AR191042

BLP9LA25S, 380-460MHz

V2.3 — 17 sep 2020

AMPLEON

Application Report

Document information	
Status	Public
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Abstract	Measurement results of a Class AB/B design for the 380-460MHz band with the BLP9LA25S

1. Revision History

Table 1: Report revisions

Revision	Date	Description	Author
1.0	20190327	Initial document	Tom Brinkman
2.0	20190410	Final	Tom Brinkman
2.1	20190418	Final -corrected typo	Tom Brinkman
2.2	20190513	Final -corrected typo	Tom Brinkman
2.3	20200917	Layout changes	Tom Brinkman

2. Contents

3. List of figures

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5. General description

This report presents the measurement results of the Class AB/B demo AR191042. The device used is a 25W, 9th generation LDMOS, the BLP9LA25S. The presented demo is tuned for the frequency 380-460MHz.

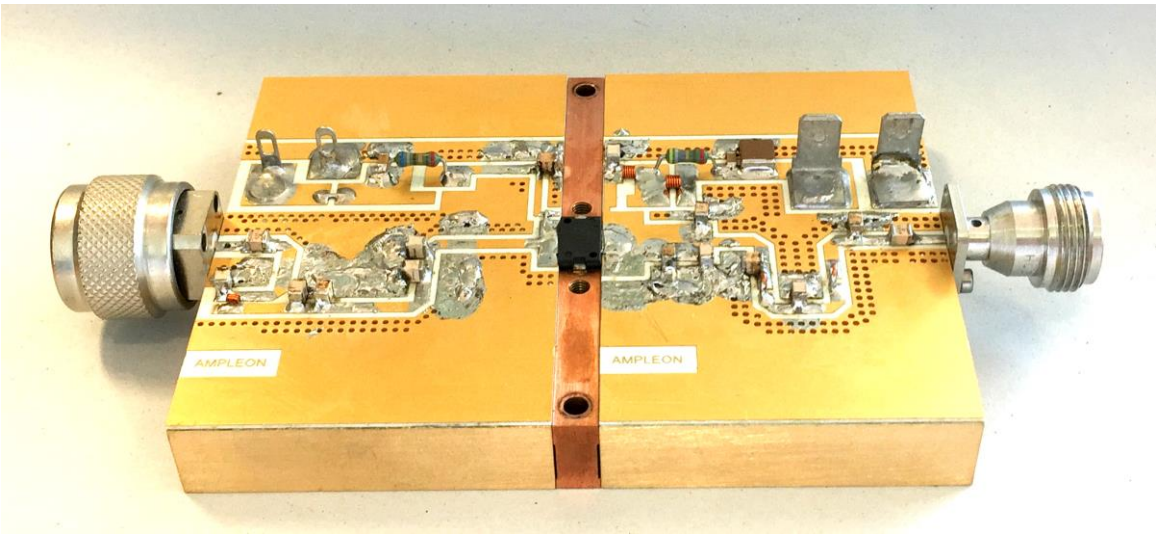


Figure 1 Demo Front view

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} = 1.8V, leading to an I_{DQ} = 42mA

7. Performance Indication 380-460MHz

Table 2: Performance indication, sampled at 380-460MHz

Parameter	Condition	Unit	CW
V_{DD}		V	13.6
S11 at connector		dB	-7.3
P_{1dB}[1]	G_{MAX}-1dB	W	27
P_{2dB}[1]	G_{MAX}-2dB	W	31
P_{OUT} of operation	***P_o***[2]	W	***31***
Gain	**@P_o**	dB	>15.7
Drain Efficiency	**@P_o**	%	>48
Drain Efficiency	**@ 2dB comp.**	dB	>56

[1] *Pout at 1 and 2dB 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 380-460MHz

