AR212082

ART1K6FH — **2-30MHz**

Document information

Info	Content
Status	General Publication
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Abstract	Measurement results of the ART1K6FH LDMOS Device in Board #AR212082 tuned for 2-30MHz at 50V

1 Revision History

Table 1. Report revisions

Revision No.	Date	Description	Author
1.0	20180608	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

This report presents the measurement results Demo Board AR212082 using the ART1K6FH. The demo achieves ≥ 59dBm CW at 2-30MHz.

6 Biasing

6.1 Bias Details

VDD =50V

IDQ =200mA

Bias Module must be supplied with external 5V

7 Test Bench Set Up

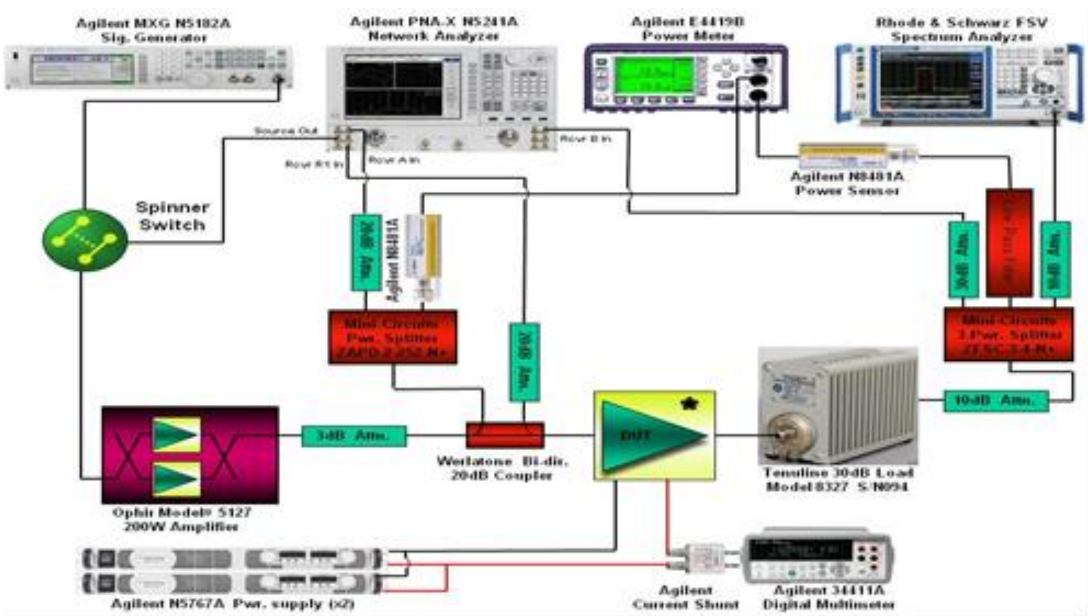

Figure 1.Test Bench Equipment set up

Demo was screwed down to a liquid cold plate with external cooling fan for testing

8 Performance Summary

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

Parameter	Measurement	Unit
Specified frequency	15MHz	MHz
Drain voltage	50	V
Quiescent drain current	200	mA
P3dB	868.96	W
Efficiency at P3dB	63.02	%
Gain at P3dB	23.23	dB

Based on Advanced Rugged Technology (ART), this 1600 W LDMOS RF power transistor has been designed to cover a wide range of applications for ISM, broadcast, and communications. The unmatched transistor has a frequency range of 1MHz to 425MHz

AR212082_ART1K6FH_50_2-30MHz CW DriveUpData				
Freq(MHz)	P1.0dB	Pout(W)	P1dB Gain (dB)	P1dB Eff(%)
2	60.02	1004.62	27.86	63.97
10	59.03	799.83	25.94	58.31
15	58.71	743.02	25.23	55.74
20	59.02	797.99	24.73	60.56
30	58.82	762.08	23.77	53.35
	P2.0dB	Pout(W)	P2dB Gain(dB)	P2dB Eff(%)
2	60.31	1073.99	26.85	67.14
10	59.46	883.08	24.94	62.02
15	59.04	801.68	24.25	58.88
20	59.46	883.08	23.75	63.76
30	59.13	818.46	21.54	57.15
	P3.0dB	Pout(W)	P3dB Gain(dB)	P3dB Eff(%)
2	60.52	1127.20	25.89	69.52
10	59.77	948.42	23.96	65.23
15	59.39	868.96	23.23	63.02
20	59.60	912.01	22.75	64.73
30	59.14	820.35	21.72	57.09

