RELIABILITY REPORT

FOR

MAX5742EUB+

PLASTIC ENCAPSULATED DEVICES

September 30, 2010

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
|---|
| Don Lipps |
| Quality Assurance |
| Manager, Reliability Engineering |

**Conclusion**

The MAX5742EUB+ 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 MAX5742 quad, 12-bit, low-power, buffered voltage-output, digital-to-analog converter (DAC) is packaged in a space-saving 10-pin µMAX® package (5mm x 3mm). The wide supply voltage range of +2.7V to +5.5V and 229µA supply current accommodates low-power and low-voltage applications. DAC outputs employ on-chip precision output amplifiers that swing rail-to-rail. The MAX5742's reference input accepts a voltage range from 0 to VDD. In power-down the reference input is high impedance, further reducing the system's total power consumption. The 20MHz, 3-wire SPI(tm), QSPI(tm), MICROWIRE(tm) and DSP-compatible serial interface saves board space and reduces the complexity of opto- and transformer-isolated applications. The MAX5742 on-chip power-on reset (POR) circuit resets the DAC outputs to zero and loads the output with a 100k resistor to ground. This provides additional safety for applications that drive valves or other transducers that need to be off on power-up. The MAX5742's software-controlled power-down reduces supply current to less than 0.3µA and provides software-selectable output loads (1k , 100k , or high impedance) while in power-down. The MAX5742 is specified over the -40°C to +125°C automotive temperature range.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | 12-Bit, Low-Power, Quad, Voltage-Output DAC with Serial Interface |
| B. Process: | C6Y |
| C. Number of Device Transistors: | 14477 |
| D. Fabrication Location: | Japan |
| E. Assembly Location: | Malaysia, Thailand |
| F. Date of Initial Production: | July 28, 2001 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 10-pin uMAX |
| B. Lead Frame: | Copper |
| C. Lead Finish: | NiPd |
| D. Die Attach: | Non-conductive |
| E. Bondwire: | Au (1 mil dia.) |
| F. Mold Material: | Epoxy with silica filler |
| G. Assembly Diagram: | #05-9000-3376 |
| 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: | 76 X 89 mils |
| B. Passivation: | $Si_3N_4/SiO_2$ (Silicon nitride/ Silicon dioxide) |
| C. Interconnect: | Al 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

| | |
|---|---|
| A. Quality Assurance Contacts: | Don Lipps (Manager, 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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 90 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 12.2 \times 10^{-9}$

$\lambda$ = 12.2 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 C6Y Process results in a FIT Rate of 0.90 @ 25C and 15.55 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (ESD lot E5Q0EQ001B D/C 0850, Latchup lot I5Q0AZ001B D/C 0124)

The DA92 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

**Table 1**
Reliability Evaluation Test Results

**MAX5742EUB+**

| 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 | 45<br>45 | 0<br>0 | S5Q0CQ002E, DC 0607<br>I5Q0AZ001B, DC 0102 |

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