8.1.1 Gain and efficiency (2dB sweep)

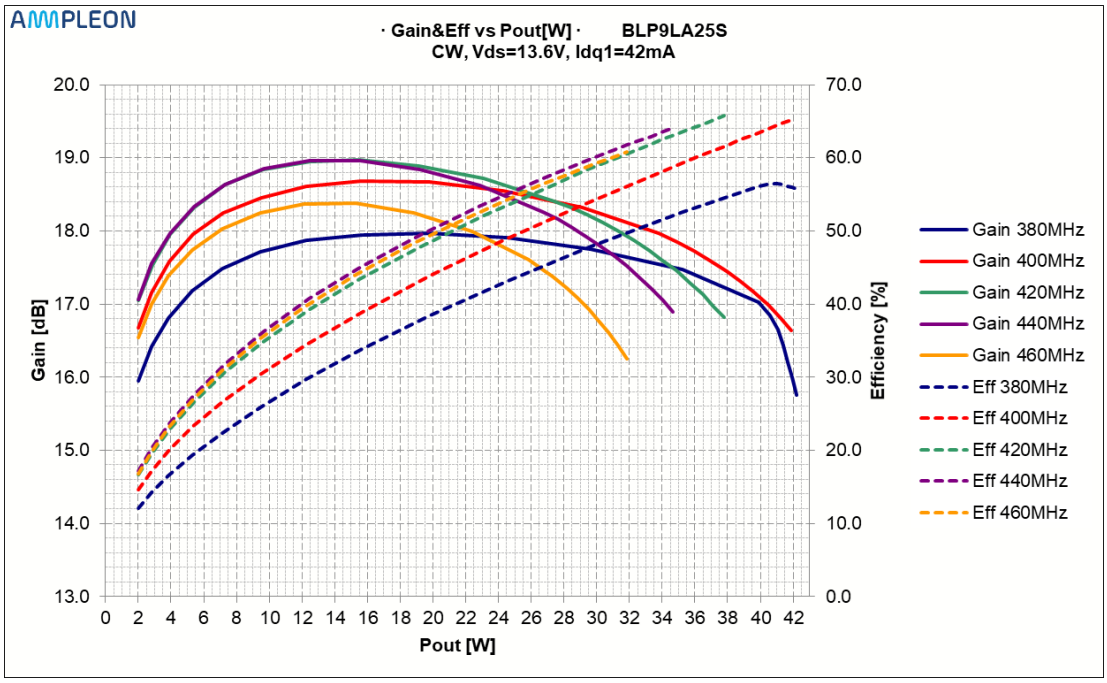


Figure 2 BLP9LA25S_PS_CW_190319_1813__13_6V Gain&Eff vs Pout[W]

8.2 Network Analyzer sweep

Frequency sweep with small signal.

Vgs = 1.8V

Input power = 5dBm (3.2mW)

