AR201104

ART2K0FE, 41MHz

v1.0 — 20-May-2020

AMPLEON

Application Report

Document information	
Status	Company Public
Author(s)	
Abstract	Measurement results of a Class AB planar balun design for the 41MHz band with the ART2K0FE

1. Revision History

Table 1: Report revisions

Revision	Date	Description	Author
1.0	2020.05.20	Initial document	

2. Contents

3. List of figures

4. List of tables

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5. Introduction

5.1 General description

This document shows the measurement results of a 41MHz demo amplifier (Board AR201104) with 1x ART2K0FE.

5.2 Test object details

Transistor type:	ART2K0FE (Soldered down)
Production code:	6337 m1952 W3 Philippines
Package:	SOT539
Board:	ART2K0_41MHz_coplanar_balun_input_output
Demo number:	AR201104

5.3 Used Test signals

CW:	CW
CW-pulsed:	Pulsed CW, Pulse Width 100us, Duty Cycle 10%

5.4 Test circuit

A description of this circuit can be found in Appendix A.

The INPUT and OUTPUT board of the test circuit have been designed on Rogers RO4350, h=0.762mm, εr=3.48, 2x35um.

Supply voltage (drain-source) is typical 65V. Increase Vgs until the total Idq will be 320mA.

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6. Measurement Results

6.1 Gain & Efficiency @ Frequency=41MHz CW

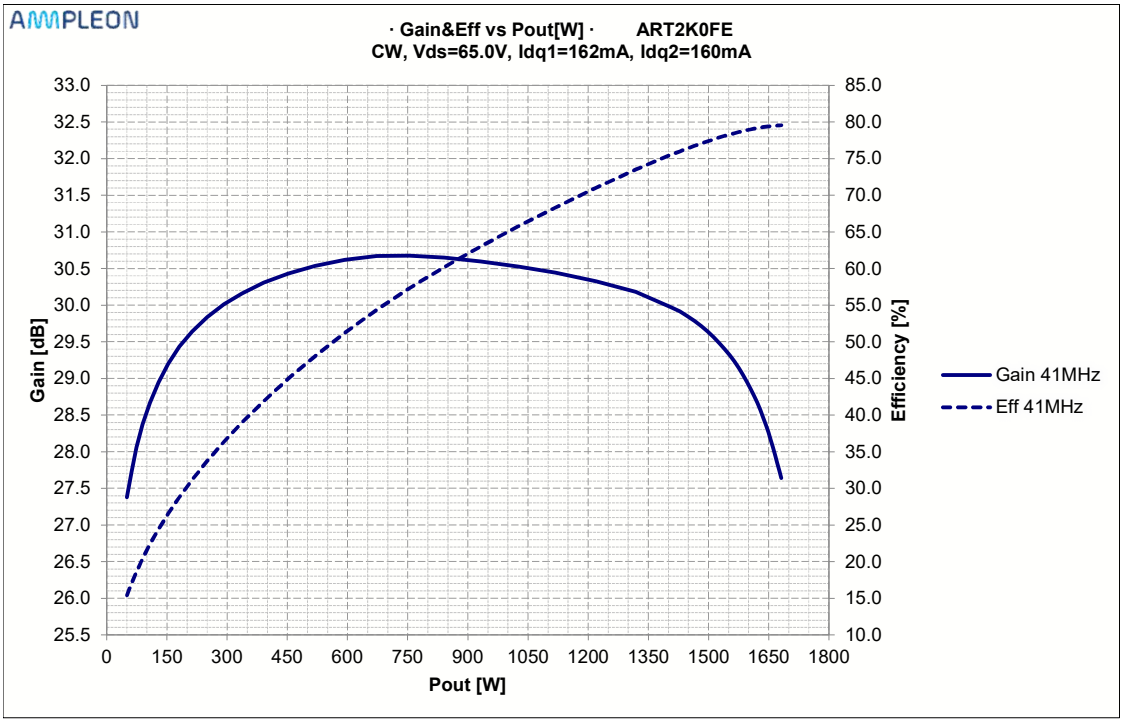

Figure 1 CW Gain and Efficiency vs Pout [W]

