

RELIABILITY REPORT
FOR
MAX5902AAETT+
(MAX5903)
PLASTIC ENCAPSULATED DEVICES

October 31, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Approved by
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Conclusion

The MAX5902AAETT+ 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 MAX5902/MAX5903 are 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 +72V and provide the simplest hot-swap solution by eliminating all external components except the external p-channel MOSFET. The MAX5902/MAX5903 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 MAX5902/MAX5903 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 MAX5902/MAX5903 provide overcurrent protection by monitoring the voltage drop across the external MOSFET's on-resistance. The MAX5902/MAX5903 include an undervoltage lockout (UVLO) function, ON/active-low OFF control input, and a power-good status output, active-low PGOOD (MAX5902) or PGOOD (MAX5903). A built-in thermal shutdown feature is also included to protect the external MOSFET in case of overheating. The MAX5902/MAX5903 offer latched or autoretry fault management and are available with 300mV, 400mV or 500mV circuit-breaker thresholds. Both the MAX5902 and MAX5903 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:	+72V 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:	April 26, 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:	#05-9000-1867
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 ₃ N ₄ /SiO ₂ (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 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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 42 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 25.6 \times 10^{-9}$$

$$\lambda = 25.6 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S3 Process results in a FIT Rate of 1.6 @ 25C and 28.5 @ 55C, data limited (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 NP11 die type has been found to have all pins able to withstand a HBM transient pulse of 2500 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

MAX5902AAETT+

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	258	156
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