Document information

Info	Content
Status	General Publication
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Abstract	Measurement results of the ART700FHG LDMOS Device in Board #AR212139 tuned for 88-108MHz at 50V

1 Revision History

Table 1. Report revisions

Revision No.	Date	Description	Author
1.0	20220124	Initial document	Tyler Ware

2 Contents

3 List of Figures

4 List of Tables

5 General Description

This report presents the measurement results of Demo Board AR212139 using the ART700FHG. The demo achieves ≥ 58.45dBm CW at 88-108MHz at 50V.

6 Biasing

6.1 Bias Details

VDD =50V
IDQ =200mA

7 Test Bench Set Up

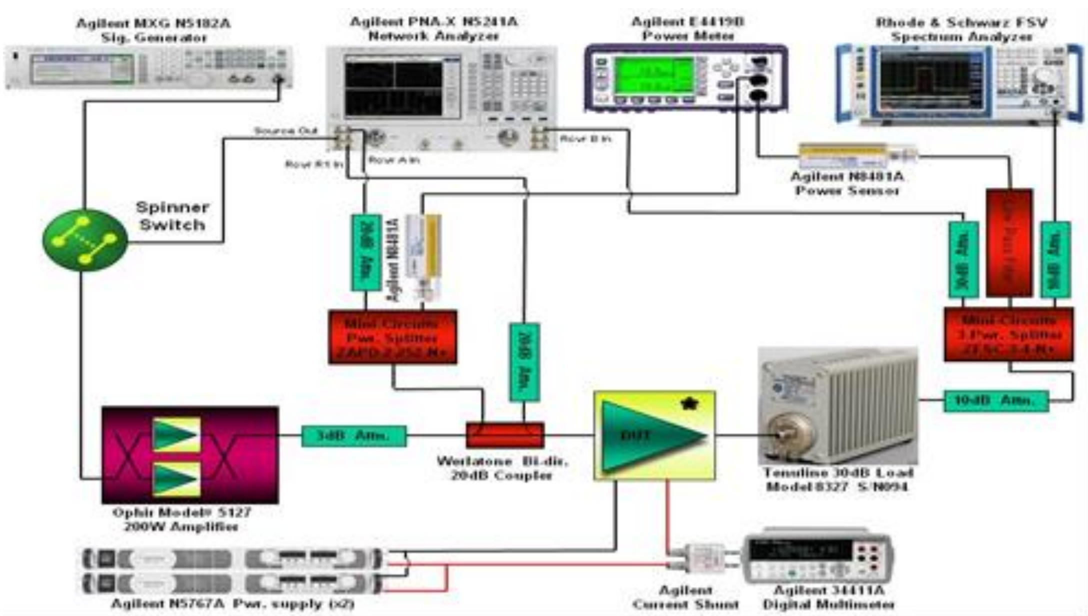

Figure 1.Test Bench Equipment set up

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

8 Performance Summary

Table 2. RF Performance, Frequency = 88-108MHz, Signal: CW

Parameter	Measurement	Unit
Specified frequency	98	MHz
Drain voltage	50	V
Quiescent drain current	200	mA
P3dB	712.85	W
Efficiency at P3dB	80.82	%
Gain at P3dB	21.57	dB

Based on Advanced Rugged Technology (ART), this 700 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 1 MHz to 425 MHz

AR212139_ART700PE_50_88-108MHz_CW DriveUpData				
Freq(MHz)	P1.0dB	Pout(W)	P1dB Gain (dB)	P1dB Eff(%)
88	56.23	419.76	23.54	64.50
93	56.71	468.81	23.68	67.70
98	57.01	502.34	23.56	69.04
103	57.13	516.42	23.37	68.08
108	56.97	497.74	23.19	65.62
Freq(MHz)	P2.0dB	Pout(W)	P2dB Gain (dB)	P2dB Eff(%)
88	57.62	578.10	22.54	74.40
93	57.77	598.41	22.68	75.62
98	58.01	632.41	22.56	76.21
103	58.03	635.33	22.37	74.88
108	57.81	603.95	22.19	71.79
Freq(MHz)	P3.0dB	Pout(W)	P3dB Gain (dB)	P3dB Eff(%)
88	58.43	696.63	21.55	81.22
93	58.41	693.43	21.69	80.87
98	58.53	712.85	21.57	80.82
103	58.56	717.79	21.37	79.05
108	58.40	691.83	21.20	76.69

