

RELIABILITY REPORT
FOR
MAX2141ETH+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

160 RIO ROBLES
SAN JOSE, CA 95134

Approved by
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Quality Assurance
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Conclusion

The MAX2141ETH+ 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 MAX2141 complete low-power receiver is designed for XM satellite radio applications. To form a complete XM radio, the MAX2141 requires only an active antenna module, a crystal, and a SAW filter. The small number of external components needed makes the MAX2141 platform the lowest cost and the smallest wideband receiver solution available. The receiver includes a self-contained RF AGC loop and IF AGC loop, effectively providing a total dynamic range in excess of 92dB. Channel selectivity is achieved by the SAW filter and by the on-chip lowpass filters. An integrated fractional-N synthesizer allows fine frequency step, making possible the implementation of a software AFC loop. Additionally, a reference buffer is provided for driving a baseband controller. An I²C bus-compatible interface programs the MAX2141, providing features such as programmable gains, variable-bandwidth lowpass filter tuning, and various power-down modes. The MAX2141 is Maxim's 2nd-generation device for XM satellite radio applications. It is a drop-in replacement for the 1st-generation MAX2140. While significantly reducing power dissipation, the MAX2141 adds an optional closed-loop IF power control, standby mode, enhanced reference buffer, and improved RF gain-control accuracy. The MAX2141 is rated to operate over the -40°C to +85°C extended temperature range and is available in a 7mm x 7mm, 44-pin thin QFN package.

II. Manufacturing Information

A. Description/Function:	Low-Power XM Satellite Radio Receiver
B. Process:	MB3
C. Number of Device Transistors:	
D. Fabrication Location:	California
E. Assembly Location:	China or Thailand
F. Date of Initial Production:	April 22, 2006

III. Packaging Information

A. Package Type:	44-pin TQFN 7x7
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:	#05-9000-1703
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:	37°C/W
K. Single Layer Theta Jc:	1.3°C/W
L. Multi Layer Theta Ja:	27°C/W
M. Multi Layer Theta Jc:	1.3°C/W

IV. Die Information

A. Dimensions:	100X106 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: 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:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 499 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 0.7 \times 10^{-9}$$

$$\lambda = 0.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 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 SGWYDA222K, D/C 1304)

The WG31-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX2141ETH+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C	DC Parameters & functionality	78	0	STX27Z074H, D/C 0802
	Biased		77	0	STX27Z072K, D/C 0751
	Time = 1000 hrs.		78	0	SGWYB3114E, D/C 0751
			78	0	SGWYB3114W, D/C 0751
			140	0	SGWYB3114A, D/C 0732
			48	0	SV11U3089D, D/C 0706

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