RELIABILITY REPORT

FOR

MAX1831EEE+

PLASTIC ENCAPSULATED DEVICES

October 8, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
|---|
| Ken Wendel |
| Quality Assurance |
| Director, Reliability Engineering |

**Conclusion**

The MAX1831EEE+ 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 MAX1830/MAX1831 constant-off-time, pulse-width-modulated (PWM) step-down DC-DC converters are ideal for use in 5V and 3.3V to low-voltage conversion necessary in notebook and subnotebook computers. These devices feature internal synchronous rectification for high efficiency and reduced component count. They require no external Schottky diode. The internal 45m PMOS power switch and 55m NMOS synchronous-rectifier switch easily deliver continuous load currents up to 3A. The MAX1830 produces preset +2.5V, +1.8V, or +1.5V output voltage or an adjustable output from +1.1V to VIN. The MAX1831 produces preset +3.3V, +2.5V, and +1.5V output voltages and an adjustable output from +1.1V to VIN. They achieve efficiencies as high as 94%. The MAX1830/MAX1831 use a unique current-mode, constant-off-time, PWM control scheme, which includes Idle Mode(tm) to maintain high efficiency during light-load operation. The programmable constant-off-time architecture sets switching frequencies up to 1MHz, allowing the user to optimize performance trade- offs between efficiency, output switching noise, component size, and cost. Both devices are designed for continuous output currents up to 3A, an internal digital soft-start to limit surge currents during startup, a 100% duty cycle mode for low-dropout operation, and a low-power shutdown mode that disconnects the input from the output and reduces supply current below 1µA.The MAX1830/MAX1831 are available in 16-pin QSOP packages. For similar devices that provide continuous output currents of 1A to 3A, refer to the MAX1644, MAX1623, and MAX1742/MAX1842/MAX1843 data sheets.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | 3A, 1MHz, Low-Voltage, Step-Down Regulators with Synchronous Rectification and Internal Switches |
| B. Process: | B8 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | California or Texas |
| E. Assembly Location: | Philippines, Thailand |
| F. Date of Initial Production: | October 27, 2001 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 16-pin QSOP |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive Epoxy |
| E. Bondwire: | Gold (2 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-2301-0073 |
| 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: | 120°C/W |
| K. Single Layer Theta Jc: | 37°C/W |
| L. Multi Layer Theta Ja: | 105°C/W |
| M. Multi Layer Theta Jc: | 37°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 86 X 144 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: | 5 mil. Sq. |
| H. Isolation Dielectric: | $SiO_2$ |
| I. Die Separation Method: | Wafer Saw |

## V. Quality Assurance Information

| | |
|---|---|
| A. Quality Assurance Contacts: | Ken Wendel (Director, Reliability Engineering)<br>Bryan Preeshl (Managing Director 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ($\lambda$) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 80 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 13.4 \times 10^{-9}$

$\lambda$ = 13.4 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 PY45-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-200 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

**Table 1**

Reliability Evaluation Test Results

**MAX1831EEE+**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | |
| | Ta = 135°C<br>Biased<br>Time = 192 hrs. | DC Parameters & functionality | 80 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| HAST | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters & functionality | 77 | 0 |
| **Mechanical Stress** (Note 2) | | | | |
| Temperature 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