TR0329M

2.0-4.2 GHz GaAs Ultra Low Noise 2 Stage Bypassed LNA

Application Note: TR0329M EVB A

Application Note

3300 MHz~4000 MHz

5.0 V, 90 mA-HG mode

5.0 V, 45mA-LG mode

Rev-2.1

List of Contents

1. General Description

The TR0329M is a high-linearity, ultra-low noise 2-stage gain block amplifier module with internal 50-ohm input output matching with a bypass mode functionality integrated to the second stage in the product. At 3.6 GHz, the amplifier, under high gain mode, typically provides 34 dB gain, +35 dBm OIP3, and 0.5 dB noise figure while drawing 90 mA current from a +5 V supply. The component also provides high performance in the low gain mode with 15 dB gain, 0.5 dB noise figure and +22 dBm OIP3 while drawing 50 mA current. The TR0329M is packaged in a compact, low-cost Quad Flat No Lead (QFN) 3.5 x 3.5 x 0.75 mm, 20 pin plastic packages.

TR0329M-EVB-A is an evaluation board specially tuned for frequency range of 3300 MHz~4000 MHz applications. Its application in the areas of Wireless infrastructure, TDD massive multiple input & multiple output, active antenna systems, TDD-based communication systems etc.

2. TR0329M-EVB-A Board Details

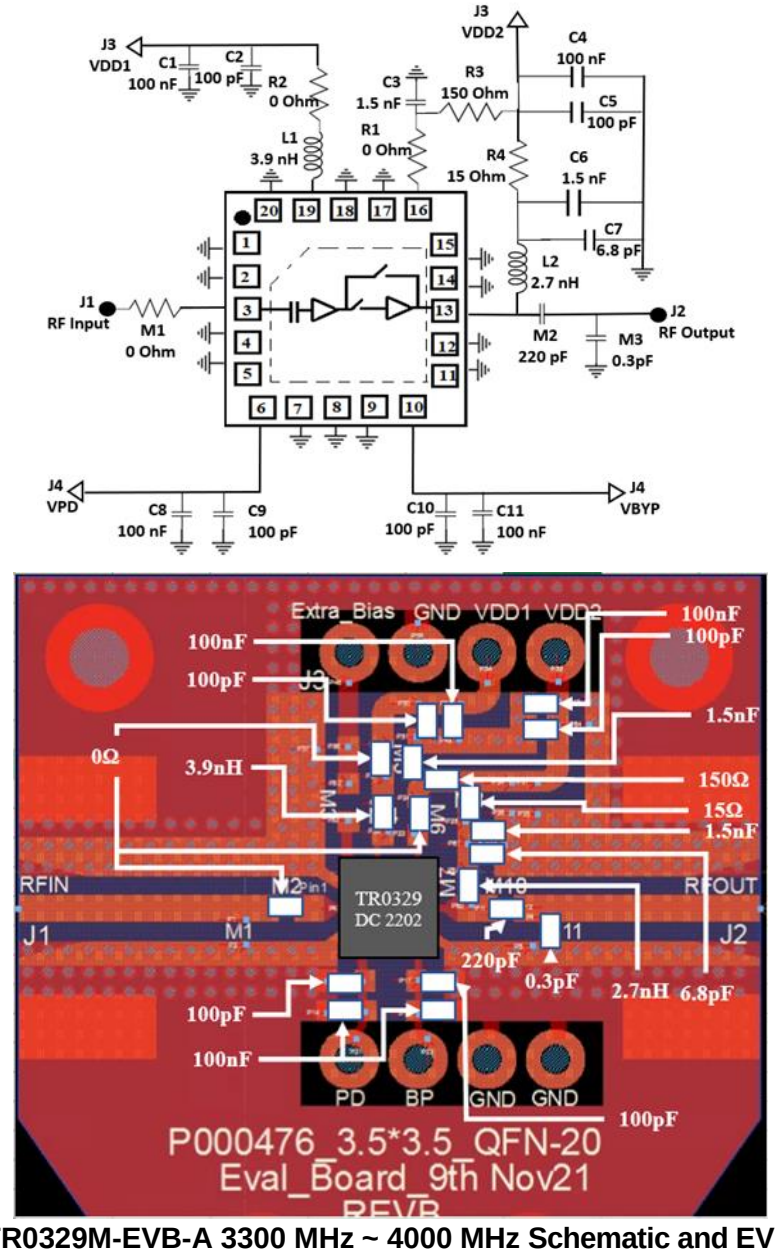

Figure 2.1 TR0329M-EVB-A 3300 MHz ~ 4000 MHz Schematic and EVB Layout

3. TR0329M-EVB-A Bill of Materials

Component ID	Value	Manufacturer	Recommended Part Number	Qty
M1, R1, R2	0 Ω	Panasonic	ERJ-2GE0R00X	3
C7	6.8 pF	Murata	GJM1555C1H6R8BB01D	1
M2	220 pF	Kemet	C0402C221K5GACAUTO	1
C2, C5, C9, C10	100 pF	AVX	04025A101JAT4A	4
C1, C4, C8, C11	100 nF	TDK	C1005X7R1H104K050BE	4
