

RELIABILITY REPORT  
FOR  
MAX2078CTK+  
PLASTIC ENCAPSULATED DEVICES

June 27, 2013

**MAXIM INTEGRATED**

160 RIO ROBLES  
SAN JOSE, CA 95134

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## Conclusion

The MAX2078CTK+ successfully meets the quality and reliability standards required of all Maxim Integrated products. In addition, Maxim Integrated's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim Integrated's quality and reliability standards.

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### I. Device Description

#### A. General

The MAX2078 octal-channel ultrasound front-end is a fully integrated bipolar, high-density octal-channel ultrasound receiver optimized for low cost, high-channel count, high-performance portable and cart-based ultrasound systems. The easy-to-use IC allows the user to achieve high-end 2D, PW, and CW Doppler (CWD) imaging capability using substantially less space and power. The highly compact imaging receiver lineup, including low-noise amplifier (LNA), variable-gain amplifier (VGA), and anti-alias filter (AAF), achieves an ultra-low 2.4dB noise figure at  $R_S = R_{IN} = 200\ \Omega$  at a very low 64.8mW per channel power dissipation. The full imaging receiver channel has been optimized for second-harmonic imaging with -64dBFS second-harmonic distortion performance with a 1VP-P 5MHz output signal. The bipolar front-end has also been optimized for excellent low-velocity PW and color-flow Doppler sensitivity with an exceptional near-carrier SNR of 140dBc/Hz at 1kHz offset from a 5MHz 1VP-P output clutter signal. A fully integrated high-performance, programmable CWD beamformer is also included. Separate I/Q mixers for each channel are available for optimal CWD sensitivity in high-clutter environments, yielding an impressive near-carrier SNR of 154dBc/Hz at 1kHz offset from a 1.25MHz 200mVP-P input clutter signal. The MAX2078 octal-channel ultrasound front-end is available in a small 10mm x 10mm, 68-pin thin QFN package with an exposed pad and is specified over a 0°C to +70°C temperature range.

## II. Manufacturing Information

A. Description/Function:	Octal-Channel Ultrasound Front-End with CW Doppler Mixers
B. Process:	CB4
C. Number of Device Transistors:	46829
D. Fabrication Location:	Oregon
E. Assembly Location:	China, Taiwan, or Thailand
F. Date of Initial Production:	April 25, 2009

## III. Packaging Information

A. Package Type:	68-pin TQFN 10x10
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:	#05-9000-3319
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 3
J. Single Layer Theta Ja:	34°C/W
K. Single Layer Theta Jc:	0.4°C/W
L. Multi Layer Theta Ja:	20°C/W
M. Multi Layer Theta Jc:	0.4°C/W

## IV. Die Information

A. Dimensions:	239.37 X 252 mils
B. Passivation:	Si <sub>3</sub> N <sub>4</sub> (Silicon nitride)
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 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 150C biased (static) life test are shown in Table 1. Using these results, the Failure Rate ( $\lambda$ ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{192 \times 9706 \times 48 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

(where 9706 = Temperature Acceleration factor assuming an activation energy of 0.8eV)

$$\lambda = 10.2 \times 10^{-9}$$

$$\lambda = 10.2 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

The following failure rate represents data collected from Maxim Integrated's reliability monitor program. Maxim Integrated performs quarterly life test monitors on its processes. This data is published in the Reliability Report found at <http://www.maximintegrated.com/qa/reliability/monitor>. Cumulative monitor data for the CB4 Process results in a FIT Rate of 0.07 @ 25C and 1.27 @ 55C (0.8 eV, 60% UCL).

### B. E.S.D. and Latch-Up Testing (lot NQDZBQ003B, D/C 0915)

The CR46 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA and overvoltage per JEDEC JESD78.

**Table 1**  
Reliability Evaluation Test Results

**MAX2078CTK+**

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
<b>Static Life Test</b> (Note 1)	Ta = 150°C Biased Time = 192 hrs.	DC Parameters & functionality	48	0	NQDZBQ003B, D/C 0915

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