

AR192069

ARF2K0F, 123-133MHz

V1.0 — 10 June 2019

AMPLEON

Application Report

Document information

Info	Content
Status	Company Public
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Abstract	Measurement results of an ART2K0FE device in board #AR192069 tested over 123-133MHz at 50-62V

1 Revision History

Table 1. Report revisions

Revision No.	Date	Description	Author
1.0	20190528	Initial document	Bill Goumas

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5 General Description

This report presents the measurement results of the Class AB Demo board AR192069. The circuit was swept over 123-133MHz and 50-62V. Current bench set-up is limited to 62V. Data at 65V is projected to be ~100W higher for P1 and P3dB based on the delta between 59 and 62V.

Idq was set for 600mA for most of the testing. Section 9.3 shows results at 200mA which give ~2% higher efficiency and at ~2A which is the best lever for gain flatness over ~10dB range.

6 Biasing

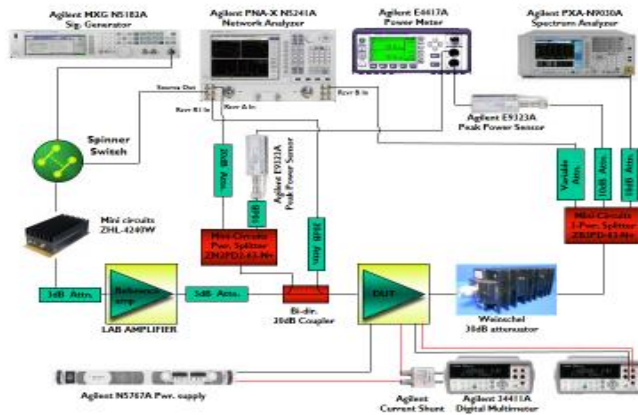
6.1 Bias Details

The efficiencies presented include the bias current from the biasing board. The current from the biasing board is ~25mA.

VDD =62 , VGS= ~2.2 V per device leading to an IDQ =600mA.

7 Test Bench Set Up

Figure 1. Test Bench Equipment set up



8 Summary

Table 2. RF Performance

Parameter	Measurement	Unit
Specified frequency range	123-133	MHz
Drain voltage	50-62	V
Quiescent drain current	600	mA
P3dB at 10% Duty Cycle and 62V	1900	W
Efficiency at Power Out=P3dB at 62V	63-67	%
Gain at P1dB and 62V	≥ 25	dB
Gain Compression at 1900W and 62V	<2.5	dB

