

RELIABILITY REPORT
FOR
MAX1837ETT33+
PLASTIC ENCAPSULATED DEVICES

December 22, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

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

Conclusion

The MAX1837ETT33+ 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 MAX1836/MAX1837 high-efficiency step-down converters provide a preset 3.3V or 5V output voltage from supply voltages as high as 24V. Using external feedback resistors, the output voltage may be adjusted from 1.25V to V_{IN} . An internal current-limited switching MOSFET delivers load currents up to 125mA (MAX1836) or 250mA (MAX1837). The unique current-limited control scheme, operating with duty cycles up to 100%, minimizes the dropout voltage (120mV at 100mA). Additionally, this control scheme reduces supply current under light loads to 12 μ A. High switching frequencies allow the use of tiny surface-mount inductors and output capacitors. The MAX1836/MAX1837 step-down converters with internal switching MOSFETs are available in 6-pin SOT23 and 3mm x 3mm TDFN packages, making them ideal for low-cost, low-power, space-sensitive applications. For increased output drive capability, use the MAX1776 step-down converter that uses an internal 24V switch to deliver up to 500mA. For even higher currents, use the MAX1626/MAX1627 step-down controllers that drive an external P-channel MOSFET to deliver up to 20W.

II. Manufacturing Information

| | |
|----------------------------------|--|
| A. Description/Function: | 24V Internal Switch, 100% Duty Cycle, Step-Down Converters |
| B. Process: | B8 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | California or Texas |
| E. Assembly Location: | Thailand |
| F. Date of Initial Production: | January 27, 2001 |

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 (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-9000-1489 |
| 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: | 45 X 90 mils |
| B. Passivation: | Si ₃ N 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)
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 (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{4.05}{192 \times 4340 \times 158 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 15.0 \times 10^{-9}$$

$$\lambda = 15.0 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 PY36-3 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 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

MAX1837ETT33+

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|-----------------------------------|---|-------------------------------|-------------|--------------------|
| Static Life Test (Note 1) | | | | |
| | Ta = 135°C Biased Time = 192 hrs. | DC Parameters & functionality | 158 | 1 |
| Moisture Testing (Note 2) | | | | |
| HAST | Ta = 130°C RH = 85% Biased Time = 96hrs. | DC Parameters & functionality | 77 | 0 |
| Mechanical Stress (Note 2) | | | | |
| Temperature Cycle | -65°C/150°C 1000 Cycles Method 1010 | DC Parameters & functionality | 77 | 0 |

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

Note 2: Generic Package/Process data