RELIABILITY REPORT

FOR MAX19993ETX+

PLASTIC ENCAPSULATED DEVICES

August 3, 2010

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX19993ETX+ 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 MAX19993 dual-channel downconverter is designed to provide 6.4dB of conversion gain, +27dBm input IP3, 15.4dBm 1dB input compression point, and a noise figure of 9.8dB for 1200MHz to 1700MHz diversity receiver applications. With an optimized LO frequency range of 1000MHz to 1560MHz, this mixer is ideal for low-side LO injection architectures. High-side LO injection is supported by the MAX19993A, which is pin-pin and functionally compatible with the MAX19993. In addition to offering excellent linearity and noise performance, the MAX19993 also yields a high level of component integration. This device includes two double-balanced passive mixer cores, two LO buffers, a dual-input LO selectable switch, and a pair of differential IF output amplifiers. Integrated on-chip baluns allow for single-ended RF and LO inputs. The device requires a nominal LO drive of 0dBm and a typical supply current of 337mA at VCC = +5.0V or 275mA at VCC = +3.3V. The MAX19993 is pin compatible with the MAX9985/MAX19985A/MAX9995/MAX19993A/MAX19994/MAX19994A/MAX19995/MAX19995A series of 700MHz to 2200MHz mixers and pin similar to the MAX19997A/MAX19999 series of 1850MHz to 4000MHz mixers, making this entire family of downconverters ideal for applications where a common PCB layout is used across multiple frequency bands. The device is available in a 6mm × 6mm, 36-pin TQFN 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, 1200MHz to 1700MHz Downconversion Mixer with LO Buffer/Switch
B. Process:	G4
C. Number of Device Transistors:	3715
D. Fabrication Location:	Oregon
E. Assembly Location:	China and Thailand
F. Date of Initial Production:	June 25, 2010

III. Packaging Information

A. Package Type:	36-pin TQFN 6x6
B. Lead Frame:	Copper
C. Lead Finish:	100% matte Tin
D. Die Attach:	Conductive
E. Bondwire:	Au (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-3791
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:	131 X 131 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:	Richard Aburano (Manager, Reliability Operations) 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 150°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

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

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

$\lambda = 22.9 \times 10^{-9}$

$\lambda = 22.9$ 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 G4 Process results in a FIT Rate of 0.02 @ 25C and 0.37 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot NYPZBQ002A, D/C 0944)

The CR56 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/- 250mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX19993ETX+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	NYPZBQ002A, D/C 0944

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