Document information

Info	Content
Status	General Publication
Author(s)	Tyler Ware
Abstract	Measurement results of the BLF647P LDMOS Device in Board #AR212016 tuned for 30-520MHz at 28V

1 Revision History

Table 1. Report revisions

Revision No.	Date	Description	Author
1.0	20201105	Initial document	Tyler Ware
2.0	20220426	Updated Security Status	Tyler Ware

2 Contents

3 List of Figures

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5 General Description

The BLF647P is a 200W LDMOS RF power transistor for broadcast transmitter and industrial applications. The transistor is suitable for the frequency range HF to 1500MHz. The excellent ruggedness and broadband performance of this device makes it ideal for digital applications.

This report presents the measurement results of Demo Board AR212016 using the BLF674P. The demo achieves ≥ 50dBm across 30-520MHz at 28V.

6 Biasing

6.1 Bias Details

Vdd = 28V
Idq = 200mA

7 Test Bench Set Up

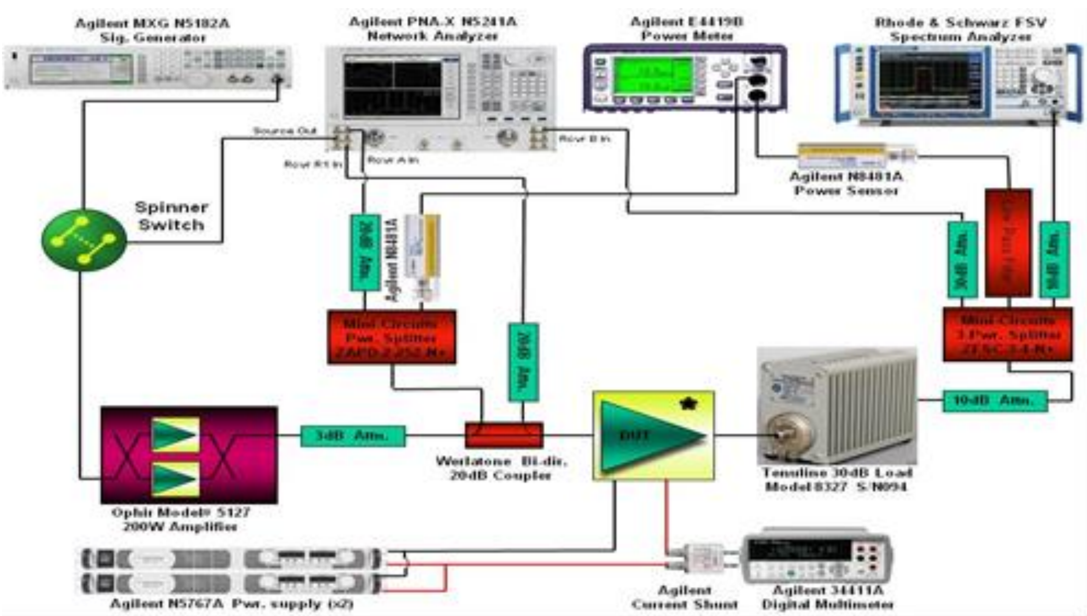

Figure 1.Test Bench Equipment set up

8 Performance Summary

Table 2. RF Performance, Frequency = 30-520MHz, CW

Parameter	Measurement	Unit
Specified frequency range	250	MHz
Drain voltage	28	V
Quiescent drain current	200	mA
Average P1dB	145.88	W
Average Efficiency at P1dB	71.46	%
Average Gain at P1dB	21.94	dB
Average Gain Flatness at P1dB	+/- 2	dB

AR212016_BLF647P_28_30-520MHz CW DriveUpData				
Freq(MHz)	P1.0dB	Pout(W)	P1dB Gain (dB)	P1dB Eff(%)
30	50.44	110.66	21.81	54.70
50	50.37	108.89	21.61	53.66
100	49.86	96.83	21.48	53.62
200	50.08	101.86	23.04	58.49
300	51.70	147.91	22.91	63.82
400	51.64	145.88	21.94	71.46
500	49.40	87.10	21.88	68.94
520	49.14	82.04	21.90	68.41
	P2.0dB	Pout(W)	P2dB Gain(dB)	P2dB Eff(%)
30	50.75	118.85	20.79	57.08
50	50.78	119.67	19.41	56.88
100	50.48	111.69	20.49	58.94
200	50.68	116.95	22.04	60.11
300	52.20	165.96	21.92	65.90
400	52.05	160.32	20.94	73.51
500	49.80	95.50	20.88	69.71
520	49.54	89.95	20.89	68.96
	P3.0dB	Pout(W)	P3dB Gain(dB)	P3dB Eff(%)
30	50.87	122.18	19.82	58.36
50	50.80	120.23	19.59	57.11
100	50.76	119.12	19.45	60.64
200	51.09	128.53	21.03	61.66
300	52.46	176.20	20.91	66.92
400	52.23	167.11	19.98	74.16
500	50.05	101.16	19.89	69.87
520	49.79	95.28	19.92	68.78