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9 Performance Details

9.1 Small Signal Results

Vdd=50V, Idq=200mA, Pin=10dBm

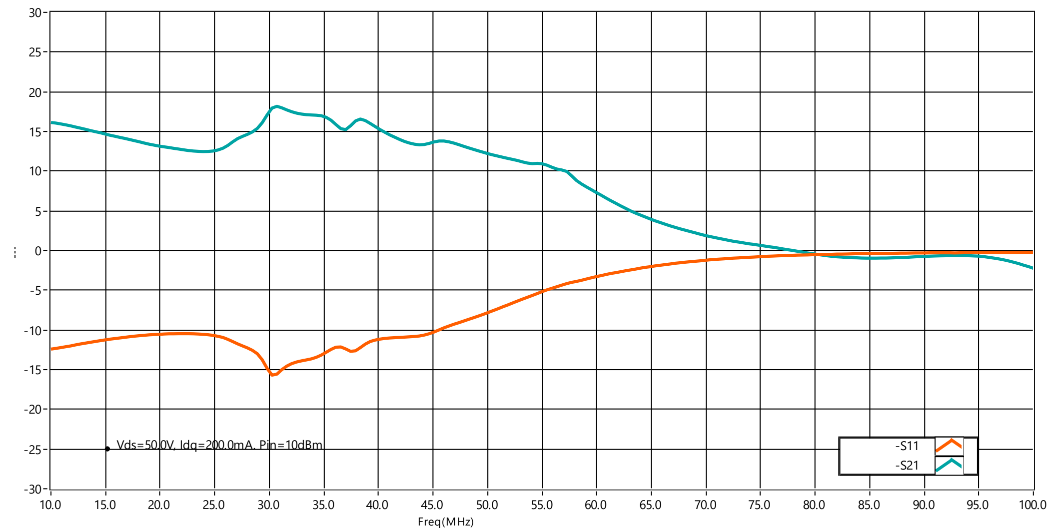

Figure 2. Small Signal results, Vdd=50V, Idq=200mA, Pin=10dBm

9.2 Pulse Gain

Vdd = 50V, Idq=200mA, 100uS Pulse Width 10% Duty, Frequency=2-30MHz

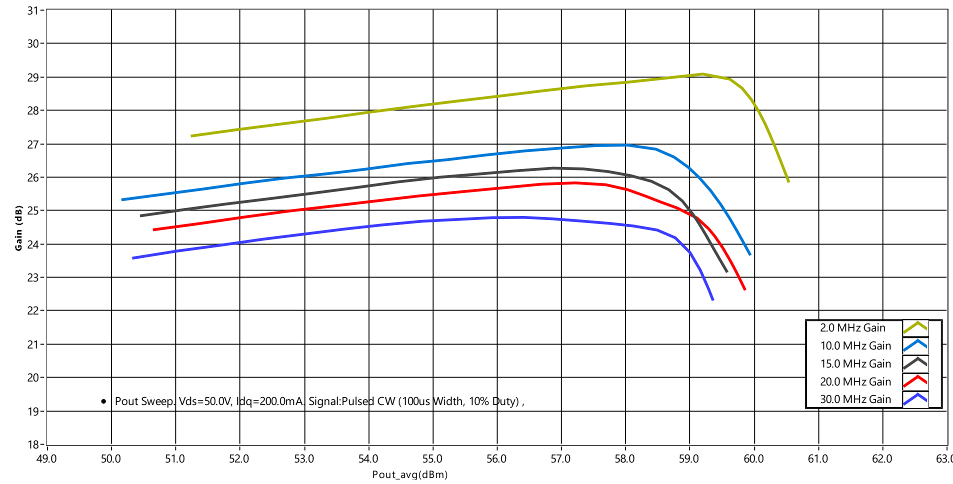

Figure 3. Pulse Gain (dB) vs Power Out(dBm)

