AR191173

BLP9LA25S, 800-870MHz

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AMPLEON

Application Report

Document information	
Status	Public
Author(s)	Tom Brinkman
Abstract	Measurement results of a Class AB design for the 800-870MHz band with the BLP9LA25S

1. Revision History

Table 1: Report revisions

Revision	Date	Description	Author
0.1	20191126	Initial document	Tom Brinkman
1.0	20200916	Final	Tom Brinkman
1.1	20201027	Typo in title corrected	Tom Brinkman

2. Contents

3. List of figures

4. List of tables

5. General description

This report presents the measurement results of the Class AB demo AR191173. The device used is a 25W, 9th generation LDMOS, the BLP9LA25S. The presented demo is tuned for the frequency 800-870MHz.

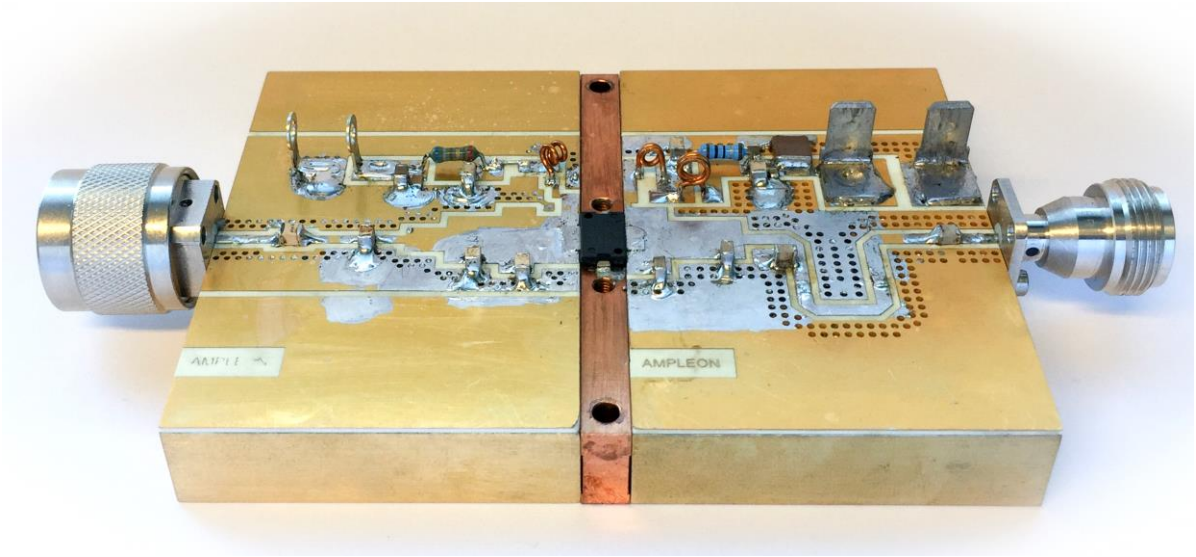


Figure 1 Demo Front view

6. Biasing

The efficiencies presented are based on the currents of the drain feeds only.
I.e. the biasing currents for the gate circuitry has not been included.

Unless otherwise stated, the biasing is as follows:

V_{DD} = 13.6V

V_{GS} = 1.93V, leading to an I_{DQ} = 100mA

7. Performance Indication 800-870MHz

Table 2: Performance indication, sampled at 800-870MHz

Parameter	Condition	Unit	CW
V_{DD}		V	13.6
S11 at connector		dB	-5.3
P_{1dB}[1]	G_{MAX}-1dB	W	24.2
P_{3dB}[1]	G_{MAX}-3dB	W	29.0
P_{OUT} of operation	***P_o***[2]	W	***25***
Gain	**@P_o**	dB	>14.2
Drain Efficiency	**@P_o**	%	>64.7
Drain Efficiency	**@ 3dB comp.**	dB	>67.7

[1] *Pout at 1 and 3dB gain compression relative to the maximum gain in the power sweep*