Table 1 – RF Performance overview

Freq [MHz]	Gmax [dB]	Pout@ Gmax [W]	P1dB [W]	P2dB [W]	P3dB [W]	Effmax [%]	Pout@ Effmax [W]	Eff P1dB [%]	Eff P2dB [%]	Eff P3dB [%]
41	30.7	754.9	1489.8	1620.9	1679.4	79.6	1681.1	77.2	79.2	79.5

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6.2 Gain & Efficiency @ Frequency=41MHz CW-Pulsed

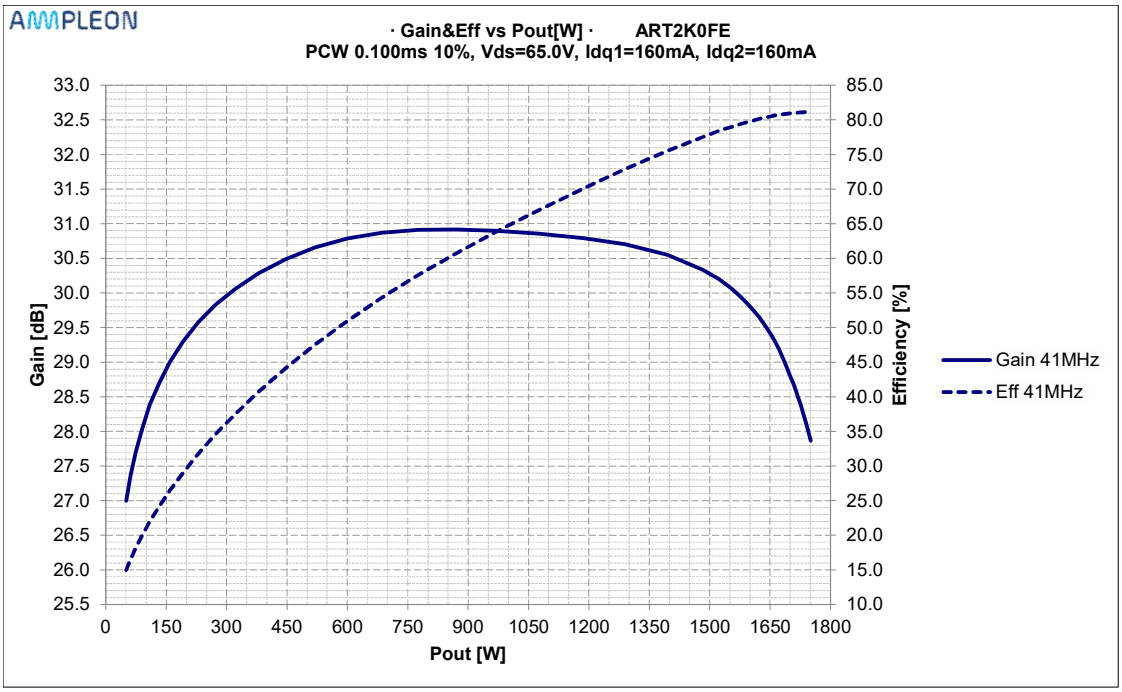

Figure 2 PCW Gain and Efficiency vs Pout[W]

Table 2 – RF Performance overview

Freq [MHz]	Gmax [dB]	Pout@ Gmax [W]	P1dB [W]	P2dB [W]	P3dB [W]	Effmax [%]	Pout@ Effmax [W]	Eff P1dB [%]	Eff P2dB [%]	Eff P3dB [%]
41	30.9	870.3	1582.2	1692.4	1748.8	81.2	1746.6	79.5	80.9	81.2

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7. Appendix A – PCB Layout and components

