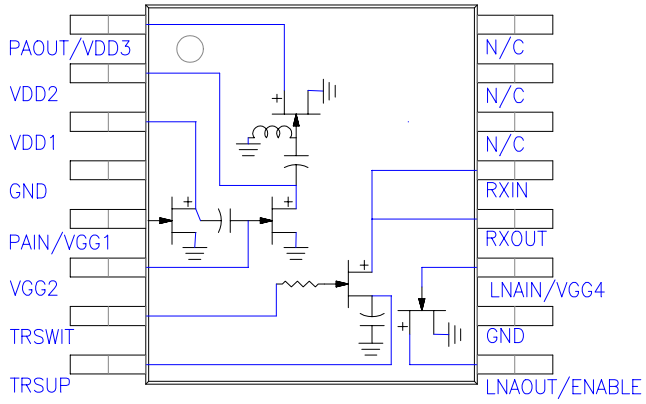
3.3V Integrated RF Front-End for 2.4GHz ISM
ITT2304GF

PRELIMINARY

FEATURES

- Build a Bluetooth or HomeRF radio by connecting directly to popular single chip transceivers like the National LMX3162.
- 3.3V operation
- Single positive supply
- 100% duty cycle
- Linear power amplifier, +34 dBm TOI
- Output power control and low current “bypass” mode
- 1.6 dB LNA noise figure
- 16 Pin TSSOP full downset plastic package
- Self-aligned MSAG®-Lite MESFET process



Package bottom is electrical and thermal ground

DESCRIPTION

The ITT2304GF is an integrated RF front-end based on GaAsTEK’s GaAs Self-Aligned MSAG® MESFET Process. This product has an integrated power amplifier, low noise amplifier, and switch in one surface mount package. For booster applications, it features a low power “bypass” mode and output power control via V_{DD1}.

MAXIMUM RATINGS (T_A = 25 °C unless otherwise noted)

Rating	Symbol	Value	Unit
DC Supply Voltage	V_{DD}	+5.5	V
Reverse DC Supply Voltage,	$-V_{DD}$	-0.7	V
RF Input Power, PA_{IN}	P_{IN}	+10	mW
RF Input Power, LNA_{IN}	P_{IN}	+10	mW
Junction Temperature	T_J	+150	°C
Storage Temperature	T_{STG}	-40 to +175	°C

ELECTRICAL CHARACTERISTICS T_s (Solder Point of Downset Paddle) = 40 °C

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency	f	2400	—	2497	MHz
Transmit Path (Power Amplifier + T/R Switch) $V_{DD1,2,3}$= 3.3V, P_{IN}=-9 dBm, TR_{SUP}=3.3V, TR_{SWIT}=3.3V, LNA_{ENABLE}=0.0V, f=2450MHz					
Load Power (at Ant)	P_{OUT}		23.1		dBm
Current Consumption	$I_{DD1,2,3}$		280		mA
Third-Order Intercept Point (f_1=2450 MHz, f_2 = 2451 MHz, P_{IN} = -20 dBm SCL)	IP_3		39		dBm
Harmonics	—		-32		dBc
Duty Cycle	—			100	%
Forward Isolation (RF_{IN} to Ant) $V_{DD1,2,3}$=0.0V	—		46		dB
Forward Isolation (ANT to LNA_{OUT})	—		34		dB
Receive Path (T/R Switch + Low Noise Amplifier) $V_{DD1,2,3}$= 0.0V, TR_{SUP}=3.3V, TR_{SWIT}=0.0V, LNA_{ENABLE}=2.4V, f=2450MHz					
Current Consumption	LNA_{ENABLE}		5		mA
Noise Figure (Ant to LNA_{OUT})	NF		2.4		dB
Gain (Ant to LNA_{OUT})	G		14		dB
Third-Order Input Intercept Point (f_1=2450 MHz, f_2 = 2451 MHz, P_{IN} = -20 dBm SCL)	IIP_3		3.2		dBm
Reverse Isolation (LNA_{OUT} to ANT)	—		20		dB
Thermal Resistance (Junction of 3rd stage FET to solder point of package bottom)	R_{TH}		37.5		°C/W

