



RELIABILITY REPORT
FOR MAX5949AESA+
PLASTIC ENCAPSULATED DEVICES

March 26, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Richard Aburano
Quality Assurance
Manager, Reliability Operations

Conclusion

The MAX5949AESA+ 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	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX5949A/MAX5949B are hot-swap controllers that allow a circuit card to be safely hot plugged into a live backplane. The MAX5949A/MAX5949B operate from -20V to -80V and are well-suited for -48V power systems. These devices are pin and function compatible with the LT4250 and pin compatible with the LT1640. The MAX5949A/MAX5949B provide a controlled turn-on to circuit cards preventing glitches on the power-supply rail and damage to board connectors and components. The MAX5949A/MAX5949B provide undervoltage, overvoltage, and overcurrent protection. These devices ensure the input voltage is stable and within tolerance before applying power to the load. Both the MAX5949A and MAX5949B protect a system against overcurrent and short-circuit conditions by turning off the external MOSFET in the event of a fault condition. The MAX5949A/MAX5949B also provide protection against input voltage steps. During an input voltage step, the MAX5949A/MAX5949B limit the current drawn by the load to a safe level without turning off power to the load. Both devices feature an open-drain power-good status output (PWRGD-bar for the MAX5949A or PWRGD for the MAX5949B) that can be used to enable downstream converters. The MAX5949A/MAX5949B are available in an 8-pin SO package. Both devices are specified for the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	-48V Hot-Swap Controllers with External R _{SENSE}
B. Process:	BCD8
C. Number of Device Transistors:	2645
D. Fabrication Location:	Oregon
E. Assembly Location:	Malaysia, Philippines, Thailand
F. Date of Initial Production:	October 22, 2004

III. Packaging Information

A. Package Type:	8-pin SOIC (N)
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:	#05-9000-1474
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:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	128.4°C/W
M. Multi Layer Theta Jc:	36°C/W

IV. Die Information

A. Dimensions:	145 X 80 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:	3.0 microns (as drawn)
F. Minimum Metal Spacing:	3.0 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Operations) 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:

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

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

$$\lambda = 22.9 \times 10^{-9}$$
$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 BCD8 Process results in a FIT Rate of 0.06 @ 25C and 1.08 @ 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 NP82-2 die type has been found to have all pins able to withstand a HBM transient pulse of $\pm 2500\text{V}$ per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of $\pm 250 \text{ mA}$ and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX5949AESA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	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