Document information

Info	Content
Status	General Publication
Author(s)	Tyler Ware
Abstract	Measurement results of the ART150FE LDMOS Device in Board #AR202075 tuned for 100-140MHz at 62V

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

4 List of Tables

5 General Description

This report presents the measurement results Demo Board AR202075 using the ART150FE. The demo achieves ≥ 52dBm at 100-140MHz.

6 Biasing

6.1 Bias Details

Vdd = 62V
Idq = 100mA

7 Test Bench Set Up

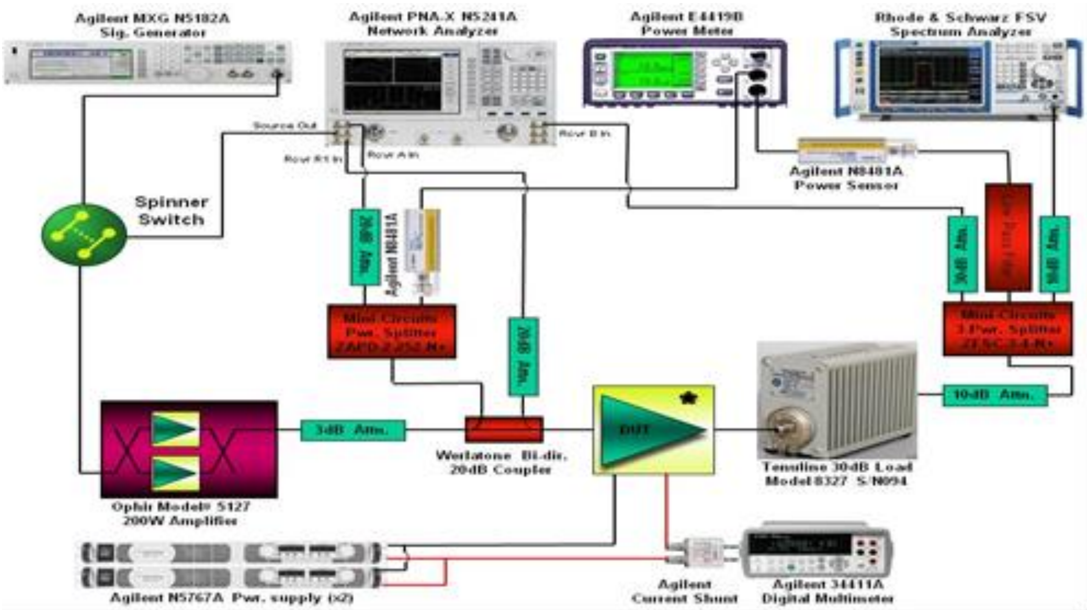


Figure 1.Test Bench Equipment set up

8 Performance Summary

Table 2. RF Performance, Frequency = 127MHz, Pulse 10%100uS

Parameter	Measurement	Unit
Specified frequency	127	MHz
Drain voltage	62	V
Quiescent drain current	100	mA
Average P1dB	162.93	W
Average Pulsed Efficiency at P1dB	73.75	%
Average Pulsed Gain at P1dB	25.63	dB
Average Pulsed Gain Flatness at P1dB	+/- 1	dB

AR202075_ART150FE_62_100-140MHz Pulse 10%100uS DriveUpData				
Freq(MHz)	P1.0dB	Pout(W)	P1dB Gain (dB)	P1dB Eff(%)
100	51.03	126.77	24.53	61.68
110	51.23	132.74	25.55	65.22
120	51.84	152.76	25.73	68.60
127	52.12	162.93	25.63	73.75
130	52.19	165.58	25.42	76.34
140	51.63	145.55	24.31	81.53
	P2.0dB	Pout(W)	P2dB Gain(dB)	P2dB Eff(%)
100	51.81	151.71	23.53	65.71
110	51.58	143.88	24.57	66.17
120	52.29	169.43	24.74	70.07
127	52.59	181.55	24.62	75.89
130	52.59	181.55	24.43	77.72
140	52.01	158.85	23.31	83.15
	P3.0dB	Pout(W)	P3dB Gain(dB)	P3dB Eff(%)
100	52.26	168.27	22.52	67.84
110	51.83	152.41	23.55	66.95
120	52.59	181.55	23.73	71.02
127	52.85	192.75	23.66	76.74
130	52.87	193.64	23.41	78.78
140	52.24	167.49	22.33	84.16

