

RELIABILITY REPORT  
FOR  
MAX5900AAETT+  
PLASTIC ENCAPSULATED DEVICES

February 8, 2009

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
SUNNYVALE, CA 94086

<b>Approved by</b>
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## Conclusion

The MAX5900AAETT+ 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 MAX5900/MAX5901 are SOT23/TDFN hot-swap controllers that allow a circuit card to be safely hot-plugged into a live backplane without causing a glitch on the power-supply rail. These devices operate from -9V to -100V and provide the simplest hot-swap solution by eliminating all external components except an external n-channel MOSFET. The MAX5900/MAX5901 limit the inrush current to the load and provide a circuit-breaker function for overcurrent protection. During startup, the circuit-breaker function is disabled and the MAX5900/MAX5901 limit the inrush current by gradually turning on the external MOSFET. Once the external MOSFET is fully enhanced, the circuit-breaker function is enabled and the MAX5900/MAX5901 provide overcurrent protection by monitoring the voltage drop across the external MOSFET's on-resistance. The MAX5900/MAX5901 include an undervoltage lockout (UVLO) function, ON/active-low OFF control input, and a powergood status output, active-low PGOOD (MAX5900) or PGOOD (MAX5901). A built-in thermal shutdown feature is also included to protect the external MOSFET in case of overheating. The MAX5900/MAX5901 offer latched or autoretry fault management and are available with 200mV, 300mV, or 400mV circuit-breaker thresholds. Both the MAX5900 and MAX5901 are available in small SOT23 and TDFN packages, and are specified for the extended -40°C to +85°C temperature range. For specific ordering information see the Selector Guide at the end of the data sheet.

**II. Manufacturing Information**

A. Description/Function:	-100V, SOT23/TDFN, Simple Swapper Hot-Swap Controllers
B. Process:	S3
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	UTL Thailand
F. Date of Initial Production:	July 13, 2001

**III. Packaging Information**

A. Package Type:	6-pin TDFN 3x3
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1868
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:	55°C/W
K. Single Layer Theta Jc:	8.5°C/W
L. Multi Layer Theta Ja:	42°C/W
M. Multi Layer Theta Jc:	8.5°C/W

**IV. Die Information**

A. Dimensions:	45 X 90 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO <sub>2</sub>
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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 157 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 6.8 \times 10^{-9}$$

$\lambda = 6.8$  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 S3 Process results in a FIT Rate of 3.6 @ 25C and 66.0 @ 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 NP12 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-150 mA.

**Table 1**  
Reliability Evaluation Test Results

**MAX5900AAETT+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	157	0
<b>Moisture Testing</b> (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (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