

RELIABILITY REPORT
FOR
MAX2136AETJ+
PLASTIC ENCAPSULATED DEVICES

May 12, 2015

MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
Sokhom Chum
Quality Assurance
Reliability Engineer

Conclusion

The MAX2136AETJ+ 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 MAX2136A is a low-power global automotive TV tuner. It directly converts a variety of broadcast signals including 3-13 segment ISDB-T, 6/7/8MHz DVB-T/T2, T-DMB/DAB, CTTB, CMMB, and ATSC/ATSC-MH to a low-IF using a broadband I/Q downconverter. The operating frequency range covers the VHF and UHF broadcast TV bands from 44MHz to 891MHz. The MAX2136A integrates LNAs, RF variable-gain amplifiers (VGAs), VHF and UHF tracking filters, I/Q downconverting mixers, baseband VGAs, and baseband filters. The VGAs typically provide in excess of 120dB of control range. The device also includes fully monolithic VCOs and tank circuits, as well as a complete frequency synthesizer with an on-chip crystal oscillator and output buffer/divider. The device incorporates a 2-wire (I²C) serial control interface with multiple read and write addresses. A low-power standby mode is available whereupon the signal path is shut down while leaving the serial control interface and crystal oscillator circuits active. For further power savings, the crystal oscillator can be disabled by placing the device in shutdown mode using the external shutdown pin. The MAX2136A is available in a 32-pin TQFN package (5mm x 5mm) with an exposed pad. Electrical performance is guaranteed over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	Global Automotive TV Tuner
B. Process:	MB3
C. Number of Device Transistors:	57465
D. Fabrication Location:	California
E. Assembly Location:	Taiwan, China
F. Date of Initial Production:	September 29, 2012

III. Packaging Information

A. Package Type:	32-pin TQFN 5x5
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:	#05-9000-4793
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:	47°C/W
K. Single Layer Theta Jc:	1.7°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	122.0472X113.7795 mils
B. Passivation:	BCB
C. Interconnect:	Al with top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35um
F. Minimum Metal Spacing:	0.35um
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 157 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 7.0 \times 10^{-9}$$

$\lambda = 7.0$ 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 MB3 Process results in a FIT Rate of 0.05 @ 25C and 0.88 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot EAKK3Q001, D/C 1306)

The WG58-2 die type has been found to have all pins able to withstand a transient pulse of:

ESD-HBM:	+/- 2500V per JEDEC JESD22-A114
ESD-CDM:	+/- 750V per JEDEC JESD22-C101

Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX2136AETJ+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters & functionality	32	0	IEAKK3Q001B, D/C 1309
	Biased		47	0	IEAKK3Q001A, D/C 1309
	Time = 192 hrs.		32	0	SAHA4Q002B, D/C 1228
			46	0	SAHA4Q002A, D/C 1228

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