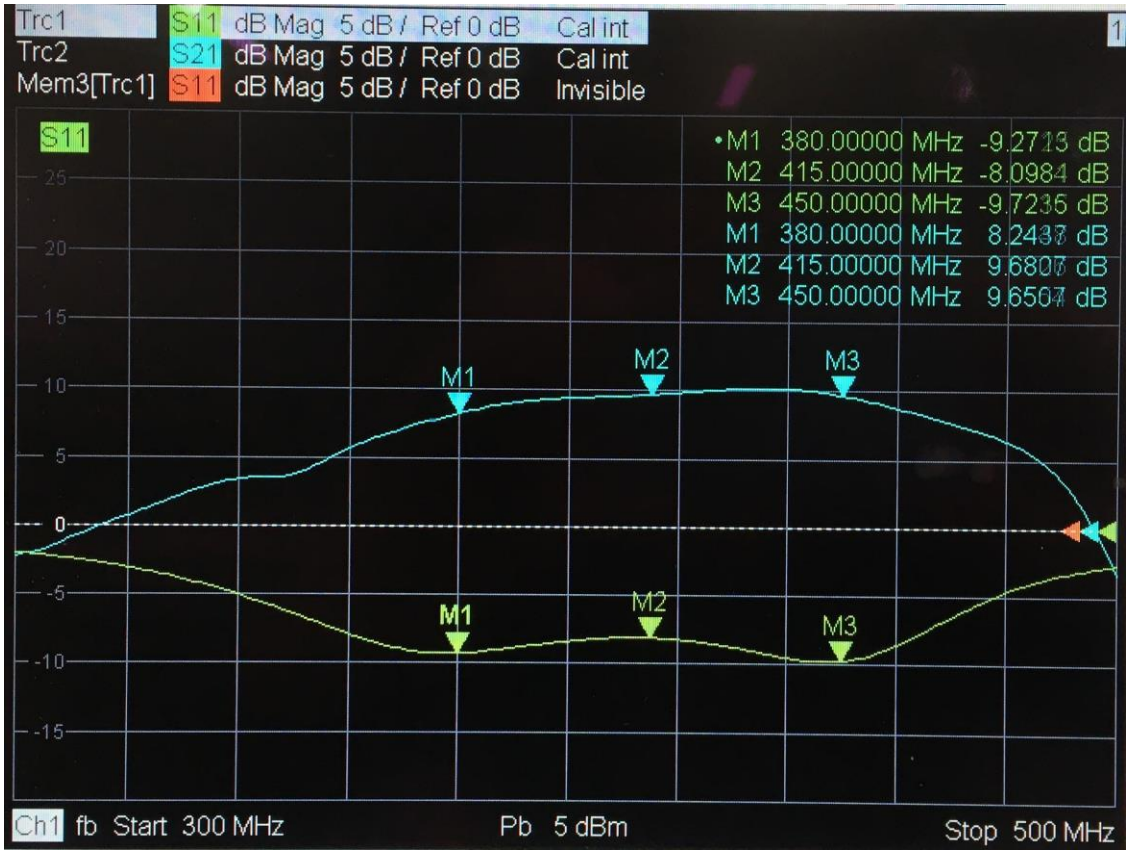


Figure 3 BLP9LA25S Low signal frequency sweep

8.3 CW Signal performance over 380-460 MHz

8.3.1 1dB compressed power

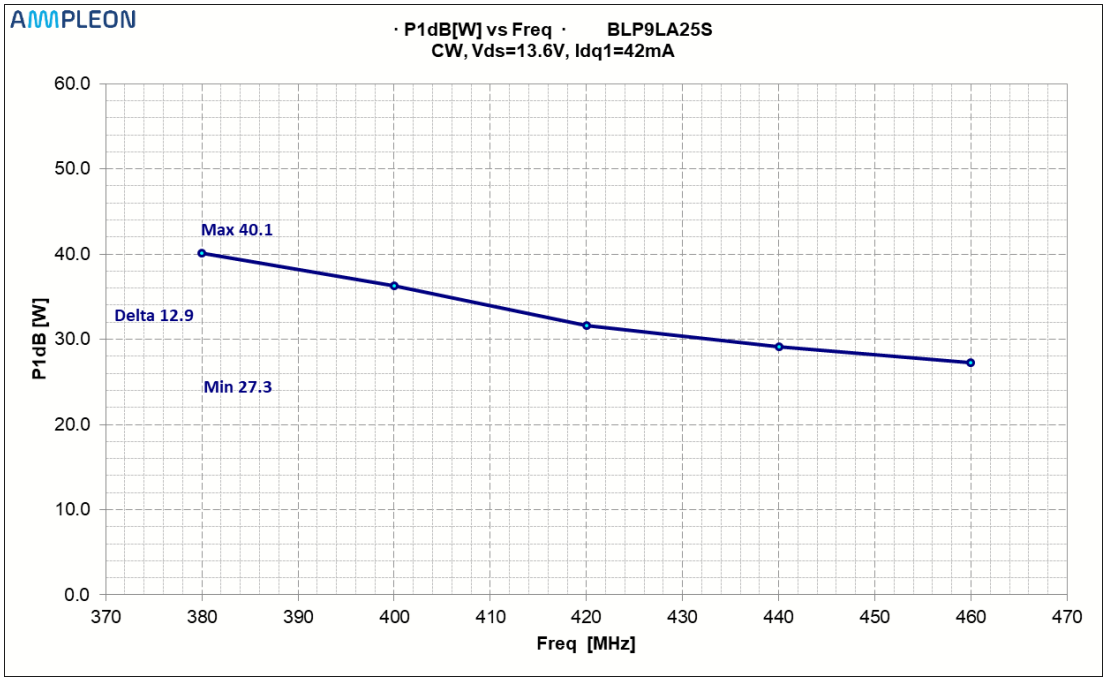


