RELIABILITY REPORT
FOR
MAX9994ETP+
PLASTIC ENCAPSULATED DEVICES

November 13, 2008

MAXIM INTEGRATED PRODUCTS
120 SAN GABRIEL DR.
SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX9994ETP+ 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 MAX9994 high-linearity downconversion mixer provides 8.3dB gain, +26.2dBm IIP3, and 9.7dB NF for 1700MHz to 2200MHz UMTS/WCDMA, DCS, and PCS base-station receiver applications. With a 1400MHz to 2000MHz LO frequency range, this particular mixer is ideal for low-side LO injection receiver architectures. High-side LO injection is supported by the MAX9996, which is pin-for-pin and functionally compatible with the MAX9994. In addition to offering excellent linearity and noise performance, the MAX9994 also yields a high level of component integration. This device includes a doublebalanced passive mixer core, an IF amplifier, a dualinput LO selectable switch, and an LO buffer. On-chip baluns are also integrated to allow for single-ended RF and LO inputs. The MAX9994 requires a nominal LO drive of 0dBm, and supply current is guaranteed to be below 235mA. The MAX9994/MAX9996 are pin compatible with the MAX9984/MAX9986 815MHz to 995MHz mixers, making this entire family of downconverters ideal for applications where a common PC board layout is used for both frequency bands. The MAX9994 is also functionally compatible with the MAX9993. The MAX9994 is available in a compact, 20-pin, thin QFN package (5mm x 5mm) with an exposed paddle. Electrical performance is guaranteed over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	SiGe High-Linearity, 1700MHz to 2200MHz Downconversion Mixer with LO Buffer/Switch
B. Process:	GST40 (SiGe HBT, 0.5 CMOS)
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	ASAT China, UTL Thailand
F. Date of Initial Production:	October 04, 2004

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:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-1284
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:	94 X 94 mils
B. Passivation:	Si3N4 (Silicon nitride)
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1: 1.2; Metal2: 1.2; Metal3: 1.2; Metal4: 5.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1: 1.6; Metal2: 1.6; Metal3: 1.6; Metal4: 4.2 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq
H. Isolation Dielectric:	SiO2
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 biased (static) life test are pending. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 4340 \times 48 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 22.4 \times 10^{-9}$

λ = 22.4 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 GST4 Process results in a FIT Rate of 0.21 @ 25C and 3.64 @ 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 CR21 die type has been found to have all pins able to withstand a HBM transient pulse of +/-400 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

MAX9994ETP+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)				
	Ta = Biased Time = 192 hrs.	DC Parameters & functionality	48	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