9.3 Pulse Efficiency

Vdd = 50V, Idq=200mA, 100uS Pulse Width 10% Duty, Frequency=2-30MHz

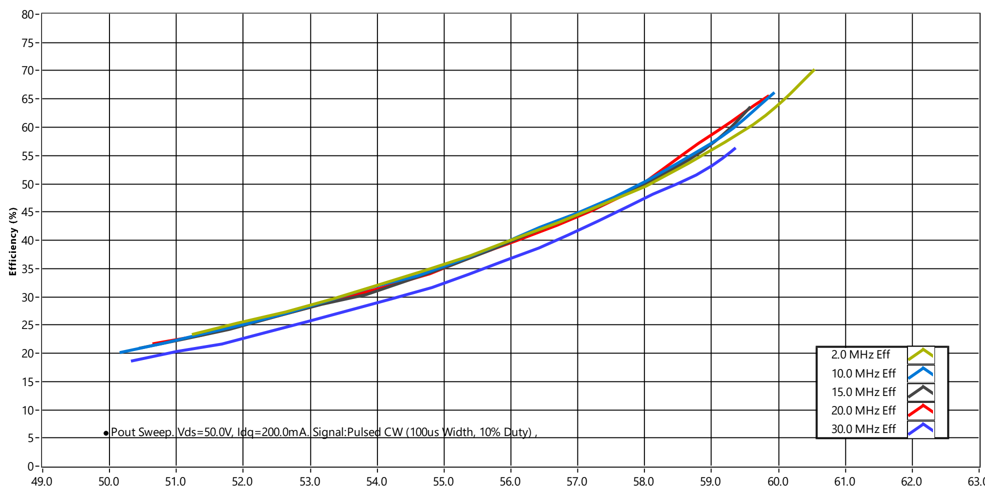

Figure 4. Pulse Efficiency(%) vs Power Out(dBm)

9.4 CW Gain

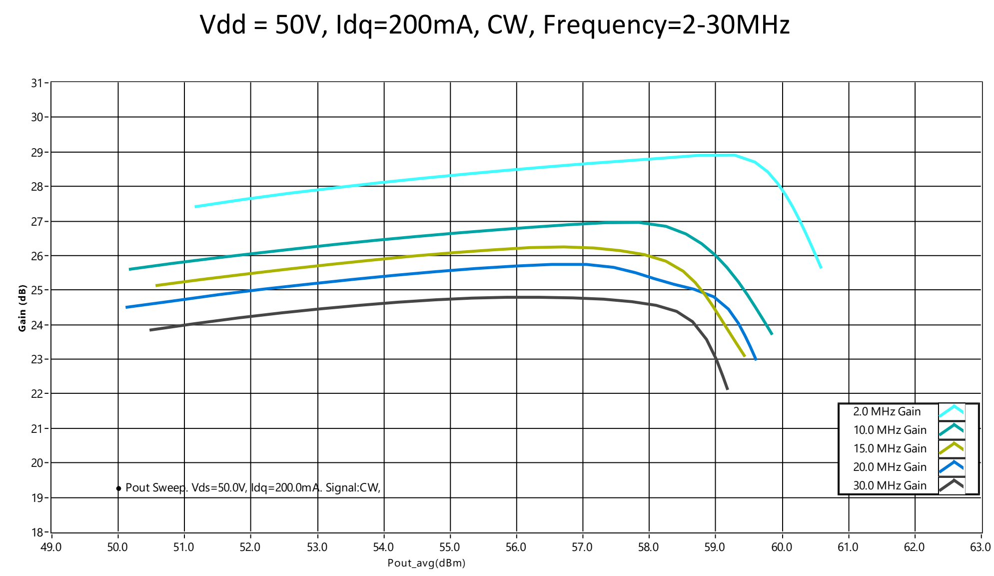

Figure 5. CW Gain (dB) vs Power Out(dBm)

9.5 CW Efficiency

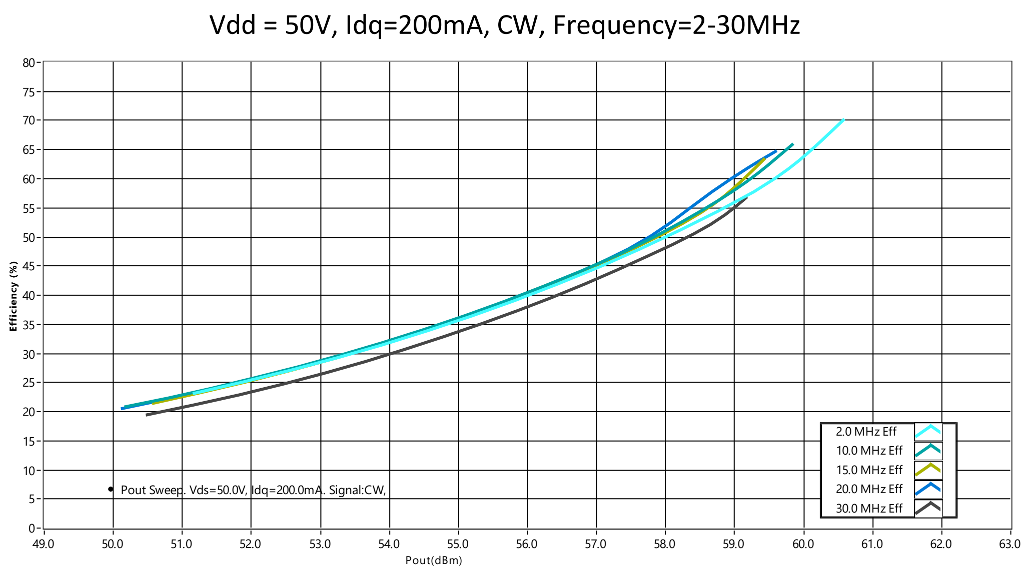

Figure 6. CW Efficiency(%) vs Power Out(dBm)