9 Performance Details

9.1 Small Signal Results

Vdd = 28V

Idq = 200mA

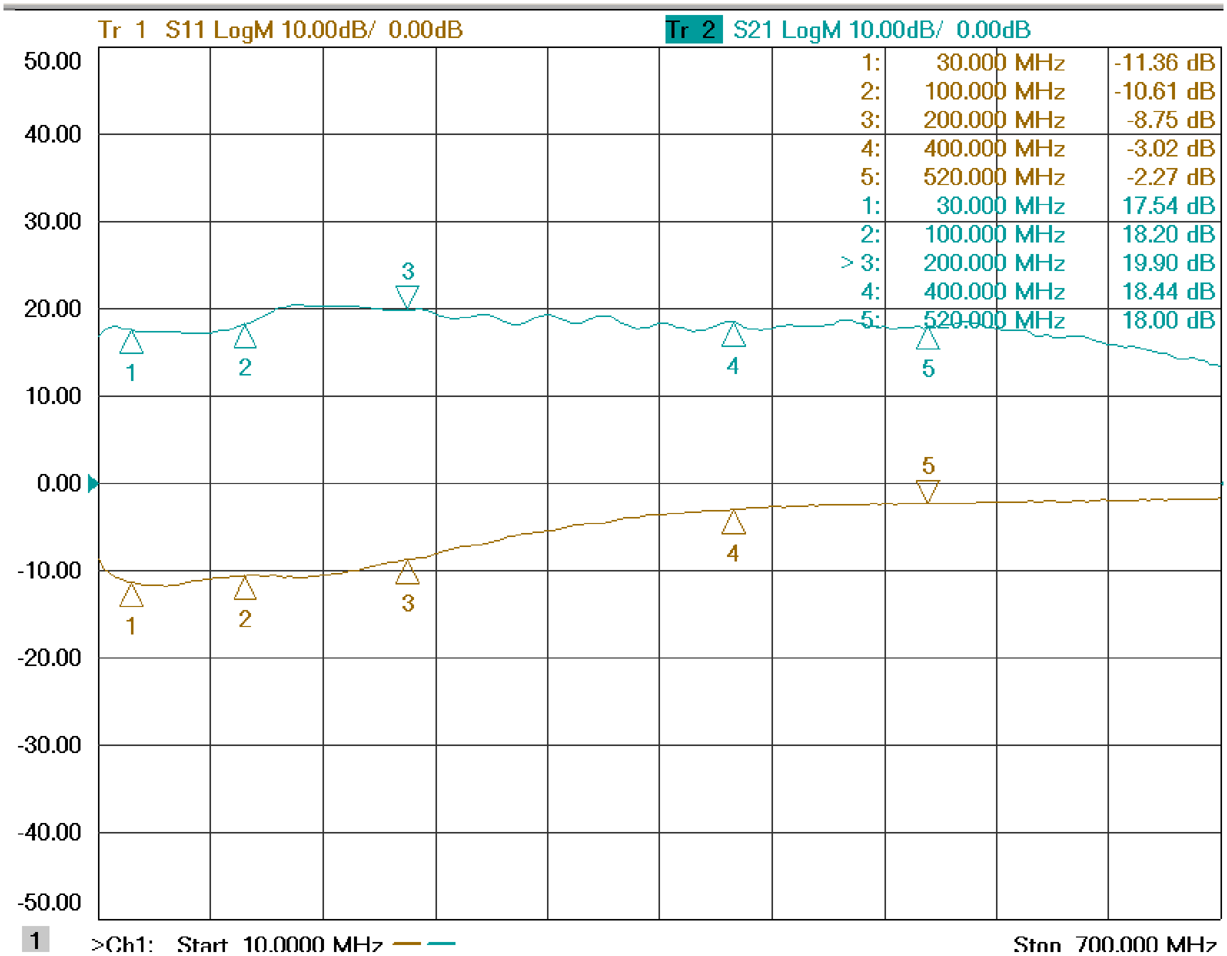

Figure 2. Small Signal results, Vdd=28V, Idq=200mA, Pin=10dBm

9.2 Pulsed Gain Sweeps

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, Pulse10%100uS, Pout=P3dB

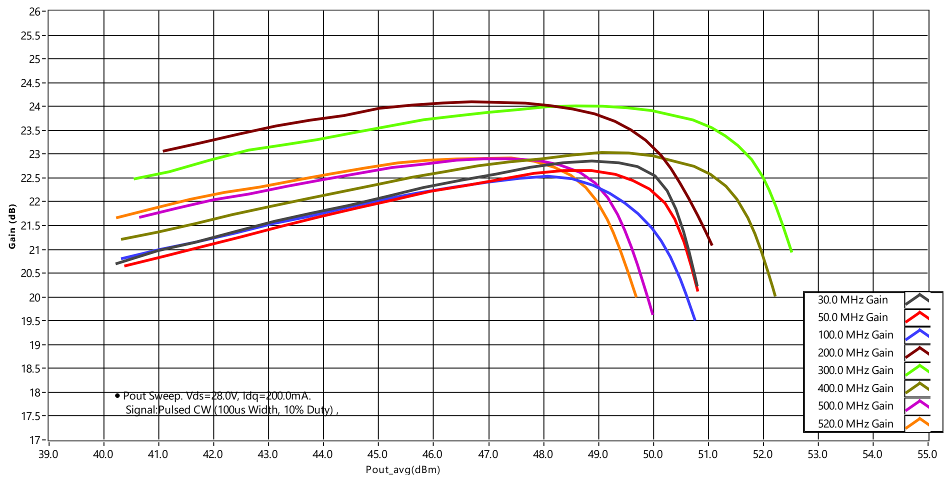

Figure 3. Pulsed Gain(dB) vs Power Out(dBm)

