RELIABILITY REPORT

FOR

MAX5380LEUK+

PLASTIC ENCAPSULATED DEVICES

June 16, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

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

**Conclusion**

The MAX5380LEUK+ 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 MAX5380/MAX5381/MAX5382 are low-cost, 8-bit digital-to-analog converters (DACs) in miniature 5-pin SOT23 packages, with a simple 2-wire serial interface that allows communication with multiple devices. The MAX5380 has an internal +2V reference and operates from a +2.7V to +3.6V supply. The MAX5381 has an internal +4V reference and operates from a +4.5V to +5.5V supply. The MAX5382 operates over the full +2.7V to +5.5V supply range and has an internal reference equal to 0.9 x VDD. The fast-mode I²C*-compatible serial interface allows communication at data rates up to 400kbps, minimizing board space and reducing interconnect complexity in many applications. Each device is available with one of four factory-preset addresses (see Selector Guide). These DACs also include an output buffer, a low-power shutdown mode, and a power-on reset that ensures the DAC outputs are at zero when power is initially applied. In shutdown mode, supply current is reduced to less than 1µA and the output is pulled down to GND with a 10k resistor.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Low-Cost, Low-Power, 8-Bit DACs with 2-Wire Serial Interface in SOT23 |
| B. Process: | C6Y |
| C. Number of Device Transistors: | 2899 |
| D. Fabrication Location: | Japan |
| E. Assembly Location: | Malaysia, Thailand, Philippines |
| F. Date of Initial Production: | July 22, 2000 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 5-pin SOT23 |
| B. Lead Frame: | Copper |
| C. Lead Finish: | 100% matte Tin |
| D. Die Attach: | Conductive Epoxy |
| E. Bondwire: | Au (1.0 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | # |
| 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: | 324.3°C/W |
| K. Single Layer Theta Jc: | 82°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 57 X 38 mils |
| B. Passivation: | SiO2/SiN3 |
| C. Interconnect: | Al/Cu |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | 0.6um |
| F. Minimum Metal Spacing: | 0.6um |
| G. Bondpad Dimensions: | 5 mil. Sq. |
| H. Isolation Dielectric: | SiO2 |
| I. Die Separation Method: | 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 467 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 2.3 \times 10^{-9}$

$\lambda = 2.3$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at http://www.maxim-ic.com/. Current monitor data for the C6Y Process results in a FIT Rate of 0.82 @ 25C and 14.21 @ 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 DA68 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 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

**MAX5380LEUK+**

| 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 | 467 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| 85/85 | Ta = 85°C<br>RH = 85%<br>Biased<br>Time = 1000hrs. | 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