[2] *Demonstrator is expected to operate at the P_o average power level*

8. Performance Details

8.1 CW signal Power sweeps

Table 3: CW Performance

Freq [MHz]	MaxGain [dB]	P1dB [W]*	P3dB [W]*	Eff@P3dB [%]*
760.00	16.9	27.48	35.07	71.0
770.00	16.8	26.90	34.27	70.8
780.00	16.7	26.45	33.67	70.8
790.00	16.5	26.00	33.02	70.3
800.00	16.3	25.70	32.56	70.0
810.00	16.1	25.46	32.19	69.8
820.00	15.9	25.42	32.00	69.7
830.00	15.8	25.36	31.83	69.5
840.00	15.7	25.27	31.60	69.4
850.00	15.6	25.05	31.16	68.9
860.00	15.5	24.67	30.42	68.5
870.00	15.5	24.19	29.03	67.7
880.00	15.4	23.97	27.93	68.0
120.0	1.549	3.517	7.138	3.322

Table 4: CW Performance at Pout = 25Watts

Freq [MHz]	Gain [dB]@	Eff [%]@	Compr [dB]@	IRL [dB]@
760.00	16.3	63.5	-0.63	6.8
770.00	16.1	64.1	-0.68	6.6
780.00	15.9	64.5	-0.75	6.3
790.00	15.7	64.6	-0.82	5.9
800.00	15.4	64.7	-0.87	5.6
810.00	15.2	64.7	-0.91	5.4
820.00	15.0	64.8	-0.92	5.3
830.00	14.8	64.8	-0.93	5.4
840.00	14.7	64.8	-0.94	5.6
850.00	14.6	64.7	-0.99	6.1
860.00	14.4	64.7	-1.08	6.9
870.00	14.2	65.0	-1.23	8.3
880.00	14.0	66.0	-1.36	10.9
120.0	2.282	2.453	0.733	5.530

8.1.1 Gain and efficiency (3dB sweep) 800-870 MHz

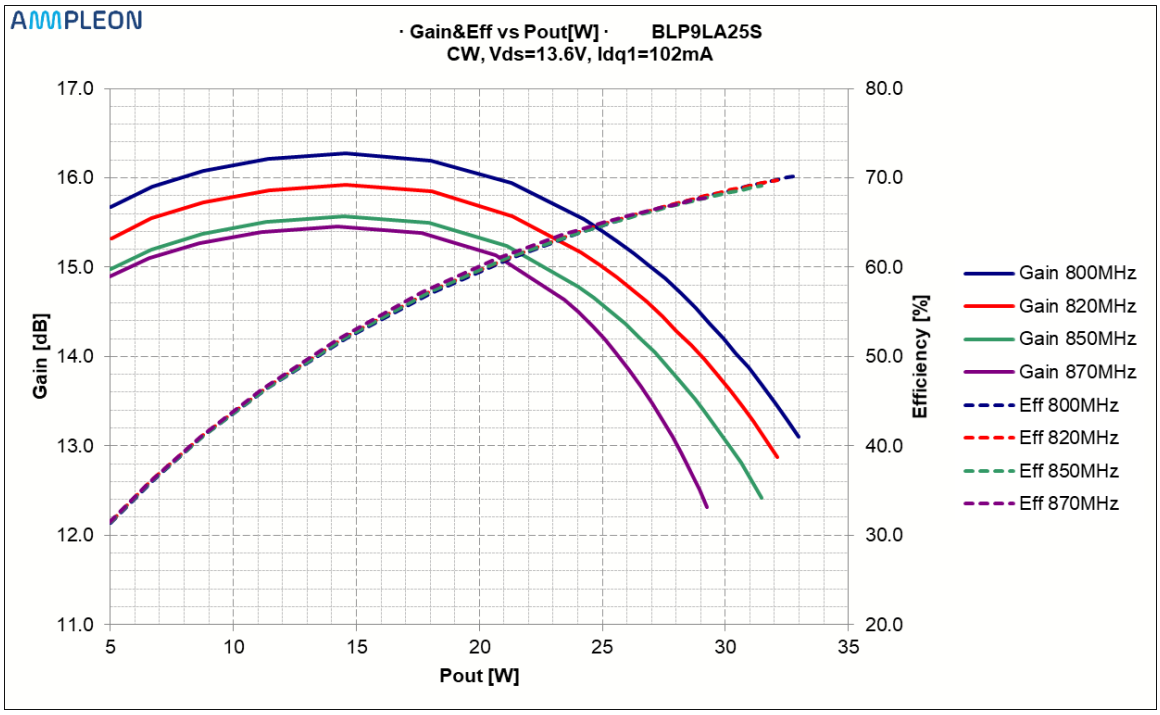


Figure 2 BLP9LA25S_PS_CW_191121_1156 Gain&Eff vs Pout[W]

