

RELIABILITY REPORT
FOR
MAX19996ETP+
PLASTIC ENCAPSULATED DEVICES

February 5, 2009

MAXIM INTEGRATED PRODUCTS

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Approved by
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Conclusion

The MAX19996ETP+ 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 MAX19996 single, high-linearity downconversion mixer provides 8.7dB conversion gain, +24.5dBm IIP3, and 9.6dB noise figure for 2000MHz to 3000MHz WCS, LTE, WiMAX(tm), and MMDS wireless infrastructure applications. With an 1800MHz to 2550MHz LO frequency range, this particular mixer is ideal for low-side LO injection receiver architectures. High-side LO injection is supported by the MAX19996A, which is pin-for-pin and functionally compatible with the MAX19996. In addition to offering excellent linearity and noise performance, the MAX19996 also yields a high level of component integration. This device includes a double-balanced passive mixer core, an IF amplifier, and an LO buffer. On-chip baluns are also integrated to allow for singleended RF and LO inputs. The MAX19996 requires a nominal LO drive of 0dBm, and supply current is typically 230mA at V_{CC} = +5.0V or 149.5mA at V_{CC} = +3.3V. The MAX19996 is pin compatible with the MAX19996A 2300MHz to 3900MHz mixer. The device is also pin similar with the MAX9984/MAX9986 400MHz to 1000MHz mixers and the MAX9993/MAX9994/MAX9996 1700MHz to 2200MHz mixers, making this entire family of downconverters ideal for applications where a common PCB layout is used for multiple frequency bands. The MAX19996 is available in a compact 5mm x 5mm, 20-pin thin QFN lead-free package with an exposed pad. Electrical performance is guaranteed over the extended -40°C to +85°C temperature range.

II. Manufacturing Information

A. Description/Function:	SiGe, High-Linearity, High-Gain, 2000MHz to 3000MHz 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:	July 25, 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:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#05-9000-2904
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:	91 X 80 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

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:

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

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

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

$$\lambda = 22.4 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 CR43-1 die type has been found to have all pins able to withstand a HBM transient pulse of +/-1000 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

MAX19996ETP+

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	0	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