9 Performance Details

9.1 Small Signal Results

Vdd=50V, Idq=600mA, Pin=0dBm

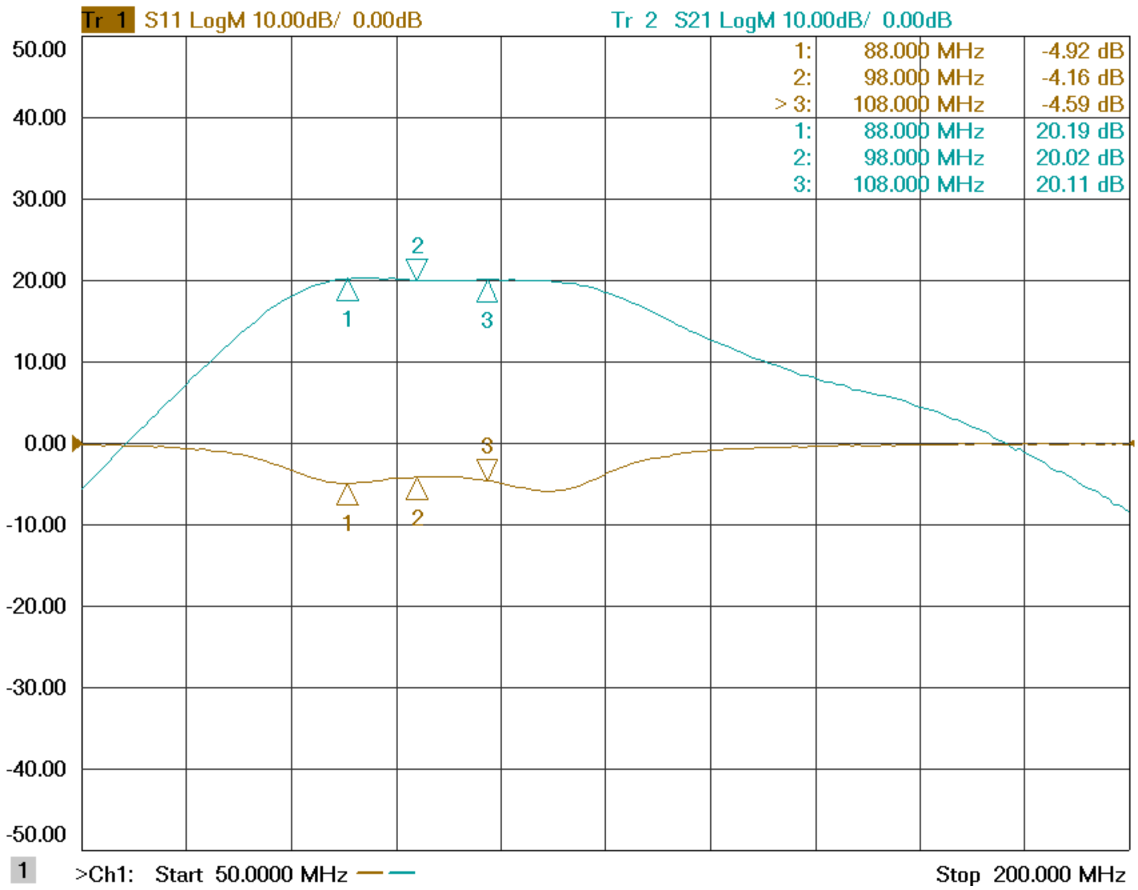

Figure 2. Small Signal results, Vdd=50V, Idq=600mA, Pin=0dBm

9.2 CW Gain

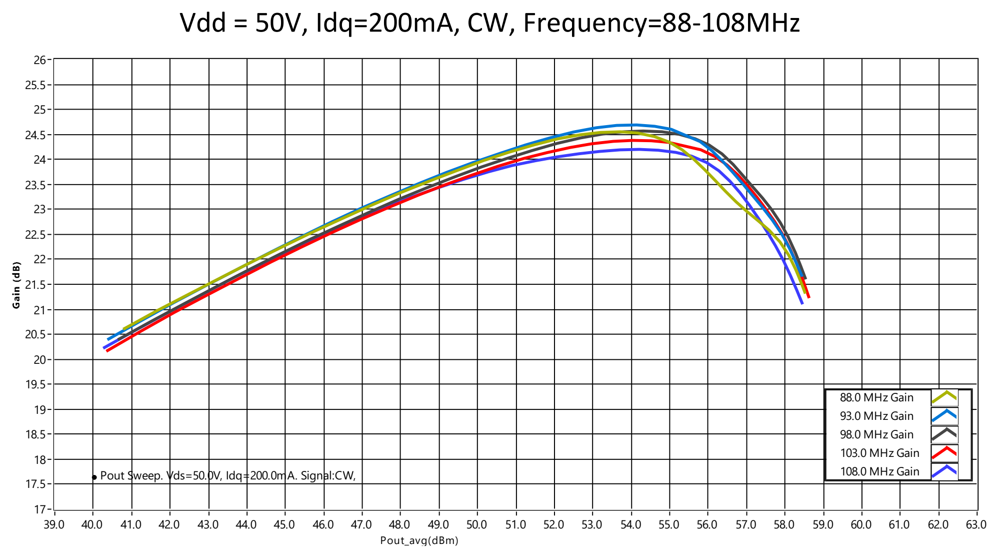

Figure 3. CW Gain (dB) vs Power Out(dBm)

