RELIABILITY REPORT

FOR

MAX4002EUA+

PLASTIC ENCAPSULATED DEVICES

December 5, 2011

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Approved by
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Quality Assurance
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Conclusion

The MAX4002EUA+ 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.

Table of Contents

I. Device Description

A. General

The MAX4000/MAX4001/MAX4002 low-cost, low-power logarithmic amplifiers are designed to control RF power amplifiers (PA) operating in the 0.1GHz to 2.5GHz frequency range. A typical dynamic range of 45dB makes this family of log amps useful in a variety of wireless applications including cellular handset PA control, transmitter power measurement, and RSSI for terminal devices. Logarithmic amplifiers provide much wider measurement range and superior accuracy to controllers based on diode detectors. Excellent temperature stability is achieved over the full operating range of -40°C to +85°C. The choice of three different input voltage ranges eliminates the need for external attenuators, thus simplifying PA control-loop design. The logarithmic amplifier is a voltage-measuring device with a typical signal range of -58dBV to -13dBV for the MAX4000, -48dBV to -3dBV for the MAX4001, and -43dBV to +2dBV for the MAX4002. The input signal for the MAX4000 is internally AC-coupled using an on-chip 5pF capacitor in series with a 2k input resistance. This highpass coupling, with a corner at 16MHz, sets the lowest operating frequency and allows the input signal source to be DC grounded. The MAX4001/MAX4002 require an external coupling capacitor in series with the RF input port. These PA controllers feature a power-on delay when coming out of shutdown, holding OUT low for approximately 5µs to ensure glitch-free controller output. The MAX4000/MAX4001/MAX4002 family is available in an 8-pin µMAX® package and an 8-bump chip-scale package (UCSP(tm)). The device consumes 5.9mA with a 5.5V supply, and when powered down the typical shutdown current is 13µA.

II. Manufacturing Information

A. Description/Function:	2.5GHz 45dB RF-Detecting Controllers
B. Process:	CB30
C. Number of Device Transistors:	
D. Fabrication Location:	Oregon
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 26, 2002

III. Packaging Information

A. Package Type:	3x3 mm 8L UMAX
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:	#05-2501-0199 / A
H. Flammability Rating:	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard J-STD-020-C	1
J. Single Layer Theta Ja:	221°C/W
K. Single Layer Theta Jc:	42°C/W
L. Multi Layer Theta Ja:	206.3°C/W
M. Multi Layer Theta Jc:	42°C/W

IV. Die Information

A. Dimensions:	49 X 48 mils
B. Passivation:	Si_3N_4 (Silicon nitride)
C. Interconnect:	Au
D. Backside Metallization:	None
E. Minimum Metal Width:	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 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:	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 biased (static) life test are shown in Table 1. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{1.83}{192 \times 4340 \times 45 \times 2}$$ (Chi square value for MTTF upper limit)

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

$\lambda = 24.4 \times 10^{-9}$

$\lambda = 24.4$ 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 CB30 Process results in a FIT Rate of 0.25 @ 25C and 4.38 @ 55C (0.8 eV, 60% UCL)

B. E.S.D. and Latch-Up Testing (lot N9O0DA010B D/C 0426)

The OX83-2 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2500V per Mil-Std 883 Method 3015.7. Latch-Up testing has shown that this device withstands a current of +/-250mA.

Table 1
Reliability Evaluation Test Results

MAX4002EUA+

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	SAMPLE SIZE	NUMBER OF FAILURES	COMMENTS
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality	45	0	N9O0DA010B, D/C 0426

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