AR191179

BLP9LA25S, 225-400MHz

V1.1 — 2022 Mar 8

AMPLEON

Application Report

Document information	
Status	Public
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Abstract	Measurement results of a Class AB design for the 225-400MHz band with the BLP9LA25S

1. Revision History

Table 1: Report revisions

Revision	Date	Description	Author
0.1	20200304	Initial document	Tom Brinkman
1.0		Final	Tom Brinkman
1.1	20220408	Bill of material added	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 AR191179. The device used is a 25W, 9th generation LDMOS, the BLP9LA25S. The results presented are within the range: 225-400MHz.

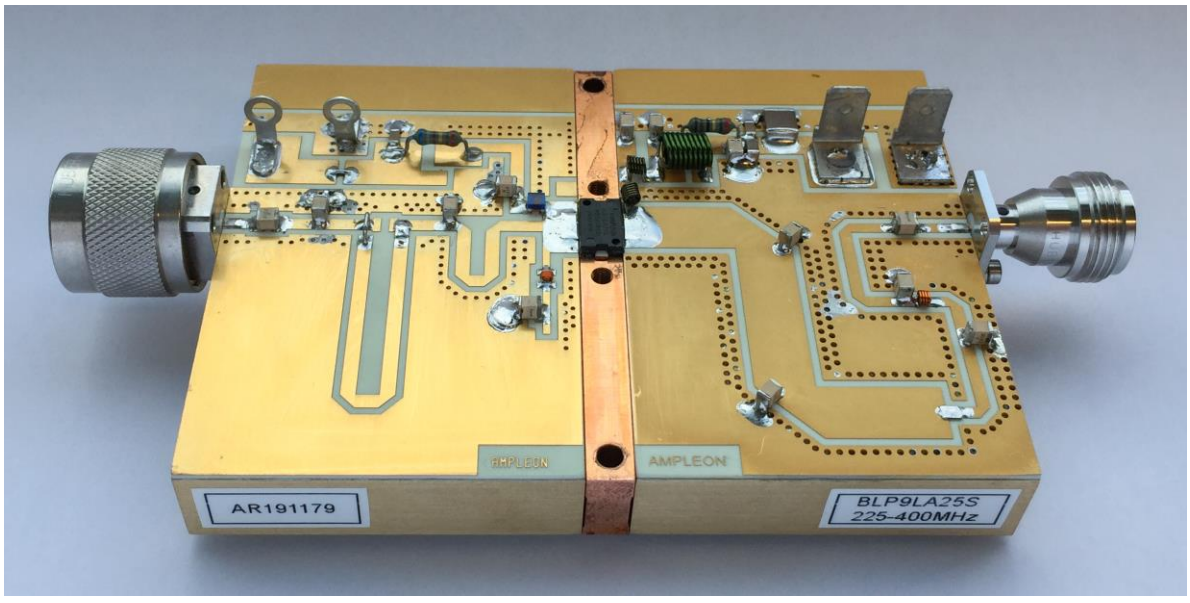


Figure 1 Demo Front view

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} = 12V

V_{GS} = 2.175V, leading to an I_{DQ} = 400mA

7. Performance Indication 225-400MHz

Table 2: Performance indication, sampled at 225-400MHz

Parameter	Condition	Unit	CW
V_{DD}		V	12
S11 at connector		dB	-5.7
P_{1dB}[1]	G_{MAX}-1dB	W	13.1
P_{2dB}[1]	G_{MAX}-2dB	W	15.2
P_{OUT} of operation	***P_o***[2]	W	***5***
Gain	**@P_o**	dB	>21
Drain Efficiency	**@P_o**	%	>31
Drain Efficiency	**@ 2dB comp.**	dB	>53

[1] *Pout at 1 and 2 dB 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 Pulsed-CW signal Power sweeps