7.1 PCB OUTPUT

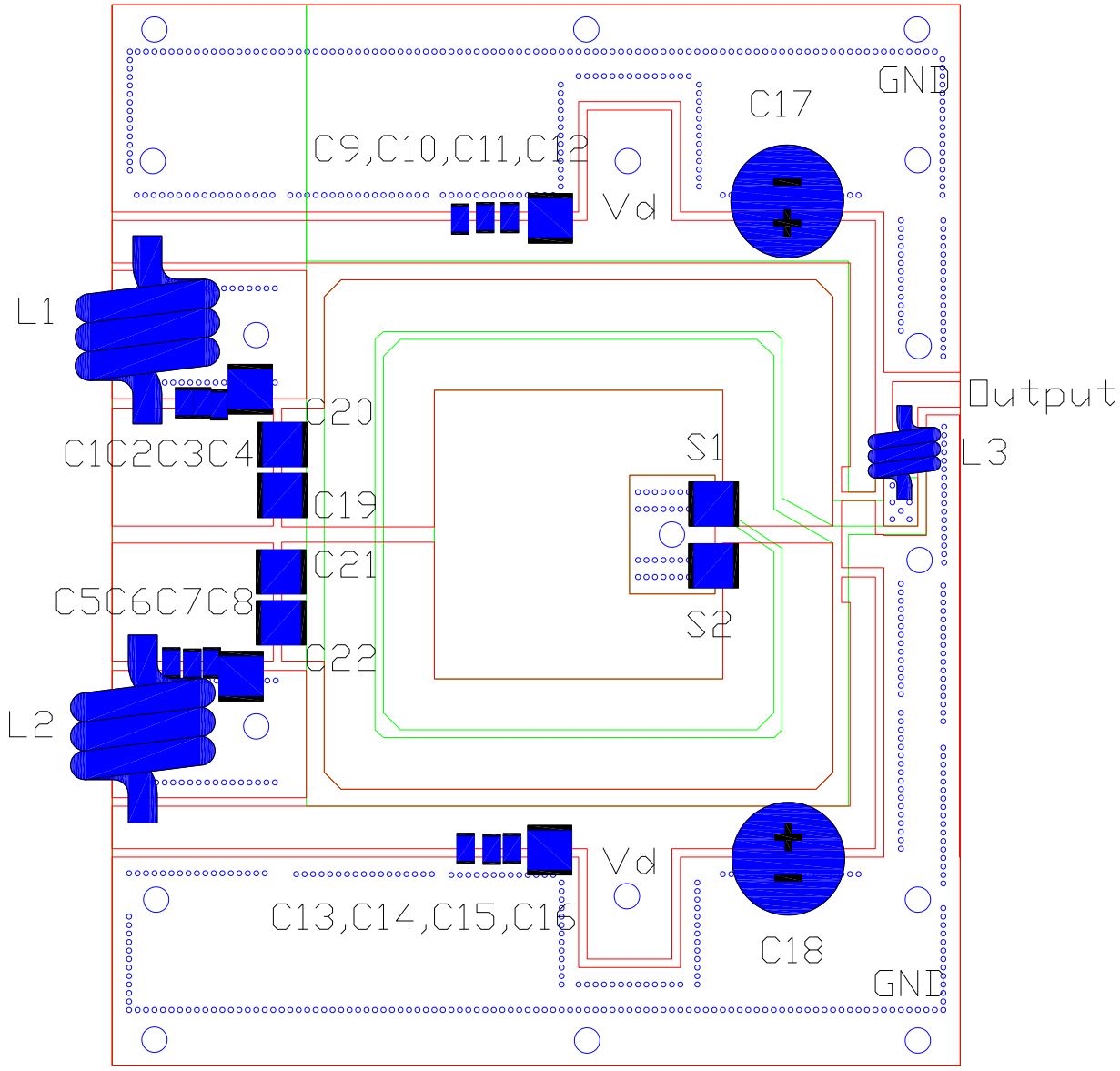

Figure 3 PCB Layout Drawing output

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7.2 Component list OUTPUT

Table 2: Component list output

Output Board			
Component	Value	manufacturer	Remarks
C1, C2	47pF	ATC	800B
C3	82pF	ATC	800B
C4	220pF	PPI	Type 2225
C5, C6	47pF	ATC	800B
C7	82pF	ATC	800B
C8	220pF	PPI	2225
C9, C10, C13, C14	510p	ATC	100B
C11, C15	100nf	TDK	100Volts
C12, C16	4u7	TDK	100Volts
C17, C18	1000uF		100Volts Electrolitic
C19 - C20	680pF	PPI	Type 2225
C21 - C22	680pF	PPI	Type 2225
S1, S2	short		Copper foil
L1, L2	Air coil 6turns, 6mm diameter		Enamel 1.6 mm copper wire
L3	66nH	Coilcraft	1212VS-66NME