9 Performance Details

9.1 Small Signal Results

Vdd = 62V
Idq = 100mA

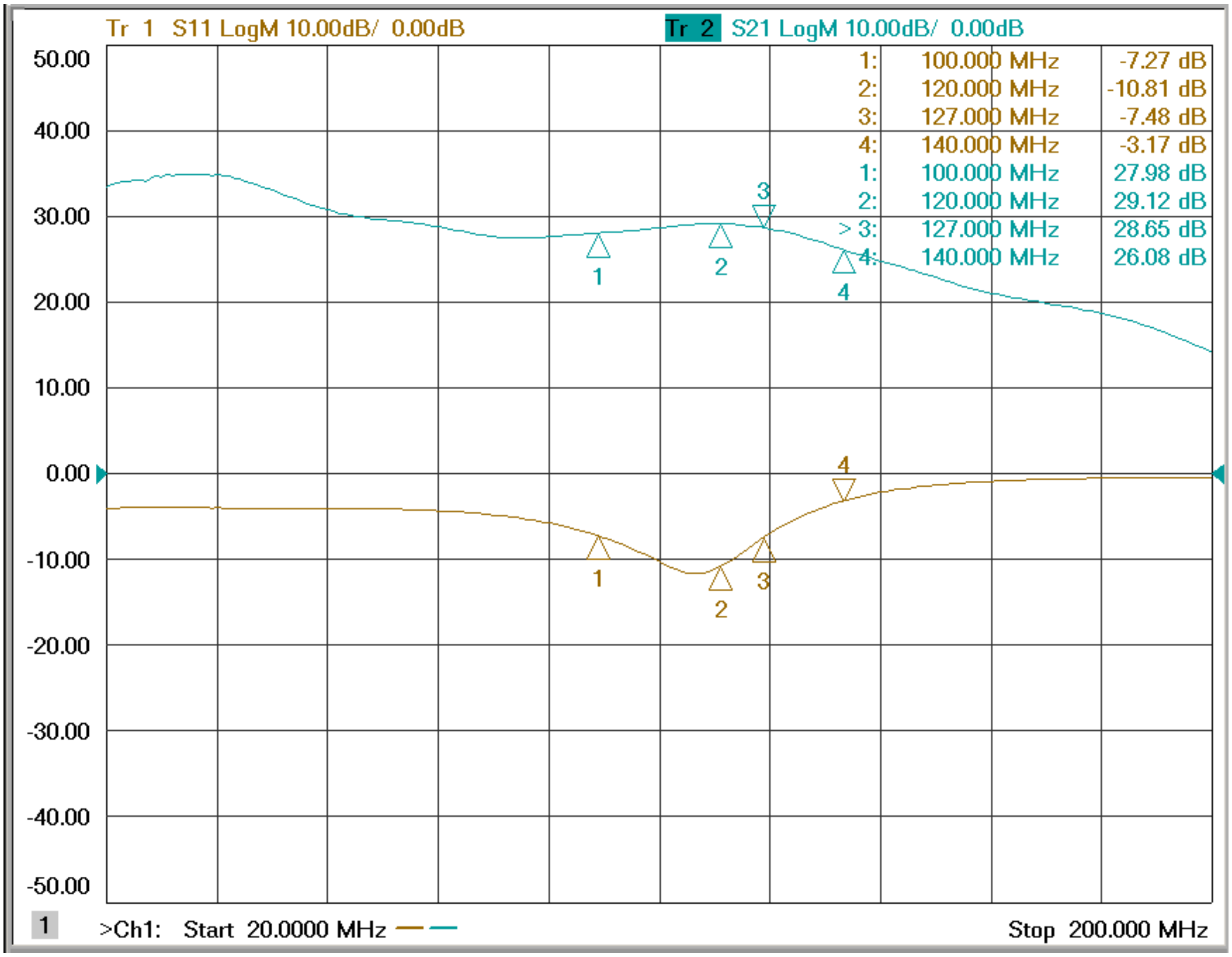


Figure 2. Small Signal results, Vdd=62V, Idq=100mA, Pin=20dBm

9.2 Pulsed Gain Sweeps

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, Pulse10%100uS, Pout=P3dB

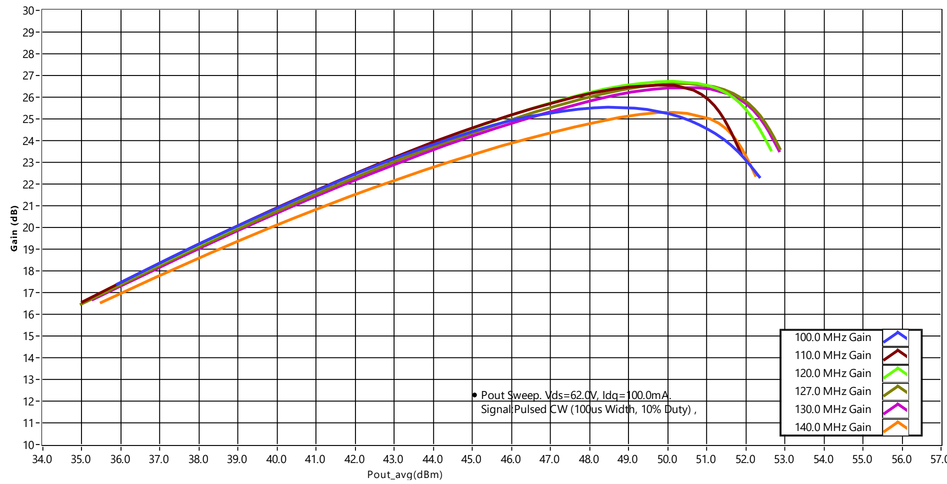


Figure 3. Pulsed Gain(dB) vs Power Out(dBm)

9.3 Pulsed Efficiency Sweeps

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, Pulse10%100uS, Pout=P3dB

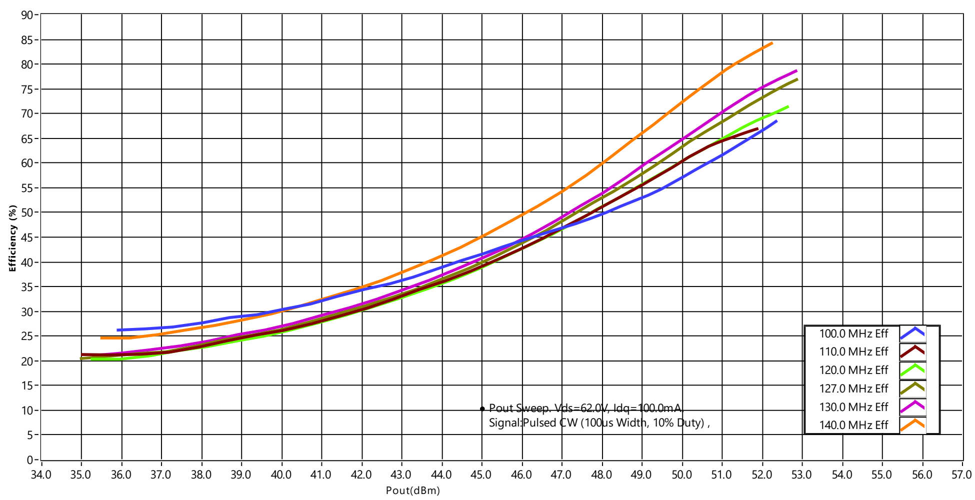


Figure 4. Pulsed Efficiency(%) vs Power Out(dBm)

