RELIABILITY REPORT

FOR

MAX2160EBG+

CHIP SCALE PACKAGE

February 20, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX2160EBG+ 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.

Table of Contents

I. Device Description

A. General

The MAX2160/EBG tuner ICs are designed for use in Japanese mobile digital TV (ISDB-T single-segment) applications. The devices directly convert UHF band signals to a low-IF using a broadband I/Q downconverter. The operating frequency range extends from 470MHz to 770MHz. The MAX2160/EBG support both I/Q low-IF interfaces as well as single low-IF interfaces, making the devices universal tuners for various digital demodulator IC implementations. The MAX2160/EBG include an LNA, RF variable-gain amplifiers, I and Q downconverting mixers, low-IF variable-gain amplifiers, and bandpass filters providing in excess of 42dB of image rejection. The parts are capable of operating with either high-side or low-side local oscillator (LO) injection. The MAX2160/EBG's variable-gain amplifiers provide in excess of 100dB of gain-control range. The MAX2160/EBG also include fully monolithic VCOs and tank circuits, as well as a complete frequency synthesizer. The devices include a XTAL oscillator as well as a separate TCXO input buffer. The devices operate with XTAL/TCXO oscillators from 13MHz to 26MHz allowing the shared use of a VC-TCXO in cellular handset applications. Additionally, a divider is provided for the XTAL/TCXO oscillator allowing for simple and low-cost interfacing to various channel decoders. The MAX2160/EBG are specified for operation from -40°C to +85°C and available in a 40-pin thin QFN lead-free plastic package with exposed paddle (EP), and in a lead-free wafer-level package (WLP).

II. Manufacturing Information

A. Description/Function:	ISDB-T Single-Segment Low-IF Tuners
B. Process:	MFN SiGe HBT CMOS (G4
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Dallas Texas
F. Date of Initial Production:	January 21, 2005

III. Packaging Information

A. Package Type:	81-pin WLP
B. Lead Frame:	N/A
C. Lead Finish:	N/A
D. Die Attach:	N/A
E. Bondwire:	N/A
F. Mold Material:	N/A
G. Assembly Diagram:	#05-9000-2022
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3

IV. Die Information

A. Dimensions:	125 X 125 mils
B. Passivation:	Si_3N_4
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	1.2 microns (as drawn) Metal 1, 2 & 3 5.6 microns (as drawn) Metal 4
F. Minimum Metal Spacing:	1.6 microns (as drawn) Metal 1, 2 & 3, 4.2 microns (as drawn) Metal 4
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts:	Ken Wendel (Director, Reliability 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 shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 47 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.8 \times 10^{-9}$

$\lambda = 22.8$ F.I.T. (60% confidence level @ 25°C)

The following 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 G4 Process results in a FIT Rate of 0.2 @ 25C and 3.6 @ 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 WG29-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

Table 1
Reliability Evaluation Test Results

MAX2160EBG+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	47	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2 & 3)				
Temperature Cycle	-40ºC/125ºC 1000 Cycles (Note 3)	DC Parameters & functionality	77	0

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data
Note 3: Ramp rate 11ºC/minute, dwell=15 minutes, One cycle/hour.