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TYPICAL CHARACTERISTICS

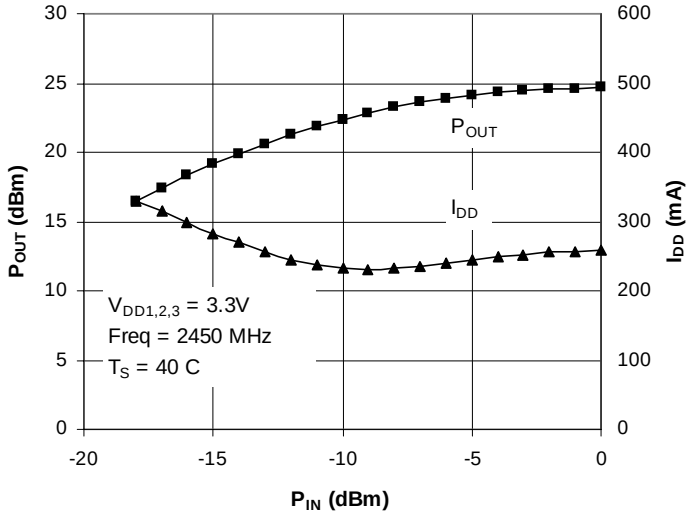

Figure 1. Output power and drain current vs. input power

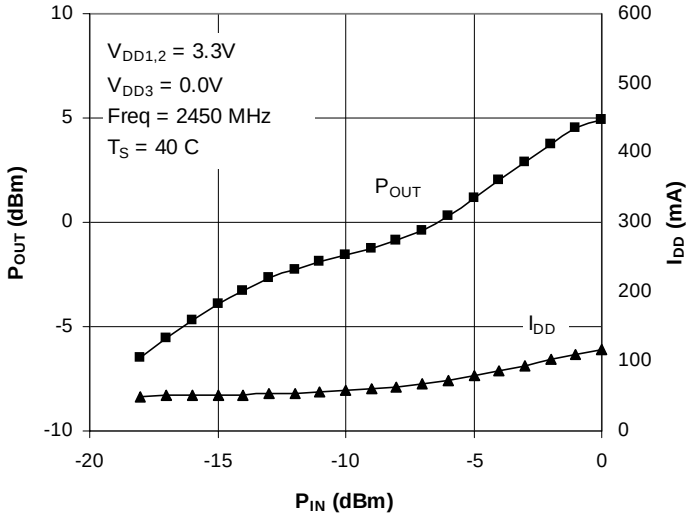

Figure 2. Output power and drain current vs. input power for low power "bypass" mode ($V_{DD1,2}$=3.3V V_{DD3}=0.0V)

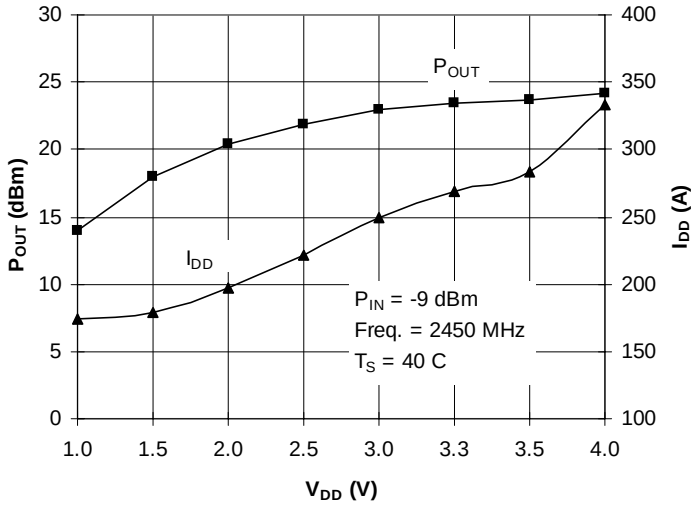

Figure 3. Output power and drain current vs. supply voltage

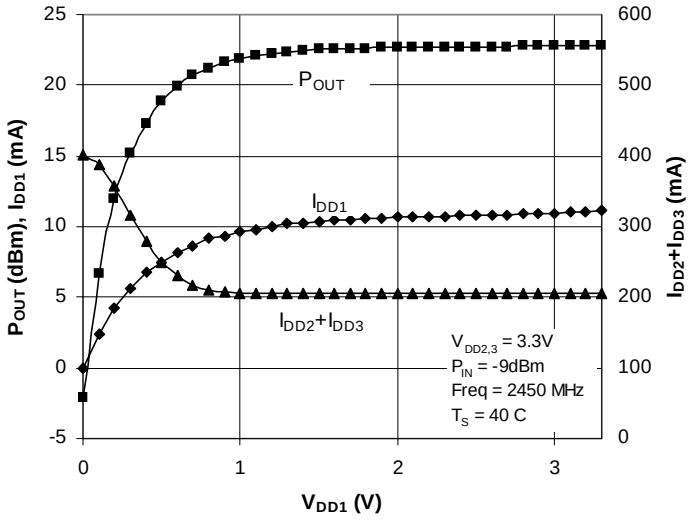

Figure 4. Output power, drain current and efficiency vs. V_{DD1} for power control

