AN11735

Maximum RF Input Power BGU6102

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Document information

Info	Content
Keywords	BGU6102, MMIC LNA, Maximum RF Input Power
Abstract	This document provides RF and DC test results by applying large RF input power.

Revision history

Rev	Date	Description
1	20150910	First publication

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1. Introduction

This document provides application examples and measurement results for large RF input signals using the BGU6102.

2. RF input power test on BGU6102

The test circuit shown in this document is using the BGU6102 and the input is matched between 1.8 – 2.2GHz (output is not matched). The Supply voltage is 4V and the bias current is set to 10mA via series resistor of 50 ohm (MMIC Vcc is 3.5V)

The test is also done without the (R2) 50 ohm series resistor on the Vsupply line and a bias current of 10 and 20mA.

The input power is swept at 1.9 GHz from -20dBm up to 15dBm and kept for 2 hours at 15dBm in gain (Venable=Vcc) and 2 hours in off mode (Venable = 0V).

After the test with 15dBm input power at 1.9GHz (21.5dB input return loss) the MMIC is tested on the Network analyzer on functionality.

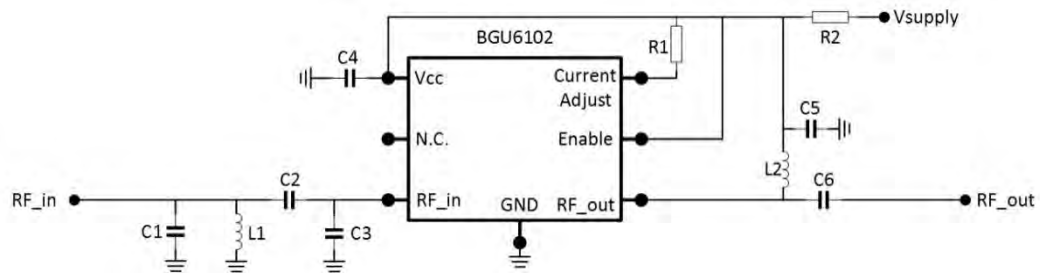

Fig 1. BGU6102 maximum RF input power test circuit +15dBm @ 1.9 GHz

The input of the BGU6102 is matched on the test frequency (RL_in > 10dB), output is not matched.

Additional resistor (R2) is used to reduce the current caused by self-biasing at large input power.

BOM BGA6102 input match at 2GHz		
COMPONENT	Value	Function
C1	0.5pF	matching
C2	1.3pF	matching
C3	1pF	matching
C4	4.7nF	decoupling
C5	4.7nF	decoupling
C6	47pF	dc-block
L1	3.3nH	matching
L2	27nH	bias
R1	5.9k	Rbias
R2	50R	Icc limit

Fig 2. BGU6102 BOM for 2GHz input matching

3. Test results with R2=50 ohm Icc=10mA

BGU6102 Pin vs Pout & Icc (Vsupply =4V ; Vcc=3.5V ; Icc= 9.6mA)						
	Test frequency 1.9GHz			Test frequency 2.2GHz		
Pin [dBm]	Pout [dBm]	Icc [mA]	Vcc [V]	Pout [dBm]	Icc [mA]	Vcc [V]
-20	-3.1	9.6	3.5	-4.7	9.6	3.5
-15	1.5	9.6	3.5	0	9.6	3.5
-12	3.8	9.8	3.5			
-11				3.3	9.8	3.5
-10	5.1	10.1	3.5	4.1	9.9	3.5
-5	7.4	11.3	3.4	6.9	11.3	3.4
0	9.7	13.8	3.3	9.5	14.1	3.3
5	12.2	17.8	3.1	12.1	18.5	3.1
10	16.4	38.3	2.1	16.2	35.5	2.2
15	16.1	47.5	1.6	16.3	44.5	1.8

Fig 3. BGU6102 maximum RF input power versus Pout and Icc test results (P1dB in red)