Table 3: Pulsed-CW Performance

Freq [MHz]	MaxGain [dB]	P1dB [W]*	P2dB [W]*	MaxEff [%]
225.00	21.5	13.412	15.323	53.1
260.00	21.5	12.892	14.579	55.7
295.00	21.6	13.097	15.252	58.6
330.00	21.5	12.416	15.829	61.8
365.00	21.9	13.011	15.467	69.5
400.00	22.4	7.3869	11.346	66.0
175.0	0.972			16.359

Table 4: Pulsed-CW Performance at Pout = 5 Watts

Freq [MHz]	Gain [dB]@	Eff [%]@	Compr [dB]@	IRL [dB]@
225.00	21.5	31.3	0.00	6.8
260.00	21.5	33.1	-0.01	5.7
295.00	21.6	34.9	0.00	6.1
330.00	21.3	35.5	-0.17	5.9
365.00	21.8	40.1	-0.12	5.8
400.00	21.8	44.2	-0.65	7.2
175.0	0.488	12.892	0.647	1.452

8.1.1 Gain and efficiency (2dB sweep) 225-400 MHz

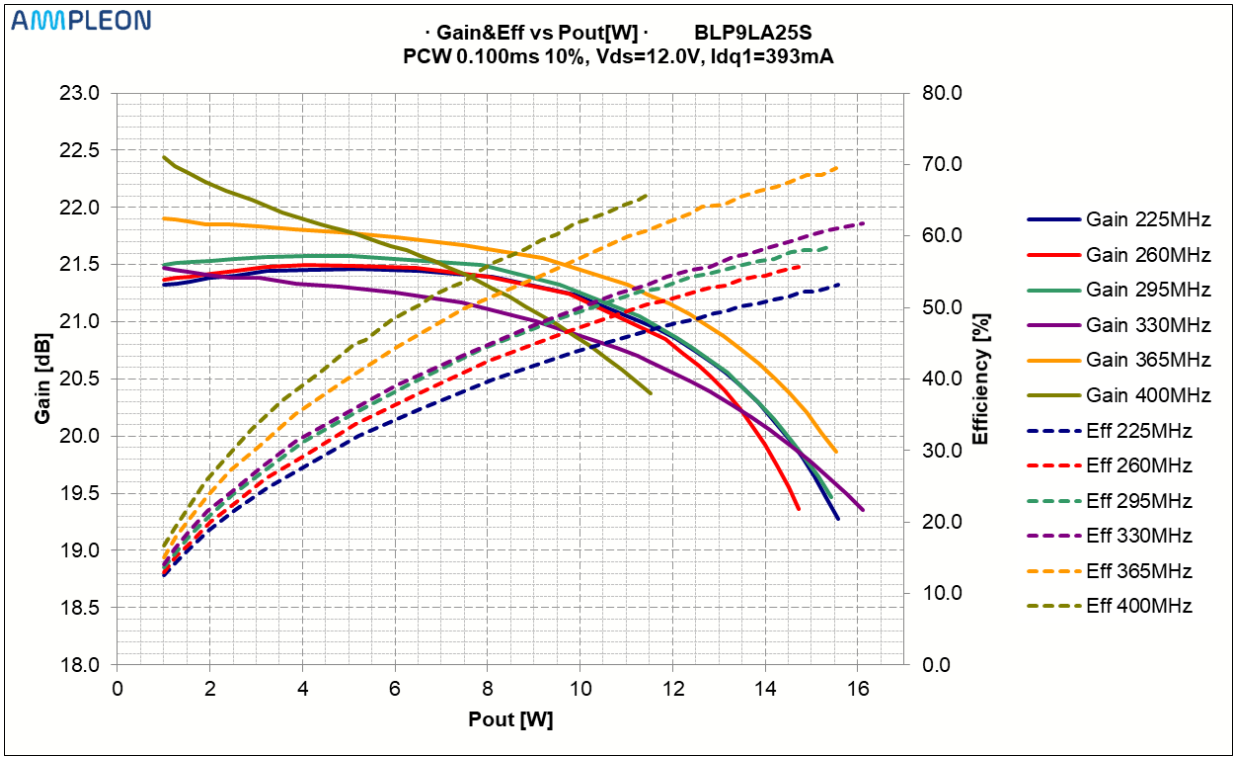


Figure 2 BLP9LA25S_PS_CW_200303_1459 Gain&Eff vs Pout[W]