10 Fixed Power Out Results

10.1 Output Power vs Frequency at P1dB

Vdd = 50V, Idq=200mA, CW, Frequency=2-30MHz, **Pout=P1dB**

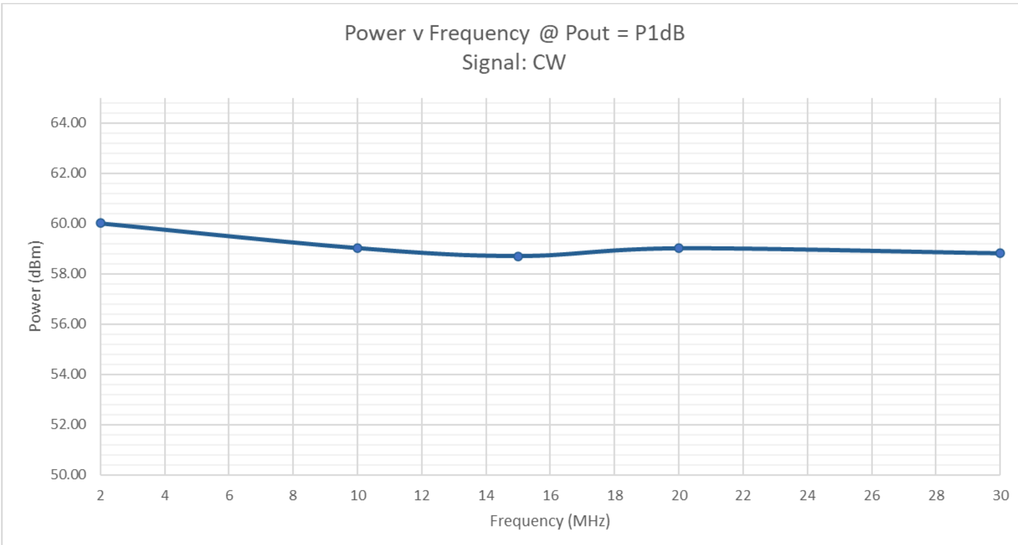

Figure 7. Output Power vs Frequency at Pout=P1dB

10.2 Output Power vs Frequency at P3dB

Vdd = 50V, Idq=200mA, CW, Frequency=2-30MHz, **Pout=P3dB**

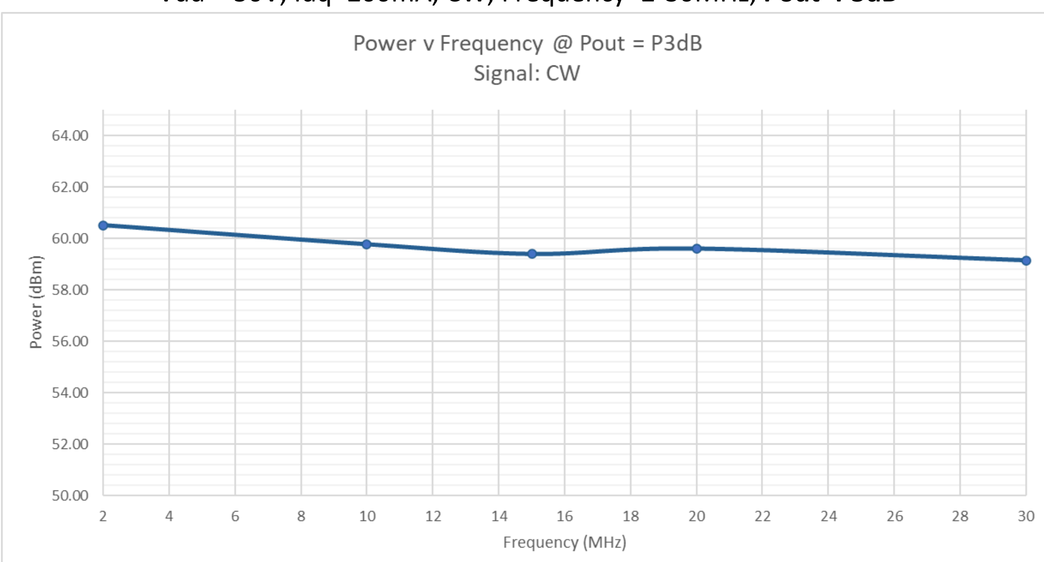

Figure 8. Output Power vs Frequency at Pout=P3dB

10.3 Gain vs Frequency at P3dB

Vdd = 50V, Idq=200mA, CW, Frequency=2-30MHz, **Pout=P1dB**

