

RELIABILITY REPORT
FOR
MAX4940ACTN+
PLASTIC ENCAPSULATED DEVICES

June 27, 2013

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX4940ACTN+ successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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I. Device Description

A. General

The MAX4940/MAX4940A integrated circuits generate high-voltage, high-frequency, unipolar or bipolar pulses from low-voltage logic inputs. These quad/dual pulsers feature independent logic inputs, independent high-voltage pulser outputs with active clamps and independent high-voltage supply inputs. The MAX4940/MAX4940A feature quad, high-voltage pulsers with 8.5 Ω output impedance for the high-voltage outputs and a 21 Ω impedance for the active clamp. The high-voltage outputs can provide 2.0A (typ) output current. All devices use two logic inputs per channel to control the positive and negative pulses. The MAX4940/MAX4940A have a dedicated input to control the active clamp. All devices feature an independent enable input EN. All digital inputs are CMOS compatible (see the Ordering Information/Selector Guide in the full data sheet). The MAX4940/MAX4940A are available in a 56-pin, 8mm x 8mm, TQFN exposed pad package and are specified over the 0°C to +70°C commercial temperature range. **Warning:** *Exercise caution. The MAX4940/MAX4940A are designed to operate with high voltages.*

II. Manufacturing Information

A. Description/Function:	Dual/Quad, Unipolar/Bipolar, High-Voltage Digital Pulsers
B. Process:	BCD250
C. Number of Device Transistors:	1828
D. Fabrication Location:	Oregon
E. Assembly Location:	Taiwan, China, or Thailand
F. Date of Initial Production:	April 24, 2009

III. Packaging Information

A. Package Type:	56-pin TQFN 8x8
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3602
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Single Layer Theta Ja:	35°C/W
K. Single Layer Theta Jc:	0.6°C/W
L. Multi Layer Theta Ja:	21°C/W
M. Multi Layer Theta Jc:	0.6°C/W

IV. Die Information

A. Dimensions:	259 X 197 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:	Metal1 = 1.5um
F. Minimum Metal Spacing:	Metal1 = 1.5um
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

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|-----------------------------------|--|
| A. Quality Assurance Contacts: | Richard Aburano (Manager, Reliability Engineering)
Don Lipps (Manager, Reliability Engineering)
Bryan Preeshl (Vice President 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 46 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 23.9 \times 10^{-9}$$

$$\lambda = 23.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the BCD250 Process results in a FIT Rate of 1.9 @ 25C and 32.7 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot NUOZAQ002B, D/C 0911)

The AJ75-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX4940ACTN+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	46	0	NUOYAQ001D, D/C 0911

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