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TYPICAL CHARACTERISTICS (CONT)

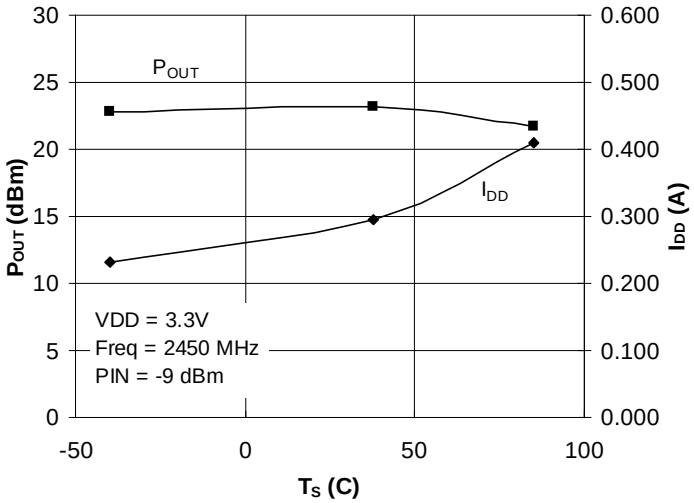

Figure 5. Output power and supply current vs. temperature

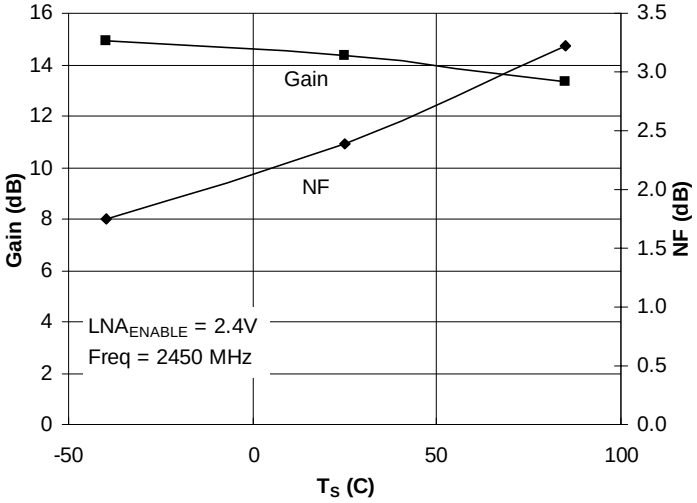

Figure 6. Noise figure, gain and supply current vs. temperature

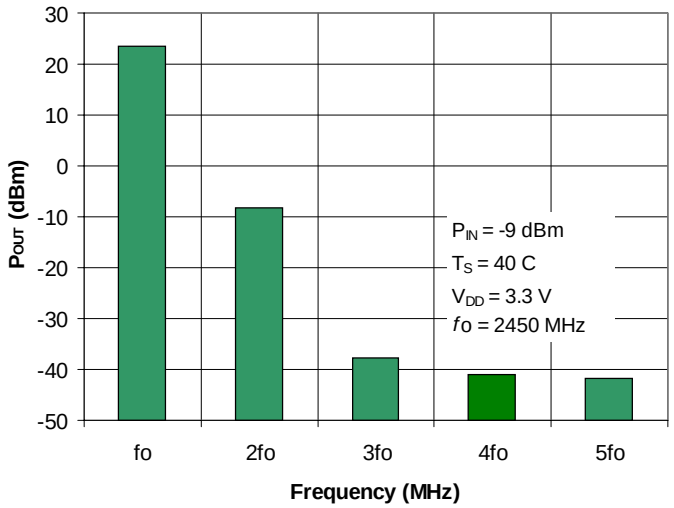