Board	Ro 4350 double sided	Rogers	Er=3.5 substrate=0.76mm Tcopper= 70um
Thermal conductor under Output Balun	Thermipad TP22626	Mueller Ahlhorn	
Baseplate	Copper with cooling channel		Cavities for coplanar baluns are 5mm deep

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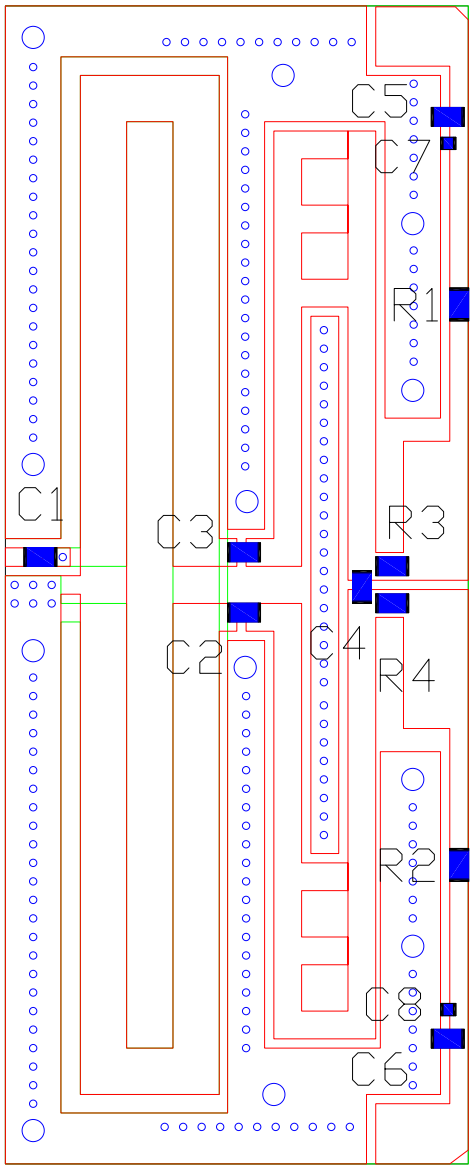
7.3 PCB INPUT



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7.4 Component list INPUT

Input Board			
Component	Value	manufacturer	remarks
C1	560pF	ATC	100B
C2	470pF	ATC	100B
C3	470pF	ATC	100B
C4	100pF	ATC	100B
C5	100n	ATC	100B
C6	100n	ATC	100B
C7, C8	1n	ATC	100B
R1	22Ohm		0812
R2	22Ohm		0812
Board	Ro 4350	Rogers	Er=3.5

