

RELIABILITY REPORT  
FOR  
MAX2021ETX+T  
PLASTIC ENCAPSULATED DEVICES

June 7, 2012

**MAXIM INTEGRATED PRODUCTS**

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## Conclusion

The MAX2021ETX+T 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 MAX2021 low-noise, high-linearity, direct upconversion/downconversion quadrature modulator/demodulator is designed for RFID handheld and portal readers, as well as single and multicarrier 750MHz to 1200MHz GSM/EDGE, cdma2000®, WCDMA, and iDEN® base-station applications. Direct conversion architectures are advantageous since they significantly reduce transmitter or receiver cost, part count, and power consumption as compared to traditional IF-based double conversion systems. In addition to offering excellent linearity and noise performance, the MAX2021 also yields a high level of component integration. This device includes two matched passive mixers for modulating or demodulating in-phase and quadrature signals, two LO mixer amplifier drivers, and an LO quadrature splitter. On-chip baluns are also integrated to allow for single-ended RF and LO connections. As an added feature, the baseband inputs have been matched to allow for direct interfacing to the transmit DAC, thereby eliminating the need for costly I/Q buffer amplifiers. The MAX2021 operates from a single +5V supply. It is available in a compact 36-pin thin QFN package (6mm x 6mm) with an exposed paddle. Electrical performance is guaranteed over the extended -40°C to +85°C temperature range.

## II. Manufacturing Information

A. Description/Function:	High-Dynamic-Range, Direct Up-/Downconversion, 750MHz to 1200MHz Quadrature Modulator/Demodulator
B. Process:	G4
C. Number of Device Transistors:	
D. Fabrication Location:	USA
E. Assembly Location:	China, Taiwan and Thailand
F. Date of Initial Production:	January 21, 2006

## 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:	#05-9000-1942
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°C/W
L. Multi Layer Theta Ja:	28°C/W
M. Multi Layer Theta Jc:	1°C/W

## IV. Die Information

A. Dimensions:	131 X 131 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub>
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1-3 = 1.2 / Metal 4 = 5.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1-3 = 1.6 / Metal 4 = 4.2 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO <sub>2</sub>
I. Die Separation Method:	Wafer Saw

## V. Quality Assurance Information

- A. Quality Assurance Contacts: Richard Aburano (Manager, Reliability Engineering)  
Don Lipps (Manager, Reliability Engineering)  
Bryan Preeshl (Vice President 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 135C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) 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)

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

$$\lambda = 22.9 \text{ F.I.T. (60\% confidence level @ 25}^\circ\text{C)}$$

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

The CR34 die type has been found to have all pins able to withstand a HBM transient pulse of +/- 2000V, except the BBI-/BBI+/BBQ-/BBQ+ pins (pins 20, 21, 25, 26) which only pass +/- 150V per JEDEC JESD22-A114 (lot NZF0AA063C, D/C 1206). Latch-Up testing has shown that this device withstands a current of 250mA (lot NZF0AQ001B, D/C 0529).

**Table 1**  
Reliability Evaluation Test Results

**MAX2021ETX+T**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)					
	Ta = 135C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	NZF0AQ001B, D/C 0529
<b>Moisture Testing</b> (Note 2)					
HAST	Ta = 130°C RH = 85% Biased Time = 96hrs.	DC Parameters & functionality	77	0	
<b>Mechanical Stress</b> (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