8.2 CW Signal performance over 760-880 MHz

8.2.1 3dB compressed power

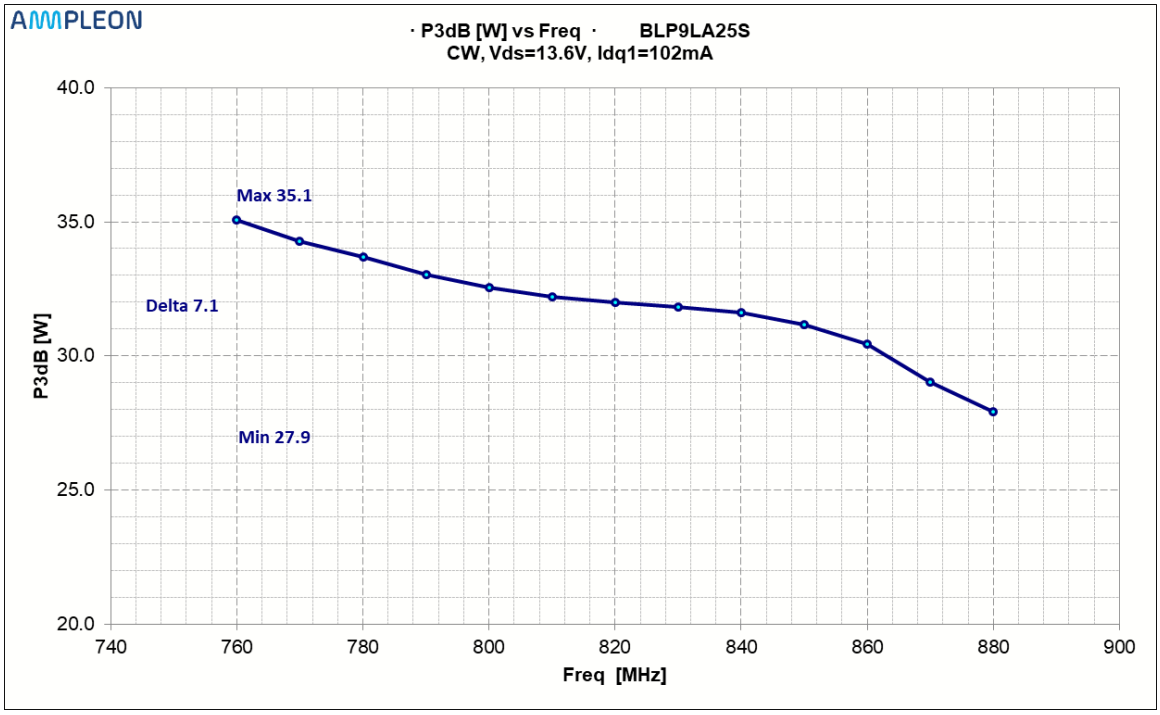


Figure 3 BLP9LA25S_PS_CW_191121_1156 P3dB[W] vs Freq

8.2.2 Gain

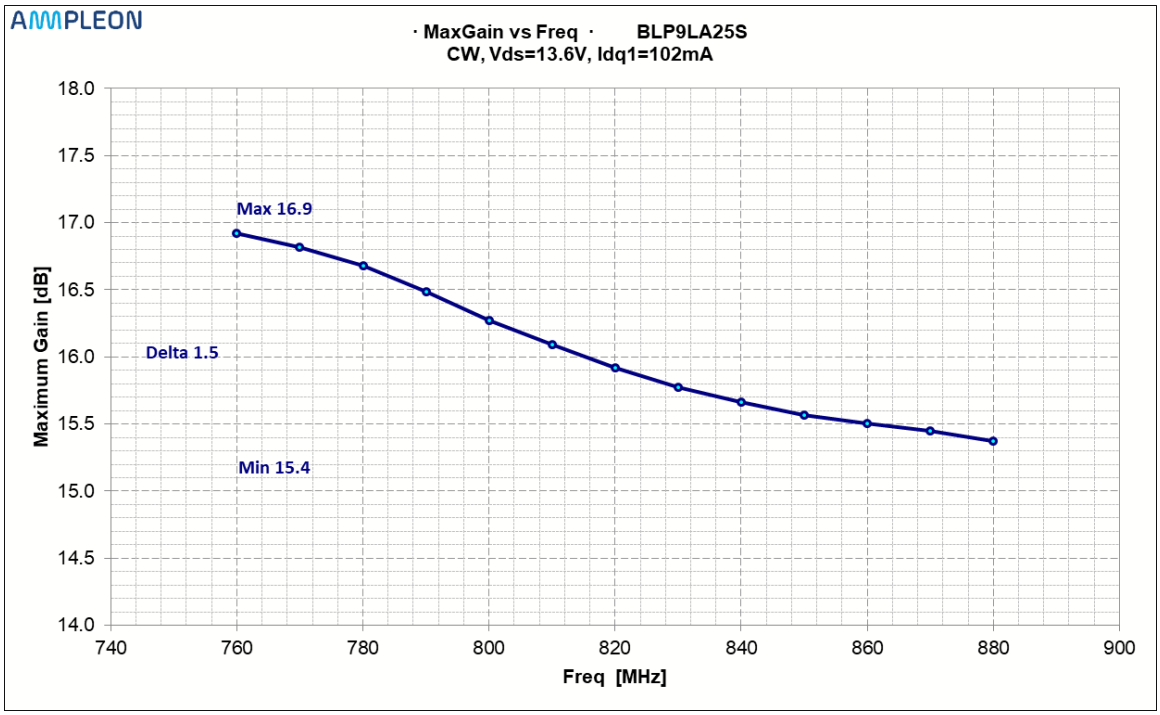