Figure 4 BLP9LA25S_PS_CW_190319_1813__13_6V Summary: P1dB[W] vs Freq

8.3.2 Gain

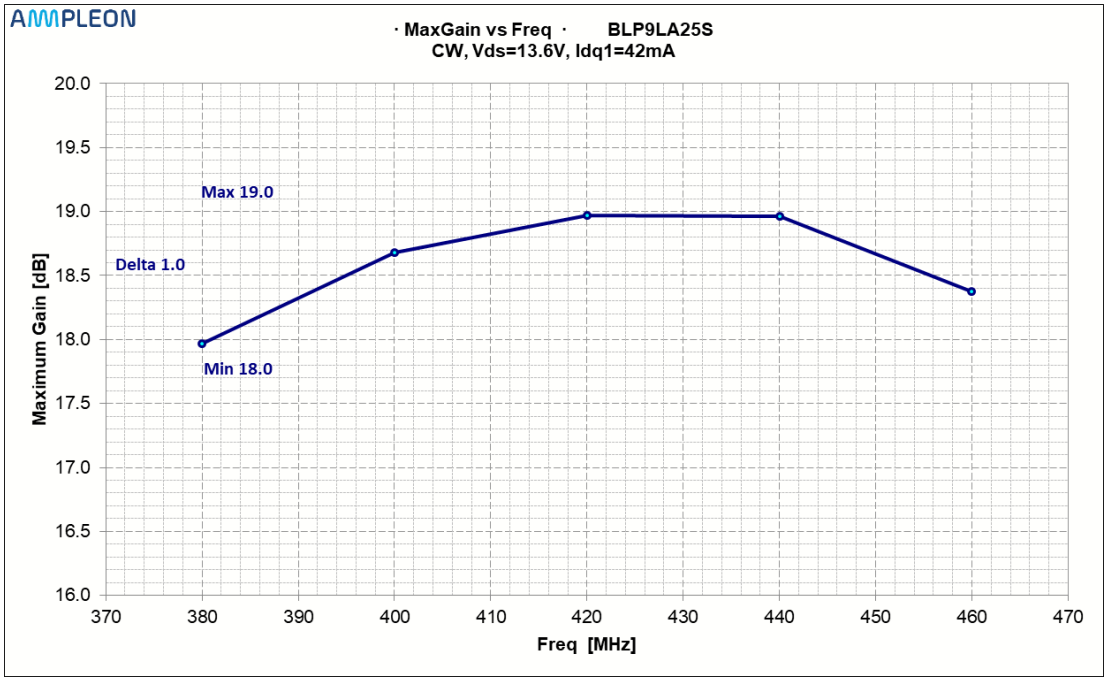


Figure 5 BLP9LA25S_PS_CW_190319_1813__13_6V Summary: MaxGain vs Freq

8.3.3 Efficiency

