AR212087

ARF2K0FE, 430-435MHz

AMPLEON

V1.0 — 8 November 2021

Application Report

Document information

Info	Content
Status	General Publication
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Abstract	Measurement results of an ART2K0FE device in board #AR212087 tested over 430-435MHz at 62V

1 Revision History

Table 1. Report revisions

Revision No.	Date	Description	Author
1.0	20210908	Initial document	Bill Goumas
2.0	20211108	Revised Security status to General	Bill Goumas

2 Contents

3 List of Figures

4 List of Tables

5 General Description

This report presents the measurement results of the Class AB Demo board AR212087. The circuit was swept over 430-435MHz and 59-62V. Current bench set-up is limited to 62V.

Idq was set for 600mA for most of the testing.

6 Biasing

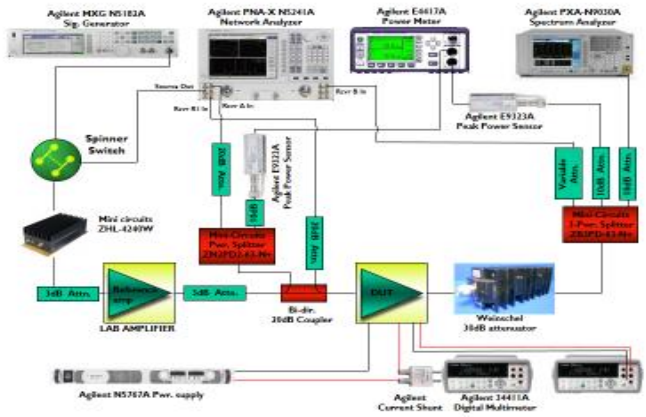
6.1 Bias Details

Idq is adjusted via the pot on the bias board. Apply +5V to the red wire. Pot is set for ~600mA at 5V.

For Vdd =62V , 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

This report presents the measurement results of the Class AB Demo board AR212087. The circuit was swept over 420-450MHz initially.P1dB performance was ~61dBm(1300W). Next step was to narrow band tune the demo for best results over 430-435MHz. Application is <5% duty at these frequencies.

Section 9.5 shows the results from using a slug tuner for a mini-load pull on the initial circuit. Optimum P1dB is ~61.45dBm(1400W) at 62V.

Results show that 1400W at Vdd=62V for P1dB can be achieved with this circuit.

Table 2. RF Performance

Parameter	Measurement	Unit
Specified frequency range	430-435	MHz
Drain voltage	62	V
Quiescent drain current	600	mA
P1dB at 5% Duty Cycle and 62V	1400	W
*P1dB at 5% Duty Cycle and 65V	1500	W
Efficiency at Power Out=P1dB at 62V	50-55	%
Gain at P1dB and 62V	≥ 19	dB

*Section 9.3 shows data at 59 and 62V. This can be used to project the P1dB at 65V. P1dB should be ~100W higher at 65V. Bench testing is currently limited to 62V due to Power Supply limitations.

The small signal gain peak near ~100MHz will be addressed when a duplication of this circuit is built with the ART2K0PE.