9 Performance Details

9.1 Small Signal Results

Vdd=50V, Idq=500mA

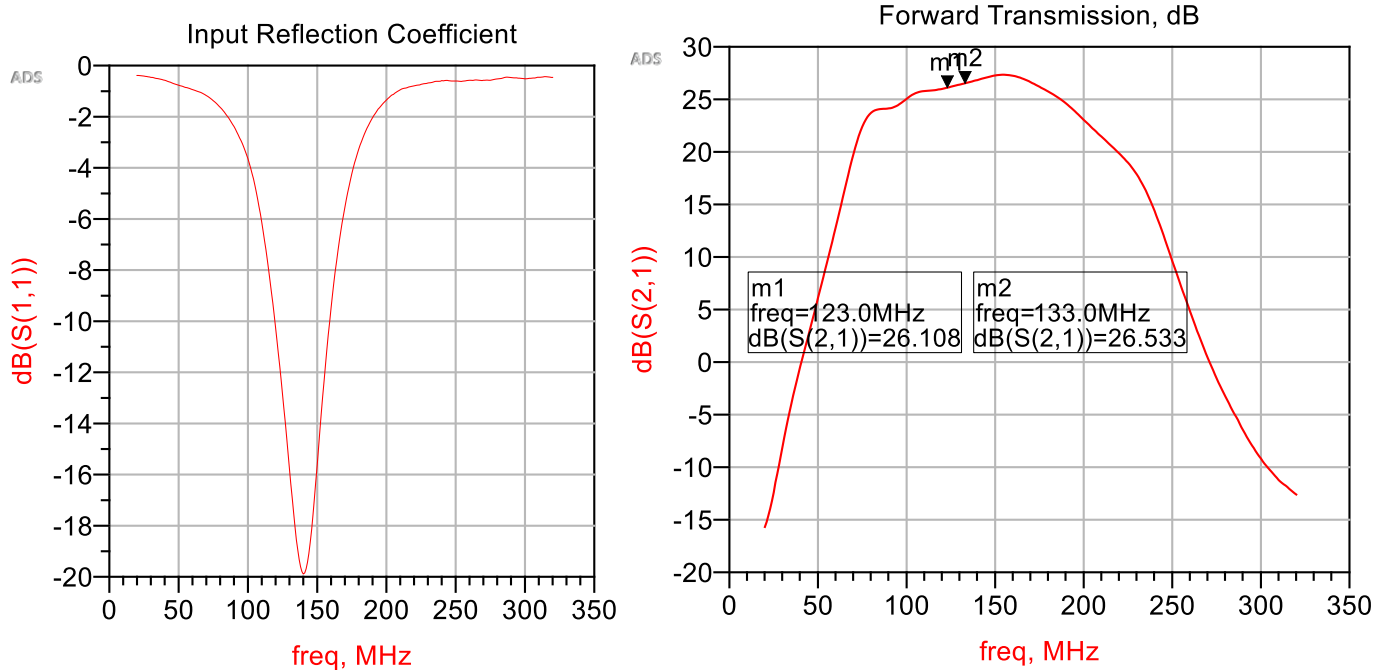
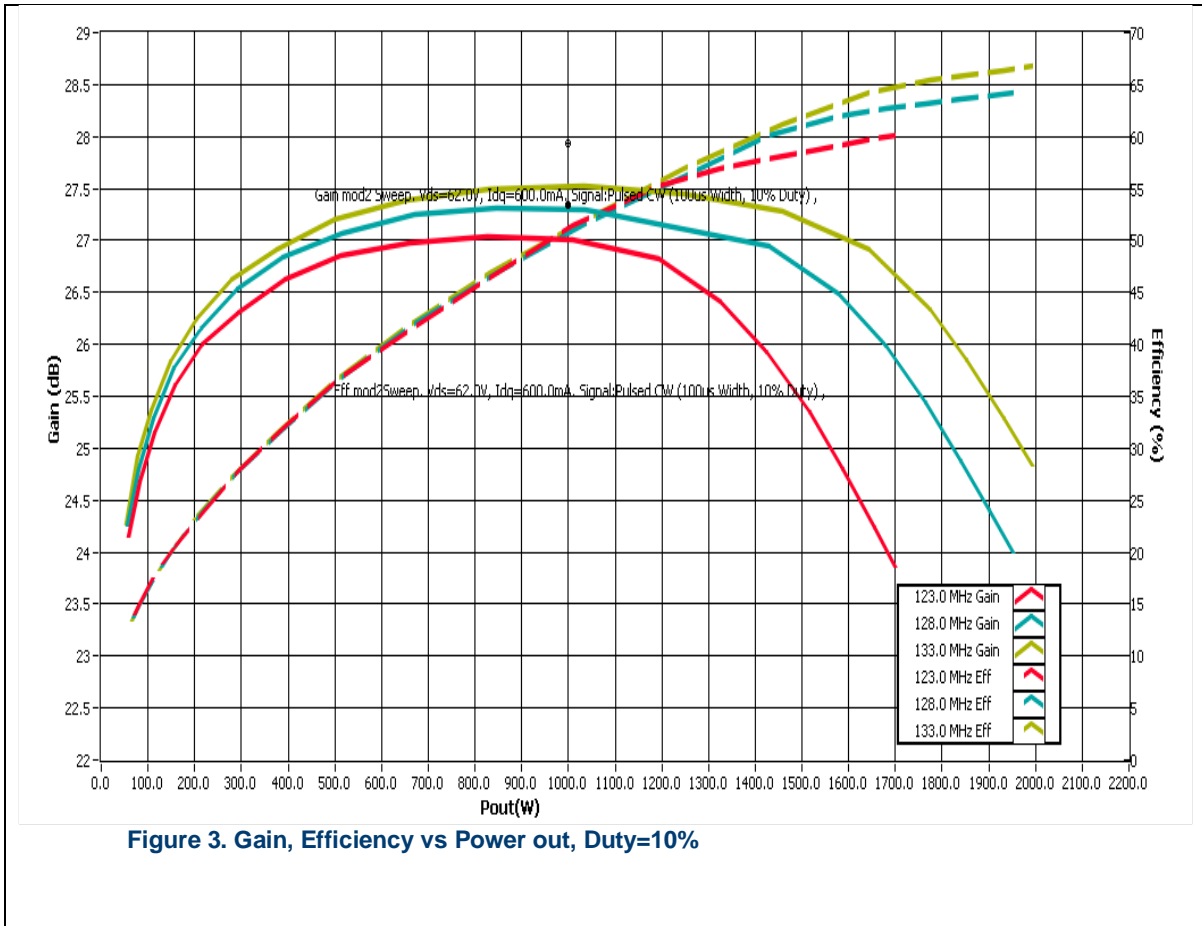