9.3 CW Efficiency

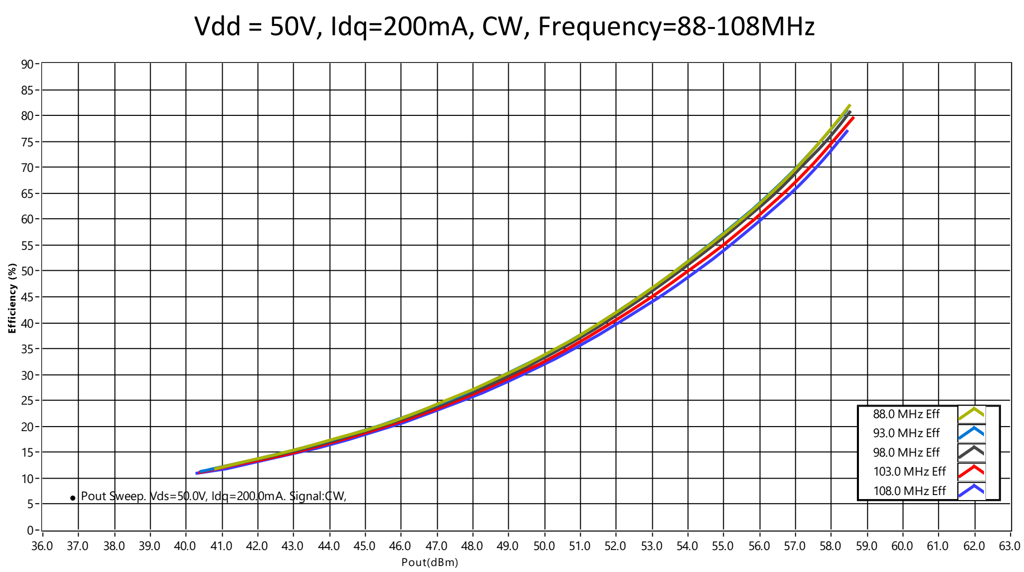

Figure 4. CW Efficiency(%) vs Power Out(dBm)

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9.1 Pulse Gain

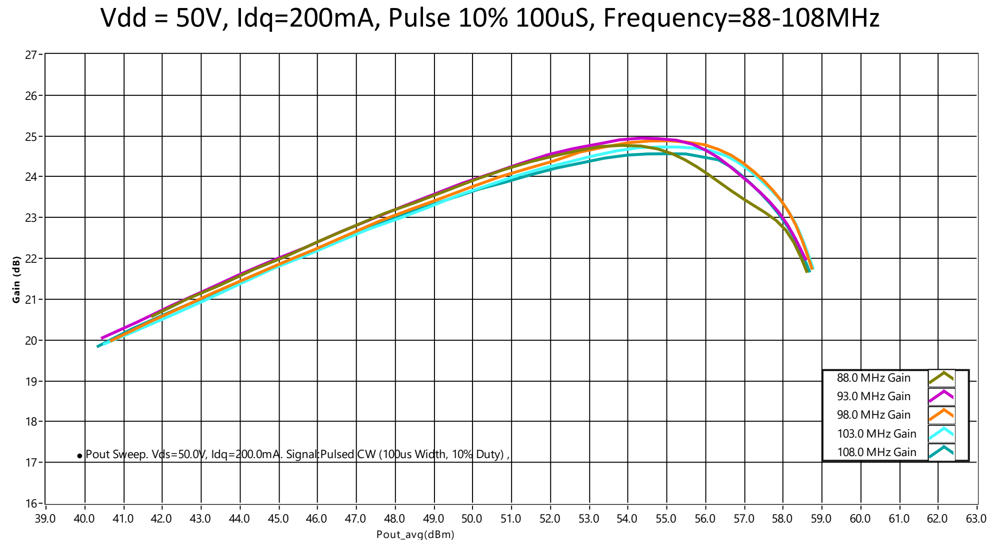


Figure 5. Pulse Gain (dB) vs Power Out(dBm)

9.2 Pulse Efficiency

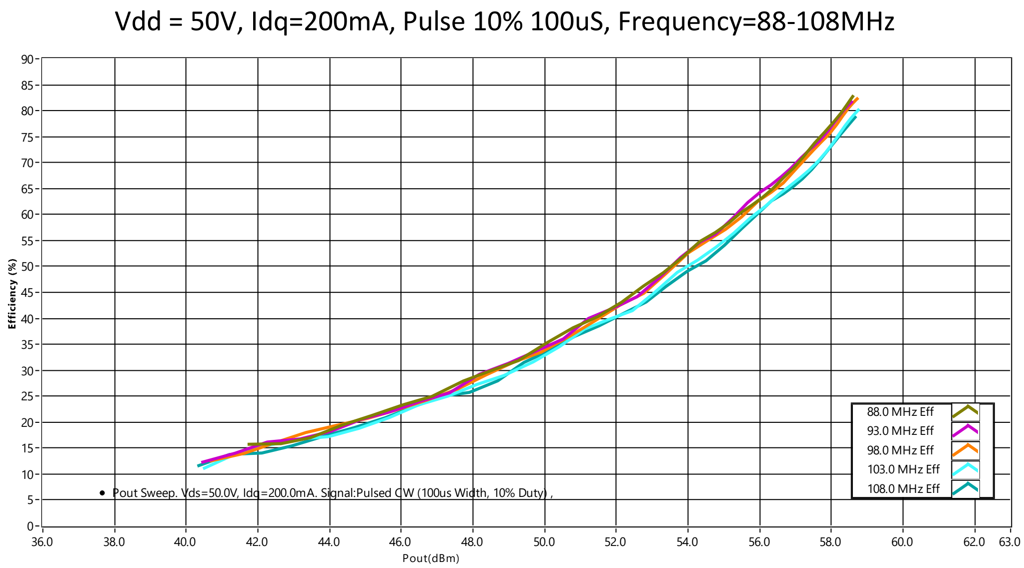


Figure 6. Pulse Efficiency(%) vs Power Out(dBm)