9 Performance Details

9.1 Small Signal Results

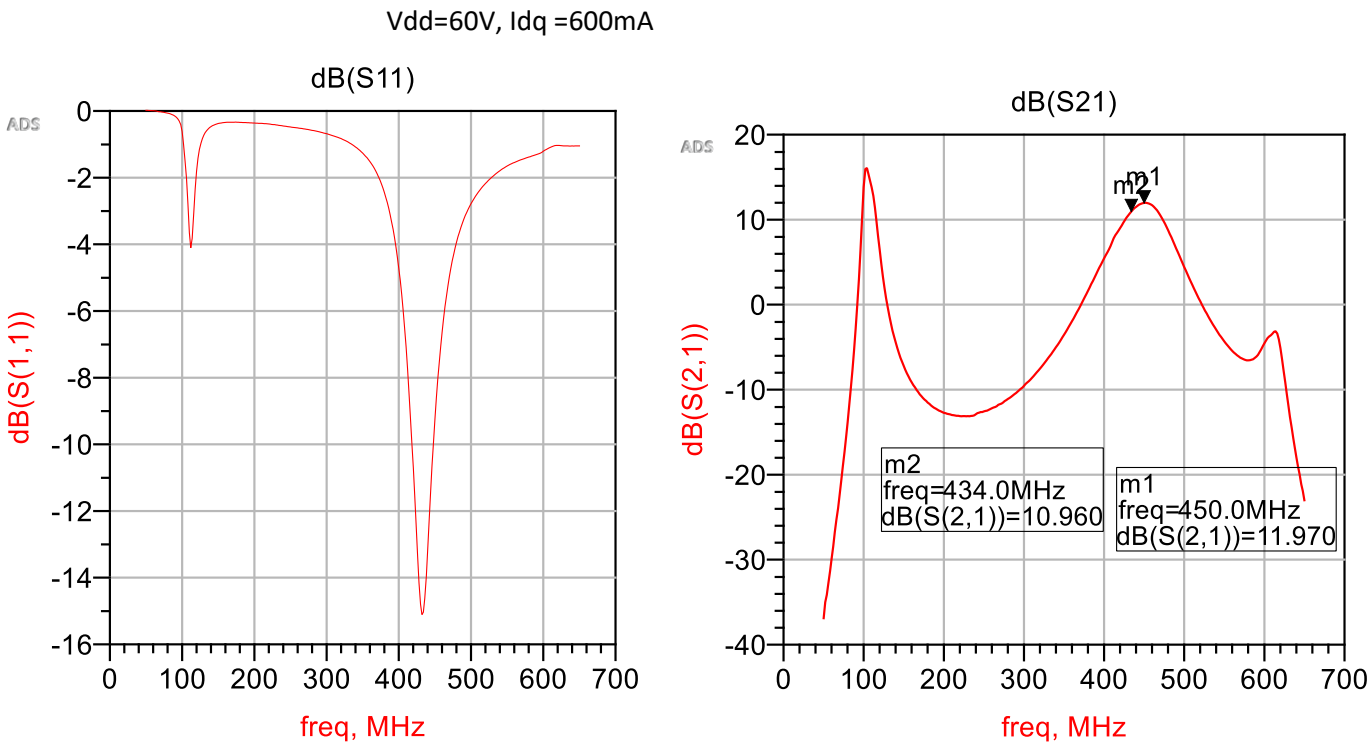


Figure 2. Small SIgnal Data, Vdd=60V, Idq=600mA, Pin=10dBm

9.2 Gain, Efficiency vs Power out

Vdd=62V, Idq=600mA, Power in dBm

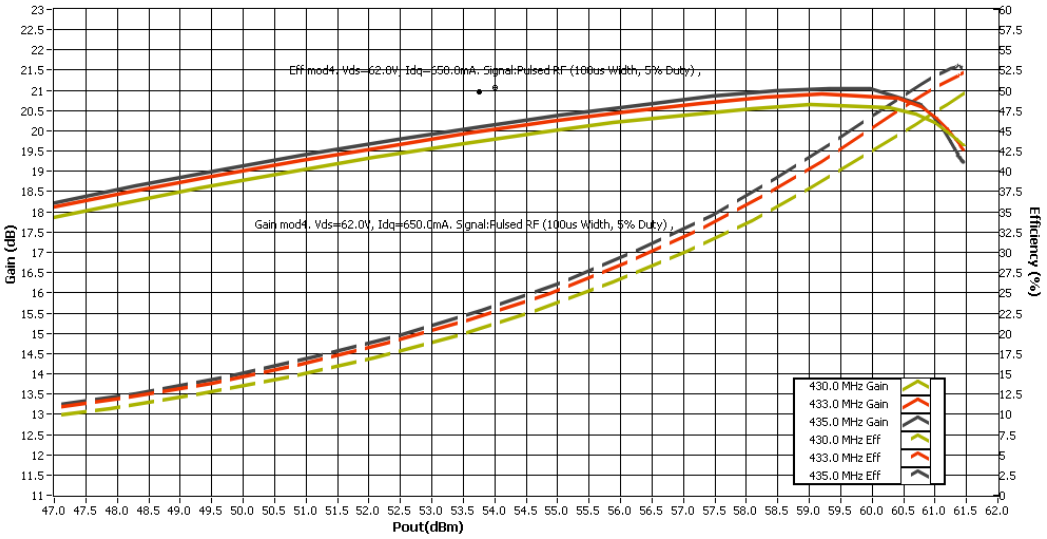