9.3 Pulsed Efficiency Sweeps

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, Pulse10%100uS, Pout=P3dB

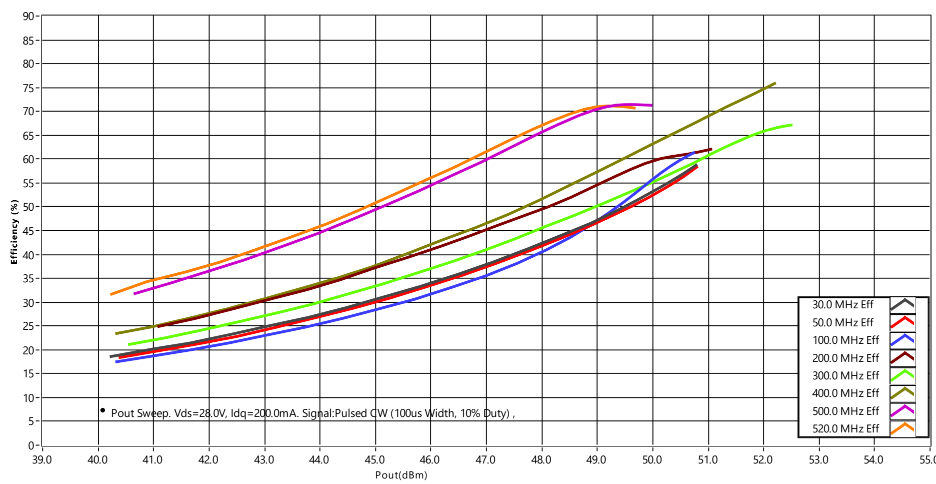

Figure 4. Pulsed Efficiency (%) vs Power Out(dBm)

9.4 CW Gain Sweeps

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, CW, Pout=P3dB

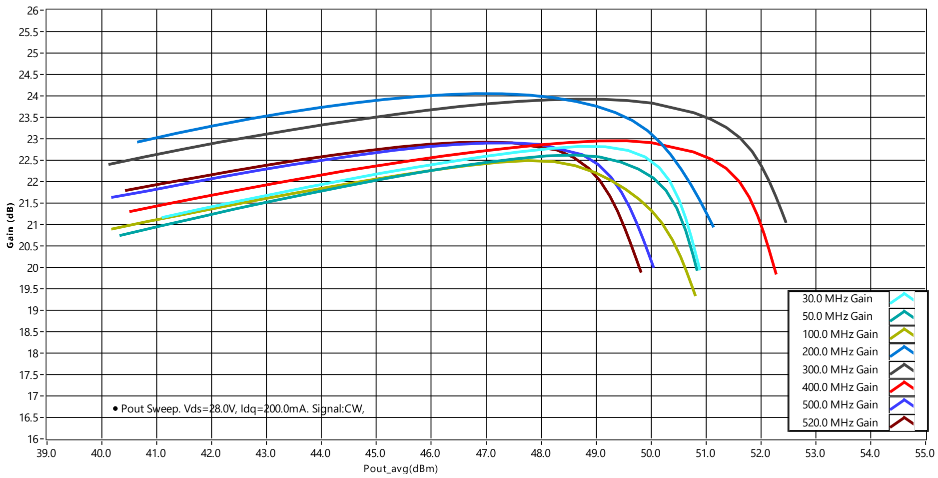

Figure 5. CW Gain(dB) vs Power Out(dBm)