10 Fixed Power Out Results

10.1 Output Power vs Frequency at P1dB

Vdd = 50V, Idq=200mA, CW, Frequency=88-108MHz, **Pout=P1dB**

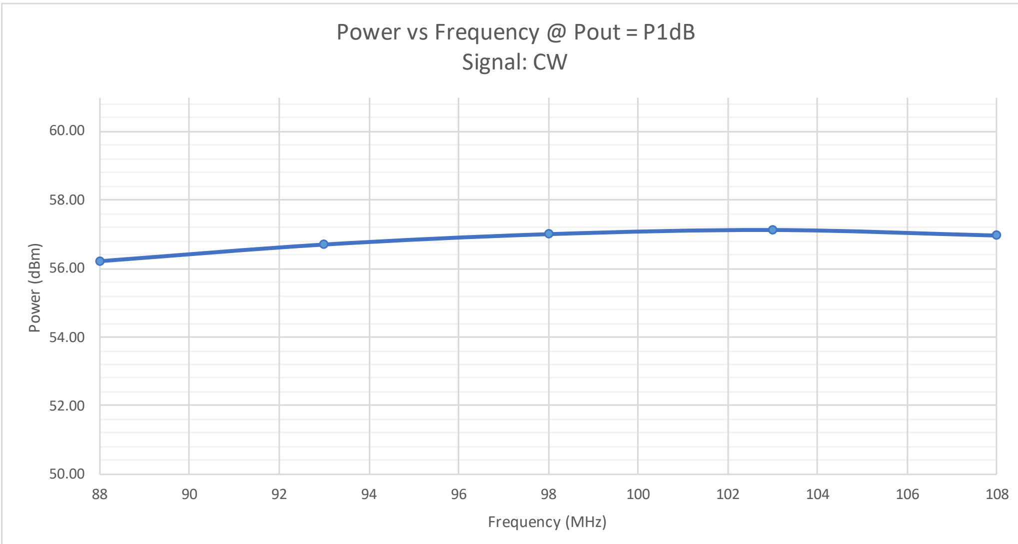


Figure 7. Output Power vs Frequency at Pout=P1dB

10.2 Output Power vs Frequency at P3dB

Vdd = 50V, Idq=200mA, CW, Frequency=88-108MHz, **Pout=P3dB**

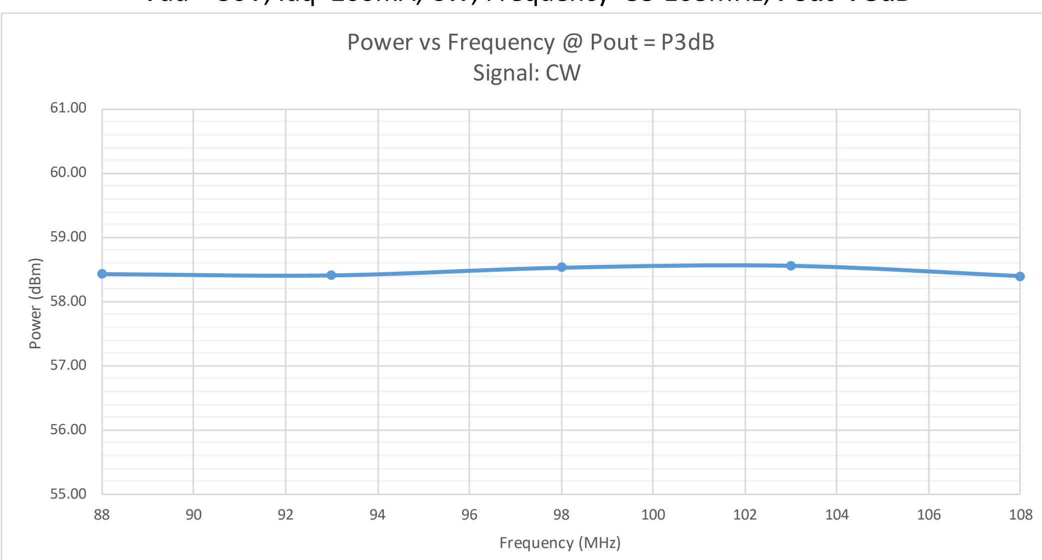


Figure 8. Output Power vs Frequency at Pout=P3dB

10.3 Gain vs Frequency at P3dB

Vdd = 50V, Idq=200mA, CW, Frequency=88-108MHz, **Pout=P3dB**

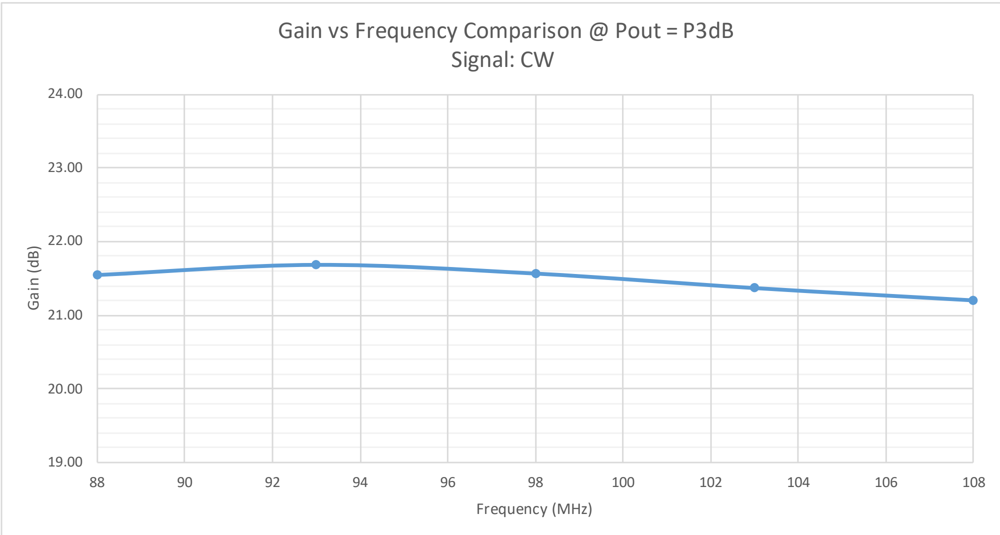


Figure 9. Gain(dB) vs Frequency(MHz) at P3dB