Figure 3. Gain, Efficiency vs Power out(dBm), Duty=10%

Vdd=62V, Idq=600mA, Power in Watts

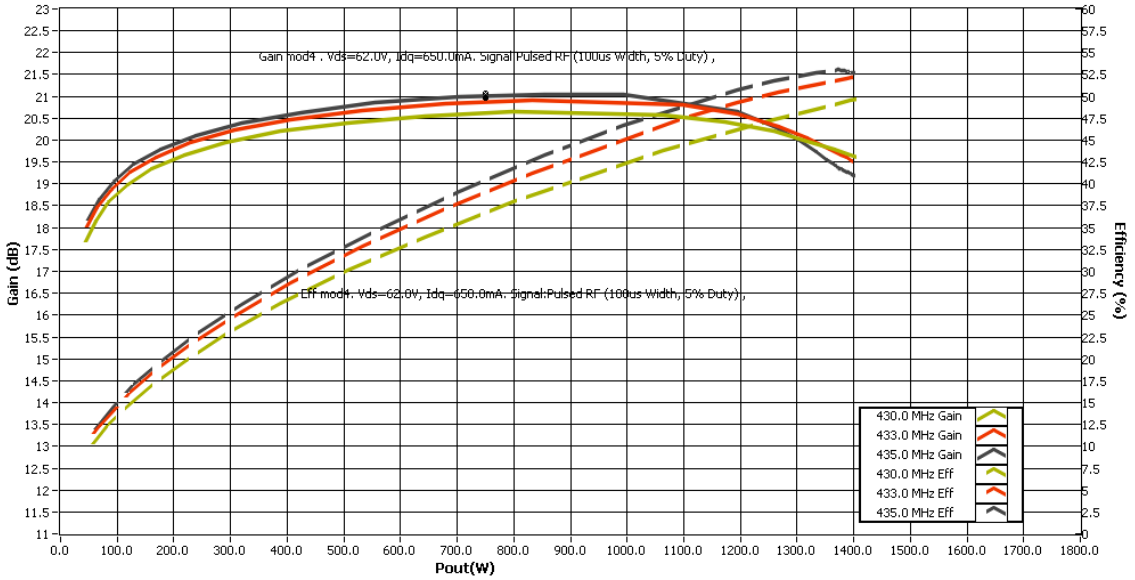


Figure 4.Gain, Efficiency vs Power out(W), Duty=10%

9.3 Performance vs Voltage and Bias

Vdd varied, Idq=600mA, Vdd=59 (red),62(blue) 5% duty,100usec PW

