

RELIABILITY REPORT
FOR
MAX5924AEUB+
PLASTIC ENCAPSULATED DEVICES

May 19, 2010

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX5924AEUB+ 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 MAX5924/MAX5925/MAX5926 1V to 13.2V hot-swap controllers allow the safe insertion and removal of circuit cards into live backplanes. These devices hot swap supplies ranging from 1V to 13.2V provided that the device supply voltage, VCC, is at or above 2.25V and the hot-swapped supply, VS, does not exceed VCC. The MAX5924/MAX5925/MAX5926 hot-swap controllers limit the inrush current to the load and provide a circuit-breaker function for overcurrent protection. The devices operate with or without a sense resistor. When operating without a sense resistor, load-probing circuitry ensures a short circuit is not present during startup, then gradually turns on the external MOSFET. After the load probing is complete, on-chip comparators provide overcurrent protection by monitoring the voltage drop across the external MOSFET on-resistance. In the event of a fault condition, the load is disconnected. The MAX5924/MAX5925/MAX5926 include many integrated features that reduce component count and design time, including configurable turn-on voltage, slew rate, and circuit-breaker threshold. An on-board charge pump provides the gate drive for a low-cost, external n-channel MOSFET. The MAX5924/MAX5925/MAX5926 are available with open-drain PGOOD and/or PGOOD-bar outputs. The MAX5925/MAX5926 also feature a circuit breaker with temperature-compensated RDS(ON) sensing. The MAX5926 features a selectable 0ppm/°C or 3300ppm/°C temperature coefficient. The MAX5924 temperature coefficient is 0ppm/°C and the MAX5925 temperature coefficient is 3300ppm/°C. Autoretry and latched fault-management configurations are available (see the *Selector Guide* in the full data sheet).

II. Manufacturing Information

A. Description/Function:	1V to 13.2V, n-Channel Hot-Swap Controllers Require No Sense Resistor
B. Process:	B8
C. Number of Device Transistors:	3751
D. Fabrication Location:	California or Texas
E. Assembly Location:	Malaysia, Thailand
F. Date of Initial Production:	October 01, 2004

III. Packaging Information

A. Package Type:	10-pin uMAX
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Non-conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0427
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:	180°C/W
K. Single Layer Theta Jc:	41.9°C/W
L. Multi Layer Theta Ja:	113.1°C/W
M. Multi Layer Theta Jc:	41.9°C/W

IV. Die Information

A. Dimensions:	75 X 88 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:	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: Don Lipps (Manager, 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 191 \times 2} \text{ (Chi square value for MTTF upper limit)}$$

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

$$\lambda = 5.8 \times 10^{-9}$$

$\lambda = 5.8$ F.I.T. (60% confidence level @ 25°C)

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 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 B8 Process results in a FIT Rate of 0.06 @ 25C and 0.99 @ 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 NP49-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX5924AEUB+

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	191	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