

**III. Packaging Information**

|  |                          |
|--|--------------------------|
| A. Package Type:   | 6-pin TDFN 3x3           |
| B. Lead Frame:   | Copper                   |
| C. Lead Finish:  | 100% matte Tin           |
| D. Die Attach:   | Conductive               |
| E. Bondwire:   | Au (13 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 | Level 1                  |
| J. Single Layer Theta Ja:  | 55°C/W                   |
| K. Single Layer Theta Jc:  | 8.5°C/W                  |
| L. Multi Layer Theta Ja:   | 42°C/W                   |
| M. Multi Layer Theta Jc:   | 8.5°C/W                  |

**IV. Die Information**

|                            |   |
|----------------------------|---|
| A. Dimensions:             | 90 X 45 mils  |
| B. Passivation:            | Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (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:     | 5 mil. Sq.  |
| H. Isolation Dielectric:   | SiO <sub>2</sub>  |
| 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 43 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 25.6 \times 10^{-9}$$

$$\lambda = 25.6 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 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 AS24-5 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 +/-250mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX4835ETT18BD2+**

| TEST ITEM                         | TEST CONDITION                                    | FAILURE IDENTIFICATION        | SAMPLE SIZE | NUMBER OF FAILURES |
|-----------------------------------|---|-------------------------------|-------------|--------------------|
| <b>Static Life Test</b> (Note 1)  |   |                               |             |                    |
|                                   | Ta = 135°C<br>Biased<br>Time = 192 hrs.           | DC Parameters & functionality | 43          | 0                  |
| <b>Moisture Testing</b> (Note 2)  |   |                               |             |                    |
| HAST                              | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters & functionality | 77          | 0                  |
| <b>Mechanical Stress</b> (Note 2) |   |                               |             |                    |
| Temperature<br>Cycle              | -65°C/150°C<br>1000 Cycles<br>Method 1010         | DC Parameters & functionality | 77          | 0                  |

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

Note 2: Generic Package/Process data