9.5 CW Efficiency Sweeps

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, CW, Pout=P3dB

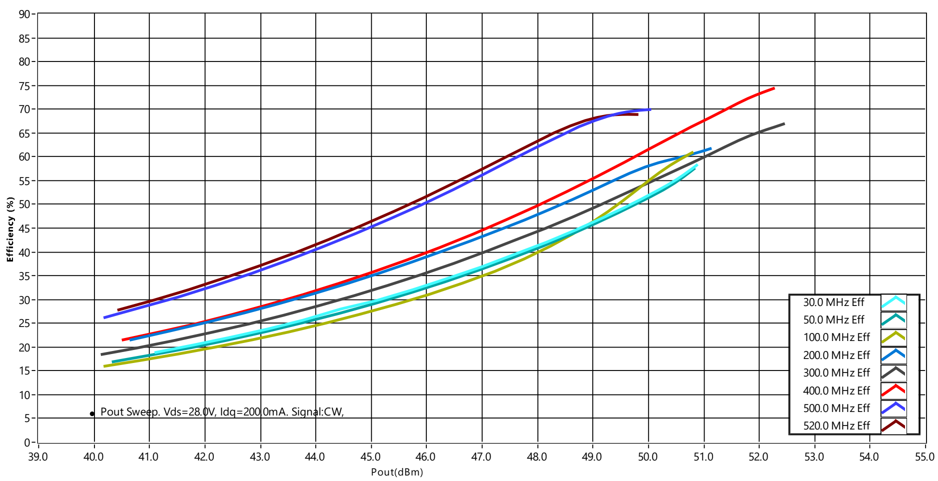

Figure 6. CW Efficiency (%) vs Power Out(dBm)