Figure 2. Small Signal Data, Sweep Vdd=50V, Idq=500mA, Pin=10dBm

9.2 Gain, Efficiency vs Power out at 123-133MHz

Vdd=62V, Idq=600mA



9.3 Pulse Gain and Efficiency Sweep Voltage and Bias

Vdd varied, Idq=600mA, Vdd=50 (red), 56 (blue), 62 (green) 10% duty, 100usec PW

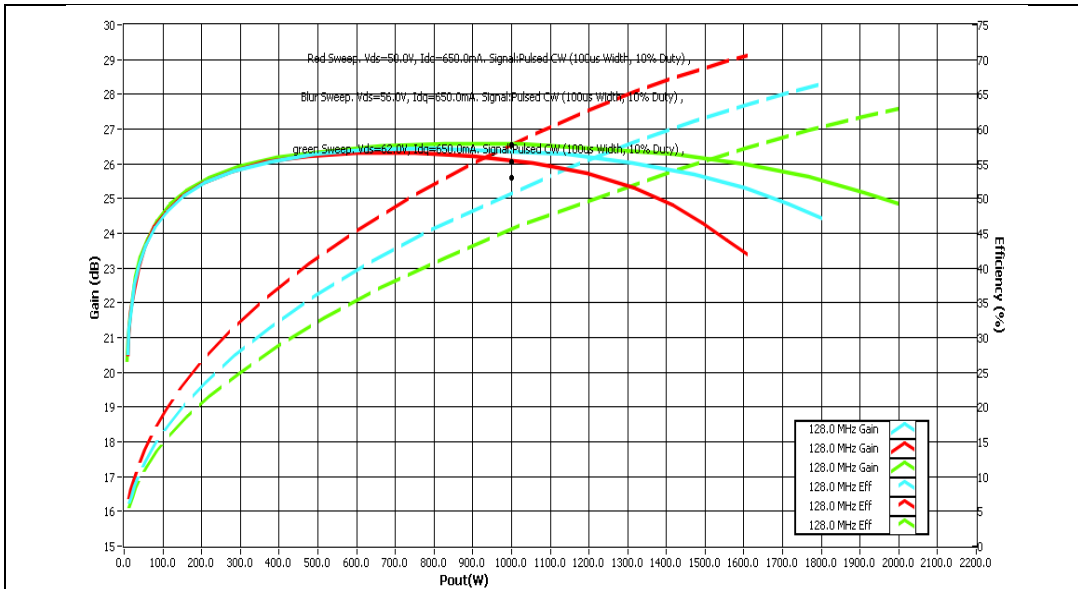


Figure 4. Gain(dB) and Eff(%) vs Pout, Freq=128MHz, Sweep Voltage,

Vdd=62V, Sweep Idq= 200(red), 600(blue) and 2000mA(black)

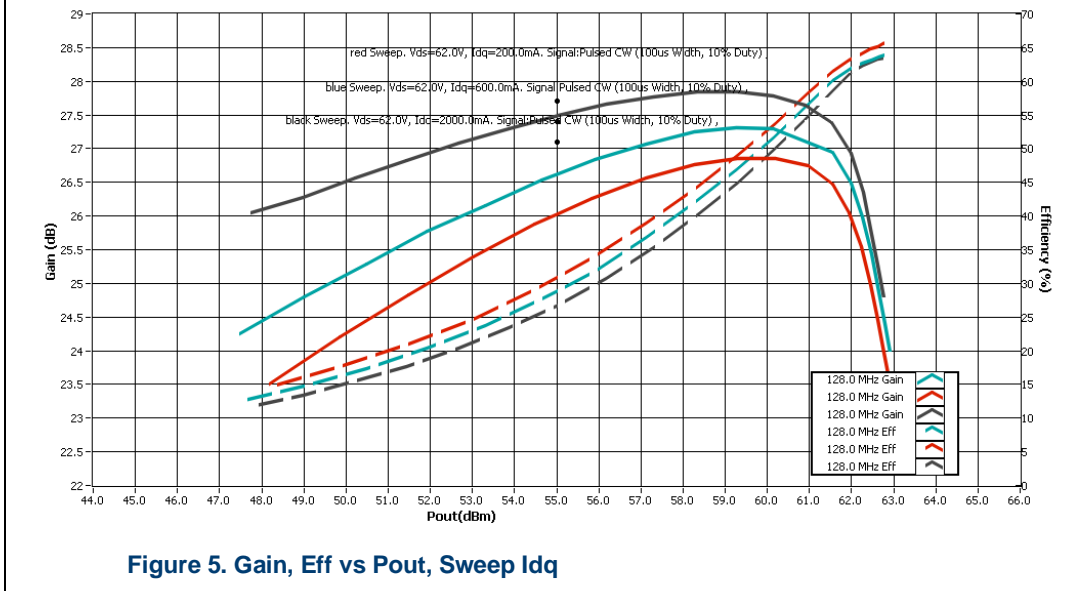
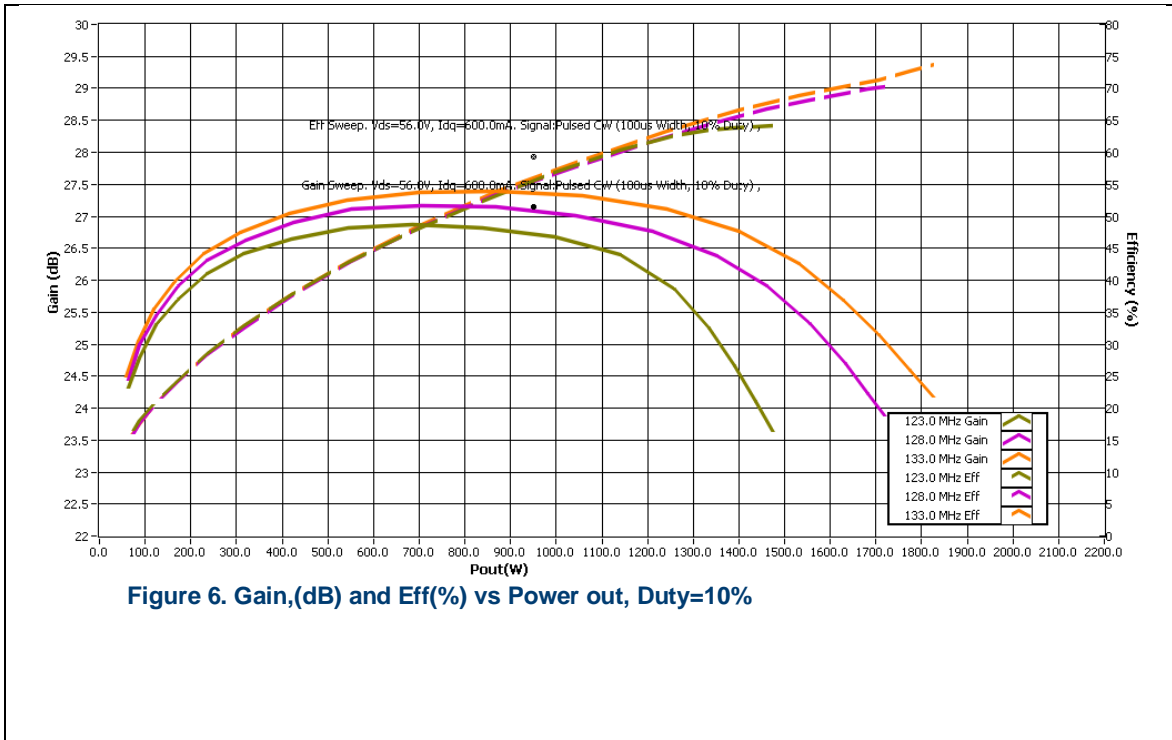