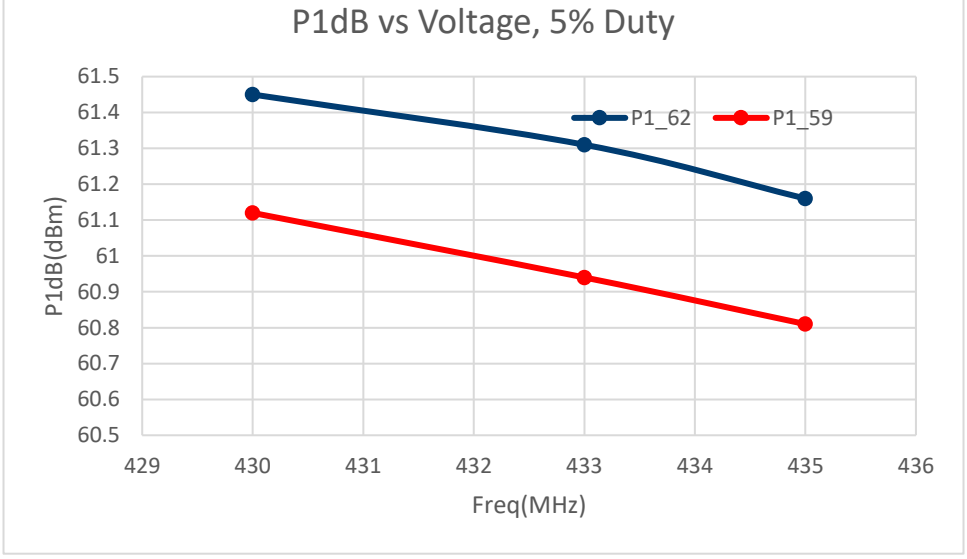


Figure 5. P1,P2dB(dBm) vs Freq, Sweep Voltage

9.4 Gain, Efficiency at Power Out=1400W

Vdd=62V,Idq=600mA, Duty=5%, 100usec PW

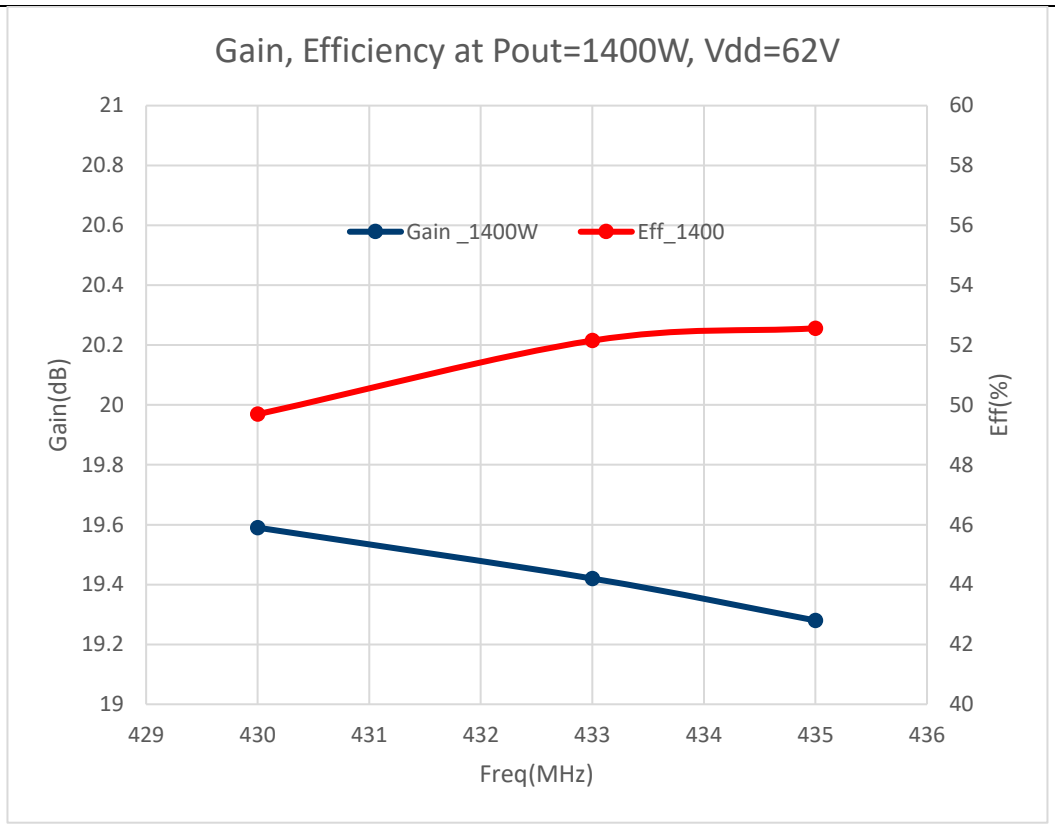