Figure 4 BLP9LA25S_PS_CW_191121_1156 MaxGain vs Freq

8.2.3 Efficiency

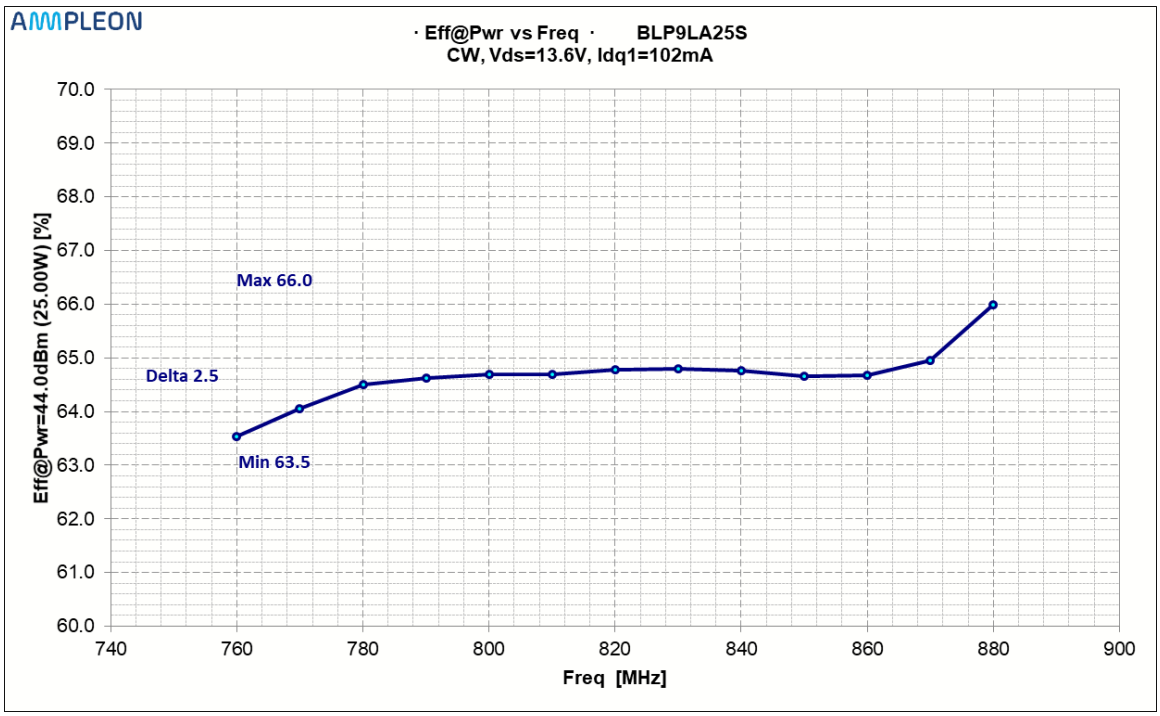


Figure 5 BLP9LA25S_PS_CW_191121_1156 Eff (25W) vs Freq

