RELIABILITY REPORT FOR

MAX5053AEUA+T / MAX5053BEUA+T

PLASTIC ENCAPSULATED DEVICES

October 14, 2014

**MAXIM INTEGRATED**

160 RIO ROBLES

SAN JOSE, CA 95134

| **Approved by** |
| --- |
| Eric Wright |
| Quality Assurance |
| Reliability Engineering |

**Conclusion**

The MAX5053AEUA+T / MAX5053BEUA+T successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

**Table of Contents**



**I. Device Description**

A. General

The MAX5052/MAX5053 current-mode PWM controllers contain all the control circuitry required for the design of wide-input-voltage isolated and nonisolated power supplies. The MAX5052 is well suited for universal input (rectified 85VAC to 265VAC) or telecom (-36VDC to -72VDC) power supplies. The MAX5053 is well suited for low-input-voltage (10.8VDC to 24VDC) power supplies. The MAX5052/MAX5053 contains an internal error amplifier that regulates the tertiary winding output voltage. This implements a primary-side regulated, isolated power supply, eliminating the need for an optocoupler. An input undervoltage lockout (UVLO) is provided for programming the input-supply start voltage and to ensure proper operation during brownout conditions. The input-supply start voltage is externally programmable with a voltage-divider. To shut down the device, the UVLO pin is pulled low. Internal digital soft-start reduces output voltage overshoot. The internal thermal shutdown circuit protects the device in the event the junction temperature exceeds +130°C. The MAX5052 has an internal bootstrap UVLO with large hysteresis that requires a minimum voltage of 23.6V for startup. The MAX5053 does not have the internal bootstrap UVLO and can be biased directly from a minimum voltage of 10.8V. The 262 kHz switching frequency is internally trimmed to ±12% accuracy; this allows the optimization of the magnetic and filter components resulting in compact, cost-effective power supplies. The MAX5052A/MAX5053A is offered with a 50% maximum duty-cycle limit. The MAX5052B/MAX5053B is offered with a 75% maximum duty-cycle limit. These devices are available in 8-pin µMAX packages and operate over the -40°C to +85°C temperature range.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Current-Mode PWM Controllers with an Error Amplifier for Isolated/Nonisolated Power Supplies |
| B. Process: | B8 |
| C. Fabrication Location: | USA |
| D. Assembly Location: | Philippines, Thailand |
| E. Date of Initial Production: | October 25, 2002 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 8-pin uMAX |
| 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: | #05-9000-0088 |
| 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: | 221°C/W |
| K. Single Layer Theta Jc: | 42°C/W |
| L. Multi Layer Theta Ja: | 206.3°C/W |
| M. Multi Layer Theta Jc: | 42°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 62 X 80 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: | 1.2 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: | 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ($\lambda$) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.9 \times 10^{-9}$

$\lambda = 22.9$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the B8 Process results in a FIT Rate of 0.05 @ 25°C and 0.9 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The NP46-2 die type has been found to have all pins able to withstand an HBM transient pulse of +/-2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

**Table 1**

Reliability Evaluation Test Results

**MAX5053AEUA+T / MAX5053BEUA+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<br>& functionality | 48 | 0 | |

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