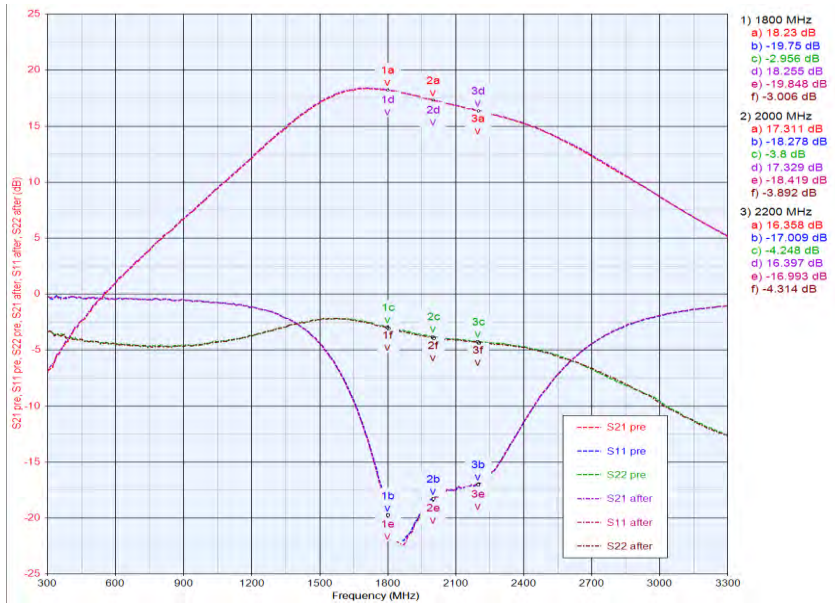

Fig 4. BGU6102 S-parameter before and after 2 hours +15dBm RF input power test

4. Test results with R2=0 ohm (not recommended), Icc=10mA, R1=8 kohm

BGU6102 Pin vs Pout & Icc (Vsupply =4V ; Icc= 9.9mA; @1.9GHz)						
	Gain mode (Venable=Vcc)			OFF mode (Venable=0V)		
Pin [dBm]	Pout [dBm]	Icc [mA]	Vcc [V]	Pout [dBm]	Icc [mA]	Vcc [V]
-20	-2.6	9.9	4	-43	0.005	4
-15	2.1	9.9	4	-38	0.005	4
-12	4.4	10.1	4			
-10	5.6	10.4	4	-33	0.005	4
-5	8.1	11.9	4	-28.3	0.005	4
0	10.7	15	4	-23.5	0.005	4
5	13.4	19.6	4	-12	0.73	4
10	19.7	50.6	4	19.2	45.1	4
15	21.25	83.9	4	21.1	79.7	4

Fig 5. BGU6102 maximum RF input power versus Pout and Icc test results (P1dB in red)

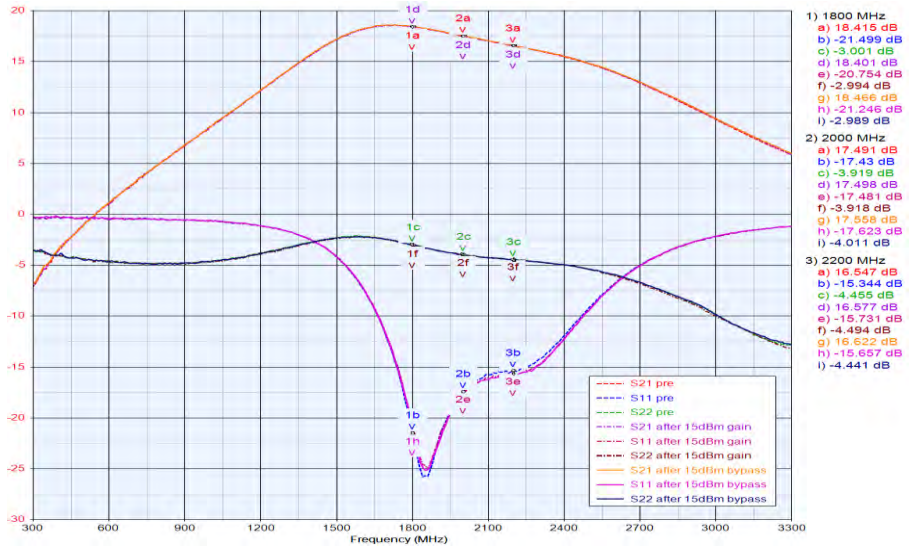

Fig 6. BGU6102 S-parameter before and after 2 hours +15dBm RF input power test in gain (Venable=Vcc) and off mode (Venable=0V)

