RELIABILITY REPORT

FOR MAX2981GCB+

PLASTIC ENCAPSULATED DEVICES

May 26, 2010

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

| **Approved by** |
|---|
| Richard Aburano |
| Quality Assurance |
| Manager, Reliability Operations |

**Conclusion**

The MAX2981GCB/V+ 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 MAX2981 powerline communication analog front-end (AFE) and line-driver IC is a state-of-the-art CMOS device that delivers high performance at low cost. This highly integrated design combines an analog-to-digital converter (ADC), digital-to-analog converter (DAC), adaptive gain control (AGC), filters, and line driver on a single chip. The MAX2981 substantially reduces previously required system components and complies with the HomePlug® 1.0 standard. Combined with Maxim's integrated PHY/MAC digital baseband, the device delivers the most flexible and cost-effective solution. The advanced design of the MAX2981 allows operation without external control, enabling simplified connection to a variety of HomePlug 1.0 digital PHY ICs. The MAX2981 is specified over the -40°C to +105°C automotive temperature range and is offered in a 64-pin lead-free LQFP package. The device is qualified to the AEC-Q100 Rev F automotive standard.

## II. Manufacturing Information

| | |
|---|---|
| A. Description/Function: | Integrated Powerline Communication Analog Front-End Transceiver and Line Driver |
| B. Process: | TS25EF |
| C. Number of Device Transistors: | 128598 |
| D. Fabrication Location: | Taiwan |
| E. Assembly Location: | Korea |
| F. Date of Initial Production: | July 21, 2009 |

## III. Packaging Information

| | |
|---|---|
| A. Package Type: | 64-pin LQFP |
| 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: | #05-9000-3276 |
| H. Flammability Rating: | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 3 |
| J. Single Layer Theta Ja: | °C/W |
| K. Single Layer Theta Jc: | °C/W |
| L. Multi Layer Theta Ja: | 40°C/W |
| M. Multi Layer Theta Jc: | 8°C/W |

## IV. Die Information

| | |
|---|---|
| A. Dimensions: | 216 X 142 mils |
| B. Passivation: | HDP Oxide, Nitride |
| C. Interconnect: | Ti/TiN/Al/Ti/TiN |
| D. Backside Metallization: | None |
| E. Minimum Metal Width: | |
| F. Minimum Metal Spacing: | |
| 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: | Richard Aburano (Manager, Reliability Operations)<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 100 biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 47 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.4 \times 10^{-9}$

$\lambda = 23.4$ 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 TS25EF Process results in a FIT Rate of 1.0 @ 25C and 17.5 @ 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 WV13 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V 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

**MAX2981GCB+**

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|---|---|---|---|---|
| **Static Life Test** (Note 1) | | | | |
| | Ta = 100°C<br>Biased<br>Time = 192 hrs. | DC Parameters & functionality | 47 | 0 |
| **Moisture Testing** (Note 2) | | | | |
| HAST | Ta = 130°C<br>RH = 85%<br>Biased<br>Time = 96hrs. | DC Parameters & functionality | 45 | 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