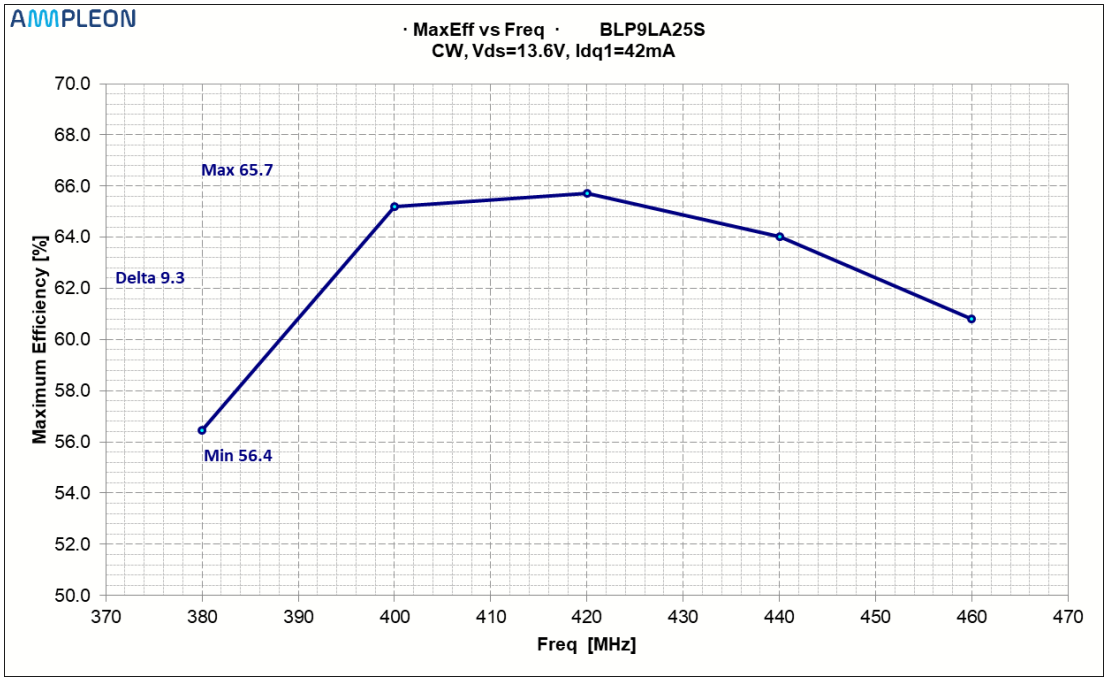


Figure 6 BLP9LA25S_PS_CW_190319_1813__13_6V Summary: MaxEff vs Freq

8.3.4 Return loss

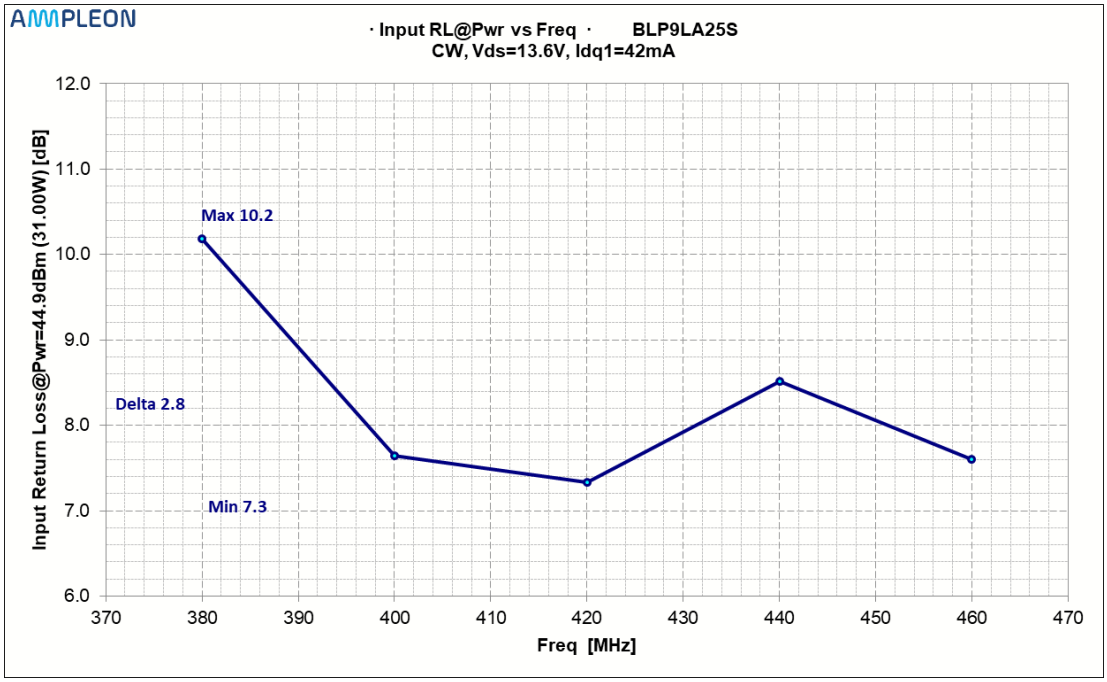
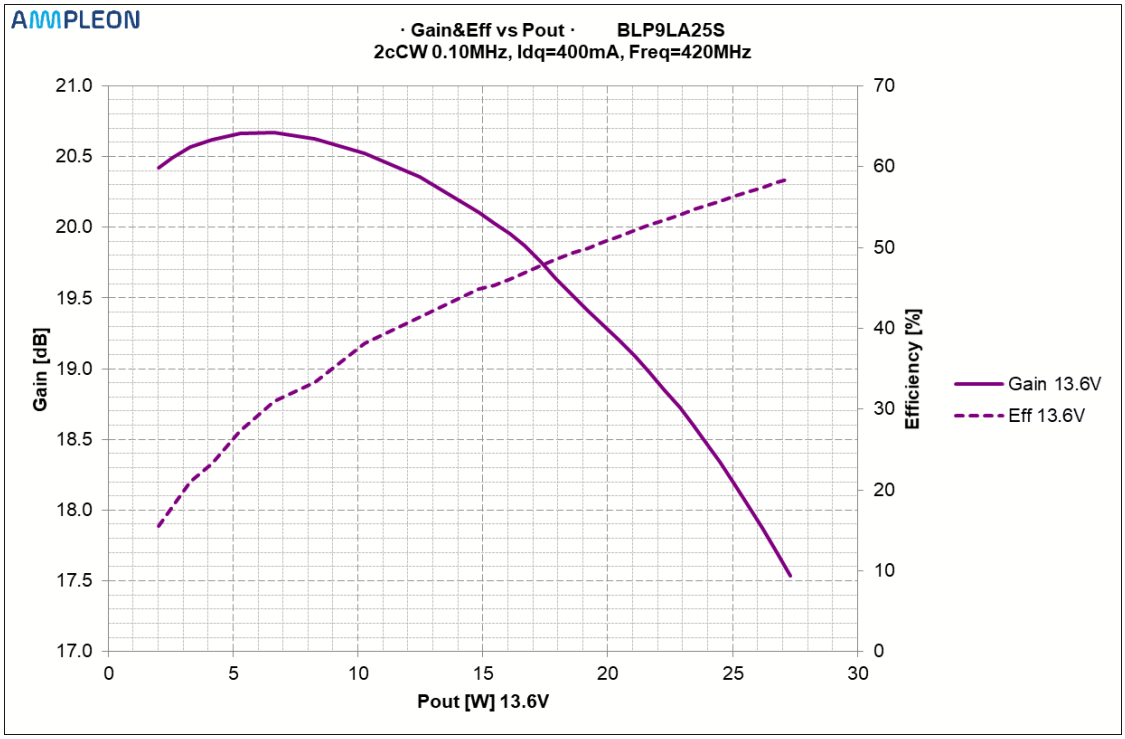