10 Fixed Power Out Results

10.1 Output Power v Frequency at P1dB

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, CW, **Pout=P1dB**

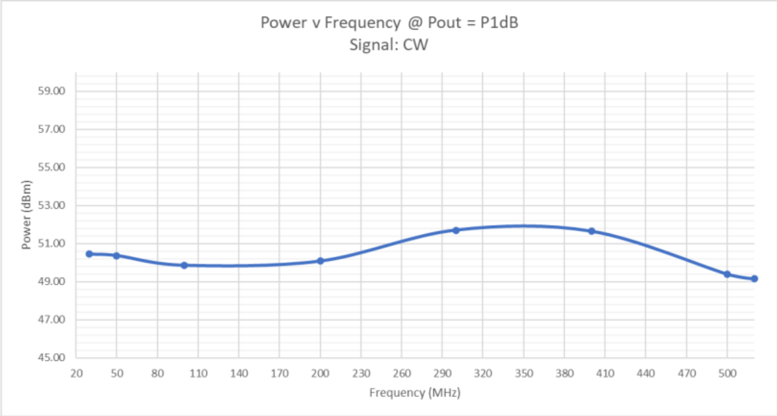

Figure 7. Output Power (dBm) vs Frequency (MHz) at P1dB

10.2 Output Power v Frequency at P3dB

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, CW, **Pout=P3dB**

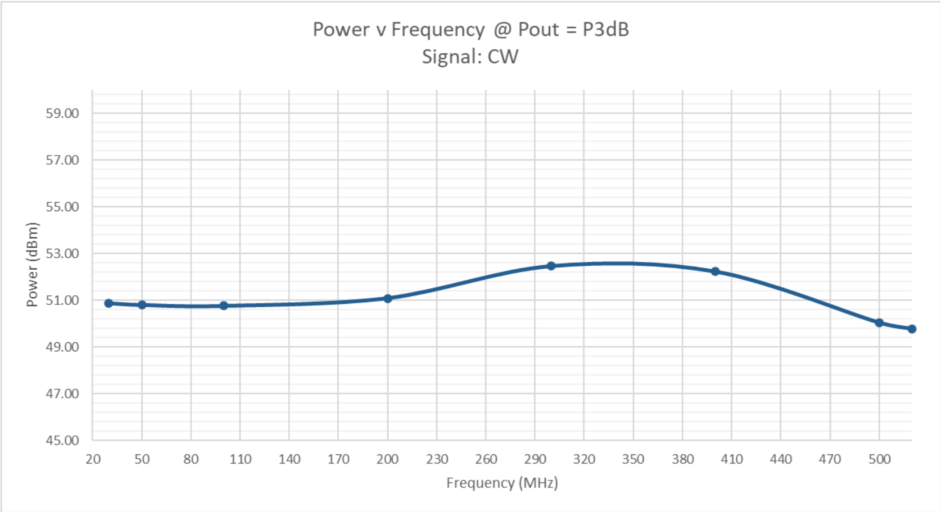

Figure 8. Output Power (dBm) vs Frequency (MHz) at P3dB

10.3 Gain v Frequency at P1dB

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, CW, **Pout=P1dB**

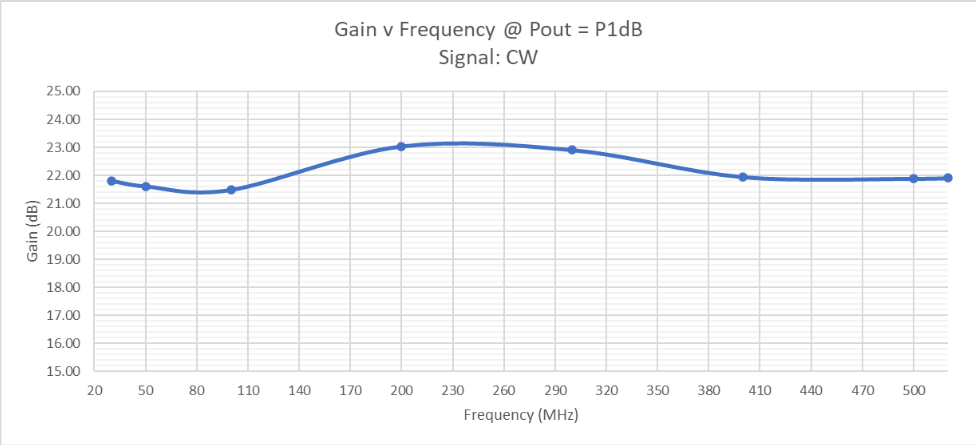

Figure 9. Gain (dB) vs Frequency (MHz) at P1dB

10.4 Efficiency v Frequency at P1dB

Vdd = 28V, Idq=200mA, Frequency=30-520MHz, CW, **Pout=P1dB**

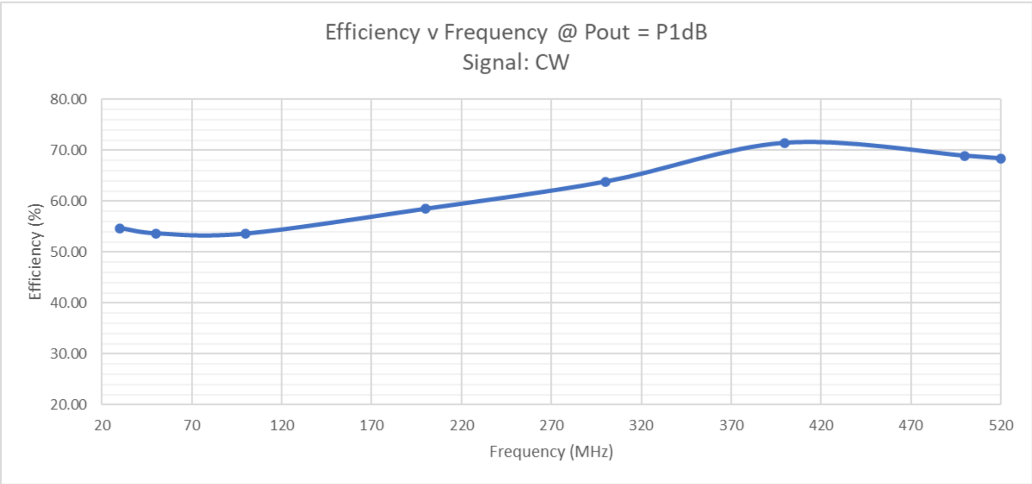

Figure 10. Efficiency (%) vs Frequency (MHz) at P1dB

11 Swept Voltage Results

11.1 Gain (dB) vs Output Power (dBm), Sweep Vdd

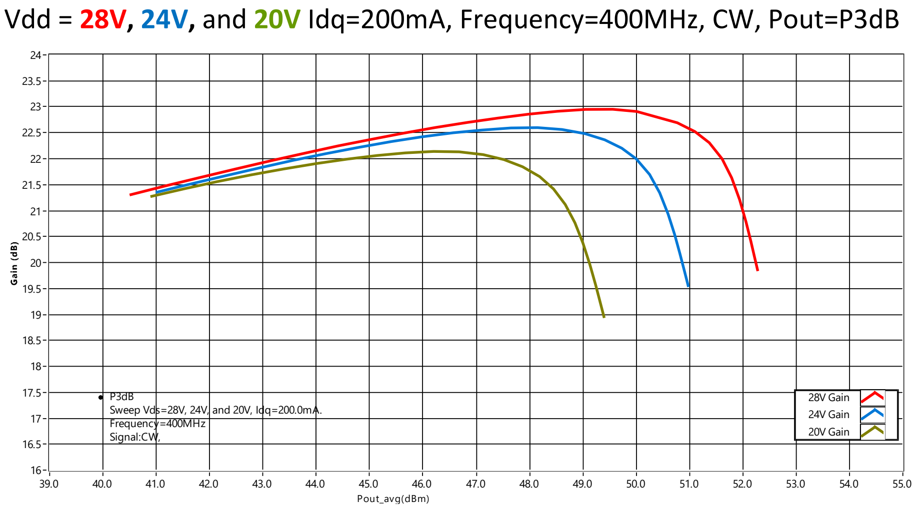

Figure 11. (Swept Voltage) Gain(dB) as a function of Output Power (dBm)