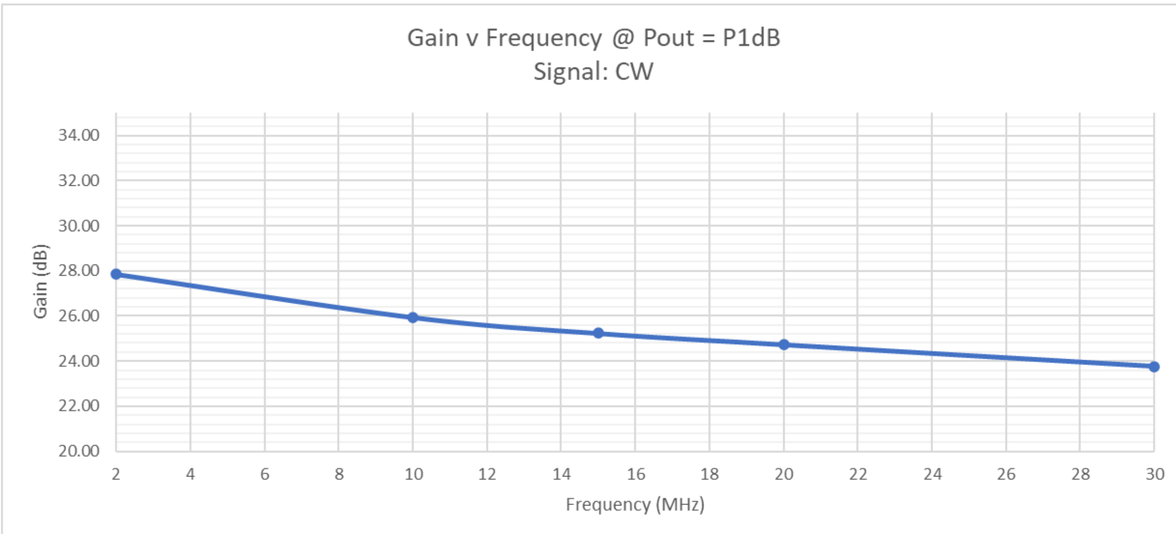

Figure 9. Gain(dB) vs Power Out(dBm) at P1dB

10.4 Efficiency vs Frequency at P3dB

Vdd = 50V, Idq=200mA, CW, Frequency=2-30MHz, **Pout=P1dB**

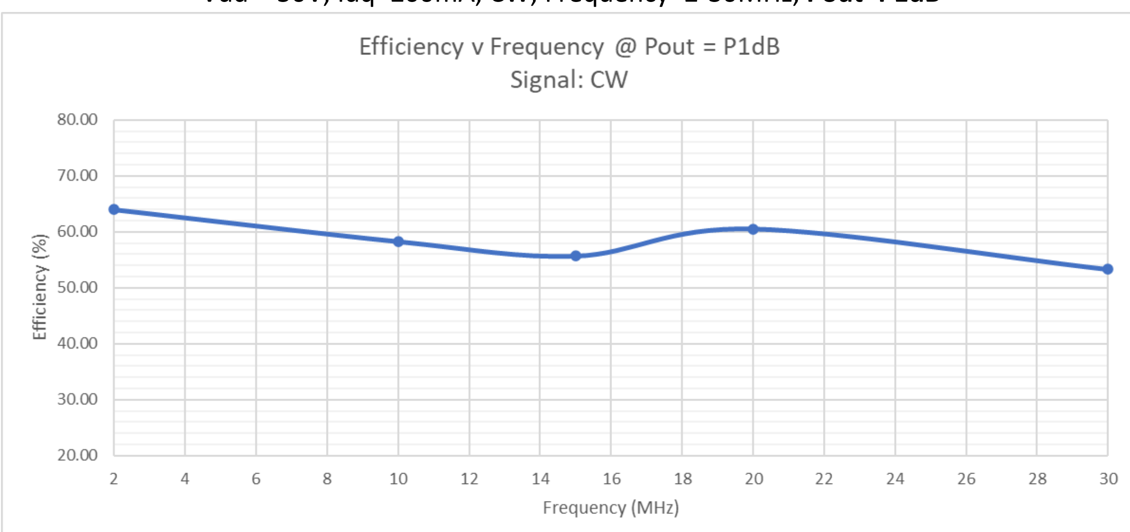

Figure 10. Efficiency(%) vs Power Out(dBm) at P1dB

11 Swept Voltage Results

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

Vdd varied 55V, 50V, 45V; Idq=200mA, Frequency=15MHz, 100uS Pulse Width 10% Duty, Pout=P3dB