Figure 7. Harmonics

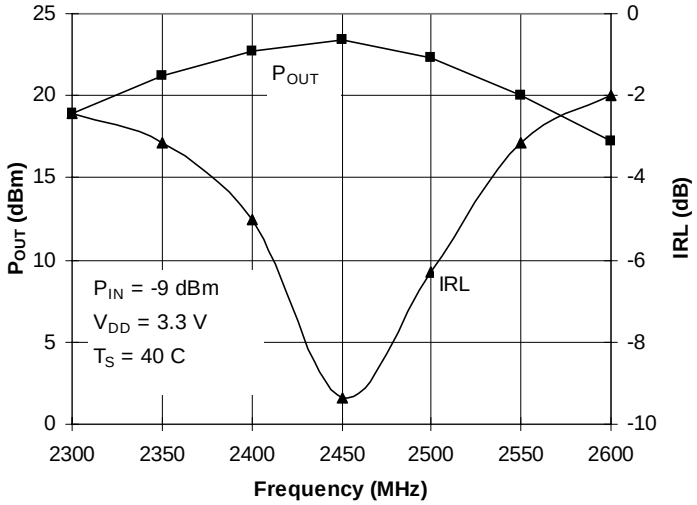

Figure 8. Output power and input return loss vs. frequency.

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APPLICATION INFORMATION

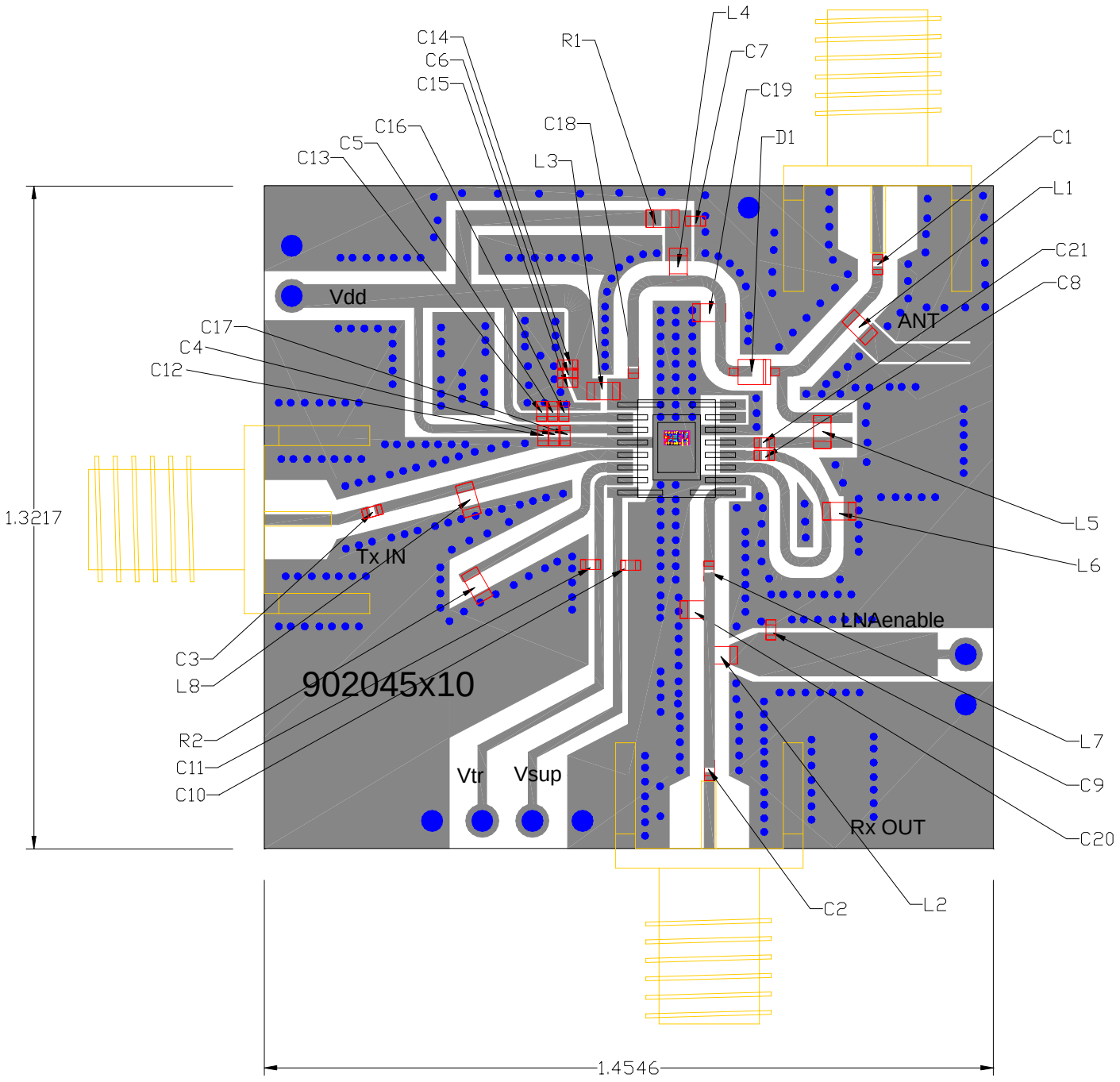

Figure 9. Component layout and printed circuit drawing for evaluation board.