11.2 Efficiency (%) vs Output Power (dBm), Sweep Vdd

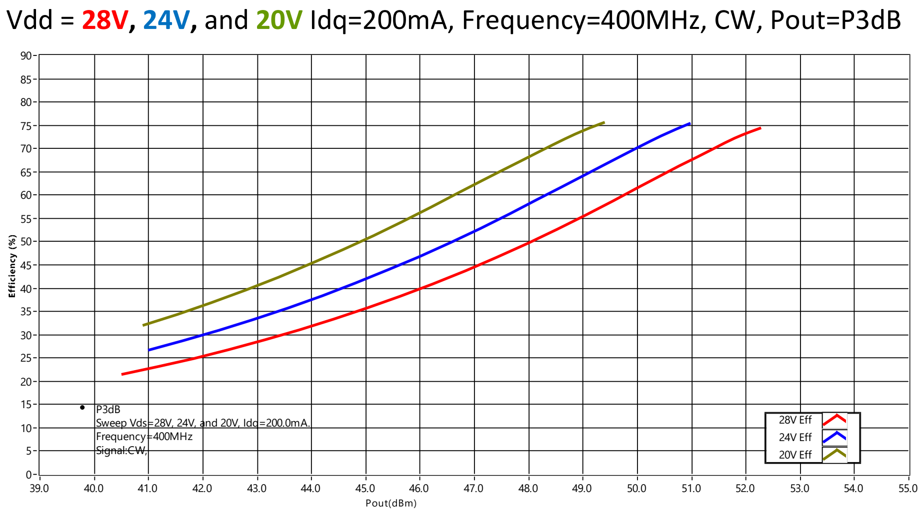

Figure 12. (Swept Voltage) Drain Efficiency(%) as a function of Output Power (dBm)

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12 Swept Bias Results

12.1 Gain (dB) vs Output Power (dBm), Sweep Idq

Vdd = 28V, Idq= **400mA**, **200mA**, and **50mA**; Frequency=400MHz, CW, Pout=P3dB

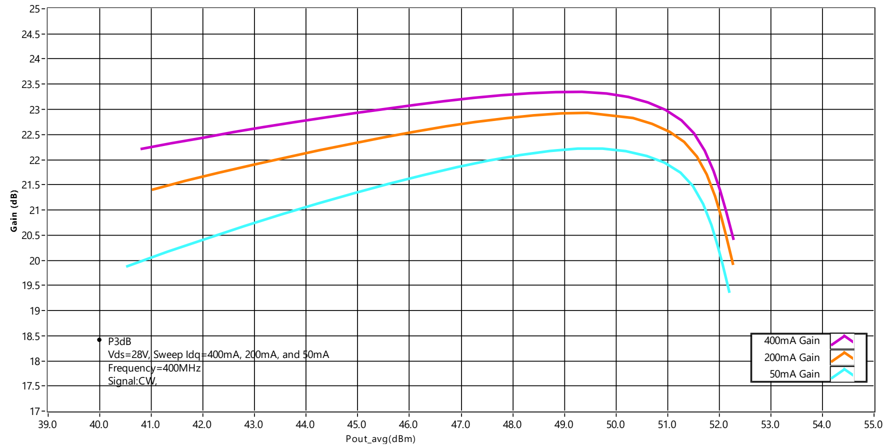

Figure 13. (Swept Bias) Gain(dB) as a function of Output Power (dBm)

12.2 Efficiency (%) vs Output Power (dBm), Sweep Idq

Vdd = 28V, Idq= **400mA**, **200mA**, and **50mA**; Frequency=400MHz, CW, Pout=P3dB

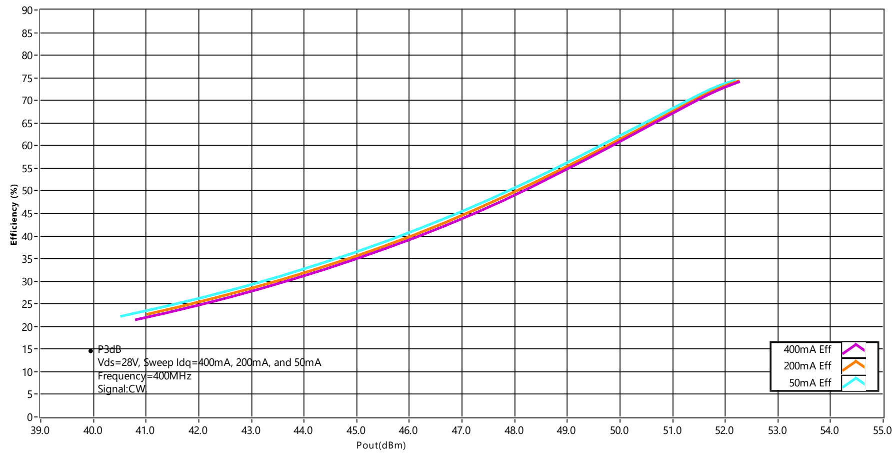

Figure 14. (Swept Bias) Drain Efficiency(%) as a function of Output Power (dBm)

