

RELIABILITY REPORT  
FOR  
MAX2839ETN+  
PLASTIC ENCAPSULATED DEVICES

December 19, 2011

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX2839ETN+ 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.

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### I. Device Description

#### A. General

The MAX2839 direct conversion, zero-IF, RF transceiver is designed specifically for 2GHz 802.16e MIMO mobile WiMAX systems. The device incorporates one transmitter and two receivers, with > 40dB isolation between each receiver. The MAX2839 completely integrates all circuitry required to implement the RF transceiver function, providing RF to baseband receive path, and baseband to RF transmit path, VCO, frequency synthesizer, crystal oscillator, and baseband/control interface. The device includes a fast-settling sigma-delta RF synthesizer with smaller than 40Hz frequency steps and a crystal oscillator that allows the use of a low-cost crystal in place of a TCXO. The transceiver IC also integrates circuits for on-chip DC-offset cancellation, I/Q error, and carrier leakage detection circuits. An internal transmit to receive loopback mode allows for receiver I/Q imbalance calibration. The local oscillator I/Q quadrature phase error can be digitally corrected in approximately 0.125° steps. Only an RF bandpass filter (BPF), crystal, RF switch, PA, and a small number of passive components are needed to form a complete wireless broadband RF radio solution. The MAX2839 completely eliminates the need for an external SAW filter by implementing on-chip programmable monolithic filters for both the receiver and transmitter, for all 2GHz and 802.16e profiles and WIBRO. The baseband filters along with the Rx and Tx signal paths are optimized to meet the stringent noise figure and linearity specifications. The device supports up to 2048 FFT OFDM and implements programmable channel filters for 3.5MHz to 20MHz RF channel bandwidths. The transceiver requires only 2µs Tx-Rx switching time. The IC is available in a small 56-pin TQFN package measuring 8mm x 8mm x 0.8mm.

## II. Manufacturing Information

A. Description/Function:	2.3GHz to 2.7GHz MIMO Wireless Broadband RF Transceiver
B. Process:	MB3
C. Number of Device Transistors:	94325
D. Fabrication Location:	California
E. Assembly Location:	China, Thailand
F. Date of Initial Production:	April 24, 2009

## III. Packaging Information

A. Package Type:	56L 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:	#05-9000-2817 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	3
J. Single Layer Theta Ja:	35°C/W
K. Single Layer Theta Jc:	1°C/W
L. Multi Layer Theta Ja:	21°C/W
M. Multi Layer Theta Jc:	1°C/W

## IV. Die Information

A. Dimensions:	144 X 203 mils
B. Passivation:	BCB
C. Interconnect:	Al with top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.35µm
F. Minimum Metal Spacing:	0.35µm
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO <sub>2</sub>
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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 22.9 \times 10^{-9}$$

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

The following failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maxim-ic.com/qa/reliability/monitor>. Cumulative monitor data for the MB3 Process results in a FIT Rate of 0.08 @ 25C and 1.33 @ 55C (0.8 eV, 60% UCL)

### B. E.S.D. and Latch-Up Testing (lot SESZEA079C D/C 1005)

The WD35 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000V 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

**MAX2839ETN+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	SESZD3006E, D/C 0802

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