9.4 CW Gain Sweeps

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, CW, Pout=P3dB

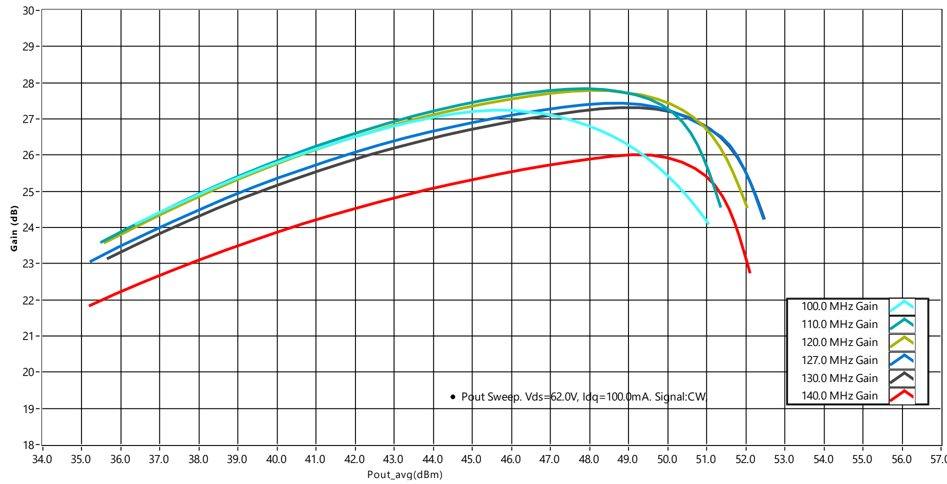


Figure 5. CW Gain(dB) vs Power Out(dBm)

9.5 CW Efficiency Sweeps

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, CW, Pout=P3dB

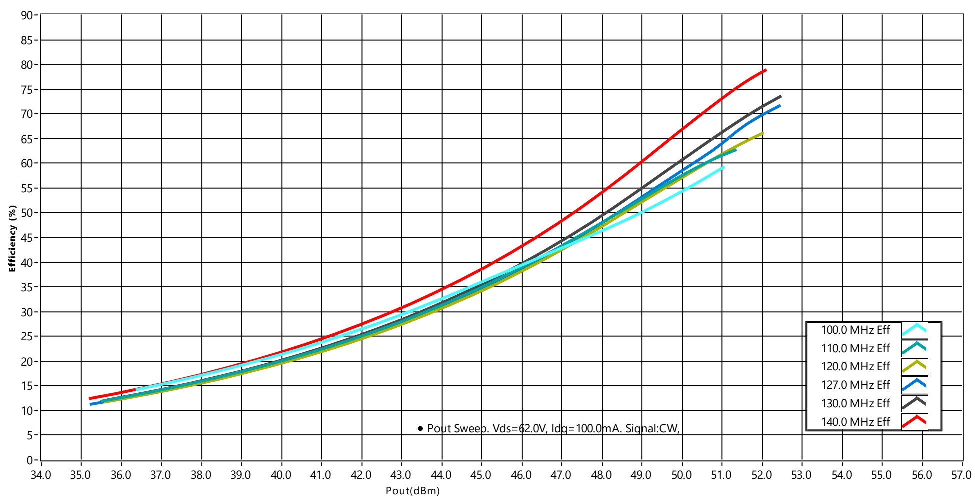


Figure 6. CW Efficiency(%) vs Power Out(dBm)

10 Fixed Power Out Results

10.1 Output Power v Frequency at P1dB

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, Pulse10%100uS, **Pout=P1dB**

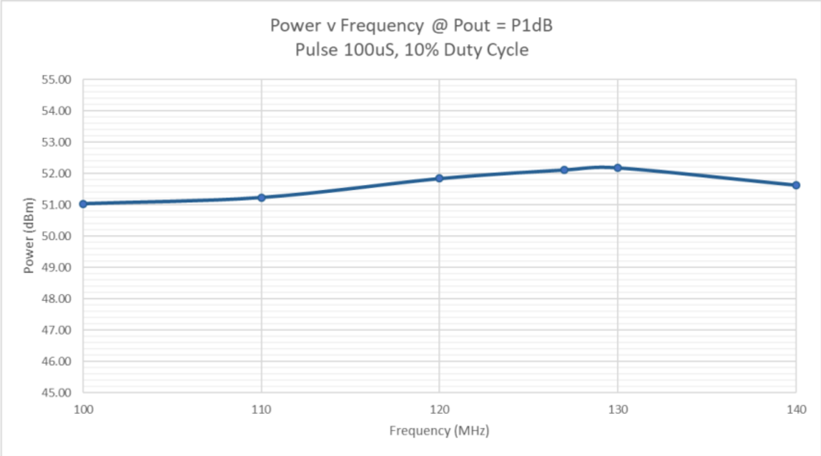


Figure 7. Output Power (dBm) vs Frequency (MHz) at P1dB

10.2 Output Power v Frequency at P3dB

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, Pulse10%100uS, **Pout=P3dB**