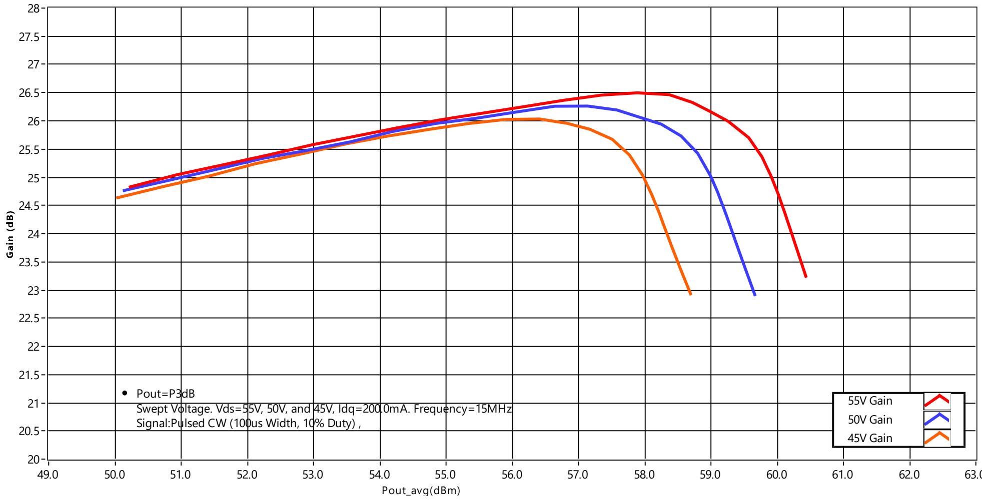

Figure 11. (Swept Voltage) Gain(dB) as a function of Output Power (dBm)

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

Vdd varied 55V, 50V, 45V; Idq=200mA, Frequency=15MHz, 100uS Pulse Width 10% Duty, Pout=P3dB

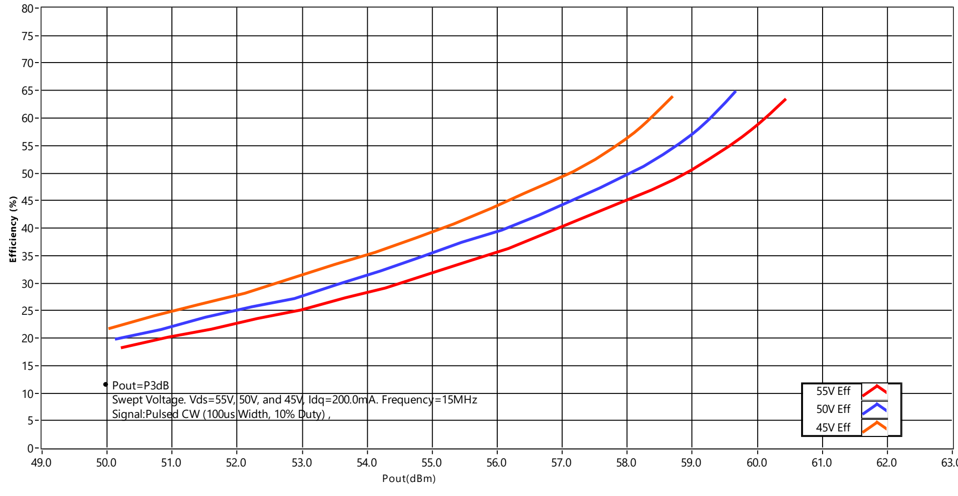

Figure 12. (Swept Voltage) Drain Efficiency(%) as a function of Output Power (dBm)

12 Swept Bias Results

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

Vdd=50V, Bias varied **600mA, 200mA, 50mA**; Frequency= 15MHz, 100uS Pulse Width 10% Duty, Pout = P3dB

