

RELIABILITY REPORT
FOR
MAX5940BESA+
PLASTIC ENCAPSULATED DEVICES

November 26, 2008

MAXIM INTEGRATED PRODUCTS

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Conclusion

The MAX5940BESA+ 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.

Table of Contents

I.Device Description	V.Quality Assurance Information
II.Manufacturing Information	VI.Reliability Evaluation
III.Packaging Information	IV.Die Information
.....Attachments	

I. Device Description

A. General

The MAX5940A/MAX5940B/MAX5940C/MAX5940D provide complete interface function for a powered device (PD) to comply with the IEEE® 802.3af standard in a power-over-ethernet system. MAX5940A/MAX5940B/MAX5940C/MAX5940D provide the PD with a detection signature, a classification signature, and an integrated isolation switch with programmable inrush current control. These devices also feature power-mode undervoltage lockout (UVLO) with wide hysteresis and power-good outputs. The MAX5940A/MAX5940B are available with an absolute maximum rating of 80V and the MAX5940C/MAX5940D are rated for an absolute maximum rating of 90V. An integrated MOSFET provides PD isolation during detection and classification. All devices guarantee a leakage current offset of less than 10 μ A during the detection phase. A programmable current limit prevents high inrush current during power-on. The device features power-mode UVLO with wide hysteresis and long deglitch time to compensate for twisted-pair cable resistive drop and to assure glitch-free transition between detection, classification, and power-on/-off phases. The MAX5940A/MAX5940C provide an active-high (PGOOD) open-drain output and a fixed UVLO threshold. The MAX5940B/MAX5940D provide both active-high (PGOOD) and active-low (active-low PGOOD) outputs and have an adjustable UVLO threshold with the default value compliant to the 802.3af standard. All devices are designed to work with or without an external diode bridge. The MAX5940A/MAX5940B/MAX5940C/MAX5940D are available in 8-pin SO packages and are rated over the extended temperature range of -40°C to +85°C.

II. Manufacturing Information

A. Description/Function:	IEEE 802.3af PD Interface Controller for Power-Over-Ethernet
B. Process:	BCD8
C. Number of Device Transistors:	0
D. Fabrication Location:	Oregon
E. Assembly Location:	Unisem Malaysia, ATP Philippines, UTL Thailand
F. Date of Initial Production:	10/25/03

III. Packaging Information

A. Package Type:	8-pin SOIC (N)
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Gold (1.3 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-0759
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:	170°C/W
K. Single Layer Theta Jc:	40°C/W
L. Multi Layer Theta Ja:	128.4°C/W
M. Multi Layer Theta Jc:	36°C/W

IV. Die Information

A. Dimensions:	137 X 80 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:

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

(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 BCD8 Process results in a FIT Rate of 2.3 @ 25C and 39.6 @ 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 NP57-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 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

MAX5940BESA+

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	-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