

RELIABILITY REPORT
FOR
MAX4949ELA+
PLASTIC ENCAPSULATED DEVICES

December 3, 2008

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Approved by
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Conclusion

The MAX4949ELA+ 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 MAX4943-MAX4946/MAX4949 family of overvoltage-protection devices feature a low 80m (typ) RON internal FET and protect low-voltage systems against voltage faults up to +28V. These devices also drive an optional external pFET to protect down to -28V when connected to a load with reverse current protection. When the input voltage exceeds the overvoltage threshold, the internal FET is turned off to prevent damage to the protected components. All switches feature a minimum 1.2A current-limit protection. During a short-circuit occurrence, the MAX4944B and MAX4945B place the switch in a latching state where the switch turns off and remains off. For the autoretry devices, the switch turns off and continuously checks after a 15ms (typ) retry time. The overvoltage thresholds (OVLO) are preset to 7.4V, 6.35V, 5.8V, 4.56V, or 8.9V. The undervoltage-lockout (UVLO) thresholds are preset to 2.45V and 4.15V. When the input voltage drops below the undervoltage-lockout (UVLO) threshold, the devices enter a low-current standby mode. (See the Ordering Information/Selector Guide in the full data sheet for more details on UVLO/OVLO). All devices are offered in a small, 8-pin μ DFN (2mm x 2mm) package and are specified for operation over the -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Overvoltage-Protection Controllers with Internal FET
B. Process:	S4
C. Number of Device Transistors:	0
D. Fabrication Location:	California
E. Assembly Location:	Hana Thailand
F. Date of Initial Production:	7/28/2007

III. Packaging Information

A. Package Type:	8-pin uDFN
B. Lead Frame:	Substrate C.
Lead Finish:	Gold
D. Die Attach:	Non-conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2379
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
J. Multi Layer Theta Ja:	210.2°C/W
K. Multi Layer Theta Jc:	122.1°C/W

IV. Die Information

A. Dimensions:	62 X 45 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:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 47 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.8 \times 10^{-9}$$
$$\lambda = 22.8 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 S4 Process results in a FIT Rate of 0.28 @ 25C and 4.85 @ 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 AS80-8 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 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

MAX4949ELA+

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	47	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	-55°C/125°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