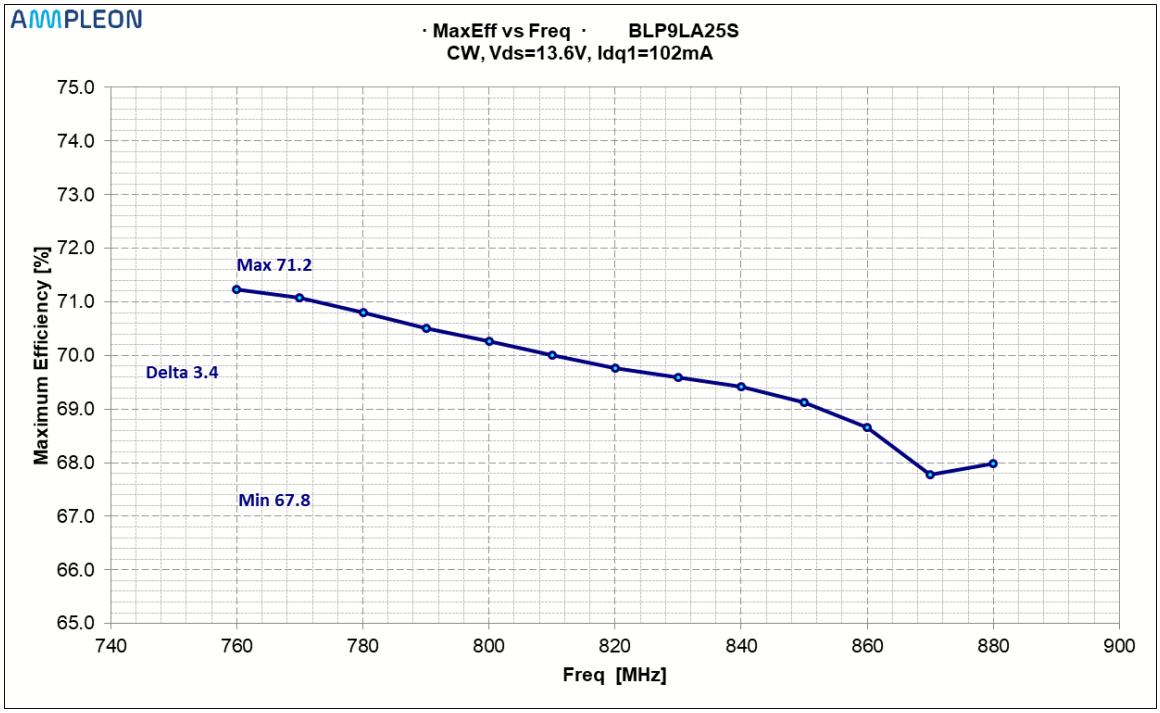


Figure 6 BLP9LA25S_PS_CW_191121_1156 Eff (P3dB) vs Freq

8.2.4 Return loss

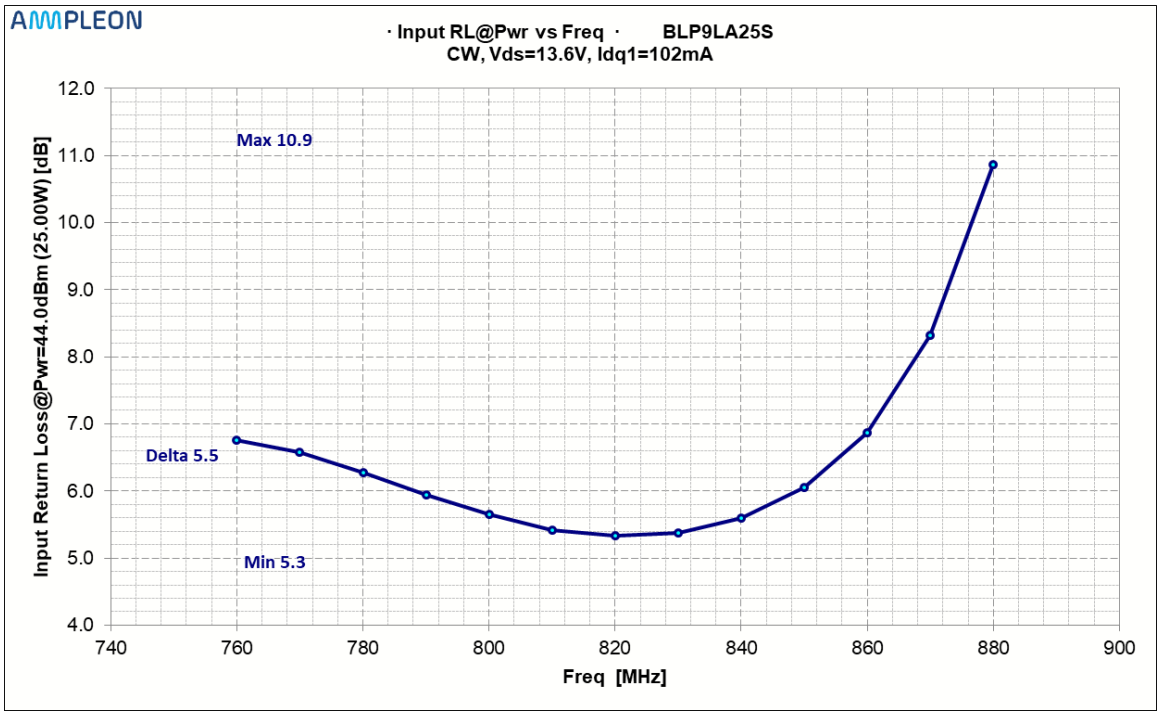


Figure 7 BLP9LA25S_PS_CW_191121_1156 IRL vs Pout

8.3 Thermal behavior

The amplifier was operated with a 50 Ohm load delivering an output power of 29W (CW). The gain compression is 3dB. The highest measured temperature was of a 18pF (ATC800B) capacitor on the output board.