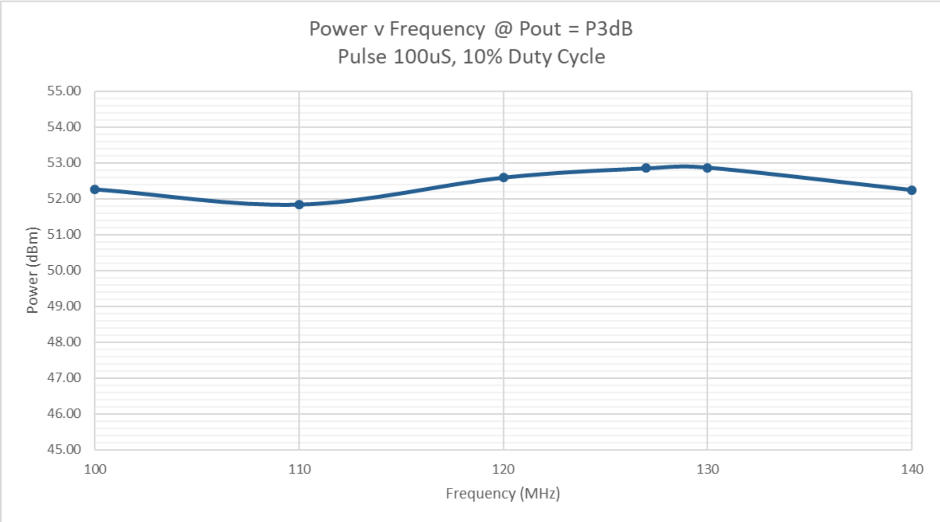


Figure 8. Output Power (dBm) vs Frequency (MHz) at P3dB

10.3 Gain v Frequency at P1dB

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, Pulse10%100uS, **Pout=P1dB**