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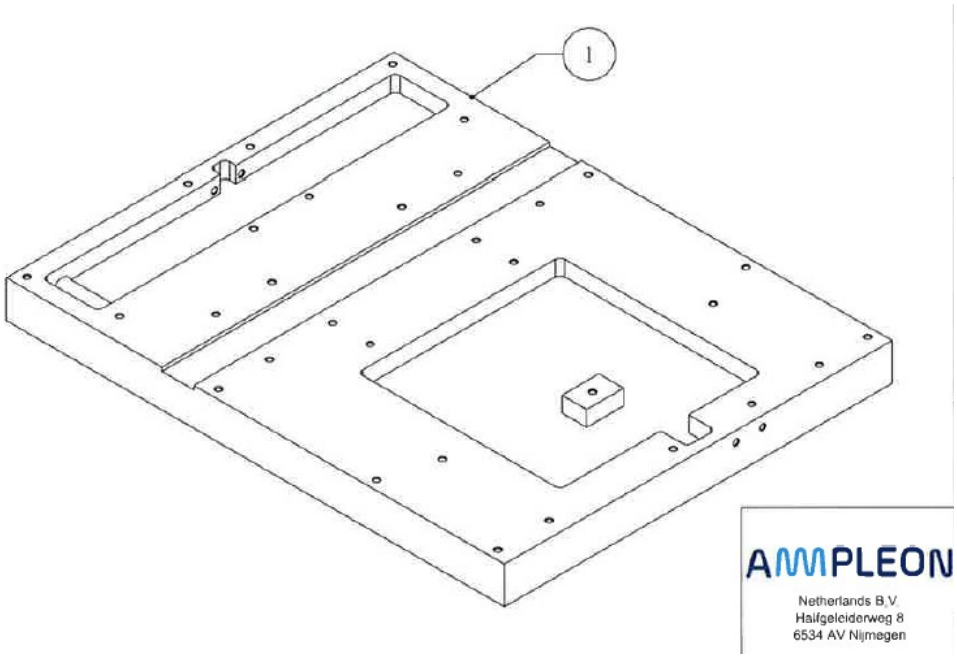
7.5 Baseplate

The demo amplifier pcb boards are mounted on a full copper base plate. The base plate contains a water channel to supply the amplifier with sufficient cooling.

The base plate contains two cavities for the coplanar baluns.The input balun cavity is air filled. The output balun cavity is filled with a thermal conductive material that has good electrical properties. The material is conducting the heat from the balun, generated as a result of RF losses, to the baseplate. The thermal conductive material is absolutely necessary to cool the coplanar output balun.

A drawing of the base plate is shown below.