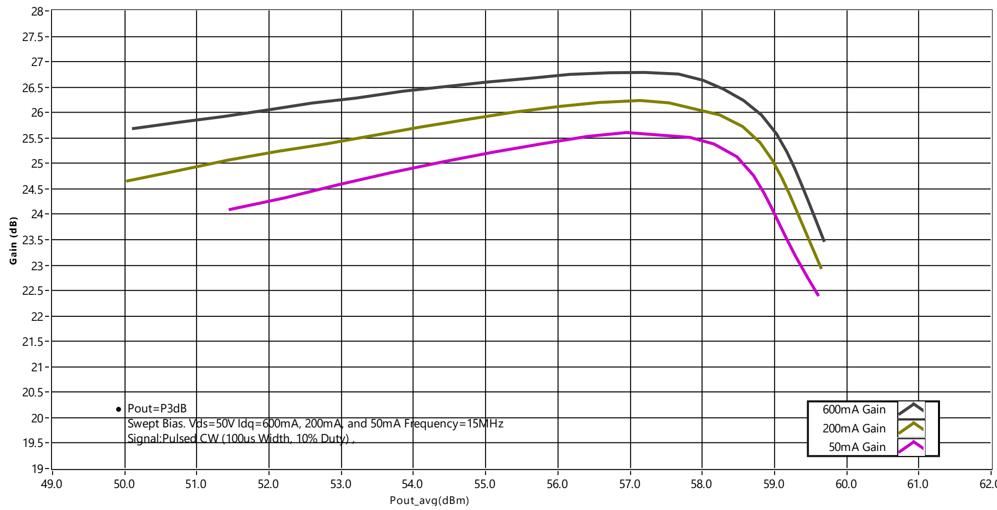

Figure 13. (Swept Bias) Gain(dB) as a function of Output Power (dBm)

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

Vdd=50V, Bias varied **600mA, 200mA, 50mA**; Frequency= 15MHz, 100uS Pulse Width 10% Duty, Pout = P3dB

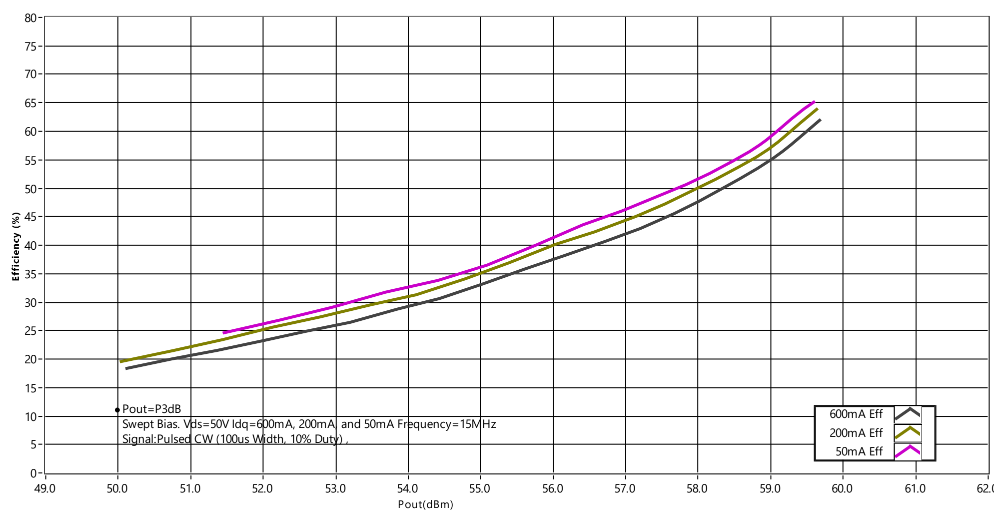

Figure 14. (Swept Bias) Drain Efficiency(%) as a function of Output Power(dBm)