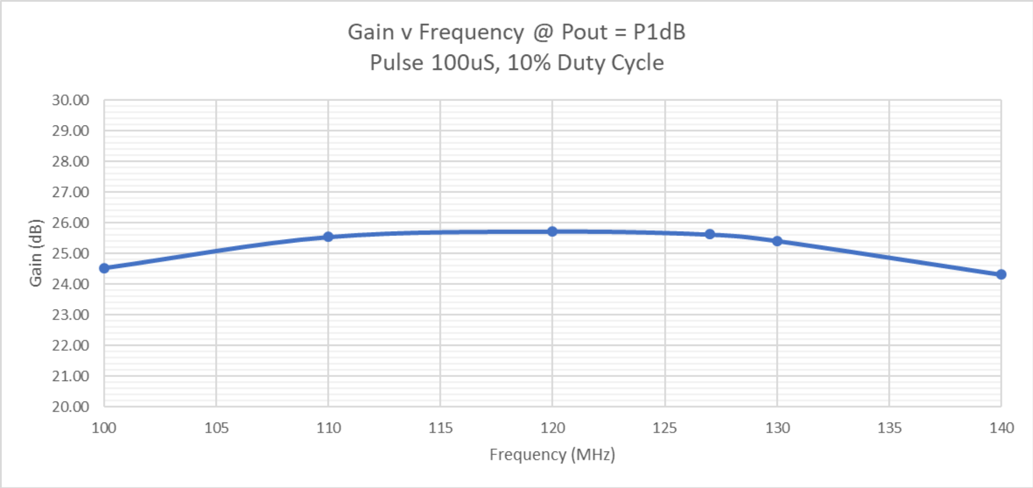


Figure 9. Gain (dB) vs Frequency (MHz) at P1dB

10.4 Efficiency v Frequency at P1dB

Vdd = 62V, Idq=100mA, Frequency=100-140MHz, Pulse10%100uS, **Pout=P1dB**

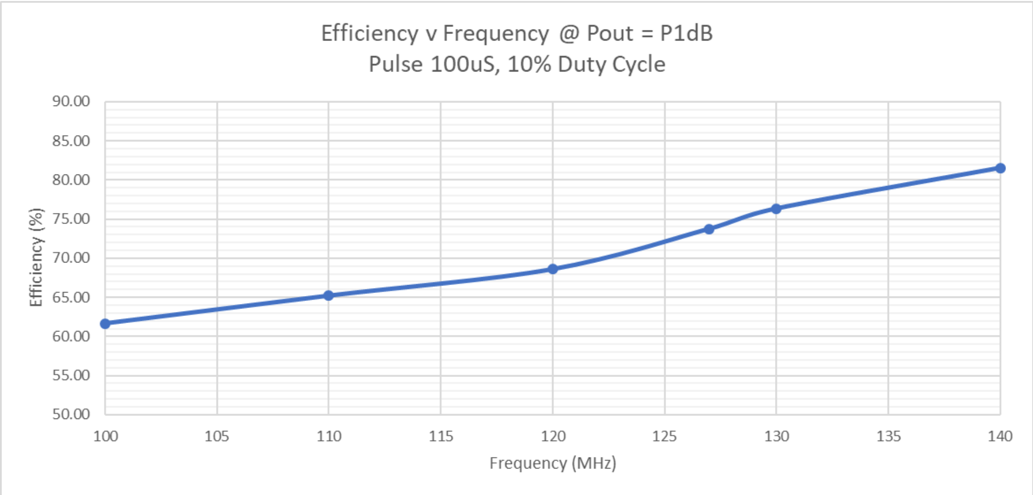


Figure 10. Efficiency (%) vs Frequency (MHz) at P1dB

11 Swept Voltage Results

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

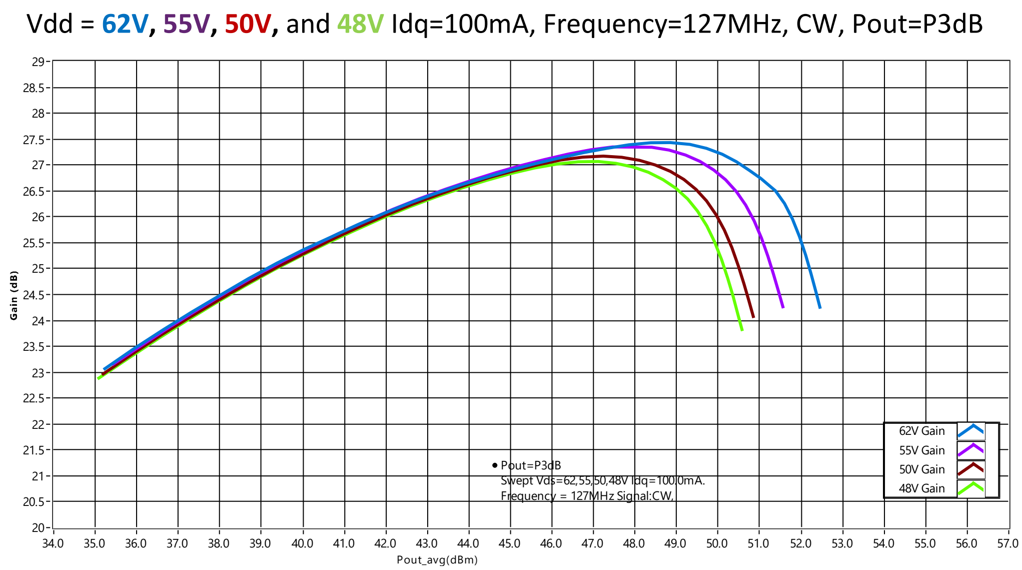


Figure 11. (Swept Voltage) Gain(dB) as a function of Output Power (dBm)

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

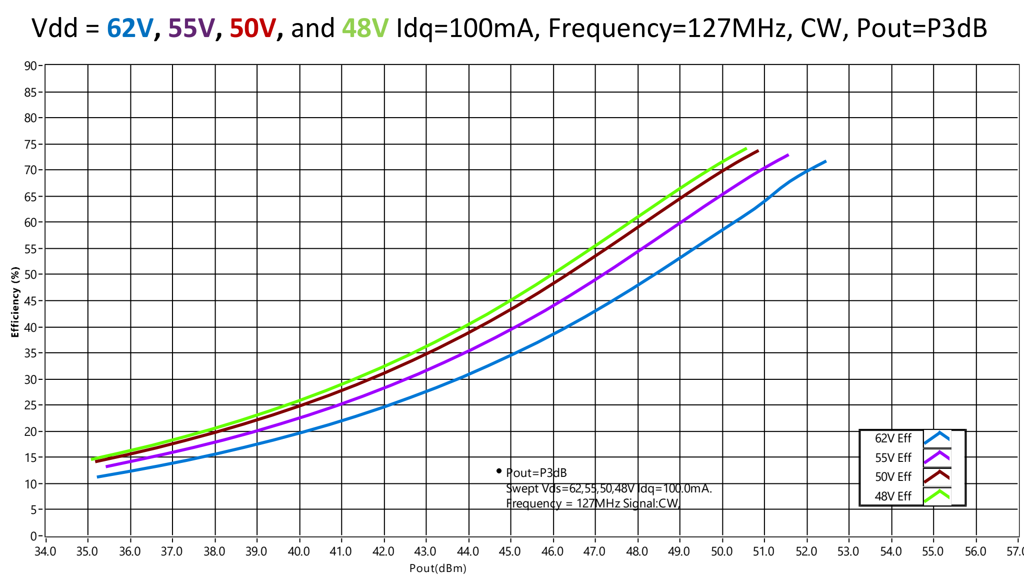


Figure 12. (Swept Voltage) Drain Efficiency(%) as a function of Output Power (dBm)

12 Swept Bias Results

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

Vdd = 62V, Idq=**400mA**, **300mA**, **200mA**, and **100mA** Frequency=127MHz, CW, Pout=P3dB

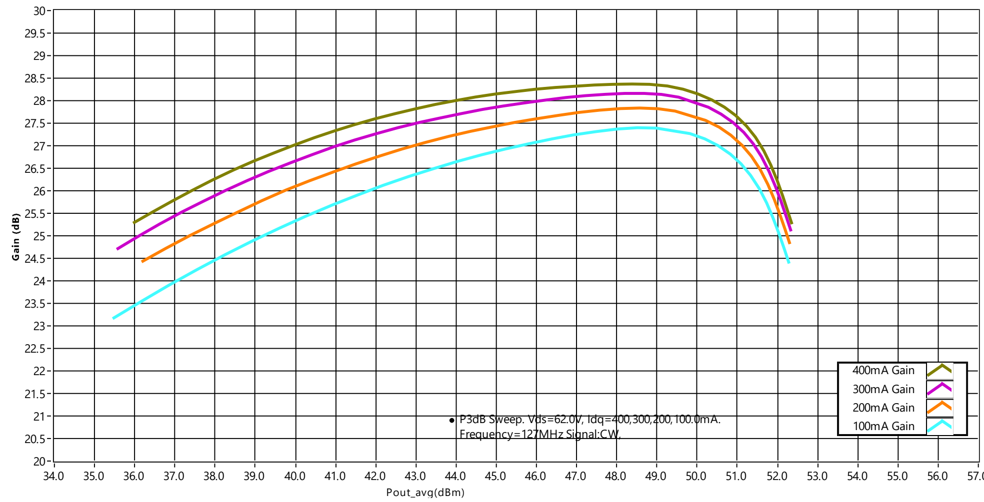


Figure 13. (Swept Bias) Gain(dB) as a function of Output Power (dBm)

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

Vdd = 62V, Idq=**400mA**, **300mA**, **200mA**, and **100mA** Frequency=127MHz, CW, Pout=P3dB

