

RELIABILITY REPORT
FOR
MAX4937ACTO+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX4937ACTO+ 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.

Table of Contents

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

I. Device Description

A. General

The MAX4936A/MAX4937A are octal, high-voltage, transmit/receive (T/R) switches. The T/R switches are based on a diode bridge topology, and the amount of current in the diode bridges can be programmed by three digital inputs (S0, S1, and S2). Two control inputs (EN1 and EN2) allow enabling/disabling channels 1â€"4 and channels 5â€"8, respectively. The MAX4936A includes the T/R switch and grass-clipping diodes, performing both transmit and receive operations. The MAX4937A includes just the T/R switch and performs the receive operation only. These devices feature low on-impedance in the entire ultrasound frequency range with extremely low power dissipation of 15mW (typ) per channel. The receive path for both devices is low impedance during low-voltage receive and high impedance during high-voltage transmit, providing protection to the receive circuitry. The low-voltage receive path is high bandwidth, low noise, low distortion, and low jitter. The MAX4936A SWC_ pins can be driven with high-voltage signals using the anti-parallel diodes as grass clippers while connecting the SWB_ pins to the low-noise amplifier (LNA). Connecting SWC_ to GND allows the internal anti-parallel diodes to be used as clamps. Grass-clipping diodes can then be connected to SWB_ and the LNA to SWA_. Both devices are available in a small, 42-pin, 3.5mm x 9mm TQFN package, and are specified over the commercial 0°C to +70°C temperature range.

II. Manufacturing Information

A. Description/Function:	Octal High-Voltage Transmit/Receive Switches
B. Process:	DM200
C. Number of Device Transistors:	408
D. Fabrication Location:	Oregon
E. Assembly Location:	Taiwan, Thailand
F. Date of Initial Production:	November 01, 2011

III. Packaging Information

A. Package Type:	42-pin TQFN 3.5x9
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:	#05-9000-4441
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:	40°C/W
K. Single Layer Theta Jc:	2°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	68.90X235.04 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 = 0.8 microns
F. Minimum Metal Spacing:	Metal1 = 2.0 microns
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: | 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 79 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 13.9 \times 10^{-9}$$

$$\lambda = 13.9 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 DM200 Process results in a FIT Rate of 0.32 @ 25C and 5 . 5 @ 55C (0.8 eV, 60% UCL).

B. E.S.D. and Latch-Up Testing (lot JWZDU008J, D/C 1029)

The AK31 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500V 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

MAX4937ACTO+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters	31	0	JZ3ZCQ001C, D/C 1136
	Biased	& functionality	48	0	JZ3ZCQ001B, D/C 1136
	Time = 192 hrs.				

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