Figure 5. Gain, Eff vs Pout, Sweep Idq

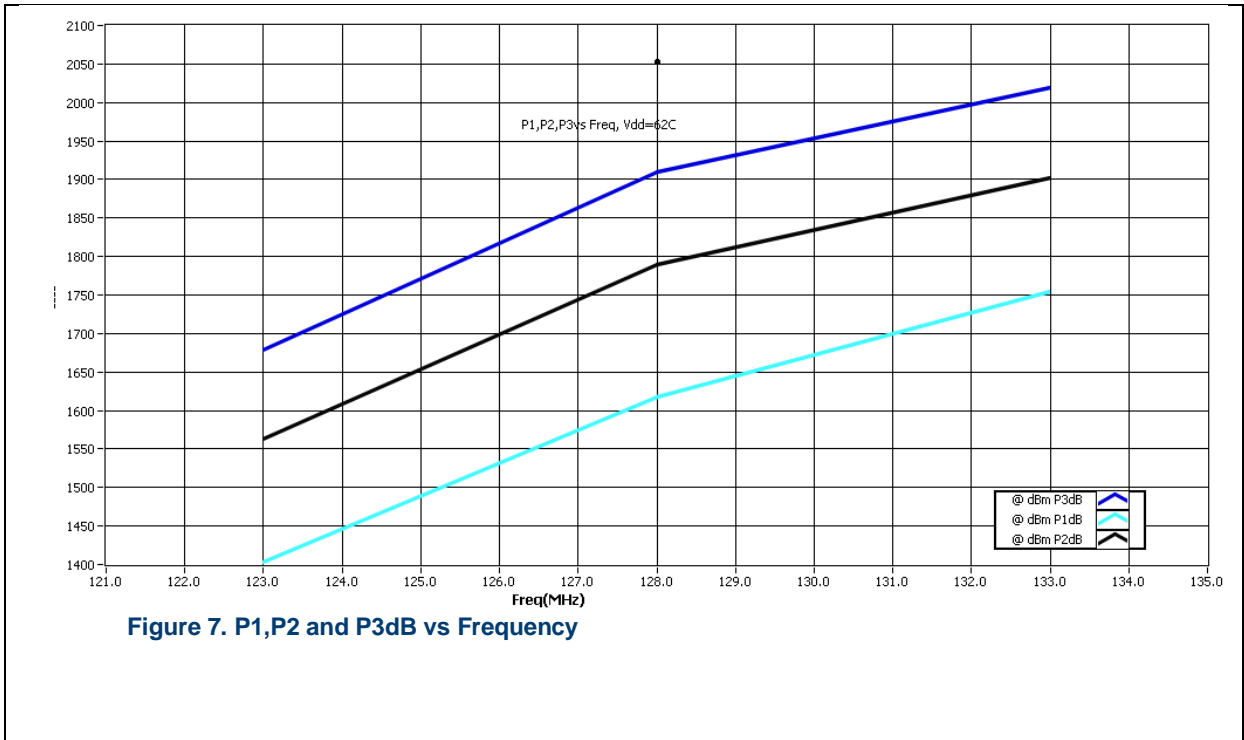
9.4 Gain, Efficiency vs Power Out, Vdd=56V

