



RELIABILITY REPORT  
FOR  
MAX2117  
PLASTIC ENCAPSULATED DEVICES

October 13, 2008

**MAXIM INTEGRATED PRODUCTS**

120 SAN GABRIEL DR.  
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<b>Approved by</b>
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## Conclusion

The MAX2117 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 MAX2117 low-cost, direct-conversion tuner is intended for receiving MMDS transmissions in the 470MHz to 1000MHz band. The MAX2117 is designed to be used in consumer set-top boxes and is compatible with most DVB-S demodulators.

The MAX2117 directly converts the QPSK broadcast signals from the antenna to baseband using a broadband I/Q downconverter. The tuner provides differential I and Q outputs to the demodulator IC.

The device includes an LNA and an RF variable-gain amplifier, I and Q downconverting mixers, and baseband lowpass filters with programmable cutoff frequency control and digitally controlled baseband variable-gain amplifiers. Together, the RF and baseband variable-gain amplifiers provide more than 80dB of gain-control range. The IC is compatible with virtually all QPSK demodulators.

The MAX2117 includes fully monolithic VCOs, as well as a complete frequency synthesizer. Additionally, an on-chip crystal oscillator is provided along with a buffered output for driving additional tuners and demodulators. Synthesizer programming and device configuration are accomplished with a 2-wire serial interface. The IC features a VCO autoselect (VAS) function that automatically selects the proper VCO. For multituner applications, the device can be configured to have one of two 2-wire interface addresses. A low-power standby mode is available whereupon the signal path is shut down while leaving the reference oscillator, digital interface, and buffer circuits active, providing a method to reduce power in single and multituner applications.

The MAX2117 is the most advanced MMDS tuner available today. The low noise figure eliminates the need for an external LNA. A small number of passive components are needed to form a complete MMDS front-end solution. The tuner is available in a very small 28-pin thin QFN package.

**II. Manufacturing Information**

A. Description/Function:	Complete, Direct-Conversion Tuner for MMDS Applications
B. Process:	MB3HW
C. Number of Device Transistors:	
D. Fabrication Location:	California, Texas or Japan
E. Assembly Location:	UTL (NSEB) UTAC Thailand; ASAT-DongGuan (China) DongGuan

**III. Packaging Information**

A. Package Type:	TQFN
B. Lead Frame:	Copper Alloy
C. Lead Finish:	SnPb Plating
D. Bondwire:	1.0 mil Au
E. Flammability Rating:	Class UL94-V0
F. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 1
G. Single Layer Theta Ja:	48°C/W
H. Single Layer Theta Jc:	2°C/W

**IV. Die Information**

A. Die Type:	WG51Z
B. Dimensions:	98 X 84 mils
C. Passivation:	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> (Silicon nitride/ Silicon dioxide)
D. Interconnect:	Aluminum/Cu (Cu = 0.5%)
E. Backside Metallization:	None
F. Bondpad Opening Dimensions:	3 mil. Sq.
G. Isolation Dielectric:	SiO <sub>2</sub>
H. Die Separation Method:	Wafer Saw



## V. Quality Assurance Information

- A. Quality Assurance Contacts: Ken Wendel (Director, Rel Engineering)  
Bryan Preeshl (Managing Director 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 135°C biased (static) life test are pending. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 0 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 0.6 \times 10^{-9}$$

$$\lambda = 0.6 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

This failure rate represents data collected from Maxim's reliability monitor program. Maxim performs quarterly 1000 hour life test monitors on its processes. This data is published in the Product Reliability Report found at <http://www.maxim-ic.com/>. Current monitor data for the MBIC3 Process results in a FIT Rate of 0.6 @ 25C and 9.23 @ 55C (0.8 eV, 60% UCL)

### B. Moisture Resistance Tests

The industry standard 85°C/85%RH or HAST testing is monitored per device process once a quarter.

### C. E.S.D. and Latch-Up Testing

The WG51 die type has been found to have all pins able to withstand a HBM transient pulse of 2500V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of 250ma.



**Table 1**  
Reliability Evaluation Test Results

**MAX14515EWA+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
<b>Static Life Test</b> (Note 1)	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0
<b>Moisture Testing</b> (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
<b>Mechanical Stress</b> (Note 2) Temperature Cycle	-40°C/125°C 1000 Cycles Method 1010	DC Parameters & functionality	77	0

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

Note 2: Generic Package/Process data