L1	3.9 nH	Coil craft / Wurth Electronics	0402HP-3N9XGE / 744916039	1
C3, C6	1.5 nF	Murata	04025C152JAT2A	2
L2	2.7 nH	Coil craft / Wurth Electronics	0402HP-2N7XGE / 744916027	1
R4	15 Ω	Panasonic	ERJ-H2RD15R0X	1
R3	150 Ω	Panasonic	ERJ-2RHD1500X	1
M3	0.3 pF	Murata	GJM1555C1HR30BB01	1
PCB	Rogers RO4350B, 20 mils, 1 oz copper			1

Table 3.1 TR0329M-EVB-A BOM

4. TR0329M-EVB-A Biasing Sequence

Turn ON Device	Turn OFF Device
1. Apply bias to the VDD1 and VDD2=5 V test points. 2. Apply bias to the BP test points. 3. Apply bias to the PD test point. 4. Apply an RF input signal.	1. Turn RF power off. 2. Turn off VDD1 and VDD2=5 V test points. 3. Turn off BP and PD

Table 4.1 TR0329M-EVB-A Bias and Sequencing

5. TR0329M-EVB-A Board Measurement Summary

Parameter	Test Condition	Typical Values	Unit
Operational frequency Range		3.3-4.0	GHz
Gain	HG	36.5-32	dB
	LG	16-14.3	dB
Noise Figure (De-embedded)	HG	0.5-0.8	dB
	LG	0.5-0.8	dB
EVB Noise Figure	HG	0.6-0.9	dB
	LG	0.7-0.9	dB
Input Return Loss	HG	Less than -9	dB
	LG	Less than -14	dB
Output Return Loss	HG	Less than -13	dB
	LG	Less than –8.3	dB
OP1dB	HG	19-20.5	dBm
	LG	9-11	dBm
OIP3 (With 1MHz tone spacing)	0 dBm per tone,	33-36	dBm
	-2 dBm per tone,	19-22	dBm
Current, Id	HG	90	mA
	LG	45	
	PD	5	
Isolation between RFIN and RF-out PD mode ON and Bypass ON	At 3.6 GHz Receive operation	50	dB
Isolation between RFIN and RF-out PD mode ON and High Gain ON		50	dB

Table 5.1 TR0329M-EVB-A Electrical Characteristics Summary

6. TR0329M-EVB-A Test Results

All the tests are carried out at room temperature.