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7.6 Photo's Demo Board

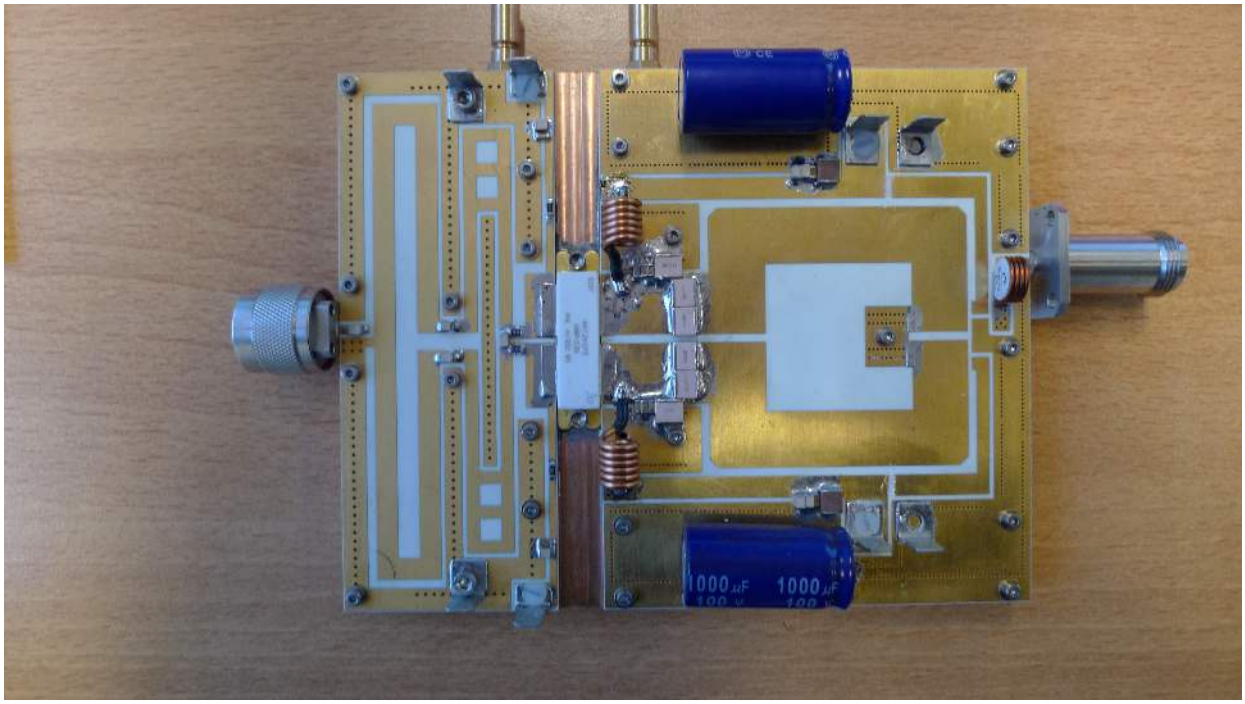

Figure 4 Picture Top View Demo Board

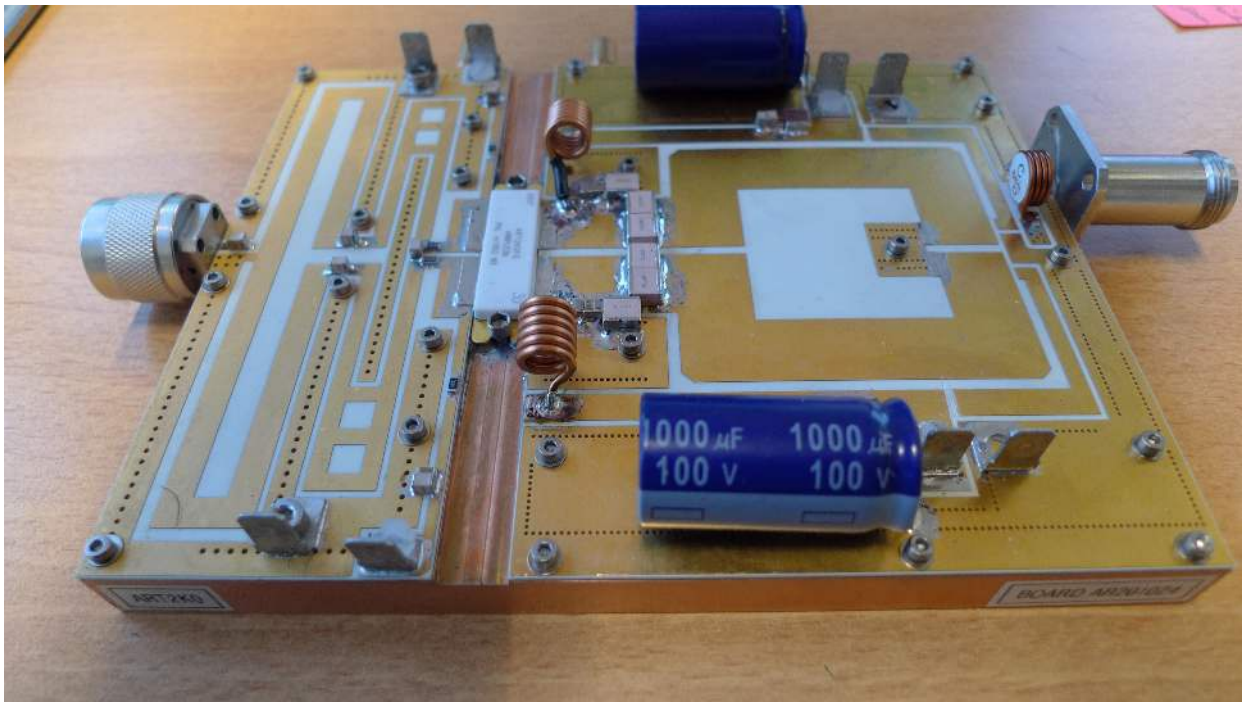

Figure 5 Side View Picture Demo Board

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