RELIABILITY REPORT

FOR

MAX2091ETP+

PLASTIC ENCAPSULATED DEVICES

July 31, 2012

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Conclusion

The MAX2091ETP+ 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 MAX2091 monolithic SiGe BiCMOS upconverter IC integrates an analog variable-gain amplifier (VGA) with an upconverting mixer stage and image filter. The device amplifies IF signals in the 250MHz to 450MHz range before mixing them with an LO signal. The resulting 1735MHz to 1935MHz upconverted signal is then filtered on-chip as the final stage of signal conditioning. For a broadband variant that does not include the image filter, refer to the MAX2091B. The analog attenuator is controlled by an external analog control voltage. Device features include 23dB gain (no attenuation), 5.4dB NF (no attenuation, including attenuator insertion loss), and +24.5dBm OIP3. Each of these features makes the MAX2091 an ideal upconverter for numerous transmitter applications. When paired with the MAX2092 RF VGA, a complete 2-chip IF-RF signal conditioning solution is possible for microwave point-to-point transmitter applications. The MAX2091 operates from a single 5V supply, and is available in a compact 20-pin TQFN package (5mm x 5mm) with an exposed pad. Electrical performance is guaranteed over the extended temperature range from TC = -40°C to +95°C.

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II. Manufacturing Information

A. Description/Function:	50MHz to 500MHz Analog VGA, 1735MHz to 1935MHz Upconverting Mixer with Image Filtering, Threshold Alarm Circuit, and Error Amplifier for Level Control
B. Process:	MB3
C. Number of Device Transistors:	10406
D. Fabrication Location:	USA
E. Assembly Location:	Taiwan and Thailand
F. Date of Initial Production:	June 29, 2012

III. Packaging Information

A. Package Type:	20-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (0.8 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-4186
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:	116.14 X 104.33 mils
B. Passivation:	BCB
C. Interconnect:	Al with top layer 100% Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.23 microns as drawn
F. Minimum Metal Spacing:	0.23 microns as drawn
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

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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 90C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 260.5 \times 144 \times 2}$$ (Chi square value for MTTF upper limit)

(where 260.5 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$\lambda = 127 \times 10^{-9}$

λ = 127 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 0.08 @ 25C and 1.33 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot SL8ZEQ002D, D/C 1122)

The CR54 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

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Table 1
Reliability Evaluation Test Results

MAX2091ETP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 90C	DC Parameters	48	0	SL8ZEQ002J, D/C 1122
	Biased	& functionality	48	0	SL8ZEQ002I, D/C 1122
	Time = 192 hrs.		48	0	SL8ZEQ002E, D/C 1122

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

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