

RELIABILITY REPORT
FOR
MAX5930EEG+
(MAX5930/MAX5931)
PLASTIC ENCAPSULATED DEVICES

January 13, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX5930EEG+ 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 MAX5930/MAX5931 +1V to +13.2V triple hot-swap controllers provide complete protection for multisupply systems. They allow the safe insertion and removal of circuit cards into live backplanes. These devices hot swap multiple supplies ranging from +1V to +13.2V, provided one supply is at or above +2.7V and only one supply is above 11V. The input voltage rails (channels) can be configured to sequentially turn-on/off, track each other, or have completely independent operation. The discharged filter capacitors of the circuit card provide low impedance to the live backplane. High inrush currents from the backplane to the circuit card can burn up connectors and components, or momentarily collapse the backplane power supply leading to a system reset. The MAX5930/MAX5931 hot-swap controllers prevent such problems by gradually ramping up the output voltage and regulating the current to a preset limit when the board is plugged in, allowing the system to stabilize safely. After the startup cycle is complete, on-chip comparators provide VariableSpeed/BiLevel protection against short-circuit and overcurrent faults, and provide immunity against system noise and load transients. The load is disconnected in the event of a fault condition. The MAX5930/MAX5931 fault-management mode is selectable, allowing latched fault or autoretry after a fault condition. The MAX5930/MAX5931 offer a variety of options to reduce external component count and design time. All devices integrate an on-board charge pump to drive the gates of low-cost, external N-channel MOSFETs, an adjustable startup timer, and an adjustable current limit. The devices offer integrated features like startup current regulation and current glitch protection to eliminate external timing resistors and capacitors. The MAX5931L provides an open-drain, active-low status output for each channel, the MAX5931H provides an open-drain, active-high status output for each channel, and the MAX5930 status output polarity is selectable. The MAX5930 is available in a 24-pin QSOP package, and the MAX5931 is available in a 20-pin QSOP package. All devices are specified over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Low-Voltage, Triple, Hot-Swap Controllers/Power Sequencers/Voltage Trackers
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	Texas
E. Assembly Location:	Carsem Malaysia, ATP Philippines, UTL Thailand
F. Date of Initial Production:	October 25, 2003

III. Packaging Information

A. Package Type:	24-pin QSOP
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:	#05-9000-0661
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:	105°C/W
K. Single Layer Theta Jc:	34°C/W
L. Multi Layer Theta Ja:	88°C/W
M. Multi Layer Theta Jc:	34°C/W

IV. Die Information

A. Dimensions:	81 X 121 mils
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 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: 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:

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

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

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

$\lambda = 22.4$ 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 B8 Process results in a FIT Rate of 2.71 @ 25C and 17.30 @ 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 NP54-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 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

MAX5930EEG+

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) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	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