6.1. S parameters

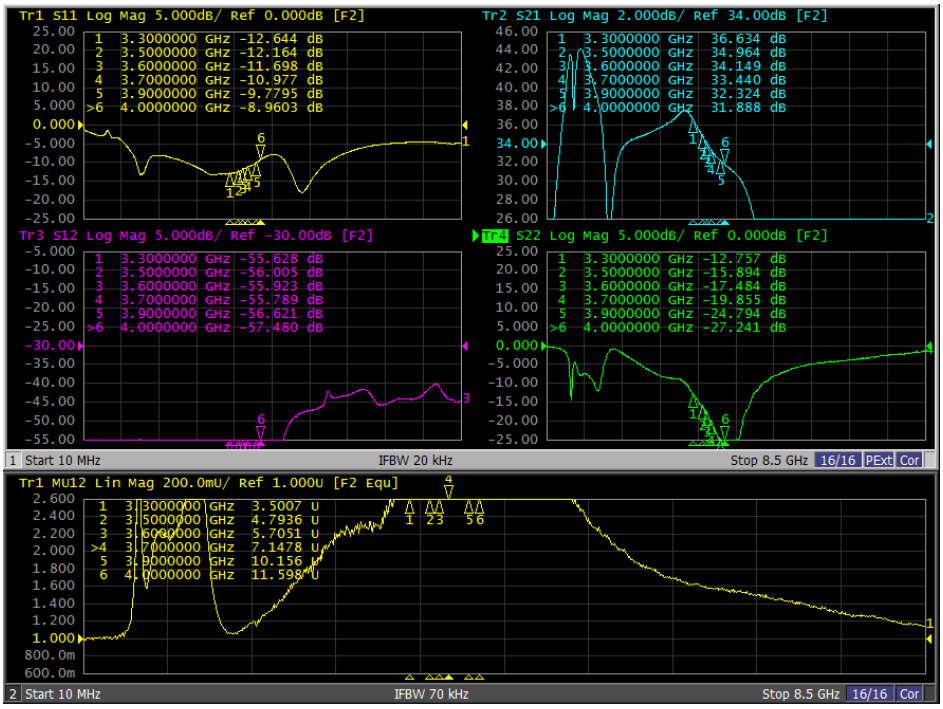

Figure 6.1.1. S parameters of HG mode of TR0329M-EVB-A

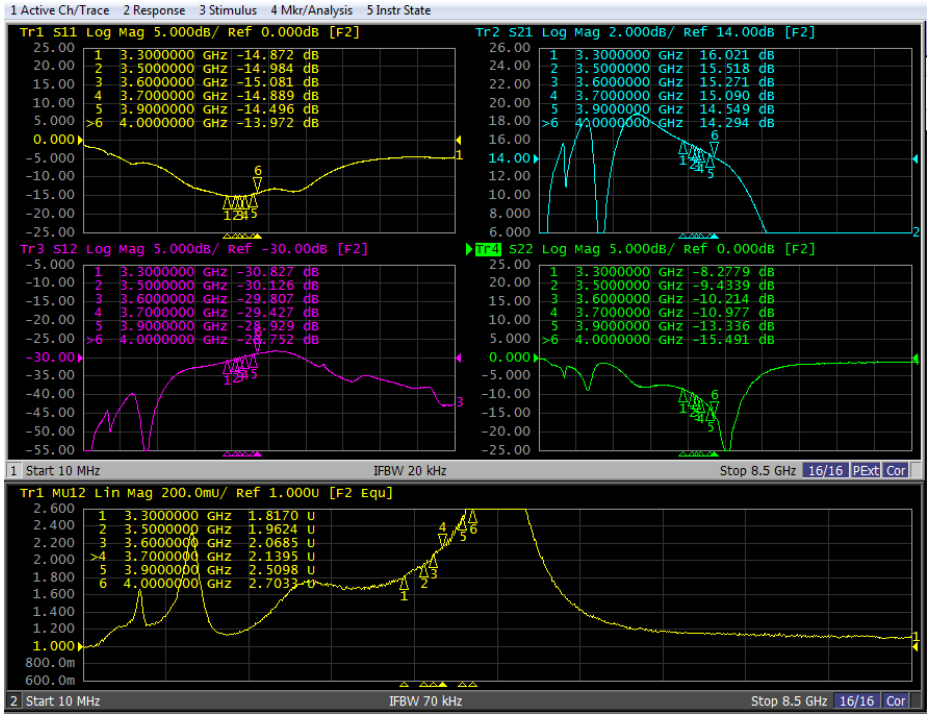

Figure 6.1.2 S parameters of LG mode of TR0329M-EVB-A

6.2. De-embedded Noise Figure

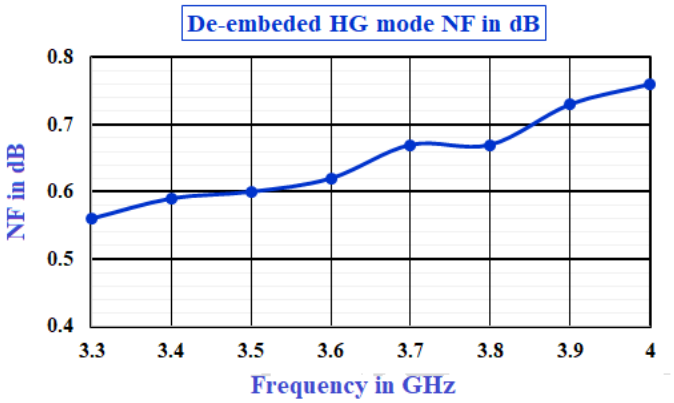

Figure 6.2.1 De-embedded NF of HG mode of of TR0329M-EVB-A

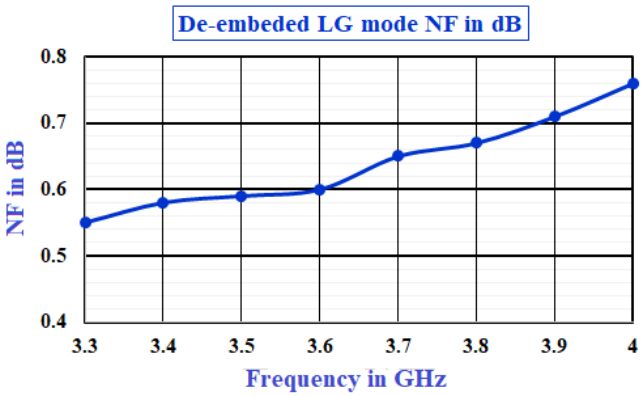