Figure 7 BLP9LA25S_PS_CW_190319_1813__13_6V IRL vs Pout

8.4 Two Carrier signal Intermodulation 420 MHz

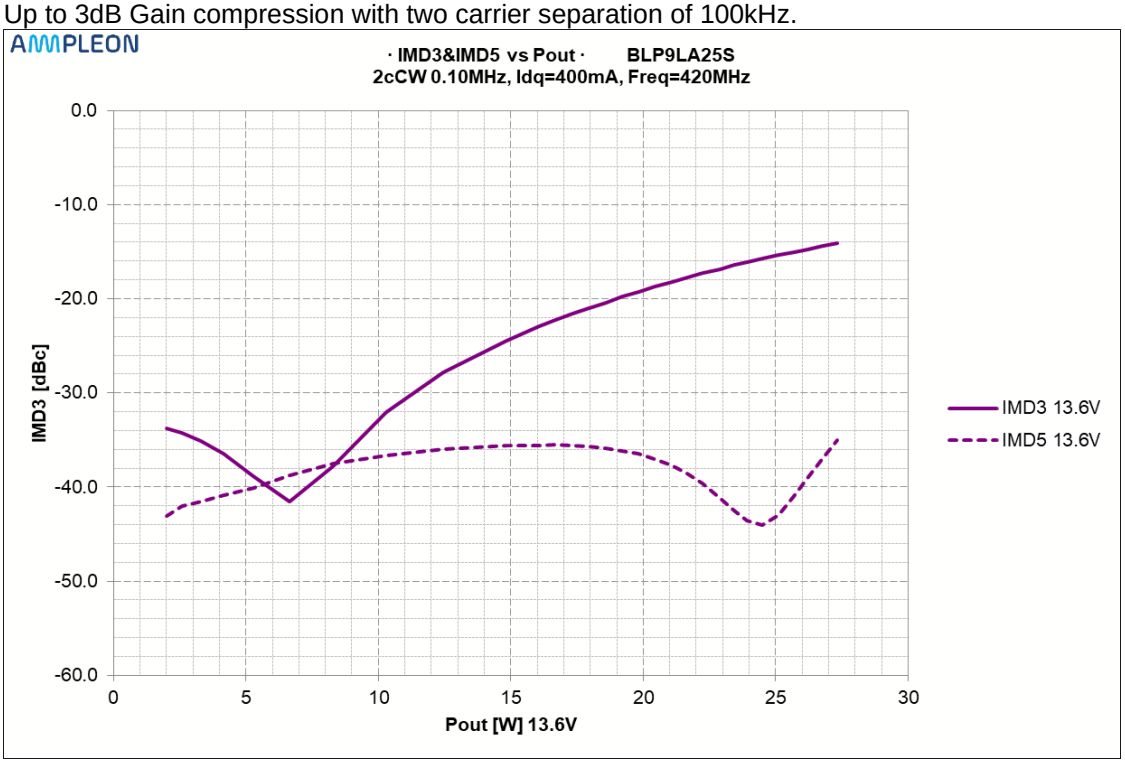
8.4.1 Gain and efficiency power sweep (two carrier)