10.4 Efficiency vs Frequency at P3dB

Vdd = 50V, Idq=200mA, CW, Frequency=88-108MHz, **Pout=P3dB**

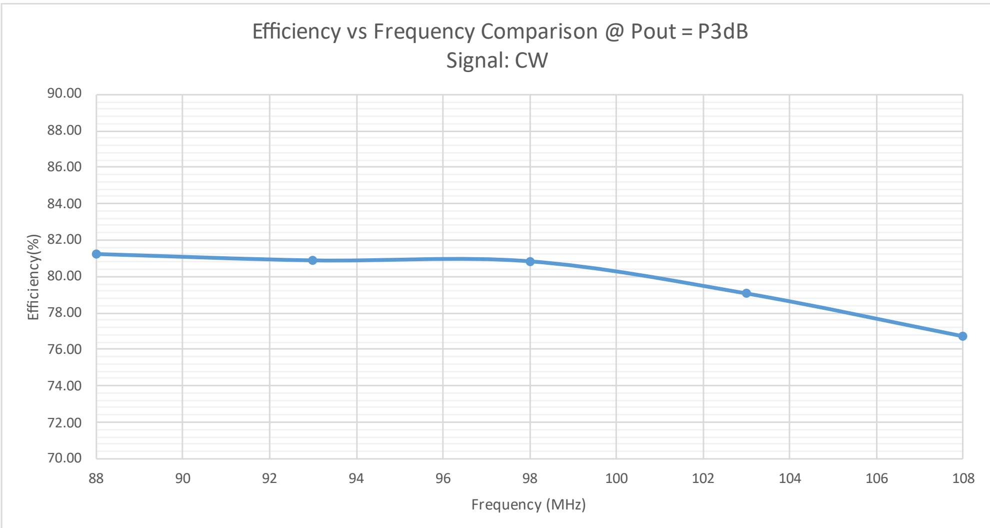


Figure 10. Efficiency(%) vs Frequency(MHz) at P3dB

11 Swept Voltage Results

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

Vdd varied 55V ,50V, 45V, and 40V; Idq=200mA, Frequency=100MHz, Pulse 10%100uS, Pout=P3dB

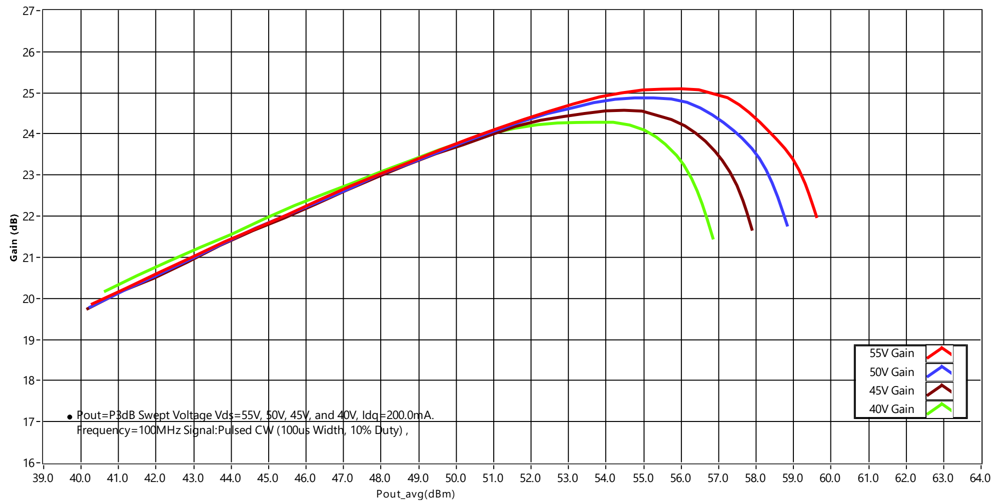


Figure 11. (Swept Voltage) Gain(dB) as a function of Output Power (dBm)

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

Vdd varied 55V ,50V, 45V, and 40V; Idq=200mA, Frequency=100MHz, Pulse 10%100uS, Pout=P3dB