13 Hardware

13.1 Board photograph

Figure 15. Board Photograph

13.2 PCB layout

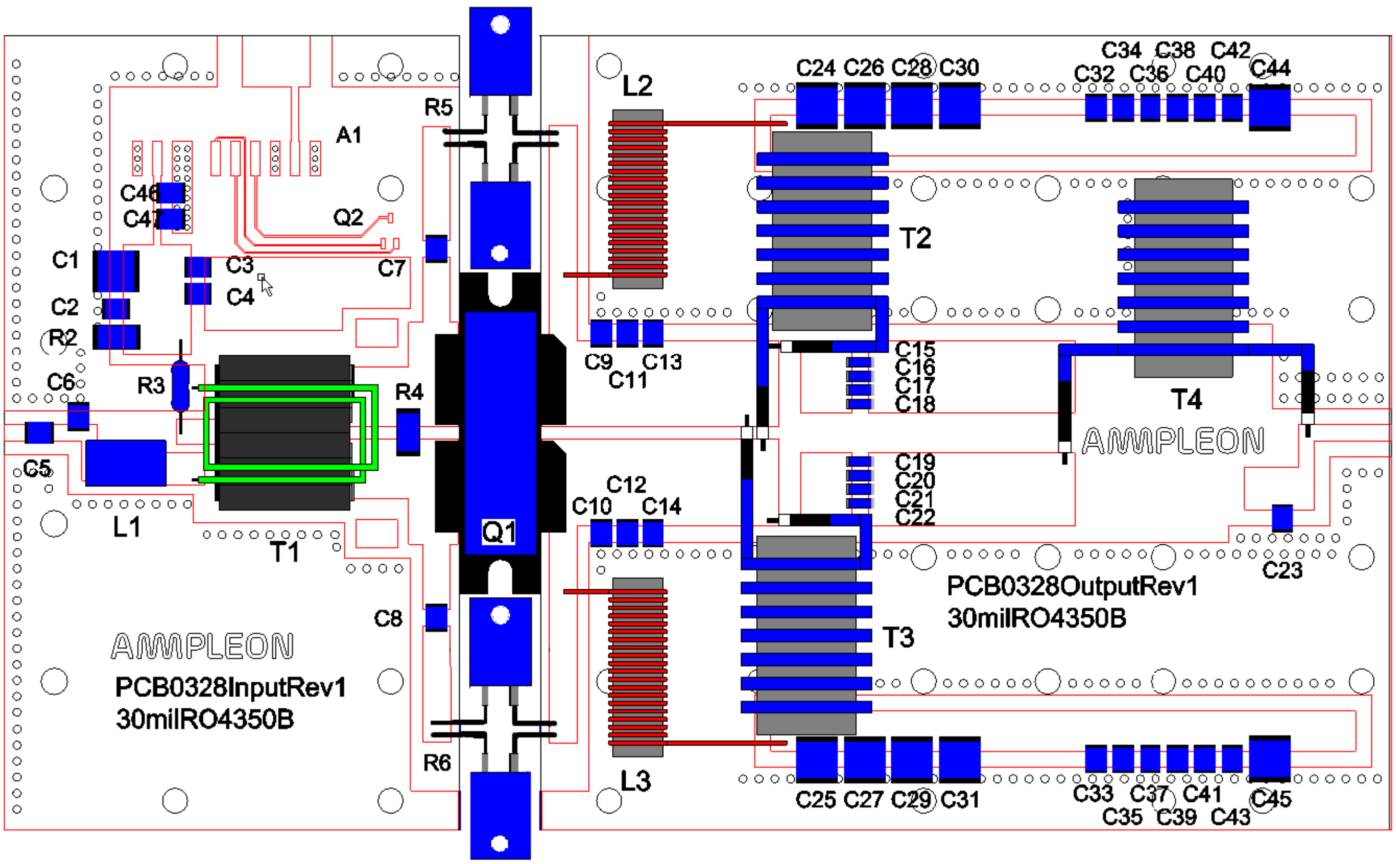

Figure 16. PCB Layout Board #AR212082

13.3 Bill of materials

Table 3. BOM

Designator	Description	Part #	Manufacturer
PCB	Rogers RO4350B, Er = 3.5, 30mils, 1oz	PCB0328 Rev1	Rogers
Q1	ART1K6FH LDMOS Transistor	ART1K6FH	Ampleon
Q2	NPN Transistor	MMBT2222	Fairchild
A1	LDMOS Bias Board	CA-330-11	Ampleon
R1	0Ω 2010		Generic
R2	10KΩ 2010		Generic
R3	10Ω Leaded		Generic
R4	50Ω, Power Resistor	NDC-2010WA50R0J	IMS
R5,R6	2X 200Ω, 30W, 1%, Power Film, Leaded	MP930-200-1	Caddock
L1	169nH	132-12SMGL	Coilcraft
L2, L3	8 Turn 14 AWG Magnet Wire on Toroid		
L4	141nH	1212VS-141	Coilcraft
T1	4:1 RF Transformer	RF600 Material 43	RF Power Systems
T2 & T3	1:9 Transmission Line Transformer		
T4	Balun		
C1, C24-C31, C44-C45	10uF 2220 100V 10%	C5750X7S2A106K230KE	TDK
C2, C40-C43	1uF 1210 100V 10%	GRM32ER72A105KA01L	Murata
C3, C36-C39	0.1uF 1210 250V 10%	GRM32DR72E104KW01L	Murata
C4, C5, C15-C22, C32-C35	10nF 1210 250V 5%	C3225C0G2E103J160AA	TDK
C7-C8	1000pF 1111 50V 2%	1111N102GW500	Passive Plus
C9-C14	180pF 1111 500V 2%	1111N181GW501	Passive Plus
C6	82pF 1111 500V 2%	1111N820GW501	Passive Plus
C23	10pF 1111 500V 2%	1111N100GW501	Passive Plus
Details for L2 & L3	14 AWG Magnet Wire, 8 Turns		Belden
	1 x Toroid, Material 61 (μ=125):	FT-140-61	Amidon
Details for T2 & T3:	17Ω Coax (23") 7 Turns	TC-18	RF Power Systems
	2 x Toroids, Material 43 (μ=800):	FT-140-43	Amidon
Details for T4:	50Ω Coax (23") 6 Turns		
	2 x Toroids, Material 43 (μ=800):	FT-140-43	Amidon

13.4 PCB materials

Table 4. Board Specifications

Parameter	Value
Manufacturer	Rogers
Type	4350B
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	ART1K6FH
Date Code	PHL 2044

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