

RELIABILITY REPORT
FOR
MAX2082CXD+
PLASTIC ENCAPSULATED DEVICES

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MAXIM INTEGRATED

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Conclusion

The MAX2082CXD+ 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 MAX2082 is the world's first fully integrated octal ultrasound transceiver. The device is optimized for high-channel count, high performance portable and cart-based ultrasound systems. The easy-to-use transceiver allows the user to achieve high-end 2D and Doppler imaging capability using substantially less space and power. The transceiver transmitters are high-performance, 3-level 2A pulsers capable of generating high-voltage pulses up to $\hat{A}\pm 105V$. The highly compact receiver with T/R switch, LNA, input coupling and feedback capacitors, variable gain amplifier (VGA), anti-aliasing filter (AAF), analog-to-digital converter (ADC), and digital highpass filter (HPF) achieves an ultra-low noise figure with $RS = RIN = 200$ at a very low 131mW per channel power dissipation at 50Msps. The receive channel has been optimized for second harmonic imaging with -66dBFS second harmonic distortion performance at $f_{RF} = 5MHz$ over the full gain range. The full receive channel exhibits an exceptional 76dBFS SNR at 5MHz with a 2MHz bandwidth. Separate mixers for each channel are made available for optimal CWD sensitivity yielding an impressive 149dBc/Hz dynamic range per channel at 1kHz offset from the 1.25MHz carrier. The MAX2082 octal ultrasound front-end is available in a small 10mm x 23mm CSBGA package and specified over a 0°C to +70°C temperature range.

II. Manufacturing Information

A. Description/Function:	Low-Power, High-Performance Octal Ultrasound Transceiver with Integrated AFE, Pulser, T/R Switch, and CWD Beamformer
B. Process:	DM200
C. Fabrication Location:	USA
D. Assembly Location:	USA, Taiwan
E. Date of Initial Production:	September 23, 2014

III. Packaging Information

A. Package Type:	336-ball CSBGA, HYB
B. Lead Frame:	N/A
C. Lead Finish:	SnAgCu
D. Die Attach:	N/A
E. Bondwire:	Au (0.8 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#31-4953
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	Level 4
J. Single Layer Theta Ja:	N/A°C/W
K. Single Layer Theta Jc:	N/A°C/W
L. Multi Layer Theta Ja:	17.8°C/W
M. Multi Layer Theta Jc:	3.1°C/W

IV. Die Information

A. Dimensions:	
B. Passivation:	Si ₃ N ₄ /SiO ₂ (Silicon nitride/ Silicon dioxide)
C. Interconnect:	Al/0.5%Cu with Ti/TiN Barrier
D. Backside Metallization:	None
E. Minimum Metal Width:	0.8 microns (as drawn)
F. Minimum Metal Spacing:	2.0 microns (as drawn)
G. Bondpad Dimensions:	
H. Isolation Dielectric:	SiO ₂
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

- A. Quality Assurance Contacts: 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 135°C biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{\text{MTTF}} = \frac{1.83}{1000 \times 4340 \times 125 \times 2} \quad (\text{Chi square value for MTTF upper limit})$$

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

$$\lambda = 1.7 \times 10^{-9}$$

$$\lambda = 1.7 \text{ F.I.T. (60\% confidence level @ 25°C)}$$

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 DM200 Process results in a FIT Rate of .92 @ 25°C and 15.8 @ 55°C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot KAHZ1AK, D/C 1435)

The CR66-0 die type has been found to have all pins able to withstand an HBM transient pulse of +/-1000V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-100mA and overvoltage per JEDEC JESD78.

Table 1
Reliability Evaluation Test Results

MAX2082CXD+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)	Ta = 135°C Biased Time = 1000 hrs.	DC Parameters & functionality	125	0	

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