



RELIABILITY REPORT FOR MAX9940AXK+

PLASTIC ENCAPSULATED DEVICES

March 19, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR. SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX9940AXK+ 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 MAX9940 signal-line overvoltage protector for low-voltage digital communication ports provides protection against high-voltage faults and ESD strikes. The MAX9940 is especially useful for sensitive communication protocols such as Maxim 1-Wire® that cannot afford standard means of fault protection, such as large series resistors or large line capacitances. The MAX9940 operates from a single supply voltage of +2.2V to +5.5V and consumes only 13µA of quiescent supply current. The EXT port is protected up to 28V. The device features a reaction time of 60ns for fast action during fault conditions and operates over the -40°C to +125°C automotive temperature range.



II. Manufacturing Information

A. Description/Function:Signal-Line Overvoltage Protector for Low-Voltage DevicesB. Process:B8C. Number of Device Transistors:52D. Fabrication Location:TexasE. Assembly Location:Carsem Malaysia, UTL ThailandF. Date of Initial Production:January 24, 2009

III. Packaging Information

A. Package Type:	5-pin SC70
B. Lead Frame:	Alloy42
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	324°C/W
K. Single Layer Theta Jc:	115°C/W

IV. Die Information

Si_3N_4/SiO_2 (Silicon nitride/ Silicon dioxide
$\Delta I_{\rm comp} = 1000 (\rm C^2 / \rm C^2 - 100)$
Aluminum/SI $(SI = 1\%)$
None
0.8 microns (as drawn)
0.8 microns (as drawn)
5 mil. Sq.
SiO ₂
Wafer Saw



V. Quality Assurance Information

A.	Quality Assurance Contacts:	Ken Wendel (Director, Reliability Engineering)	
Б			
р.	Outgoing inspection Level.	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:

$$\begin{split} \lambda &= \underbrace{1}_{\text{MTTF}} &= \underbrace{1.83}_{192 \text{ x} 4340 \text{ x} 48 \text{ x} 2} \text{ (Chi square value for MTTF upper limit)} \\ & \text{(where } 4340 = \text{Temperature Acceleration factor assuming an activation energy of 0.8eV)} \\ \lambda &= 22.4 \text{ x } 10^{-9} \\ \lambda &= 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)} \end{split}$$

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 CM93 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/250 mA, 1.5x VCCMax Overvoltage per JESD78.



Table 1 Reliability Evaluation Test Results

MAX9940AXK+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES				
Static Life Test (Note 1)								
	Ta = 135°C	DC Parameters	48	0				
	Biased	& functionality						
	Time = 192 hrs.							
Moisture Testing (Note 2)								
85/85	Ta = 85°C	DC Parameters	77	0				
	RH = 85%	& functionality						
	Biased							
	Time = 1000hrs.							
Mechanical Stress (Note 2)								
Temperature	-65°C/150°C	DC Parameters	77	0				
Cycle	1000 Cycles	& functionality						
	Method 1010							

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

Note 2: Generic Package/Process data