Vdd=56V, Idq=600mA



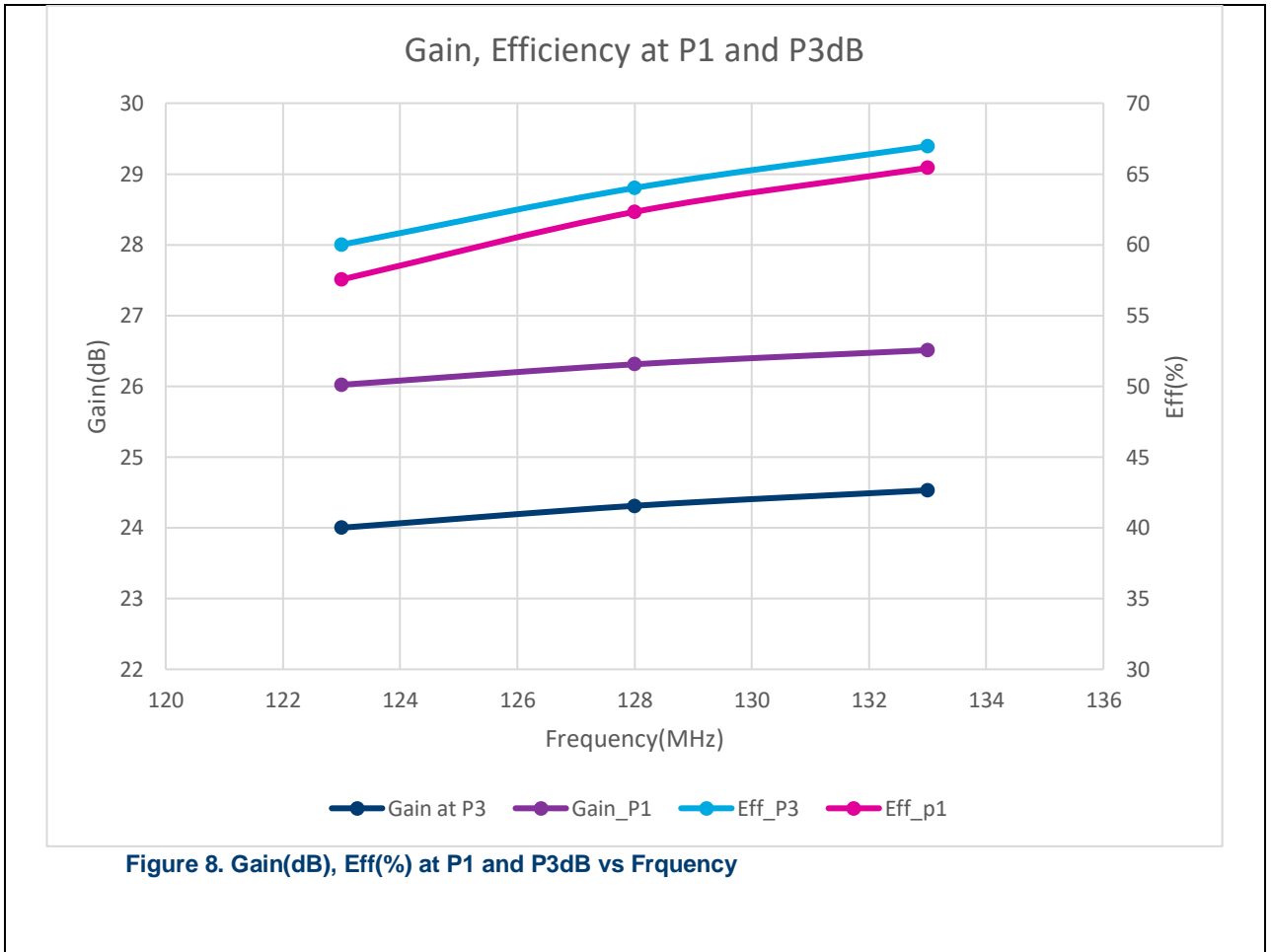
9.5 P1,P2, P3dB vs Frequency

Vdd=62V, Idq=600mA, 10% duty



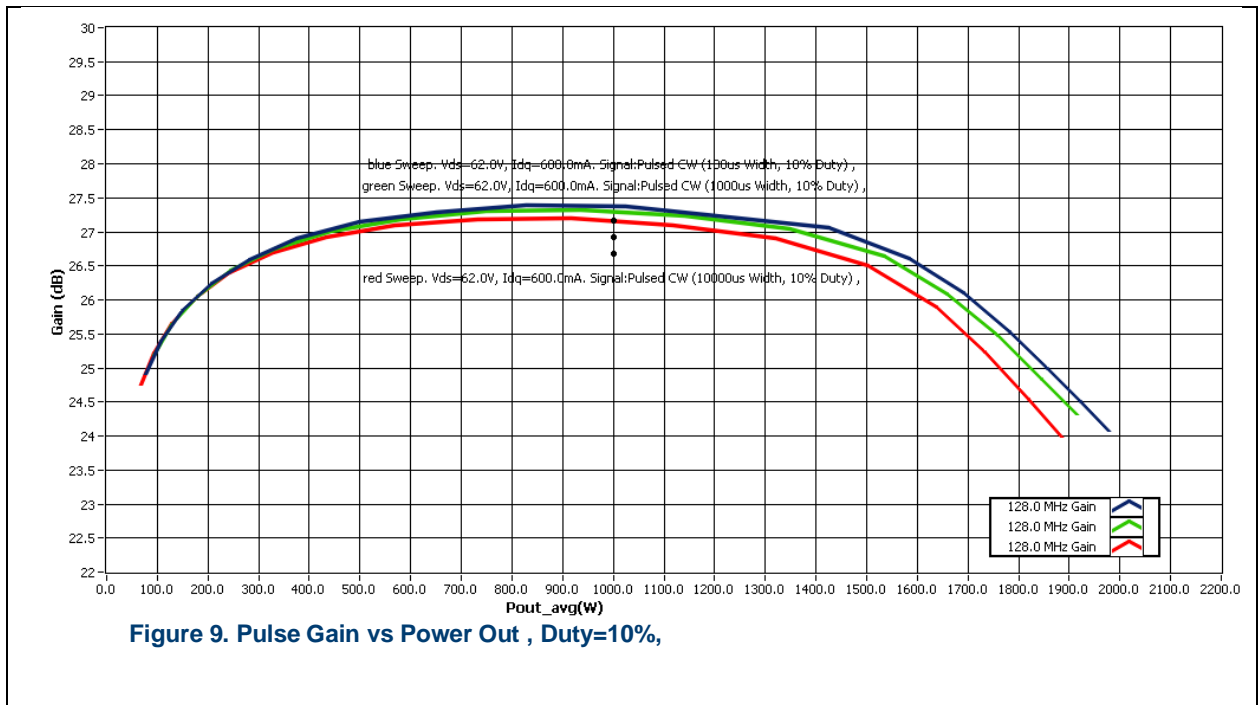
9.6 Gain, Efficiency at P1 and P3dB

Vdd=62V, Idq=10%, Duty=10%, 100usec PW



9.7 Gain, Sweep Pulse Width,

Vdd=62V, Idq=600mA, 10% Duty



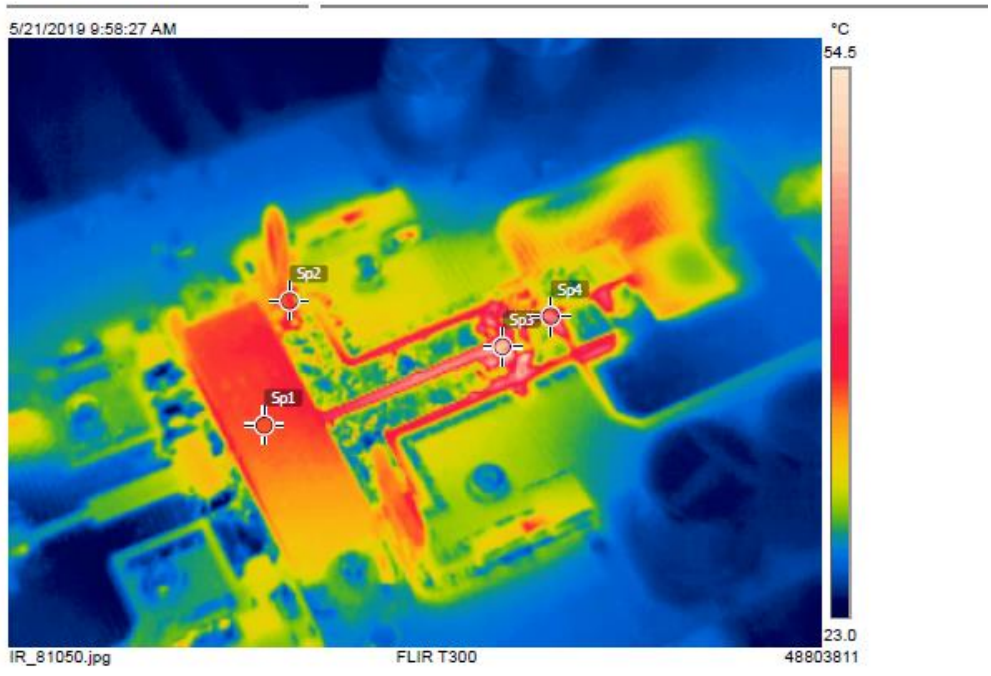
10 IR Scan Results

10.1 IR Scan, Power Out=1900W

Vdd=62V, Idq=600mA, Pout=1900W, Duty=10%, Pulse Width=10msec



Bd172496,ART2K0FE, mod6,Vdd=62V, Pout=1900W.
Duty=10%, PW=10msec. Freq=128MHz



Measurements

Sp1	38.9 °C
Sp2	38.0 °C
Sp3	50.3 °C
Sp4	47.0 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C

Figure 10. IR Scan at Pout=1900W, Duty=10%

Note: Picture show is for a different board, but results are within 5 °C.

