RELIABILITY REPORT

FOR

MAX2121ETI+T

PLASTIC ENCAPSULATED DEVICES

February 27, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX2121ETI+T 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 MAX2121 low-cost, direct-conversion tuner IC is designed for satellite set-top and VSAT applications. The device directly converts the satellite signals from the LNB to baseband using a broadband I/Q downconverter. The operating frequency range extends from 925MHz to 2175MHz. The device includes an LNA and an RF variable-gain amplifier, I and Q downconverting mixers, and baseband lowpass filters and digitally controlled baseband variable-gain amplifiers. Together, the RF and baseband variable-gain amplifiers provide more than 80dB of gain control range. The device includes fully monolithic VCOs, as well as a complete fractional-N 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 device is the most advanced broadband/VSAT DBS tuner available. The low noise figure eliminates the need for an external LNA. A small number of passive components are needed to form a complete broadband satellite tuner DVB-S2 RF front-end solution. The tuner is available in a very small, 5mm x 5mm, 28-pin thin QFN package.

II. Manufacturing Information

A. Description/Function:	Complete Direct-Conversion L-Band Tuner
B. Process:	MB3
C. Number of Device Transistors:	35,518
D. Fabrication Location:	USA
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	June 24, 2011

III. Packaging Information

A. Package Type:	28-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:	#05-9000-4542
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:	2°C/W
L. Multi Layer Theta Ja:	29°C/W
M. Multi Layer Theta Jc:	2°C/W

IV. Die Information

A. Dimensions:	98.43 x 84.65 mils
B. Passivation:	BCB
C. Interconnect:	Al/0.5%Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.23 / Metal2 = 0.6 / Metal3 = 1.2 / Metal4 = 4 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.23 / Metal2 = 0.5 / Metal3 = 1.2 / Metal4 = 4 microns (as drawn)
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 121C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 191 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 12.9 \times 10^{-9}$

λ = 12.9 F.I.T. (60% confidence level @ 25°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 0.06 @ 25C and 1.05 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing

The WG22 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 1500V per JEDEC JESD22-A114 (lot S1HZB3001C, D/C 1152). Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78 (lot S1HZB3001B, D/C 1114).

Table 1
Reliability Evaluation Test Results

MAX2121ETI+T

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 121C	DC Parameters	47	0	S1HZB3001B, D/C 1114
	Biased	& functionality	48	0	S1HZB3001C, D/C 1114
	Time = 192 hrs.		48	0	S1HZB3001D, D/C 1114
			48	0	S1HZB3001E, D/C 1114

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