8.2 Pulsed-CW Signal performance over 225-400 MHz

8.2.1 Gain

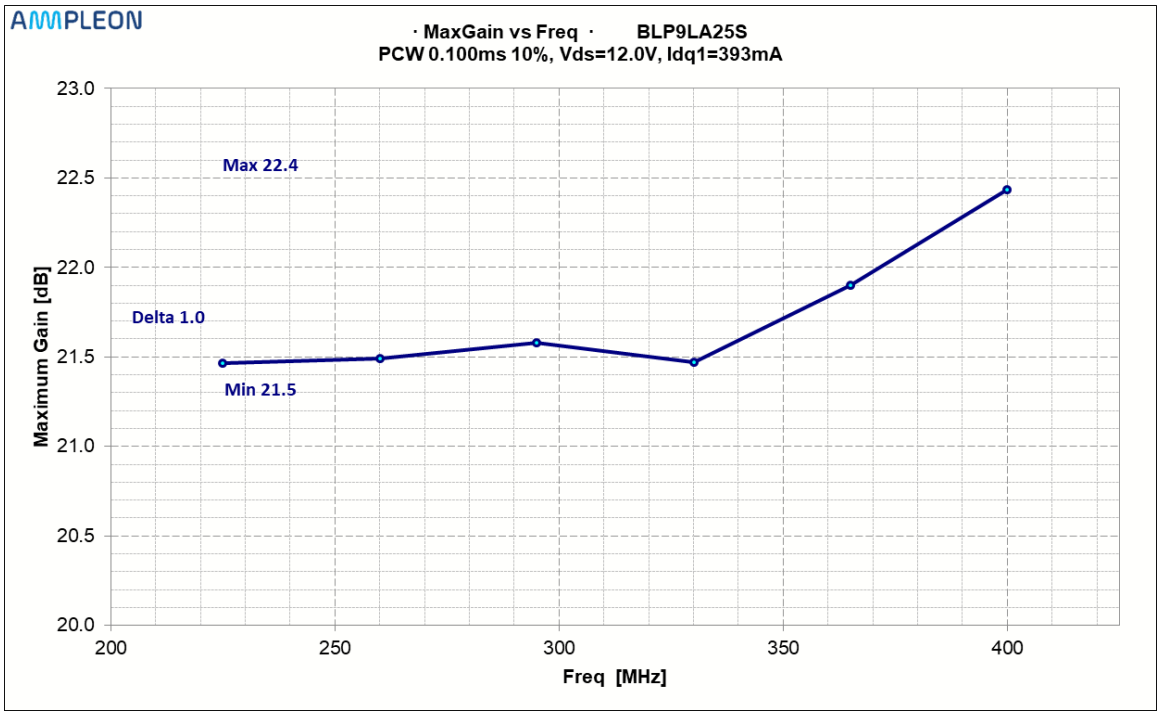


Figure 3 BLP9LA25S_PS_CW_200303_1459 MaxGain vs Freq