Up to 3dB Gain compression with two carrier separation of 100kHz.



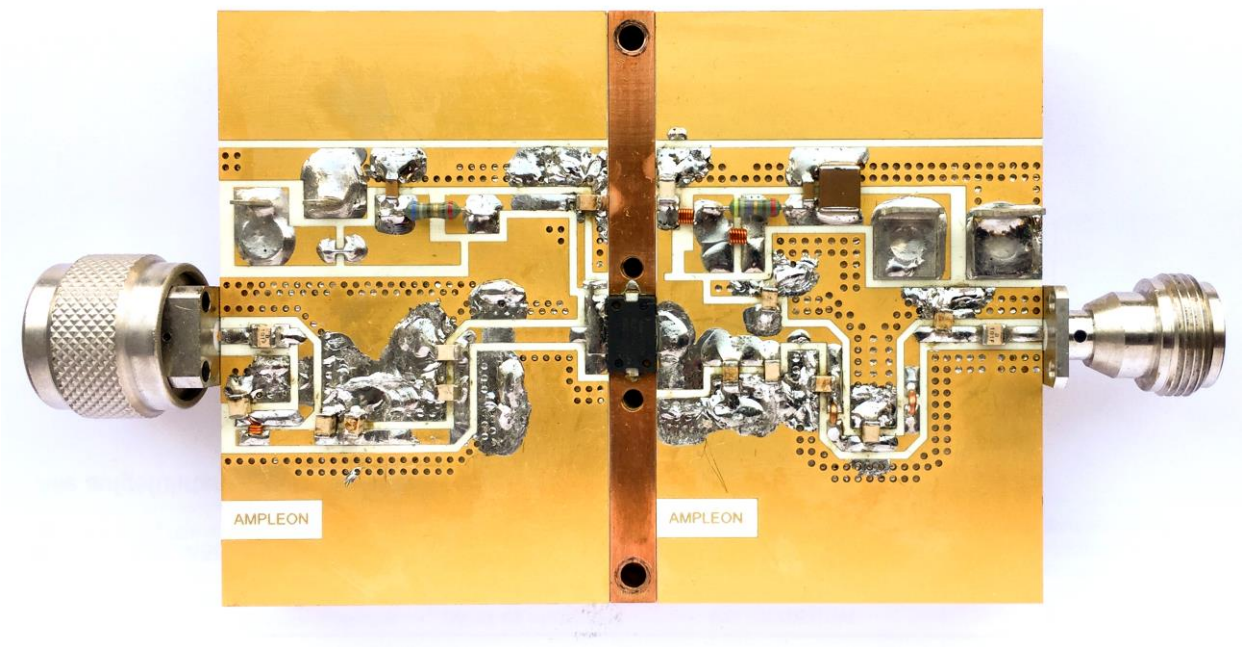
8.4.2 IMD3 & IMD5 (max)

Up to 3dB Gain compression with two carrier separation of 100kHz.