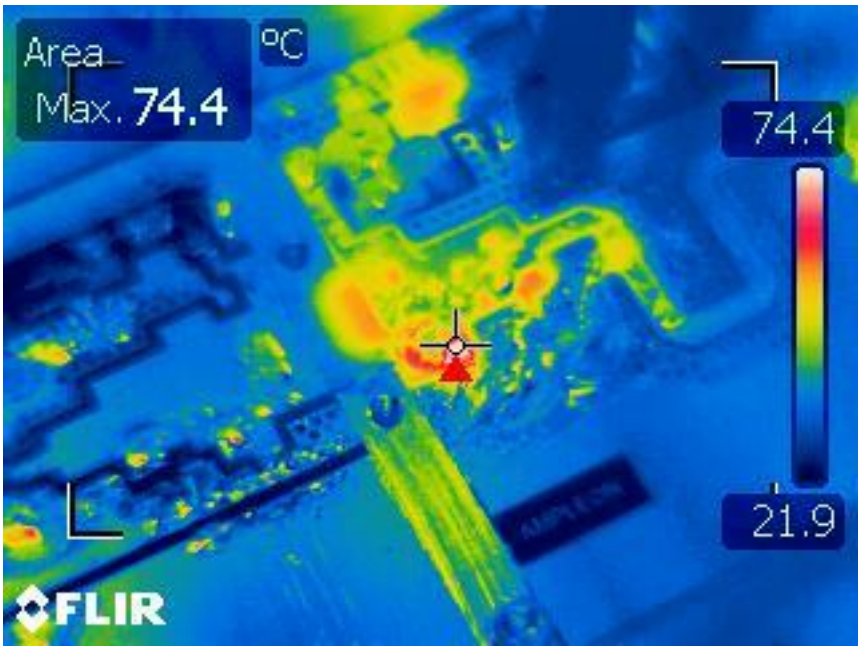
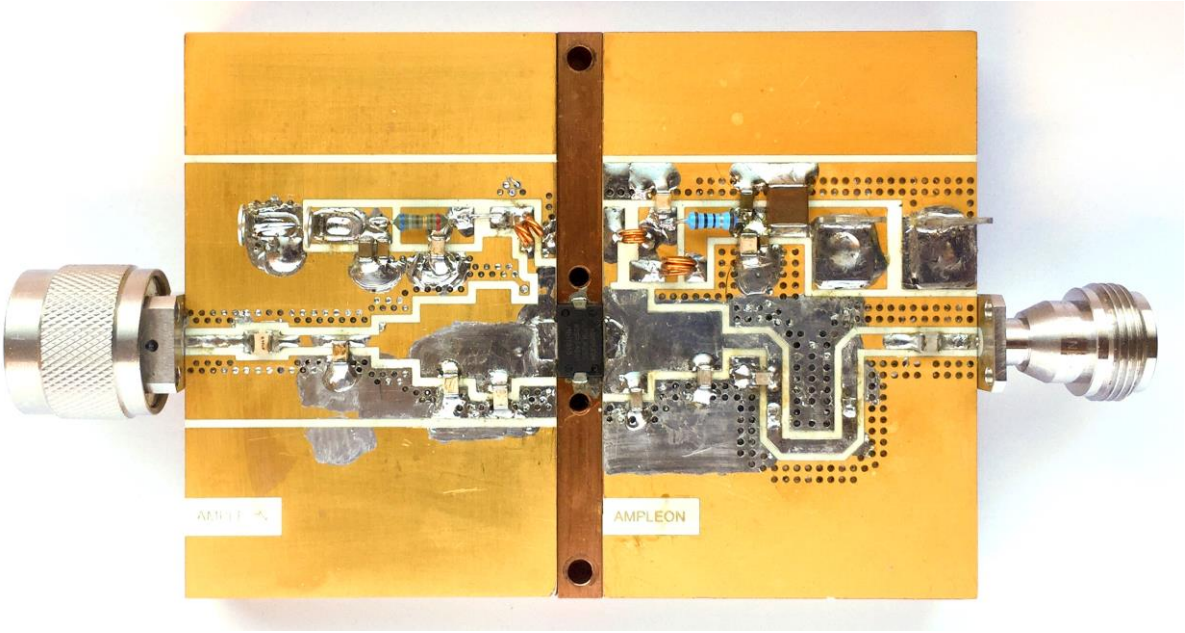