8.2.2 Efficiency

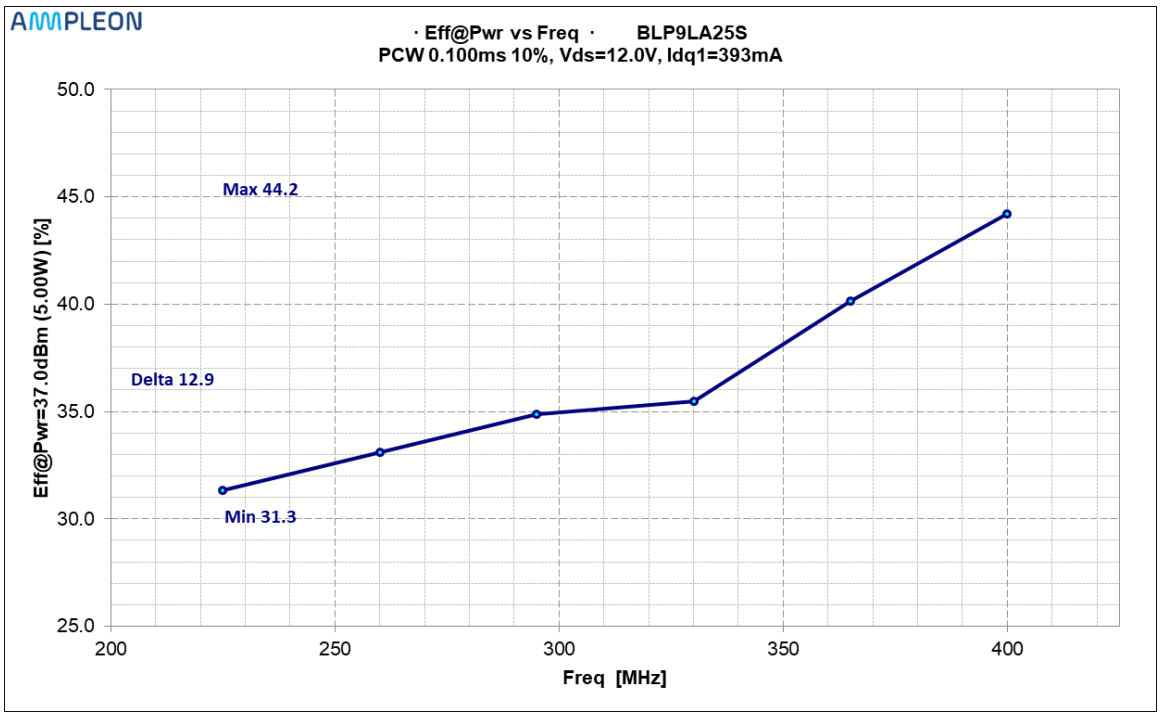


Figure 4 BLP9LA25S_PS_CW_200303_1459 Eff (5 W) vs Freq

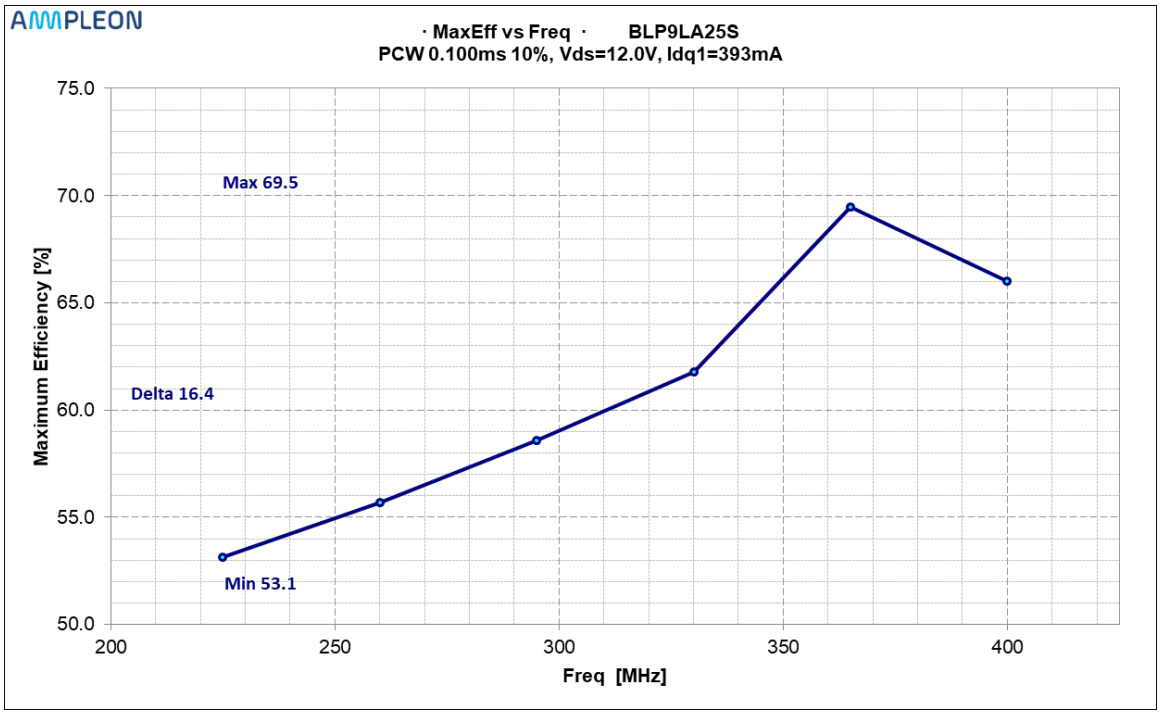