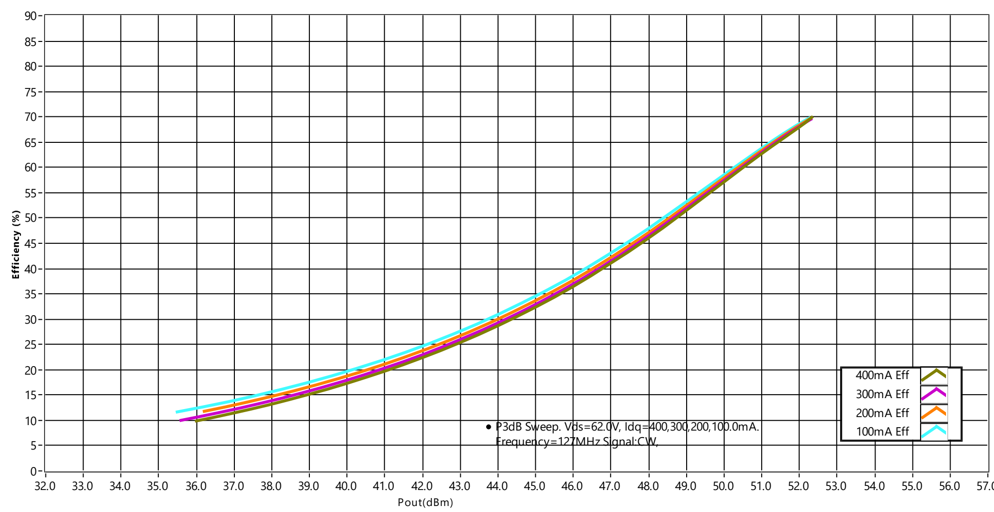
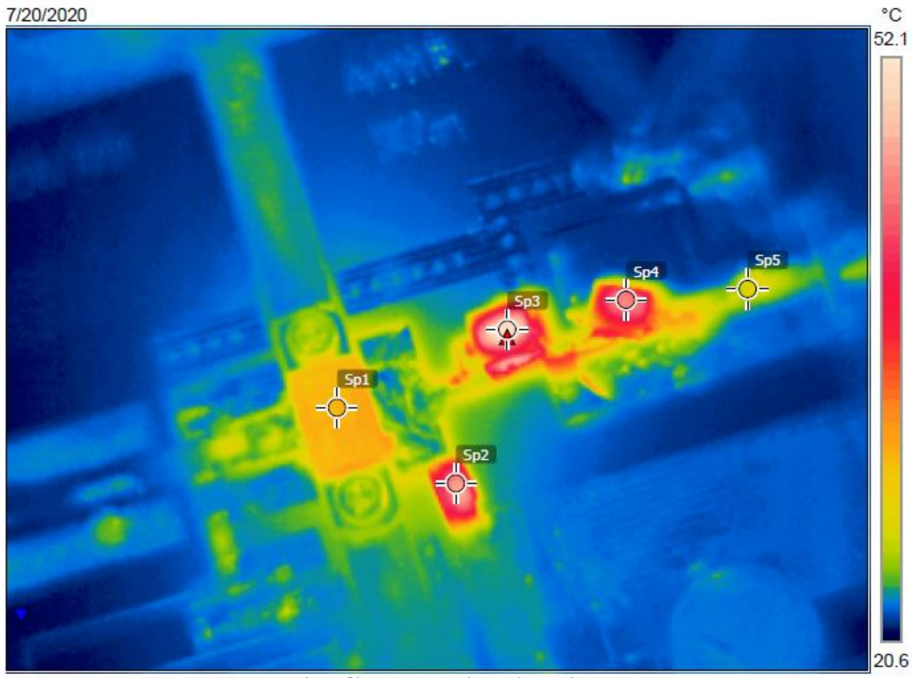


Figure 14. (Swept Bias) Drain Efficiency(%) as a function of Output Power (dBm)

13 Thermal Scan Results

13.1 Thermal Scan at 150W, 50% Duty Cycle

Vdd = 62V, Idq=100mA, Frequency=127MHz, Pulse50%100uS, Pout=150W



AR202075_ART150FE_62_127MHz_Pulse50%100uS_51.77dBm_ThermalScan 072020

Measurements

Bx1	Max	52.1 °C
	Min	20.8 °C
	Average	23.1 °C
Sp1		31.5 °C
Sp2		47.3 °C
Sp3		52.1 °C
Sp4		46.3 °C
Sp5		27.6 °C

