RELIABILITY REPORT

FOR

MAX2051ETP+

PLASTIC ENCAPSULATED DEVICES

February 5, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX2051ETP+ 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 MAX2051 high-linearity, up/downconversion mixer provides +34.2dBm input IP3, 7.8dB noise figure (NF), and 7.4dB conversion loss for 850MHz to 1550MHz wireless infrastructure and multi-carrier cable head-end downstream video, video-on-demand (VOD), and cable modem termination systems (CMTS) applications. The MAX2051 also provides excellent suppression of spurious intermodulation products (> 75dBc at an RF level of -14dBm), meeting DOCSIS® 3.0 and Euro DOCSIS system requirements. With an LO circuit tuned to support frequencies ranging from 1200MHz to 2250MHz, the MAX2051 is ideal for high-side LO injection applications over an IF frequency range of 50MHz to 1000MHz. In addition to offering excellent linearity and noise performance, the MAX2051 also yields a high level of component integration. The device integrates baluns in the RF and LO ports, which allow for a single-ended RF input and a single-ended LO input. The MAX2051 requires a typical LO drive of 0dBm and supply current guaranteed to below 130mA. The MAX2051 is available in a compact 5mm × 5mm, 20-pin thin QFN package with an exposed pad. Electrical performance is guaranteed over the extended temperature range, from TC = -40°C to +85°C.

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II. Manufacturing Information

A. Description/Function:	SiGe, High-Linearity, 850MHz to 1550MHz Up/Downconversion Mixer with LO Buffer
B. Process:	G4
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	October 24, 2008

III. Packaging Information

A. Package Type:	20-pin TQFN 5x5
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive Epoxy
E. Bondwire:	Au (1.0 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#
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:	48°C/W
K. Single Layer Theta Jc:	2.1°C/W
L. Multi Layer Theta Ja:	32°C/W
M. Multi Layer Theta Jc:	2.7°C/W

IV. Die Information

A. Dimensions:	86 X 75 mils
B. Passivation:	TEOS Ox-Nit $_2$-Mask Laser/Pass
C. Interconnect:	Al/Cu
D. Backside Metallization:	None
E. Minimum Metal Width:	0.4 um
F. Minimum Metal Spacing:	0.35um
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	Silicon Dioxide
I. Die Separation Method:	Saw

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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:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 50 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 21.5 \times 10^{-9}$

λ = 21.5 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 E35X Process results in a FIT Rate of 0.28 @ 25C and 17.30 @ 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 CR38 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500 V per JEDEC JESD22-A114-D. Latch-Up testing has shown that this device withstands a current of +/-250 mA, 1.5x VCCmax OverVoltage per JESD78.

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Table 1
Reliability Evaluation Test Results

MAX2051ETP+

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	50	0
Moisture Testing (Note 2) 85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality	77	0
Mechanical Stress (Note 2) Temperature Cycle	-65°C/150°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

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