5. Test results with R2=0 ohm (not recommended), Icc=20mA, R1=1.7 kohm

BGU6102 Pin vs Pout & Icc (Vsupply =4V ; Icc= 20mA; @1.9GHz)						
	Gain mode (Venable=Vcc)			OFF mode (Venable=0V)		
Pin [dBm]	Pout [dBm]	Icc [mA]	Vcc [V]	Pout [dBm]	Icc [mA]	Vcc [V]
-20	-1.8	20	4	-43	0.005	4
-15	3.2	20	4	-38	0.005	4
-10	7.9	20	4	-33		4
-7	10.2	20	4			
-5	11.3	20.1	4	-28.5	0.005	4
0	13.3	22.3	4	-23.6	0.005	4
5	15.1	26.1	4	-13	0.63	4
10	19.6	52.6	4	19	44.4	4
15	21.1	85.4	4	21	80	4

Fig 7. BGU6102 maximum RF input power versus Pout and Icc test results (P1dB in red)

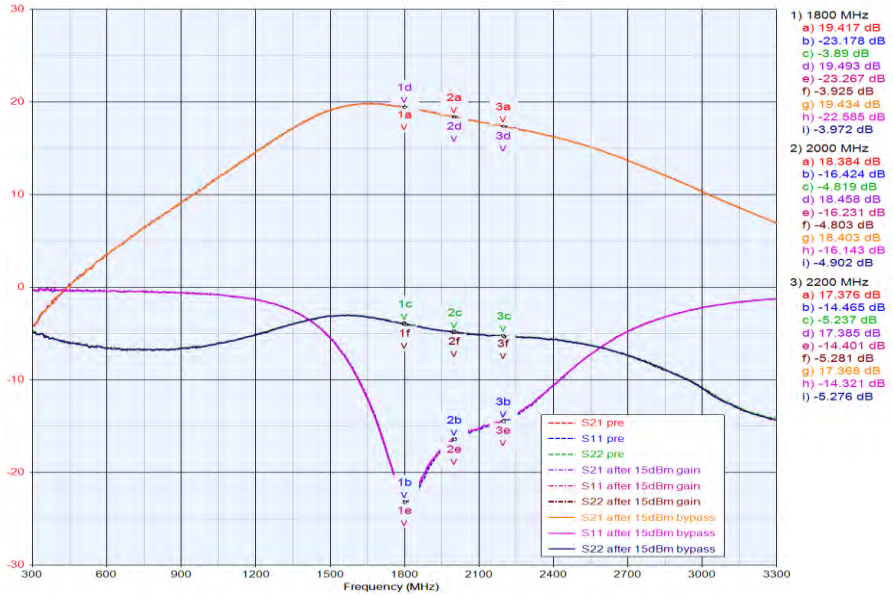

Fig 8. BGU6102 S-parameter before and after 2 hours +15dBm RF input power test in gain (Venable=Vcc) and off mode (Venable=0V)

6. Conclusion

After 2 hours stress with 15dBm at RF input using the input matched BGU6102, no changes on S-parameter and DC-biasing observed.

The test is done with R2=50 ohm and R2=0 ohm series resistor at the Vcc in gain and OFF mode.

To minimize the self-biasing (increase of Icc) we recommend additional series resistor R2 at the Vsupply, for details see the test schematic Fig.1.

In case of using the 50ohm series resistor at the Vsupply and different control voltage at the Venable can lead to voltage difference between Vcc and Venable higher than 1.8V (Venable max. = Vcc + 1.8V) and internal ESD protection diodes can start to conduct.

To protect the ESD diodes we recommend to use series resistor to limit the current on the Venable pin to max 20mA (5mA recommended) or limit the Venable voltage for gain mode to max. 2V (min. 1.2V).

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8. List of figures

9. Contents

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