Figure 8 thermal picture

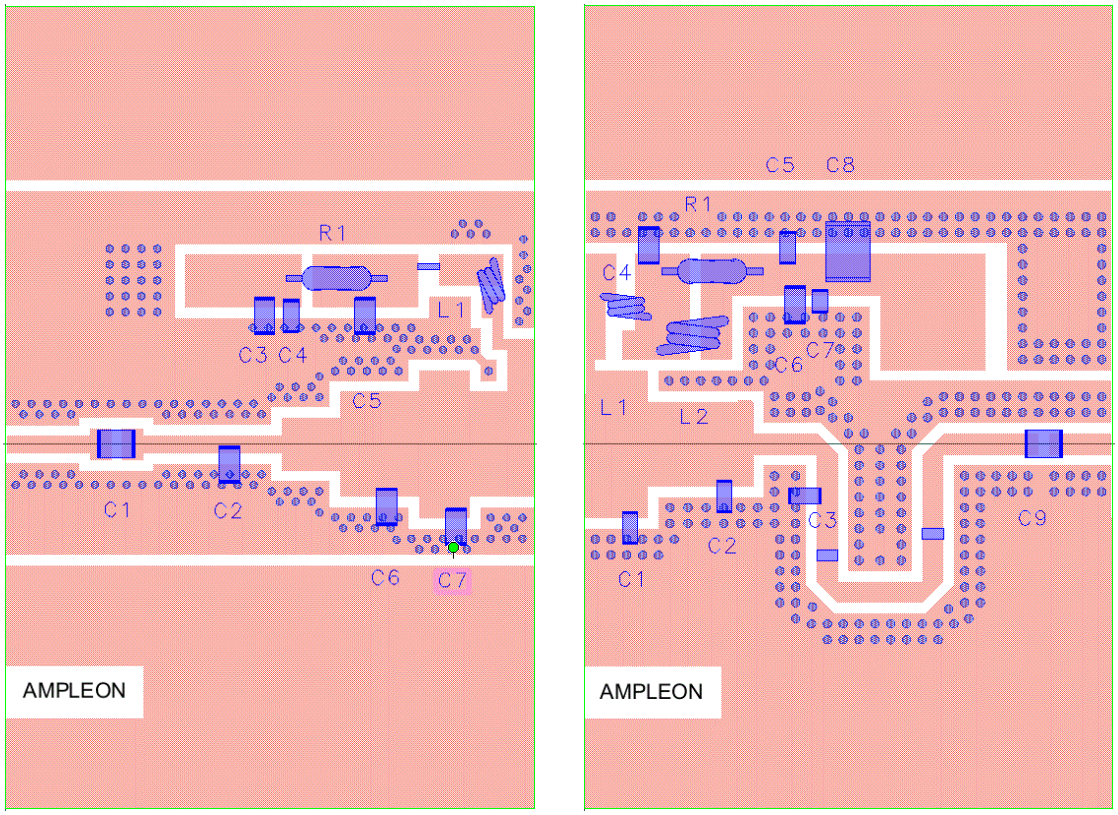
9. Hardware

9.1 Board Image



9.2 Board layout

9.2.1 Input & Output



9.3 Bill of materials

9.3.1 Input & Output

Table 5: Bill of Materials input board

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C1	47 pF	ATC	ATC100B
Capacitor	C2	10 pF	ATC	ATC100B
Capacitor	C3	1 uF / 25V	MURATA	GRM31MR71E105KA01L
Capacitor	C4	100 nF	KEMET	C1206C104K1RAC
Capacitor	C5	220 pF	ATC	ATC100B
Capacitor	C6	8.2 pF	ATC	ATC100B
Capacitor	C7	18 pF	ATC	ATC100B
Inductor	L1	~5 nH	wire wound	WD=0.8 mm; N=2; D=1.5 mm; L=3 mm
Resistor	R1	68 Ohm		0.6 Watt

Table 6: Bill of Materials output board

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C1	18 pF	ATC	ATC800B
Capacitor	C2	16 pF	ATC	ATC800B
Capacitor	C3	8.2 pF	ATC	ATC800B
Capacitor	C4	100 pF	ATC	ATC100B
Capacitor	C5	100 nF	KEMET	C1206C104K1RAC
Capacitor	C6	1 nF	ATC	ATC100B
Capacitor	C7	1 uF / 50V	MURATA	GRM32RR71H105KA01LATC100B
Capacitor	C8	10 uF / 50V		50V
Capacitor	C9	82 pF	ATC	ATC800B
Inductor	L1	~9 nH	wire wound	WD=0.8 mm; N=2; D=2 mm; L=2 mm
Inductor	L2	~15 nH	wire wound	WD=0.8 mm; N=2; D=3 mm; L=2 mm
Resistor	R1	10 Ohm		0.6 Watt

9.4 Board material

Table 7: Board specifications

Parameter	Value
Manufacturer	Rogers
Type	RO4350B
Thickness	30mil, 0.762mm>
Layers	Top layer: “cond” ; bottom layer: “cond2”
Layer thickness	35um

9.5 Device markings

Table 8: Device specifics

Parameter	Value
Manufacturer	Ampleon
Device	BLP9LA25S
Marking	BLP9LA25S
Comments	Engineering sample

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