Figure 6. Gain(dB), Eff(%) at Power Out=1400W vs Frequency

9.5 Performance into Slug Tuner at circuit output

Vdd=62V,Idq=600mA, Duty=5%, 100usec PW

Gain, Eff vs Power Out into various loads

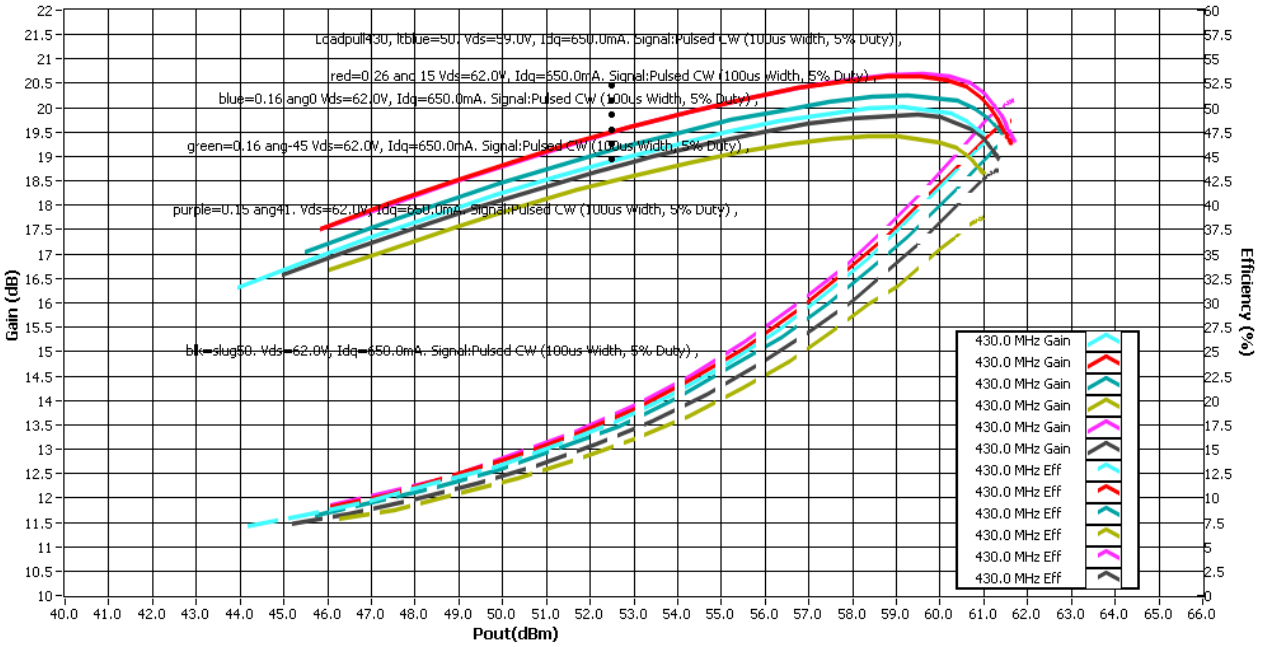


Figure 7. Gain(dB), Eff(%) vs Power Out(dBm)