Figure 6.2.2 De-embedded NF of LG mode of TR0329M-EVB-A

6.3. Large Signal Test Results

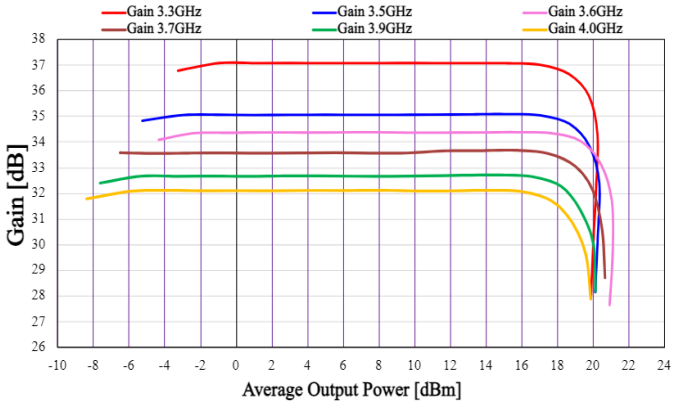

Figure 6.3.1. Gain Vs Pout of HG mode of TR0329M-EVB-A

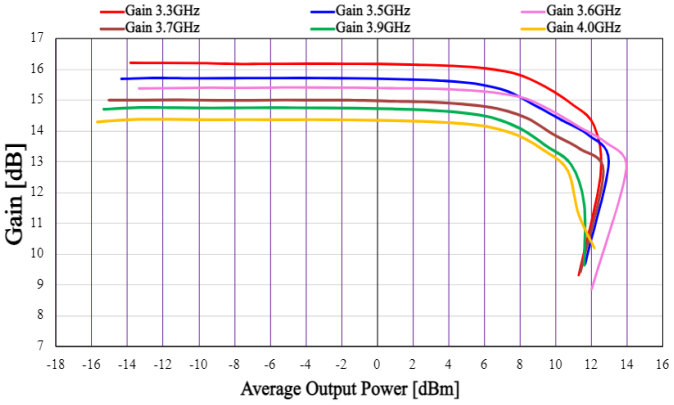

Figure 6.3.2. Gain Vs Pout of LG mode of TR0329M-EVB-A

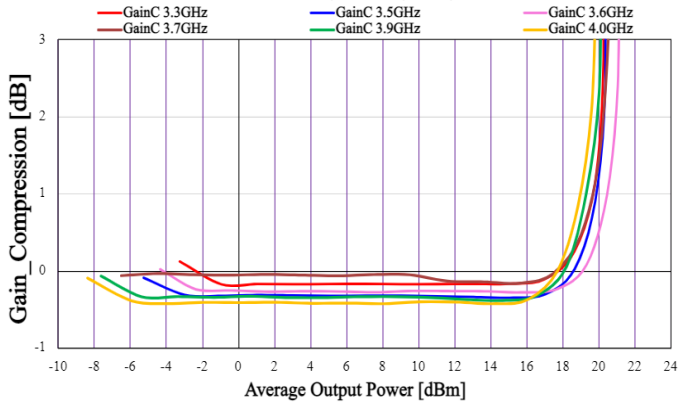

Figure 6.3.3. Gain compression Vs Pout of HG mode of TR0329M-EVB-A