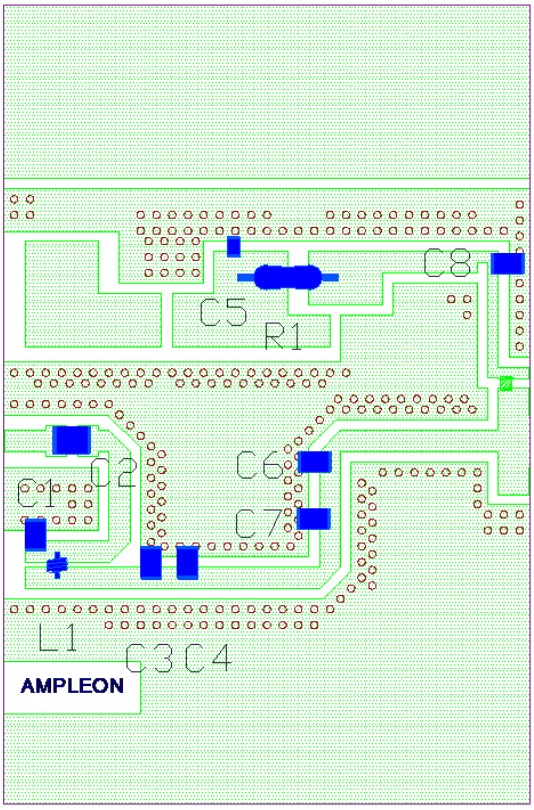
9. Hardware

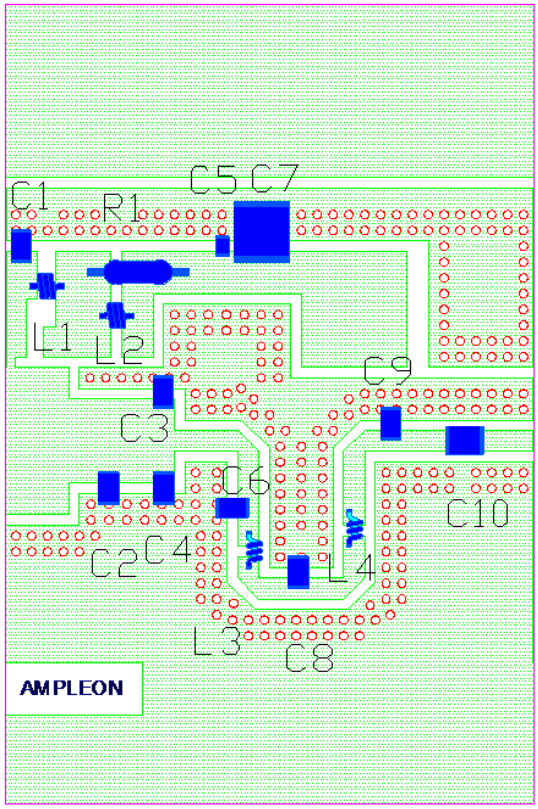
9.1 Board Image



9.2 Board layout

9.2.1 Input & Output





9.3 Bill of materials

9.3.1 Input & Output

Table 3: Bill of Materials input board

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C1	9.1 pF	ATC	ATC100B
Capacitor	C2	100 pF	ATC	ATC100B
Capacitor	C3	6.8 pF	ATC	ATC100B
Capacitor	C4	15 pF	ATC	ATC100B
Capacitor	C5	100 nF		50V
Capacitor	C6	33 pF	ATC	ATC100B
Capacitor	C7	16 pF	ATC	ATC100B
Capacitor	C8	120 pF	ATC	ATC100B
Inductor	L1	6.9 nH		
Resistor	R1	68.1 Ohm		

Table 4: Bill of Materials output board

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C1	22 pF	ATC	ATC100B
Capacitor	C2	56 pF	ATC	ATC100B
Capacitor	C3	15 pF	ATC	ATC100B
Capacitor	C4	62 pF	ATC	ATC100B
Capacitor	C5	100 nF		50V
Capacitor	C6	27 pF	ATC	ATC100B
Capacitor	C7	4.7 uF		
Capacitor	C8	6.8 pF	ATC	ATC100B
Capacitor	C9	1.7 pF	ATC	ATC100B
Capacitor	C10	100 pF	ATC	ATC100B
Inductor	L1	23 nH		
Inductor	L2	22 nH		
Inductor	L3, L4	wire		N=1; D=1.4mm; WD=1mm
Resistor	R1	48.7 Ohm		

9.4 Board material

Table 5: 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 6: Device specifics

Parameter	Value
Manufacturer	Ampleon
Device	BLP9LA25S
Marking	BLP9LA25S
Comments	Engineering sample

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