RELIABILITY REPORT

FOR

MAX6838XSDx

PLASTIC ENCAPSULATED DEVICES

January 12, 2010

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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

**Conclusion**

The MAX6838XSDx 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.

**Table of Contents**



**I. Device Description**

A. General

The MAX6832-MAX6840 are microprocessor (µP) supervisory circuits used to monitor low-voltage power supplies in µP and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +1.2V to +1.8V powered circuits. These devices assert a reset signal whenever the VCC supply voltage declines below a preset threshold or whenever manual reset (active-low MR) is asserted. Reset remains asserted for a fixed timeout delay after VCC has risen above the reset threshold or when manual reset is deasserted. Five different timeout periods are available: 70µs (voltage detector), 1.5ms, 30ms, 210ms, and 1.68s. Reset thresholds suitable for operation with a variety of supply voltages are available. The MAX6832/MAX6835/MAX6838 have a push-pull active-low reset output (active-low RESET). The MAX6833/MAX6836/MAX6839 have a push-pull active-high reset output (RESET) and the MAX6834/MAX6837/MAX6840 have an open-drain active-low reset output (active-low RESET). The open-drain active-low reset output requires a pullup resistor that can be connected to a voltage higher than VCC. The MAX6835/MAX6836/MAX6837 feature a debounced manual reset input (active-low MR), while the MAX6838/MAX6839/MAX6840 provide a RESET-IN input allowing the user to externally adjust the reset threshold. The reset comparator is designed to ignore fast transients on VCC . Low supply current of 7.5µA makes the MAX6832-MAX6840 ideal for use in portable equipment. These devices are available in 3- and 4-pin SC70 packages.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Ultra-Low-Voltage SC70 Voltage Detectors and µP Reset Circuits |
| B. Process: | C6 |
| C. Number of Device Transistors: | 680 |
| D. Fabrication Location: | California |
| E. Assembly Location: | Malaysia |
| F. Date of Initial Production: | October 27, 2001 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 4-pin SC70 |
| B. Lead Frame: | Alloy42 |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Non Conductive Epoxy |
| E. Bondwire: | Au (1.0 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-1601-0159 |
| 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: | 327°C/W |
| K. Single Layer Theta Jc: | 115°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 30 X 31 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: | 0.6 microns (as drawn) |
| F. Minimum Metal Spacing: | 0.6 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 80 \times 2}$$ (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 C6 Process results in a FIT Rate of 0.43 @ 25C and 7.50 @ 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 MS64-3 die type has been found to have all pins able to withstand a transient pulse of

HBM ESD: +/-1000V per JEDEC JESD22-A114
CDM ESD: +/-750V per JEDEC JESD22-C101
MM ESD: +/-250V per JEDEC JESD22-A115

Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCMax Overvoltage per JESD78.

**Table 1**
Reliability Evaluation Test Results

**MAX6838XSD**x

| 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