RELIABILITY REPORT

FOR

MAX8545EUB+

PLASTIC ENCAPSULATED DEVICES

October 1, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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

**Conclusion**

The MAX8545EUB+ 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 MAX8545/MAX8546/MAX8548 are voltage-mode pulse-width-modulated (PWM), step-down DC-DC controllers ideal for a variety of cost-sensitive applications. They drive low-cost n-channel MOSFETs for both the high-side switch and synchronous rectifier, and require no external current-sense resistor. These devices can supply output voltages as low as 0.8V. The MAX8545/MAX8546/MAX8548 have a wide 2.7V to 28V input range, and do not need any additional bias voltage. The output voltage can be precisely regulated from 0.8V to 0.83 x VIN. These devices can provide efficiency up to 95%. Lossless short-circuit and current-limit protection is provided by monitoring the RDS(ON) of the low-side MOSFET. The MAX8545 and MAX8548 have a current-limit threshold of 320mV, while the MAX8546 has a current-limit threshold of 165mV. All devices feature foldback-current capability to minimize power dissipation under short-circuit condition. Pulling the COMP/EN pin low with an open-collector or low-capacitance, open-drain device can shut down all devices. The MAX8545/MAX8546 operate at 300kHz and the MAX8548 operates at 100kHz. The MAX8545/MAX8546/MAX8548 are compatible with low-cost aluminum electrolytic capacitors. Input undervoltage lockout prevents proper operation under power-sag operations to prevent external MOSFETs from overheating. Internal soft-start is included to reduce inrush current. These devices are offered in space-saving 10-pin µMAX® packages.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Low-Cost, Wide Input Range, Step-Down Controllers with Foldback Current Limit |
| B. Process: | B8 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | California or Texas |
| E. Assembly Location: | Thailand, Malaysia |
| F. Date of Initial Production: | July 11, 2003 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 10-pin uMAX |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive Epoxy |
| E. Bondwire: | Gold (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-3501-0016 |
| 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: | 180°C/W |
| K. Single Layer Theta Jc: | 41.9°C/W |
| L. Multi Layer Theta Ja: | 113.1°C/W |
| M. Multi Layer Theta Jc: | 41.9°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 58 X 72 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

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|---|---|
| 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 305 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 3.5 \times 10^{-9}$

$\lambda = 3.5$ 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 PM32-3 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

**MAX8545EUB+**

| 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<br>& functionality | 305 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| HAST | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters<br>& functionality | 77 | 0 |
| **Mechanical Stress** (Note 2) | | | | |
| Temperature Cycle | -65°C/150°C<br>1000 Cycles<br>Method 1010 | DC Parameters<br>& functionality | 77 | 0 |

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

Note 2: Generic Package/Process data