



RELIABILITY REPORT
FOR
MAX532XxxE+
PLASTIC ENCAPSULATED DEVICES

February 17, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

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

Conclusion

The MAX532XxxE+ 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.

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I. Device Description

A. General

The MAX532 is a complete, dual, serial-input, 12-bit multiplying digital-to-analog converter (MDAC) with output amplifiers. No external user trims are required to achieve full specified performance. The MAX532's 3-wire serial interface minimizes the number of package pins, so it uses less board space than parallel-interface parts. The interface is SPI(tm), QSPI(tm) and Microwire(tm) compatible. A serial output, DOUT, allows cascading of two or more MAX532s and read-back of the data written to the device. The device's serial interface minimizes digital-noise feed-through from its logic pins to its analog outputs. Serial interfacing also simplifies opto-coupler-isolated or transformer-isolated applications. The MAX532 is specified with $\pm 12V$ to $\pm 15V$ power supplies. All logic inputs are TTL and CMOS compatible. It comes in space-saving 16-pin DIP and wide SO packages.

II. Manufacturing Information

| | |
|----------------------------------|---|
| A. Description/Function: | Dual, Serial Input, Voltage-Output, Multiplying, 12-Bit DAC |
| B. Process: | SG5 |
| C. Number of Device Transistors: | |
| D. Fabrication Location: | Oregon |
| E. Assembly Location: | Philippines |
| F. Date of Initial Production: | Pre 1997 |

III. Packaging Information

| | | |
|--|--------------------------|--------------------------|
| A. Package Type: | 16-pin PDIP | 16-SOIC |
| B. Lead Frame: | Copper | Copper |
| C. Lead Finish: | 100% matte Tin | 100% matte Tin |
| D. Die Attach: | Conductive | Conductive |
| E. Bondwire | Au (1.3 mil dia.) | Au (1.3 mil dia.) |
| F. Mold Material: | Epoxy with silica filler | Epoxy with silica filler |
| G. Assembly Diagram: | #05-0401-0319 | #05-0401-0359 |
| H. Flammability Rating: | Class UL94-V0 | Class UL94-V0 |
| I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C | Level 1 | Level 1 |
| J. Single Layer Theta Ja: | 95°C/W | 105°C/W |
| K. Single Layer Theta Jc: | 35°C/W | 32°C/W |

IV. Die Information

| | |
|----------------------------|---|
| A. Dimensions: | 140 X 250 mils |
| B. Passivation: | Si ₃ N 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: | 5.0 microns (as drawn) |
| F. Minimum Metal Spacing: | 5.0 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) Bryan Preeshl (Managing Director of QA) |
| B. Outgoing Inspection Level: | 0.1% for all electrical parameters guaranteed by the Datasheet. 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 (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 154 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 1.37 \times 10^{-9}$$

$$\lambda = 1.37 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 SG5 Process results in a FIT Rate of 0.12 @ 25C and 2.04 @ 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 DA48 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 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

MAX532XxxE+

| TEST ITEM | TEST CONDITION | FAILURE IDENTIFICATION | SAMPLE SIZE | NUMBER OF FAILURES |
|-----------------------------------|---|----------------------------------|-------------|--------------------|
| Static Life Test (Note 1) | | | | |
| | Ta = 135°C Biased Time = 1000 hrs. | DC Parameters & functionality | 154 | 0 |
| Moisture Testing (Note 2) | | | | |
| HAST | Ta = 130°C RH = 85% Biased Time = 96hrs. | DC Parameters & functionality | 77 | 0 |
| Mechanical Stress (Note 2) | | | | |
| Temperature Cycle | -65°C/150°C 1000 Cycles Method 1010 | DC Parameters & functionality | 77 | 0 |

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

Note 2: Generic Package/Process data