

RELIABILITY REPORT  
FOR  
MAX4995AFAVB+  
PLASTIC ENCAPSULATED DEVICES

May 20, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

|                                   |
|-----------------------------------|
| <b>Approved by</b>                |
| Ken Wendel                        |
| Quality Assurance                 |
| Director, Reliability Engineering |

## Conclusion

The MAX4995AFAB+ 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 MAX4995A/MAX4995AF/MAX4995AL/MAX4995B/MAX4995C programmable current-limit switches feature internal current limiting to prevent damage to host devices due to faulty load conditions. These analog switches feature a low 130m (typ) on-resistance and operate from a +1.7V to +5.5V input voltage range. The current limit is adjustable from 50mA to 600mA, making these devices ideal for SDIO (secure digital input/output) and other load-switching applications. Each device in the family handles an overcurrent event differently depending on the option selected. The MAX4995A/MAX4995AF/MAX4995AL go into an autoretry mode, the MAX4995B latches off the switch, and the MAX4995C places the device in a continuous current-limit mode. Additional safety features include thermal shutdown to prevent overheating and reverse-current blocking to prevent current from being driven back into the source. The MAX4995A/MAX4995AF/MAX4995AL/MAX4995B/MAX4995C are available in a tiny 10-pin, 1.4mm x 1.8mm UTQFN package and operate over the -40°C to +125°C extended temperature range.

**II. Manufacturing Information**

|                                  |   |
|----------------------------------|---|
| A. Description/Function:         | 50mA to 600mA Programmable Current-Limit Switches |
| B. Process:                      | S4  |
| C. Number of Device Transistors: | 4812  |
| D. Fabrication Location:         | Texas   |
| E. Assembly Location:            | UTL Thailand                                      |
| F. Date of Initial Production:   | October 25, 2008                                  |

**III. Packaging Information**

|  |                                |
|--|--------------------------------|
| A. Package Type:   | 10 Pin $\mu$ TQFN 1.4 x 1.8 mm |
| B. Lead Frame:   |                                |
| C. Lead Finish:  | NiPd                           |
| D. Die Attach:   | Non 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                        |

**IV. Die Information**

|                            |   |
|----------------------------|---|
| A. Dimensions:             | 31 X 47 mils  |
| B. Passivation:            | $\text{Si}_3\text{N}_4/\text{SiO}_2$ (Silicon nitride/ Silicon dioxide) |
| C. Interconnect:           | Aluminum/0.5% Cu  |
| D. Backside Metallization: | None  |
| E. Minimum Metal Width:    | Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)           |
| F. Minimum Metal Spacing:  | Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn)          |
| G. Bondpad Dimensions:     | 5 mil. Sq.  |
| H. Isolation Dielectric:   | $\text{SiO}_2$  |
| I. Die Separation Method:  | Wafer Saw   |

## V. Quality Assurance Information

- 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 ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.4 \times 10^{-9}$$

$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 S4 Process results in a FIT Rate of 4.6 @ 25C and 79.2 @ 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 AJ39-5 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114. 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

**MAX4995AFVB+**

| TEST ITEM   | TEST CONDITION                                     | FAILURE IDENTIFICATION           | SAMPLE SIZE | NUMBER OF FAILURES |
|---|--|----------------------------------|-------------|--------------------|
| <b>Static Life Test</b> (Note 1)                          | Ta = 135°C<br>Biased<br>Time = 192 hrs.            | DC Parameters<br>& functionality | 48          | 0                  |
| <b>Moisture Testing</b> (Note 2)<br>85/85                 | Ta = 85°C<br>RH = 85%<br>Biased<br>Time = 1000hrs. | DC Parameters<br>& functionality | 77          | 0                  |
| <b>Mechanical Stress</b> (Note 2)<br>Temperature<br>Cycle | -65°C/150°C<br>1000 Cycles<br>Method 1010          | DC Parameters<br>& functionality | 77          | 0                  |

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

Note 2: Generic Package/Process data