11 Hardware

11.1 Board photograph

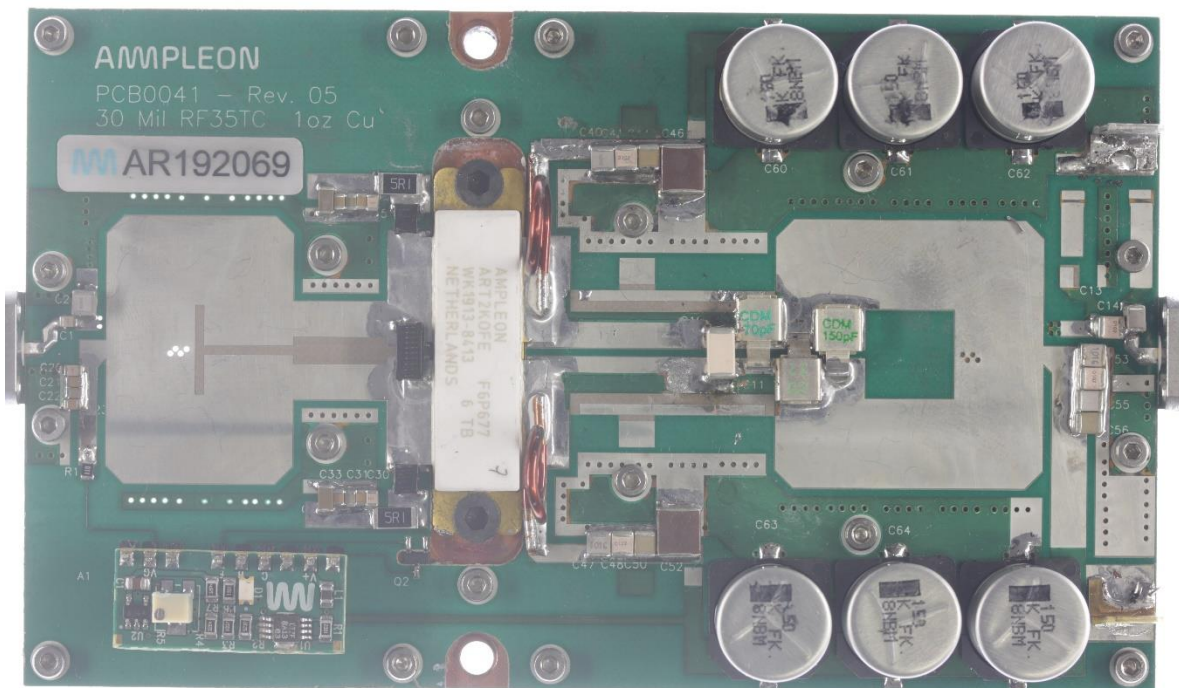


Figure 11. Board Photographs

11.2 PCB layout

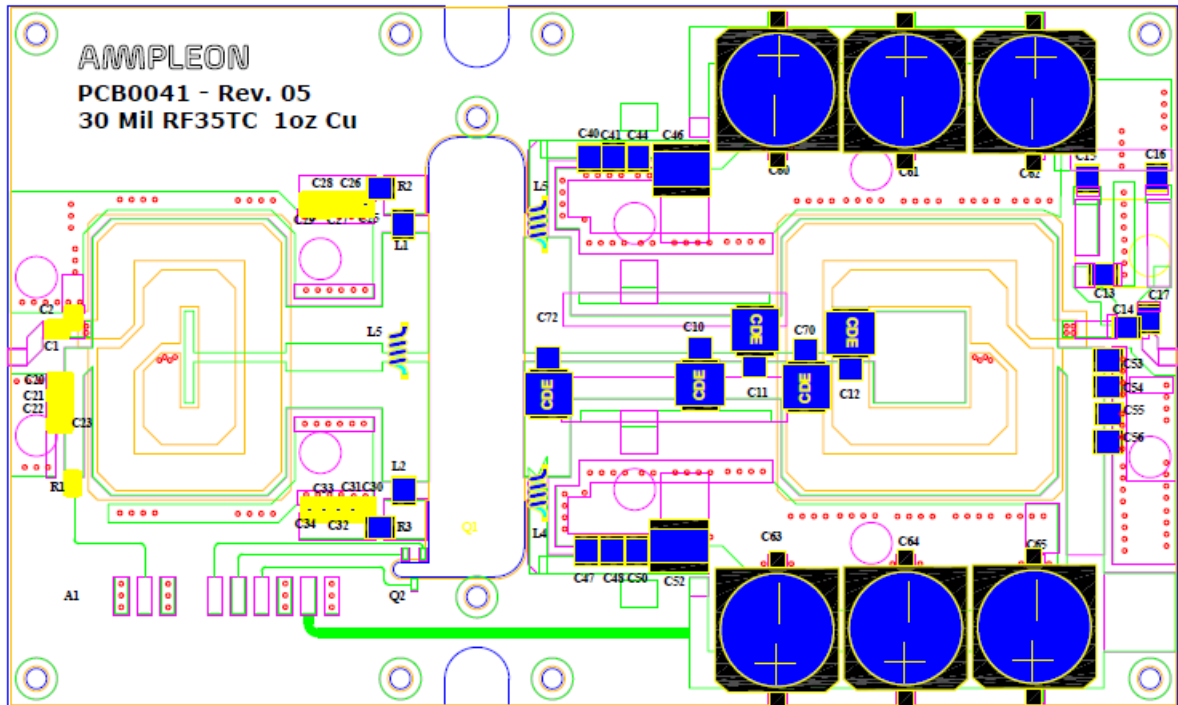


Figure 12.PCB Layout Board #AR192069

11.3 Bill of materials

Table 3. BOM

Designator	Description	Manufacturer	Part#
PCB	30 mil Taconic RF35TC	Avanti	PCB0041 Rev 5
A1	LDMOS bias module	Ampleon	CA-330-11
Q1	Transistor, 2kW, 65V 500MHz LDMOS	Ampleon	AMPLEON ART2K0
Q2	2N2222 NPN Transistor	Fairchild	MMBT2222
C1,C20,C25,C30	Capacitor,100pF, 5%	ATC or Passive Plus	ATC 600F or Passive Plus 0805N
C2	Capacitor ,30pF	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C3	Capacitor 130pF	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C10	Capacitor 82pF	ATC or Passive Plus	ATC800C or Passive Plus 2225N
C11	Capacitor 70pF	CDE	MIN02-002
C12	Capacitor 150pF	CDE	MIN02-002
C13,C15,C16	DNP	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C14	Capacitor 1000pF	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C17	Capacitor 10pF	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C21,C26,C31	Capacitor, 100V 5% NPO, 0805,1nF	Generic	
C22,C27,C32	Capacitor, 50V 10% X7R, 0805 ,10nF	Generic	
C23,C28,C33	Capacitor, 50V 10% X7R, 0805 ,100nF	Generic	
