RELIABILITY REPORT

FOR

MAX5927ETJ+

PLASTIC ENCAPSULATED DEVICES

November 19, 2013

MAXIM INTEGRATED

160 RIO ROBLES

SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX5927ETJ+ successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

Table of Contents

I. Device Description

A. General

The MAX5927/MAX5929 +1V to +13.2V quad 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 +11.0V. 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 MAX5927/MAX5929 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 MAX5929A automatically restarts after a fault condition, while the MAX5929L must be unlatched. The MAX5927 fault management mode is selectable. The MAX5927/MAX5929 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 MAX5929_L provides an open-drain active-low status output for each channel, the MAX5929_H provides an open-drain active-high status output for each channel, and the MAX5927 status output polarity is selectable. The MAX5927 is available in a 32-pin thin QFN package and the MAX5929 is available in a 24-pin QSOP package. All devices are specified over the extended temperature range, -40℃ to +85℃.

II. Manufacturing Information

A. Description/Function:	Low-Voltage, Quad, Hot-Swap Controllers/Power Sequencers
B. Process:	B8
C. Number of Device Transistors:	
D. Fabrication Location:	California or Texas
E. Assembly Location:	China, Thailand, or Malaysia
F. Date of Initial Production:	July 26, 2003

III. Packaging Information

A. Package Type:	32-pin TQFN 5x5
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:	#05-9000-3010
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:	47°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	1.7°C/W

IV. Die Information

A. Dimensions:	83X130 mils
B. Passivation:	Si_3N_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:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	0.8 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Richard Aburano (Manager, Reliability Engineering) Don Lipps (Manager, Reliability Engineering) Bryan Preeshl (Vice President 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 46 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 23.9 \times 10^{-9}$

$\lambda = 23.9$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at http://www.maximintegrated.com/qa/reliability/monitor. Cumulative monitor data for the B8 Process results in a FIT Rate of 0.015 @ 25C and 0.261 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot SCM0AQ001B, D/C 0244)

The NP54 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX5927ETJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	46	0	SCM0BQ002B

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