13 Hardware

13.1 Board photograph

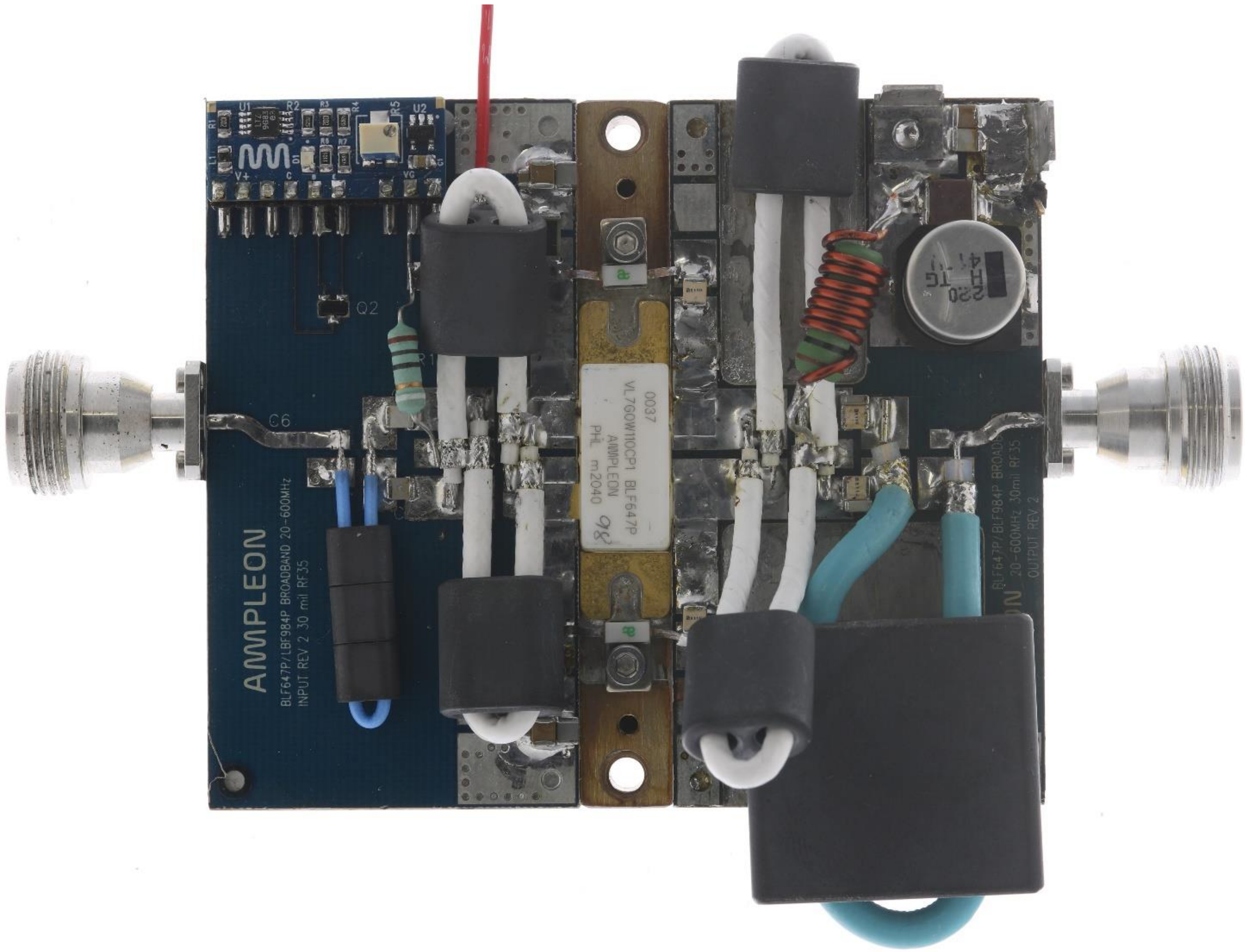

Figure 15. Board Photograph

13.2 Main PCB layout

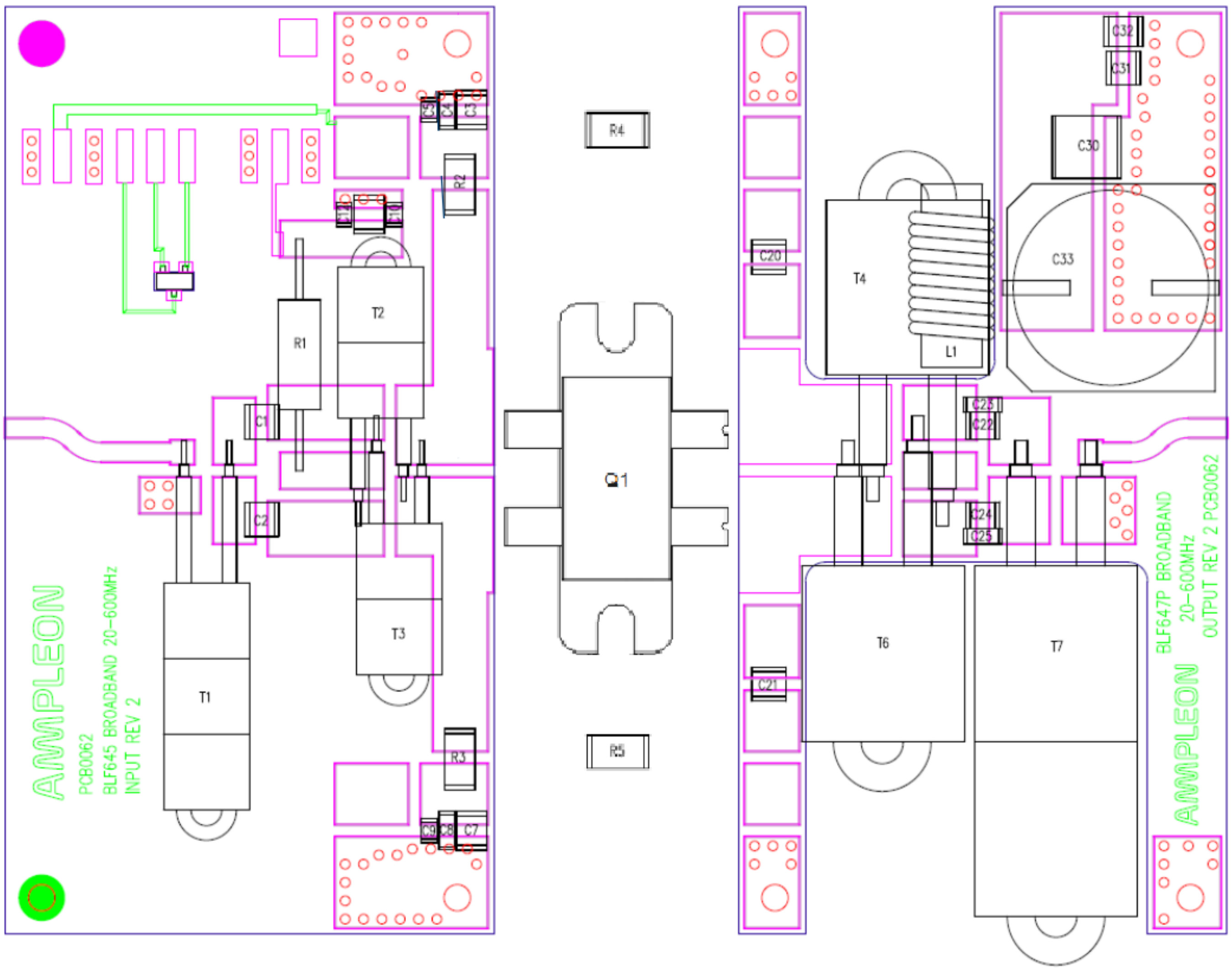

Figure 16. PCB Layout - Board #AR212016

13.3 Bill of Materials

Table 3. BOM

Designator	Description	Manufacturer	Part#
PCB Input PCB	Input PCB, 30mil thk. RF35	Avanti Circuits	PCB00062 Input Rev2
PCB Output PCB	Output PCB, 30 mil thk. RF35	Avanti Circuits	PCB00062 Output Rev2
A1	LDMOS bias module	Ampleon	CA-330-11
Q1	RF Transistor	Ampleon	BLF647P
Q2	2N2222 NPN Transistor	Fairchild	MMBT2222
R1	10Ω 0.5W5%	Generic	
R2, R3	20 Ω 5%	IMS	NADC-2010WA20R0J
R4,R5	200Ω	ATC	FR10300N0200J
R6	10 Ω 3W	Generic	
L1	8 turn 18AWG wrapped onto R6	Internal	
C5, C9, C12	100nF, 50V 10% X7R, 0805	Generic	
C1,C2,C3, C7, C11,C23,C25,C31	4.7nF,100V 5% NPO, 1210	Generic	
C4,C8,C10	10uF,100V 10% X7R, 1206	Generic	
C32	100nF,100V 10% X7R, 1210	Generic	