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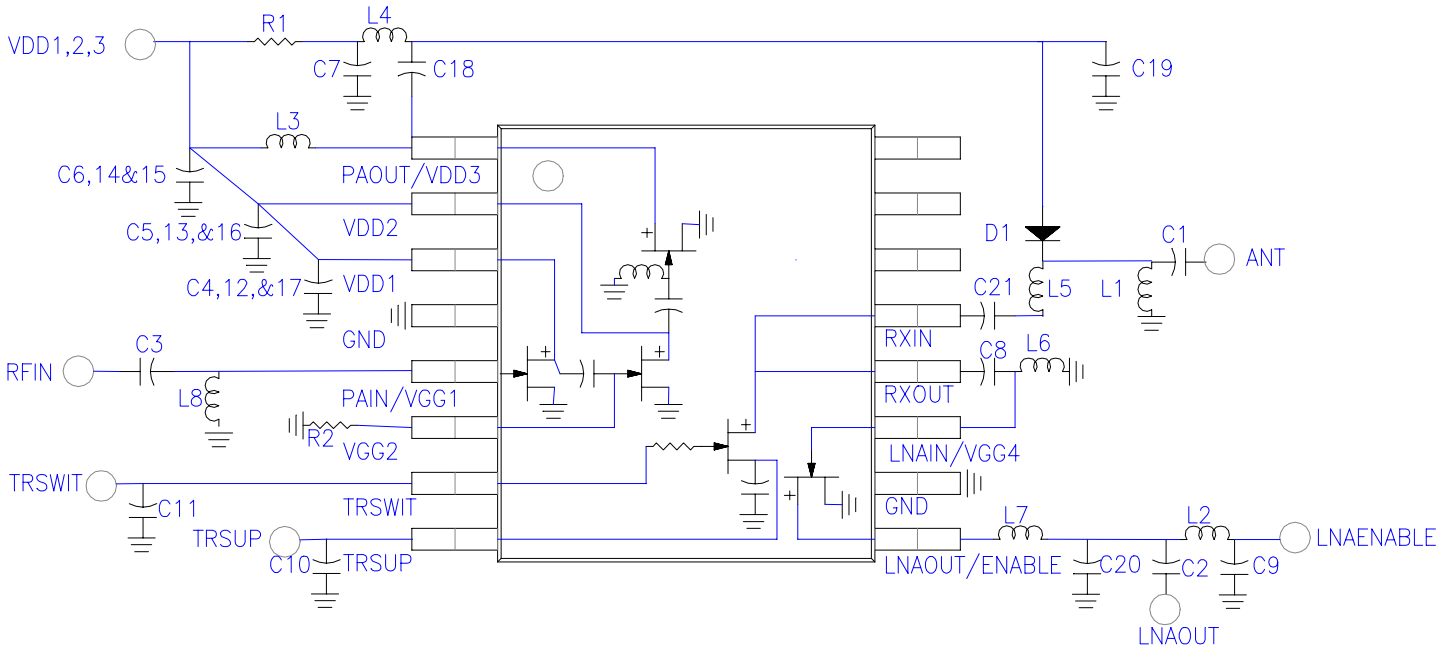

Figure 10. Evaluation Board Schematic

External components:

C1 – C11	MuRata 100 pF 0402 GRM36C0G101J50
C12 – C14	MuRata 0.1 µF 0402 GRM36X5R104K10
C15 – C17	MuRata 15 pF 0402 GRM36C0G150J50
C18	MuRata 1.0 pF 0402 GRM36C0G010C50
C19	Dielectric Laboratories 1.5 pF 0603 C06CF 1R5B5UL
C20	Dielectric Laboratories 1.5 pF 0603 C06CF 1R5B5UL
C21	MuRata 22pF 0402 GRM36C0G220G50
L1 – L4	Coilcraft 22 nH 0603 0603CS-22NXJBB
L5	Toko 3.9 nH 0603 LL1608-F3N9K
L6	Toko 1.8 nH 0603 LL1608-F1N8S
L7	Toko 3.3 nH 0402 LL1005-FH3N3KBULK
L8	Toko 1.5 nH 0603 LL1608-F1N5S
R1	Panasonic 301Ω 0603 ERJ-3EKF3010
R2	Panasonic 10 Ω 0603 ERJ-3EKF10RO
D1	Siemens PIN Diode BAR6303W