Parameters

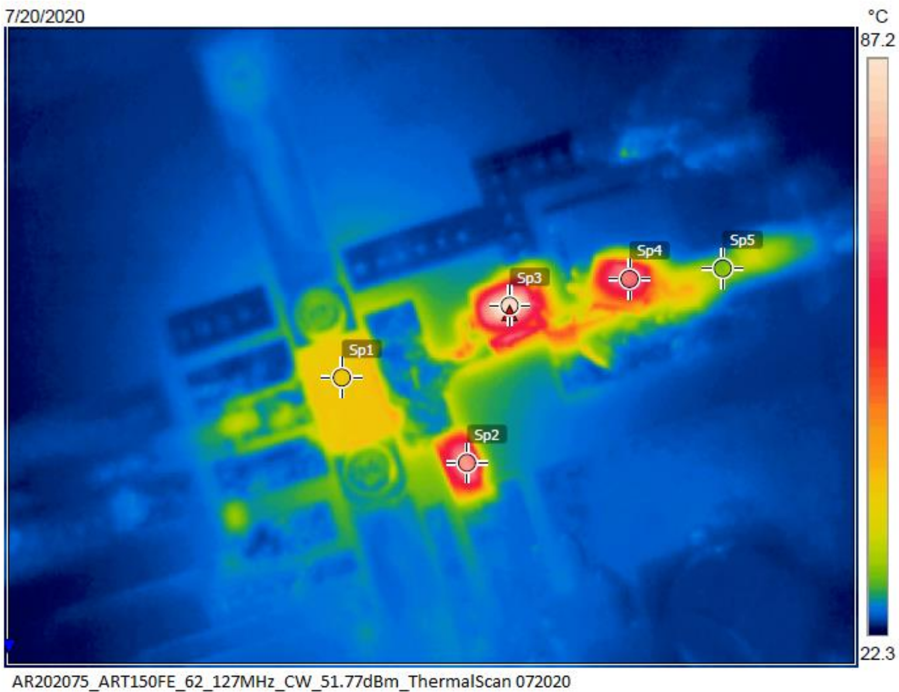
Emissivity	0.95
Refl. temp.	20 °C

Figure 15. Thermal Scan at 150W, 50% Duty Cycle

Note: Component temperatures at 10% Duty Cycle are under 34°C; therefore 50% Duty Cycle has been chosen to show a more significant change in temperature

13.2 Thermal Scan at 150W CW

Vdd = 62V, Idq=100mA, Frequency=127MHz, CW, Pout=150W



Measurements

Bx1	Max	87.0 °C
	Min	22.5 °C
	Average	26.1 °C
Sp1		41.3 °C
Sp2		78.0 °C
Sp3		87.0 °C
Sp4		73.3 °C
Sp5		30.4 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C

Figure 16. Thermal Scan at 150W CW

Note: Although temperatures are stable under CW conditions, it is still recommended to change the inductors to a heavier gauge wire