10 IR Scan Results

10.1 IR Scan, Power Out=1500W

Vdd=62V, Idq=600mA, Pout=1500W, Duty=5%, Pulse Width=10usec

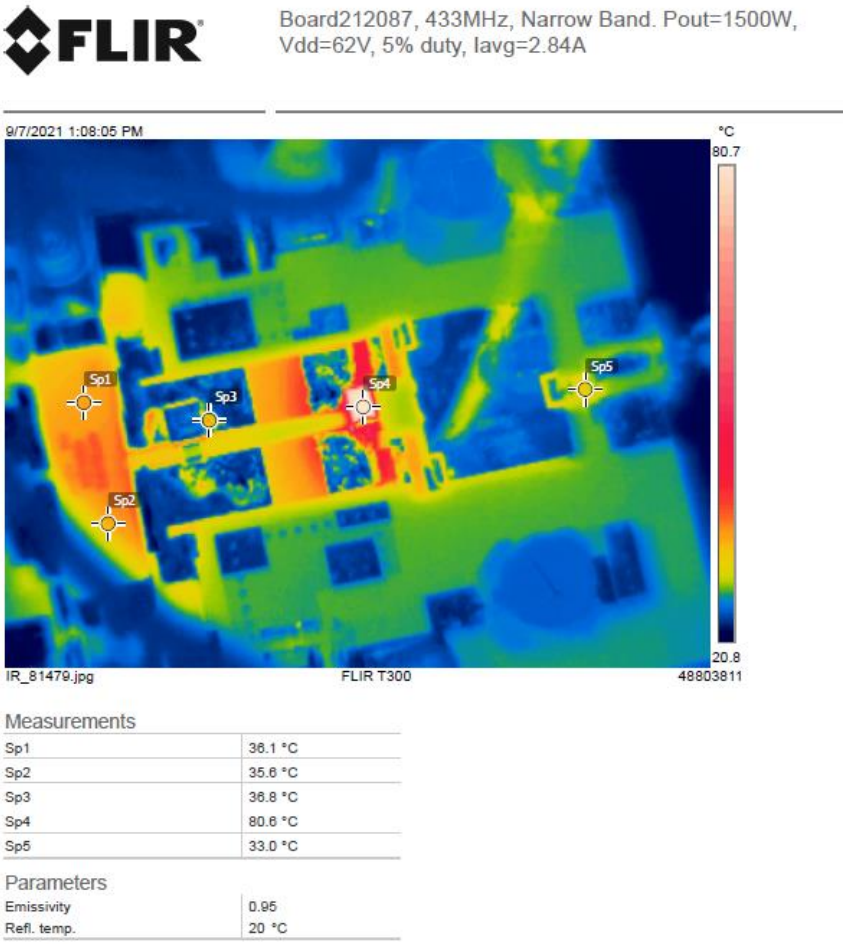


Figure 8. IR Scan at Pout=1500W, Duty=5%

11 Hardware

11.1 Board photographs

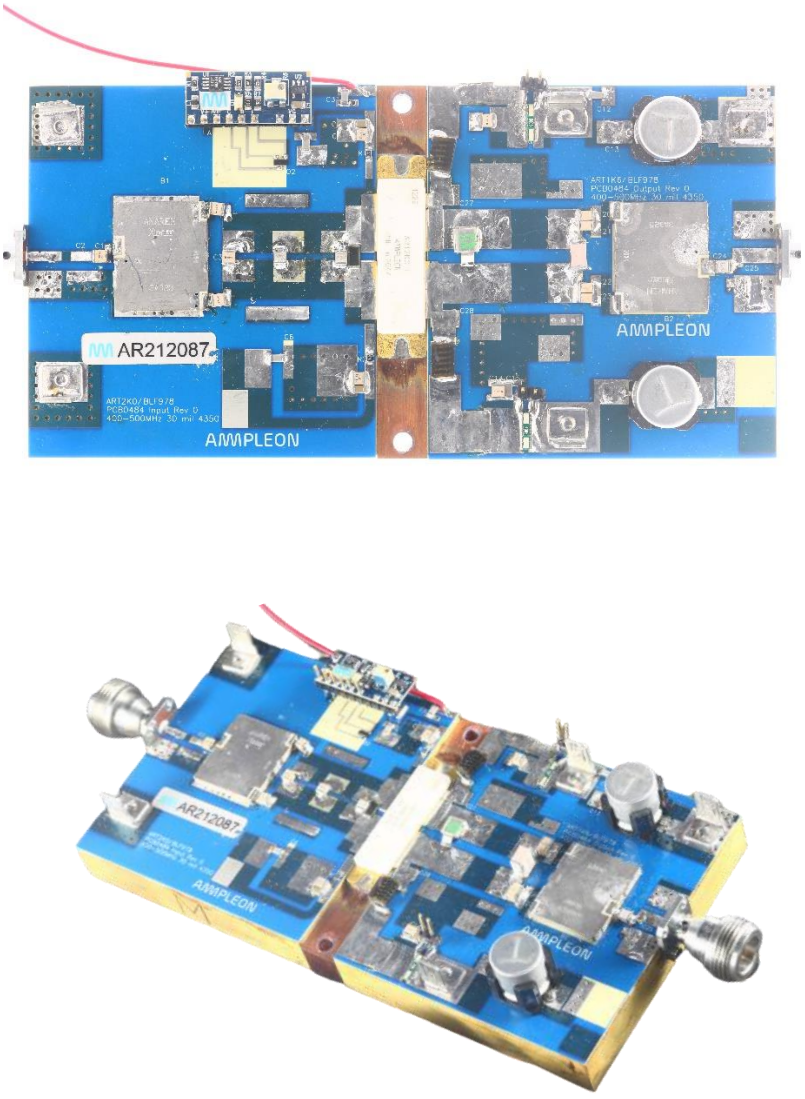


Figure 9. Board Photographs

11.2 PCB layout

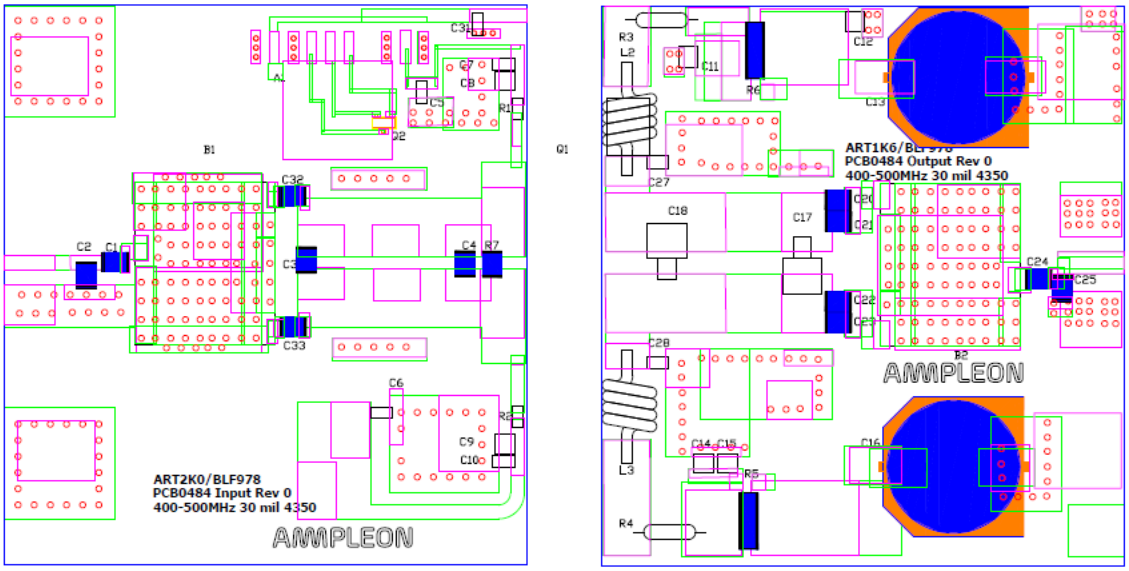


Figure 10.PCB Layout Board #AR212087

11.3 Bill of materials

Table 3. BOM

Designator	Description	Manufacturer	Part#
PCB Input	30 mil thk. Rogers 4350	Avanti Circuits	PCB0484 Input Rev 0
PCB Ouput	30 mil thk. Rogers 4350	Avanti Circuits	PCB0484 Output Rev 0
Q1	RF Transistor 2kW 65V LDMOS	Ampleon	ART2K0FE
Q2	2N2222 NPN Transistor	Fairchild	MMBT2222
A1	LDMOS bias module	Ampleon	CA-330-11
B1,B2	Balun SMT	Anaren	3A325
R1,R2	Resistor 47Ω SMD	Generic	1206
R3,R4	Short with copper tape		
R5,R6	0.005Ohm sense Resistor	Susumu	RL7520WT-R005-F
R7	50 Ohm	IMS	NGC-2010WA50R0J
C1	20pF	ATC	100B
C8,C9	100pF	ATC	100B
C2	DNP	ATC	100B
C3	18 pF	ATC	100B
C4	22pF	ATC	100B
C5,C6,C12,C15,C31	0.01uF,100V,X7R,1206	Murata	GRM319R72A103KA01D
C7,C10	0.1uF 100V,X7R	Murata	GRM319R72A104KA01D
C13,C16	150 uF, 80V, Electrolytic	Panasonic	EEE-FK1K151AV
C17	18pF	Passive Plus	2225 series
C18	36pF	CDE	MIN02
C11,C14,C20,C21, C22,C23,C32,C33	120pF soldered on side. C11,C14 and C24 flat	ATC	100B
C24	27pF	ATC	100B
C25	2.4pF	ATC	100B
C27,C28	DNP	ATC	100B
L2,L3	Inductor 30nH	Coilcraft	WA-3097

11.4 PCB materials

Table 4. Board Specifications

Parameter	Value
Manufacturer	Rogers
Type	4350
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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