C30	10uF, 100V 10% X7S, 2220	TDK	C5750X7S2A106M
C20,C21,C22,C24	510pF, 500V 5%	Passive Plus or ATC	1111N or 100B
C33	220uF, 50V, alum electrolytic	Generic	
T1	1:1 Input Balun	Pasternack	55mm PE-P047 50 flexible ohm coax
		Fair-Rite	+ (3) Fair-Rite 2861002402 cores
T2, T3	4:1 input transformer	PCS	60mm TF-25 25 ohm flexible coax
		Fair-Rite	+1 Fair-Rite 2861000202 core each
T4, T6	4:1 output transformer	Comm. Concepts	3.5" TC-18 17 ohm coax
			+1 Fair-Rite 2861000202 core each
T7	1:1 output balun w 1 core	Micro Coax	4.1" UT-141 50 ohm coax
		Fair-Rite	with one BN-61-002 core

13.4 PCB materials

Table 4. Board Specifications

Parameter	Value
Manufacturer	Rogers
Type	30RF35
Thickness	30 mils, 1oz. copper
Layers	2, top/bottom. Bottom all copper

13.5 Device markings

Table 5. Device Specifications

Parameter	Value
Manufacturer	Ampleon
Device	BLF647P
Date Code	PHL M2040 VL7G0W110CP1

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