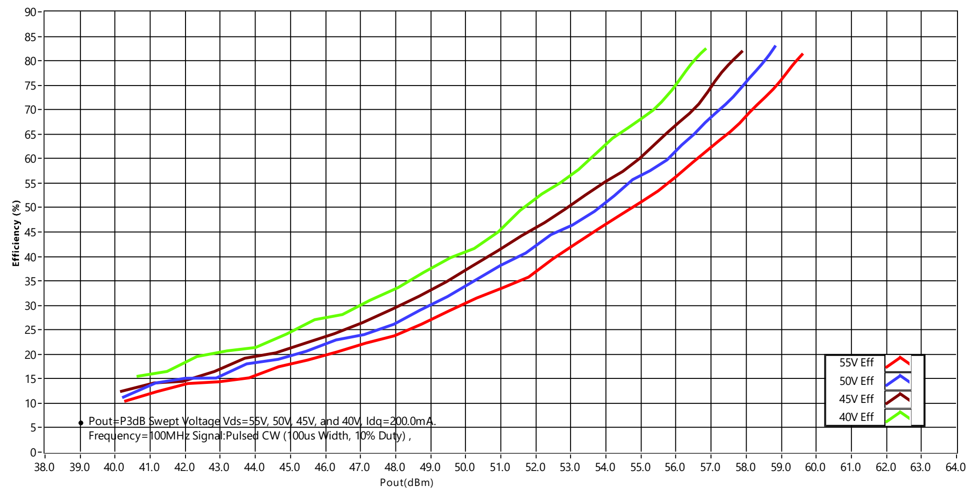


Figure 12. (Swept Voltage) Drain Efficiency(%) as a function of Output Power (dBm)

12 Swept Bias Results

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

Vdd=50V; Swept Idq=**800mA**, **500mA**, and **200mA**, Frequency=100MHz, Pulse 10%100uS, Pout=P3dB

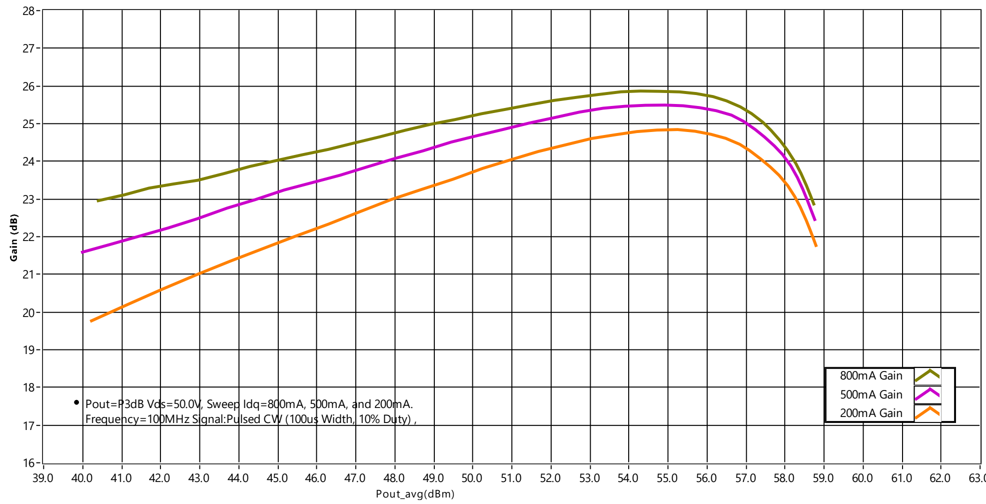


Figure 13. (Swept Bias) Gain(dB) as a function of Output Power (dBm)

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

Vdd=50V; Swept Idq=**800mA**, **500mA**, and **200mA**, Frequency=100MHz, Pulse 10%100uS, Pout=P3dB

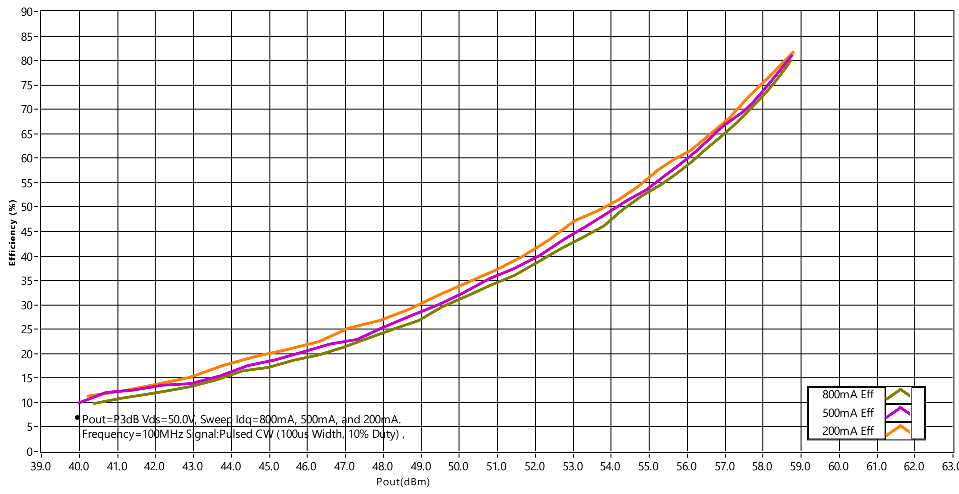
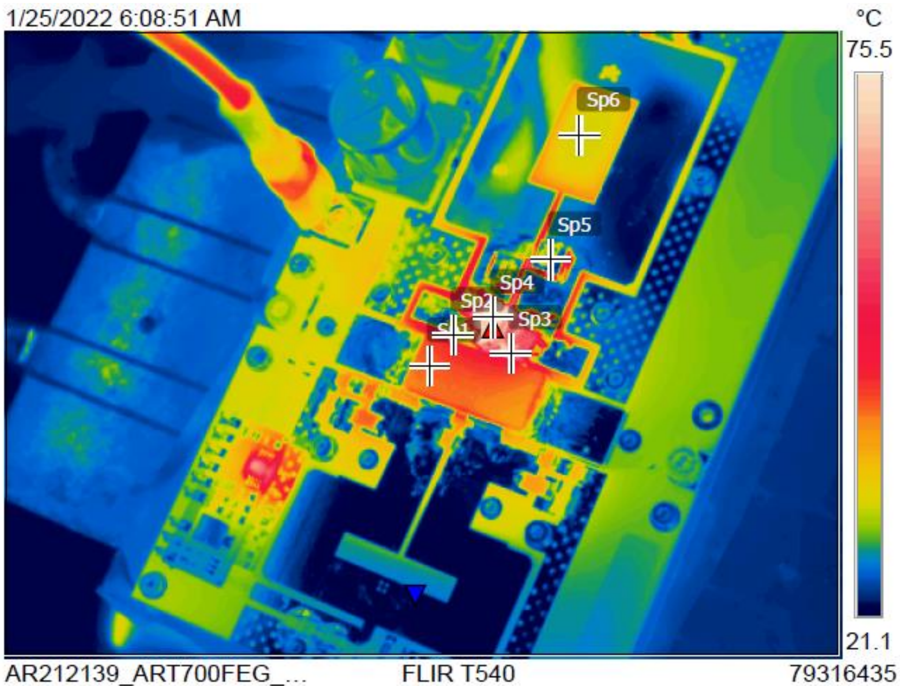


