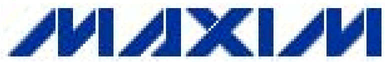

RELIABILITY REPORT

FOR

MAX11014BGTM+

PLASTIC ENCAPSULATED DEVICES

August 17, 2009

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

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Approved by
Ken Wendel
Quality Assurance
Director, Reliability Engineering

Conclusion

The MAX11014BGTM+ 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 MAX11014/MAX11015 set and control bias conditions for dual MESFET power devices found in point-to-point communication and other microwave base stations. The MAX11014 integrates complete dual analog closed-loop drain-current controllers for Class A MESFET amplifier operation, while the MAX11015 targets Class AB operation. Both devices integrate SRAM lookup tables (LUTs) that can be used to store temperature and drain-current compensation data. Each device includes dual high-side current-sense amplifiers to monitor the MESFET drain currents through the voltage drop across the sense resistors in the 0 to 625mV range. External diode-connected transistors monitor the MESFET temperatures while an internal temperature sensor measures the local die temperature of the MAX11014/MAX11015. The internal DAC sets the voltages across the current-sense resistors by controlling the GATE voltages. The internal 12-bit SAR ADC digitizes internal and external temperature, internal DAC voltages, current-sense amplifier voltages, and external GATE voltages. Two of the 11 ADC channels are available as general-purpose analog inputs for analog system monitoring. The MAX11014's gate-drive amplifier functions as an integrator for the Class A drain-current control loop while the MAX11015's gate-drive amplifier functions with a gain of -2 for Class AB applications. The current-limited gate-drive amplifier can be fast clamped to an external voltage independent of the digital input from the serial interface. Both the MAX11014 and the MAX11015 include self-calibration modes to minimize error over time, temperature, and supply voltage. The MAX11014/MAX11015 feature an internal reference and can operate from separate ADC and DAC external references. The internal reference provides a well-regulated, low-noise +2.5V reference for the ADC, DAC, and temperature sensors. These integrated circuits operate from a 4-wire 20MHz SPI(tm)-/MICROWIRE(tm)-compatible or 3.4MHz I²C-compatible serial interface (pin-selectable). Both devices operate from a +4.75V to +5.25V analog supply (2.8mA typical supply current), a +2.7V to +5.25V digital supply (1.5mA typical supply current), and a -4.5V to -5.5V negative supply (1.1mA supply current). The MAX11014/MAX11015 are available in a 48-pin thin QFN package specified over the -40°C to +105°C temperature range.

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II. Manufacturing Information

A. Description/Function:	Automatic RF MESFET Amplifier Drain-Current Controllers
B. Process:	C6 and HV3
C. Number of Device Transistors:	
D. Fabrication Location:	California (C6) Oregon (HV3)
E. Assembly Location:	Thailand
F. Date of Initial Production:	January 21, 2006

III. Packaging Information

A. Package Type:	48-pin TQFN 7x7
B. Lead Frame:	
C. Lead Finish:	100% matte Tin
D. Die Attach:	Non-conductive Epoxy
E. Bondwire:	Gold (1 mil dia.)
F. Mold Material:	Epoxy with silica filler
G. Assembly Diagram:	#31-4790
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:	36°C/W
K. Single Layer Theta Jc:	0.8°C/W
L. Multi Layer Theta Ja:	25°C/W
M. Multi Layer Theta Jc:	0.8°C/W

IV. Die Information

	C6 (CO10)	HV3 (CO11)
A. Dimensions:	212 x 137 mils	100 x 50 mils
B. Passivation:	Si_3N_4/SiO_2	Si_3N_4/SiO_2
C. Interconnect:	Aluminum/Cu (Cu = 0.5%)	Aluminum/Cu (Cu = 0.5%)
D. Backside Metallization:	None	None
E. Minimum Metal Width:	0.6 microns (as drawn)	Metal1 = 0.5 / Metal2 = 0.6 / Metal3 = 0.6 microns (as drawn)
F. Minimum Metal Spacing:	0.6 microns (as drawn)	Metal1 = 0.45 / Metal2 = 0.5 / Metal3 = 0.6 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.	5 mil. Sq.
H. Isolation Dielectric:	SiO2	SiO2
I. Die Separation Method:	Saw	Sa3

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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:

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

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

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

λ = 22.4 F.I.T. (60% confidence level @ 25°C)

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 CO07 die type has been found to have all pins able to withstand a HBM transient pulse of +/-2000 V per JEDEC JESD22-A114. Latch-Up testing has shown that this device withstands a current of +/-250 mA.

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Table 1
Reliability Evaluation Test Results

MAX11014BGTM+

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	48	0
Moisture Testing (Note 2)				
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality		
Mechanical Stress (Note 2)				
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters & functionality		

Note 1: Life Test Data may represent plastic DIP qualification lots.
Note 2: Generic Package/Process data

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