14 Hardware

14.1 Board photograph

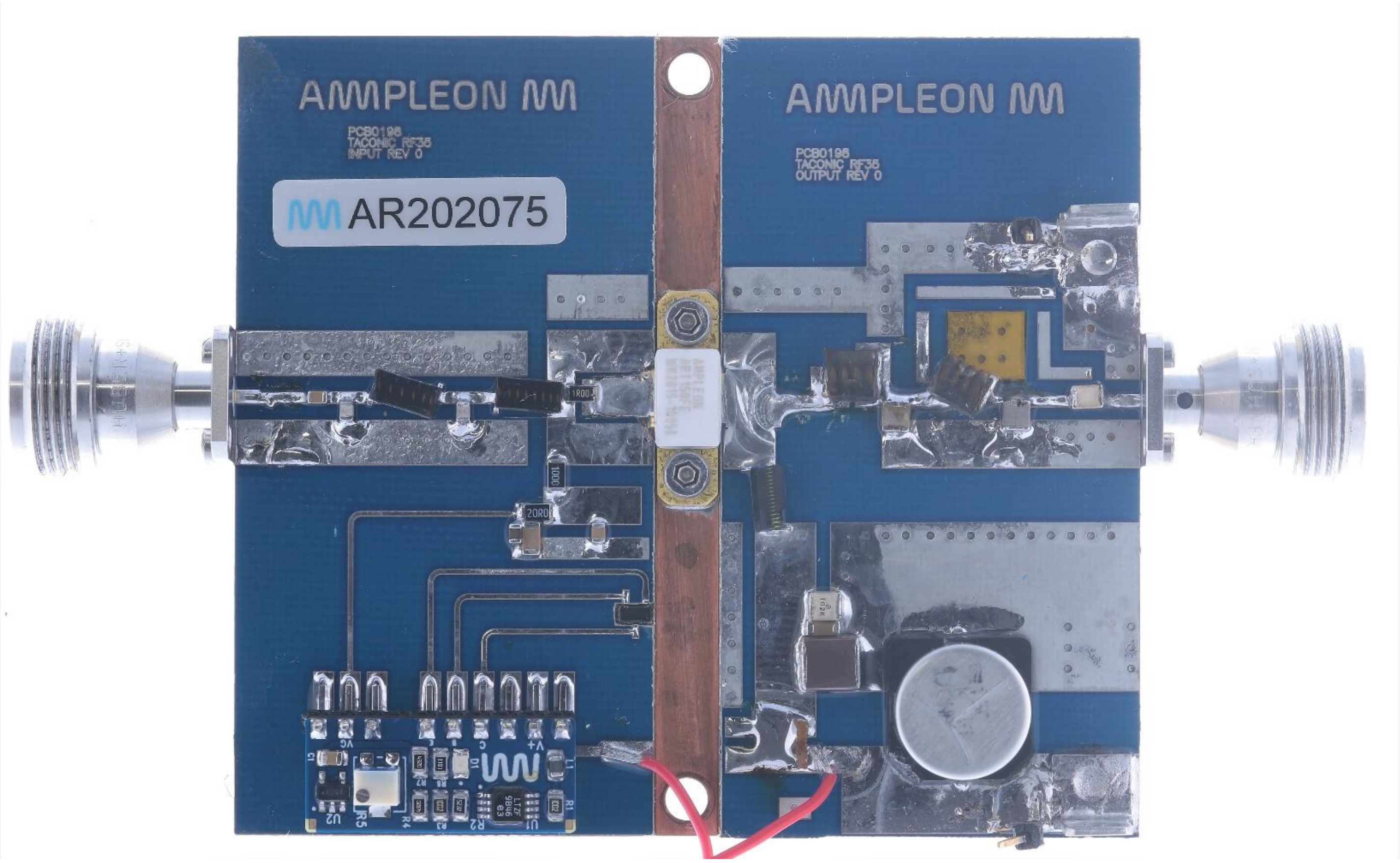


Figure 17. Board Photograph

14.2 Main PCB layout

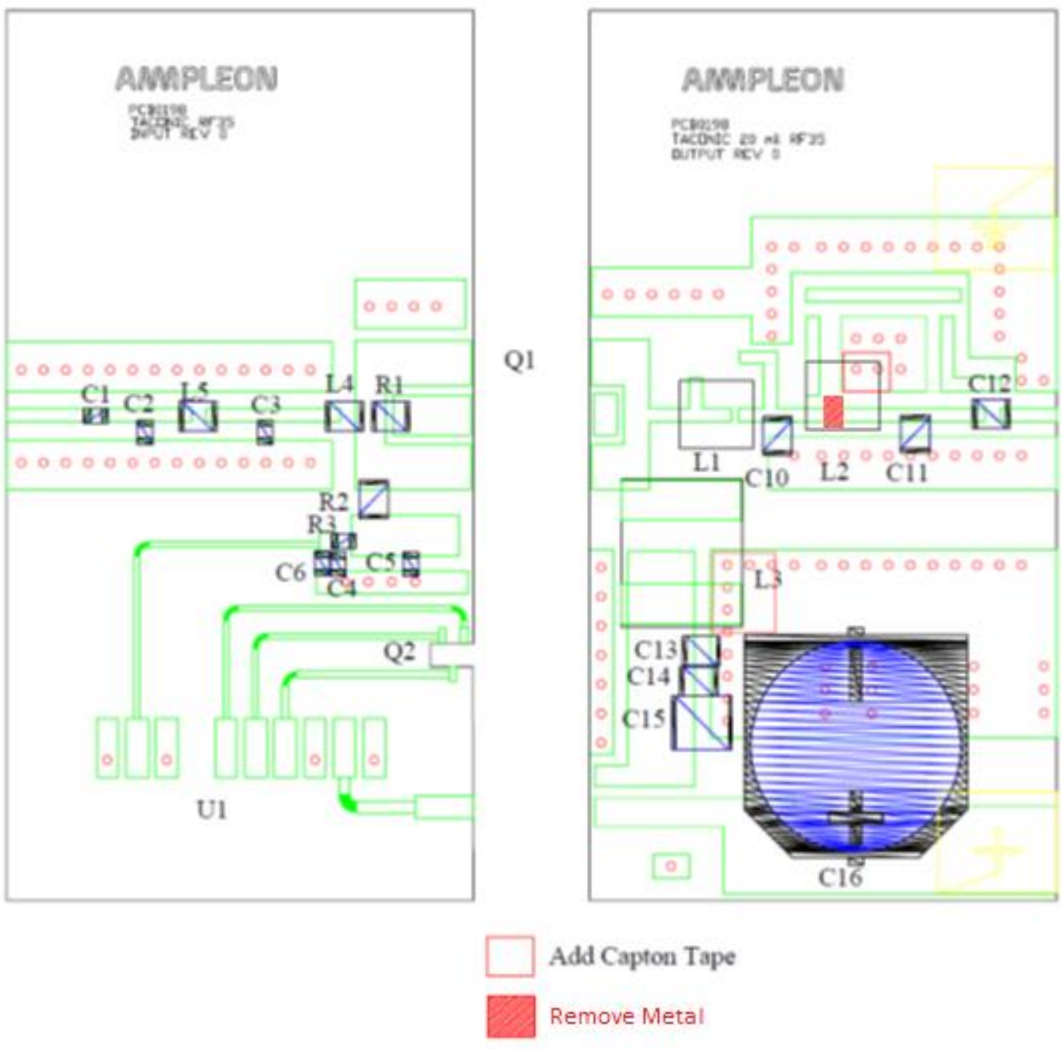


Figure 18. PCB Layout - Board #AR202075

14.3 Bill of Materials

Table 3. BOM

Designator	Description	Manufacturer	Part#
PCB input	20 mil thk. RF35	Avanti Circuits	PCB00198 Input Rev 0
PCB Output	20 mil thk. RF35	Avanti Circuits	PCB00198 Input Rev 0
Q1	RF Transistor 150W 65V LDMOS	Ampleon	ART150
Q2	2N2222 NPN Transistor	Fairchild	MMBT2222
U1	LDMOS bias module	Ampleon	CA-330-11
R1	1 Ω	Generic	1210
R2	100 Ω	Generic	1206
R3	20 Ω	Generic	1206
C1,C5	1000pF	ATC	600F
C4	0.01uF,100V,X7R,1206	Murata	GRM319R72A103KA01D
C2	47pF	ATC	600F or Passive Plus 0805N
C3	2.2pF	ATC	600F or Passive Plus 0805N
C6	1uF, ceramic, 50V, ±10%	Murata	GRM31CR71H105K
C10	33pF	ATC	ATC100B or Passive Plus 1111N
C11	33pF	ATC	ATC100B or Passive Plus 1111N
C12,C13	1000pF	ATC	100B
C14	0.01uF,100V,X7R,1206	Murata	GRM319R72A103KA01D
C15	Capacitor, 10uF 100V 10% X7S, 2220	TDK	C5750X7S2A106M
C16	Capacitor,150uF,80V 20%, alum elec	Panasonic	EEE-FK1K151AQ
L1	17.5nH	Coilcraft	GA3095
L2	17.5nH	Coilcraft	GA3095
L3	150 nH	Coilcraft	2712SP-151J6EC
L4	28nH	Coilcraft	B08T
L5	17.5nH	Coilcraft	B06T

14.4 PCB materials

Table 4. Board Specifications

Parameter	Value
Manufacturer	Taconic
Type	RF35
Thickness	20 mils, 1oz. copper
Layers	2, top/bottom. Bottom all copper

14.5 Device markings

Table 5. Device Specifications

Parameter	Value
Manufacturer	Ampleon
Device	ART150FE
Date Code	WK2015-10956

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