



RELIABILITY REPORT
FOR
MAX19999ETX+
PLASTIC ENCAPSULATED DEVICES

April 5, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.
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Approved by
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Conclusion

The MAX19999ETX+ 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 MAX19999 dual-channel downconverter provides 8.3dB of conversion gain, +24dBm input IP3, +11.4dBm 1dB input compression point, and a noise figure of 10.5dB for 3000MHz to 4000MHz WiMAX(tm) and LTE diversity receiver applications. With an optimized LO frequency range of 2650MHz to 3700MHz, this mixer is ideal for low-side LO injection architectures. In addition to offering excellent linearity and noise performance, the MAX19999 also yields a high level of component integration. This device includes two double-balanced passive mixer cores, two LO buffers, and a pair of differential IF output amplifiers. Integrated on-chip baluns allow for single-ended RF and LO inputs. The MAX19999 requires a nominal LO drive of 0dBm and a typical supply current of 388mA at VCC = +5.0V or 279mA at VCC = +3.3V. The MAX19999 is pin compatible with the MAX19997A 1800MHz to 2900MHz mixer and pin similar with the MAX19985/MAX19985A and MAX19995/MAX19995A series of 700MHz to 2200MHz mixers, making this entire family of downconverters ideal for applications where a common PCB layout is used across multiple frequency bands. The MAX19999 is available in a compact 6mm x 6mm, 36-pin thin QFN package with an exposed pad. Electrical performance is guaranteed over the extended temperature range, from TC = -40°C to +85°C.

II. Manufacturing Information

A. Description/Function:	Dual, SiGe High-Linearity, High-Gain, 3000MHz to 4000MHz Downconversion Mixer with LO Buffer/Switch
B. Process:	
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:	36-pin TQFN 6x6
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:	#05-9000-2788
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:	38°C/W
K. Single Layer Theta Jc:	1.4°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	1.4°C/W

IV. Die Information

A. Dimensions:	116 X 131 mils
B. Passivation:	Si ₃ N 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 pending. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

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

$\lambda = 22.4$ 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 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 CR41 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1500 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.

Table 1
Reliability Evaluation Test Results

MAX19999ETX+

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	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