Figure 14. (Swept Bias) Drain Efficiency(%) as a function of Output Power (dBm)

13 Thermal Scan Results

13.1 15 Minute Soak

Vdd=50V; Swept Idq=200mA, Frequency=100MHz, CW, Pout=700W



Measurements

Bx1	Max	75.5 °C
	Min	21.0 °C
	Average	28.4 °C
Sp1		44.9 °C
Sp2		40.7 °C
Sp3		67.5 °C
Sp4		75.5 °C
Sp5		36.9 °C
Sp6		34.3 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C

Figure 15. Thermal Scan Results

14 Hardware

14.1 Board photograph

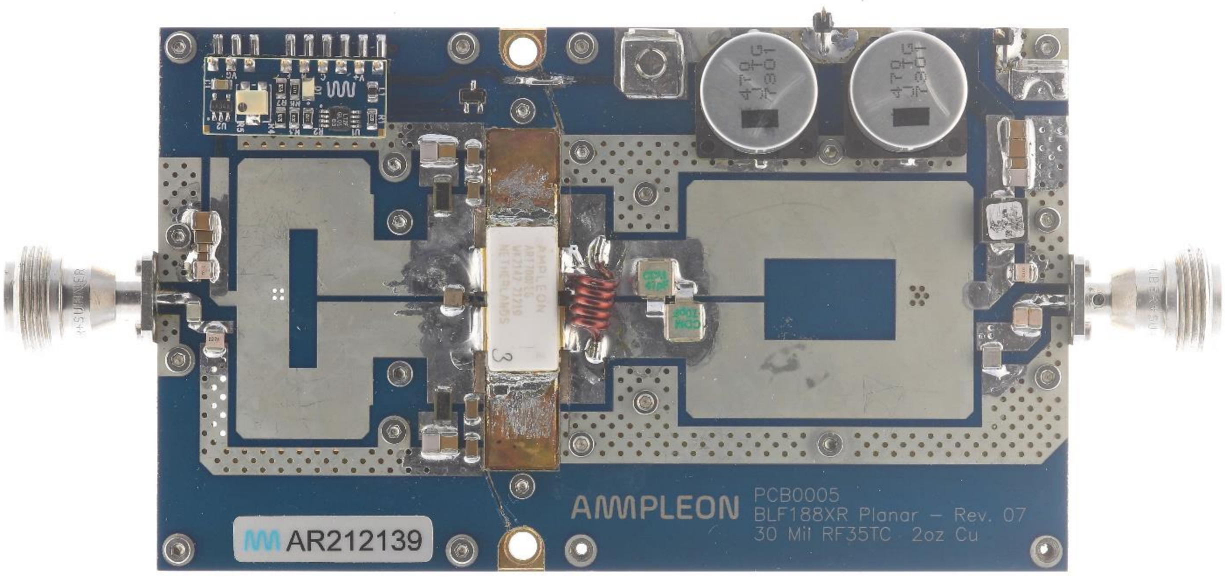


Figure 16. Board Photograph

14.2 PCB layout

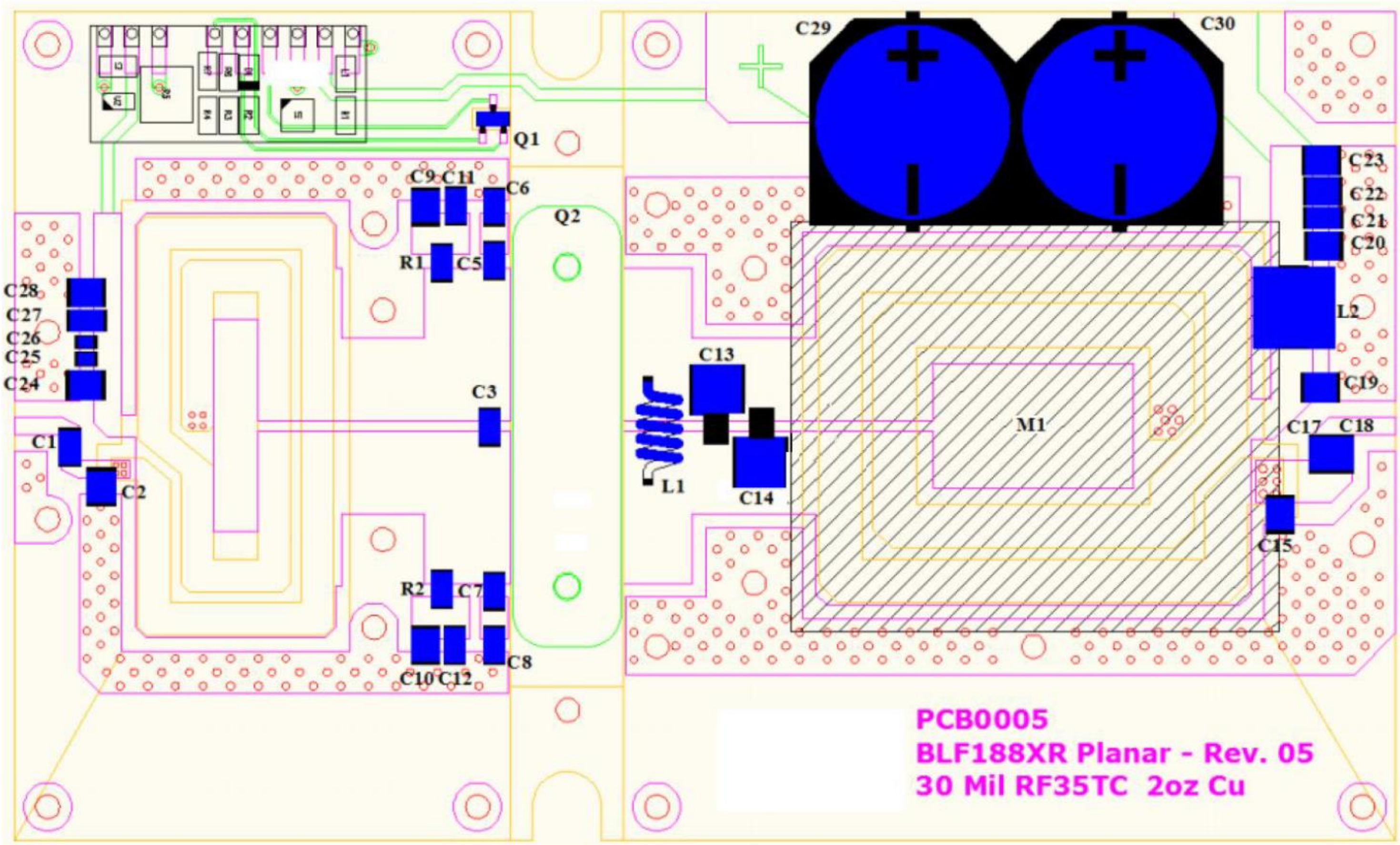


Figure 17. PCB Layout Board #AR212145

14.3 Bill of materials

Table 3. BOM

Designator	Description	Manufacturer	Part#
PCB	30 mil thk. RF35TC	Avanti Circuits	PCB0005_BLF188XR_Planar_ PCBfab_Rev05
Q1	2N2222 NPN Transistor	Fairchild	MMBT2222
Q2	BLP05H6700XR	Ampleon	BLP05H6700XR
R1, R2	ALN50W	IMS	NG3-2010WA25R0J
L1	5T, 16AWG .125 Inner		
L2	36nH High Power	Coilcraft	SLC7469_360KL
C1	43 pF	Passive Plus	1111N
C2	27 pF	Passive Plus	1111N
C3	360pF	Passive Plus	1111N
C4	270pF	Passive Plus	1111N
C5, C6, C7, C8	1uF	Murata	GRM31CR72A105KA01L
C9,C10	100nF	AVX	12101C104KAT2A