C29,C34	Capacitor, 100V 10% X7R, 1206 ,1uF	Generic	
C40,C47	Capacitor ,100pF	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C53	Capacitor, 100pF, 5%	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C41,C48,C54	Capacitor, 1000pF, 10%	ATC or Passive Plus	ATC100B or Passive Plus 1111N
C55	Capacitor ,4700pF	TDK	C3225C0G2J472K
C44,C50,C56	Capacitor, 100V 10% NPO, 1210,100nF	TDK	C3225C0G1H104K
C46,C52,C57	Capacitor, 100V 10% X7S, 2220 ,10uF	TDK	C5750X7S2A106M
C60-C65	Capacitor,150uF,80V 20%, alum elec	Panasonic	EEE-FK1K151AQ
C70	Capacitor ,22pF	CDE	MIN02-002
C72	Capacitor DNP		
L1,L2	Inductor, 5% 8nH	Coilcraft	A03T
L3,L4	Inductor, 1 Turn		16 gauge, inner dia 0.310"
L5	Inductor, 43nH	Coilcraft	B09T
R1	Resistor, zero-ohm jumper, 0805	Generic	
R2,R3	Resistor, 5Ω, 5% 75W AIM 2010	IMS	NDC-2010WA5R00J
Thermal Pad	0.2" Chomerics Therm-a-gap 976		61-20-0404-976

11.4 PCB materials

Table 4. Board Specifications

Parameter	Value
Manufacturer	Taconic
Type	RF35TC
Thickness	30 mils, 1oz. copper
Layers	2, top/bottom. Bottom all copper

11.5 Device markings

Table 5. Device Specifications

Parameter	Value
Manufacturer	Ampleon
Device	ART2K0FE
Date Code	M1914

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