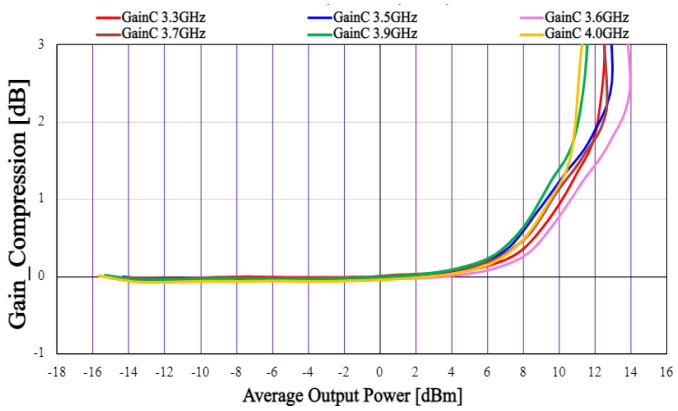

Figure 6.3.4. Gain compression Vs Pout of LG mode of TR0329M-EVB-A

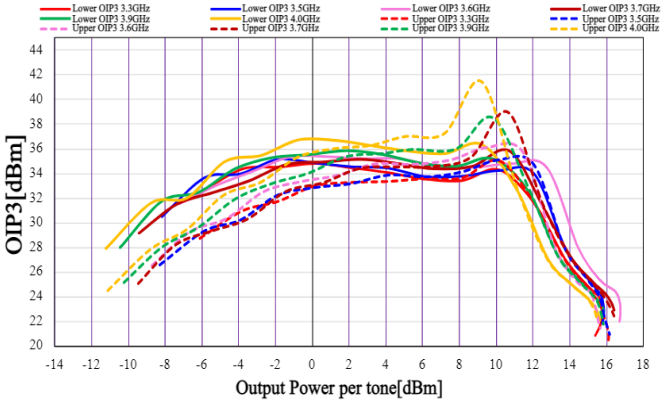

Figure 6.3.5. OIP3 Vs Pout per tone of HG mode of TR0329M-EVB-A

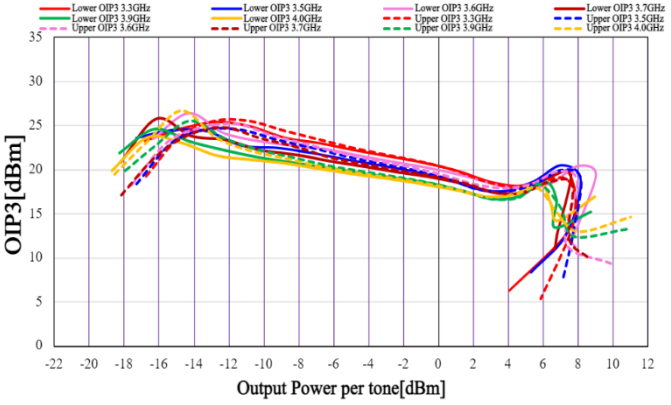

Figure 6.3.6. OIP3 Vs Pout per tone of LG mode of TR0329M-EVB-A

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