C11,C12	10nF	TDK	C3225C0G2E103J
C13	47pF MICA	Cornell Dubilier	CDE MIN02-002DC470JF
C14	70pF MICA	Cornell Dubilier	CDE MIN02-002EC700JF
C15	15pF (Initial) 20pF (TuningConfig2)	Passive Plus	1111N
C16	DNP		
C17 C18, C24	1000pF	Passive Plus	1111N
C19	1000pF	Passive Plus	1111N
C20	10 nF	TDK	C3225C0G2E103J
C21	100 nF	Murata	GRM31CR72E104KW03L
C22	2.2 uF	Murata	GRM32ER72A225KA35L
C23	10uF	Murata	GRM32DF51H106ZA01L
C25	10nF	Multicomp	U0805R103KCT
C26	100 nF	Multicomp	S0805W104K1HRN-P4
C27	1 uF	Murata	GRM31CR72A105KA01L
C28	10 uF	Murata	GRM32DF51H106ZA01L
C29, C30	470 uF, Electrolytic	Panasonic	PCE3667CT-ND
M1**	0.2 in. thick Chomerics Therma-A-G Placed in output pocket	Chomerics	Therma-A-Gap 976
Baseplate	SMI0025 Modified for Gullwing Part	Russard	SMI0025-B-S-OMP1230-4F-1-5030

14.4 PCB materials

Table 4. Board Specifications

Parameter	Value
Manufacturer	Rogers
Type	4350B
Thickness	30 mils, 1oz. copper
Layers	2, top/bottom. Bottom all copper

14.5 Device markings

Table 5. Device Specifications

Parameter	Value
Manufacturer	Ampleon
Device	ART700FHG
Date Code	WK2142-21210

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