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ITT GaAsTEK TEST SET UPS

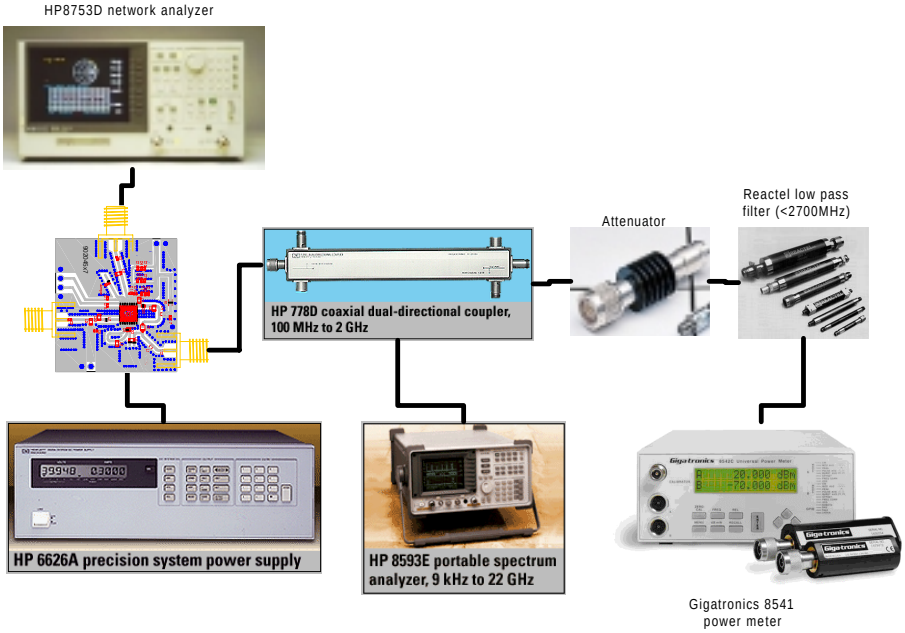

Figure 11. Transmit path power, current, and spurious.

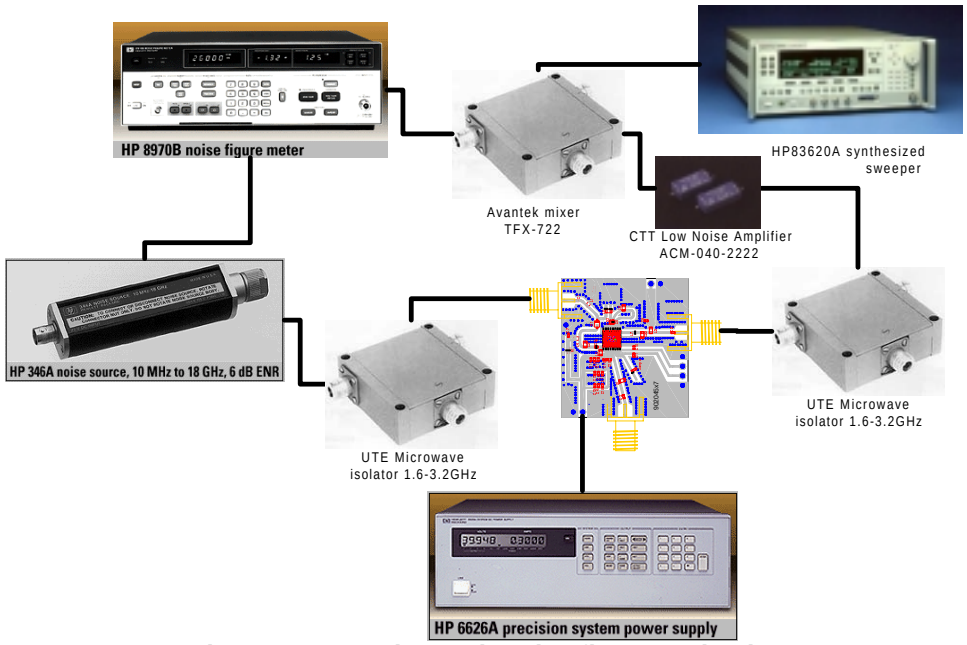

Figure 12. Receive path noise figure and gain.

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