Figure 5 BLP9LA25S_PS_CW_200303_1459 Eff (P2dB) vs Freq

8.2.3 Return loss

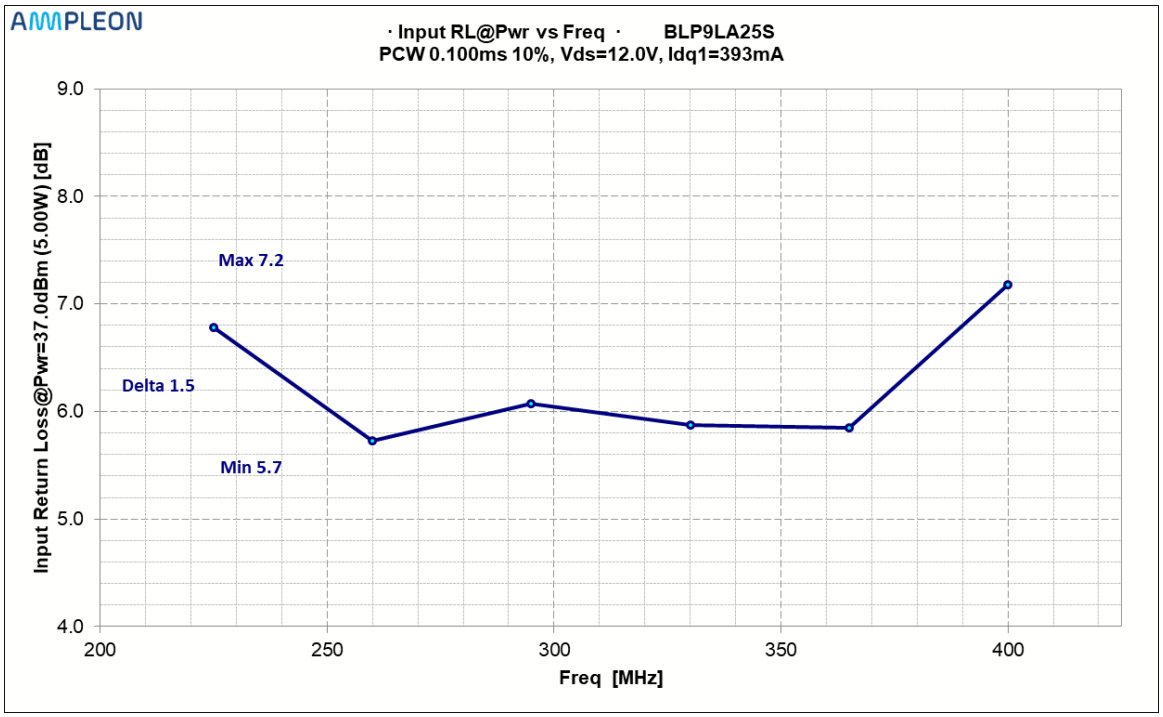


Figure 6 BLP9LA25S_PS_CW_200303_1459 IRL vs Pout

8.3 Harmonics

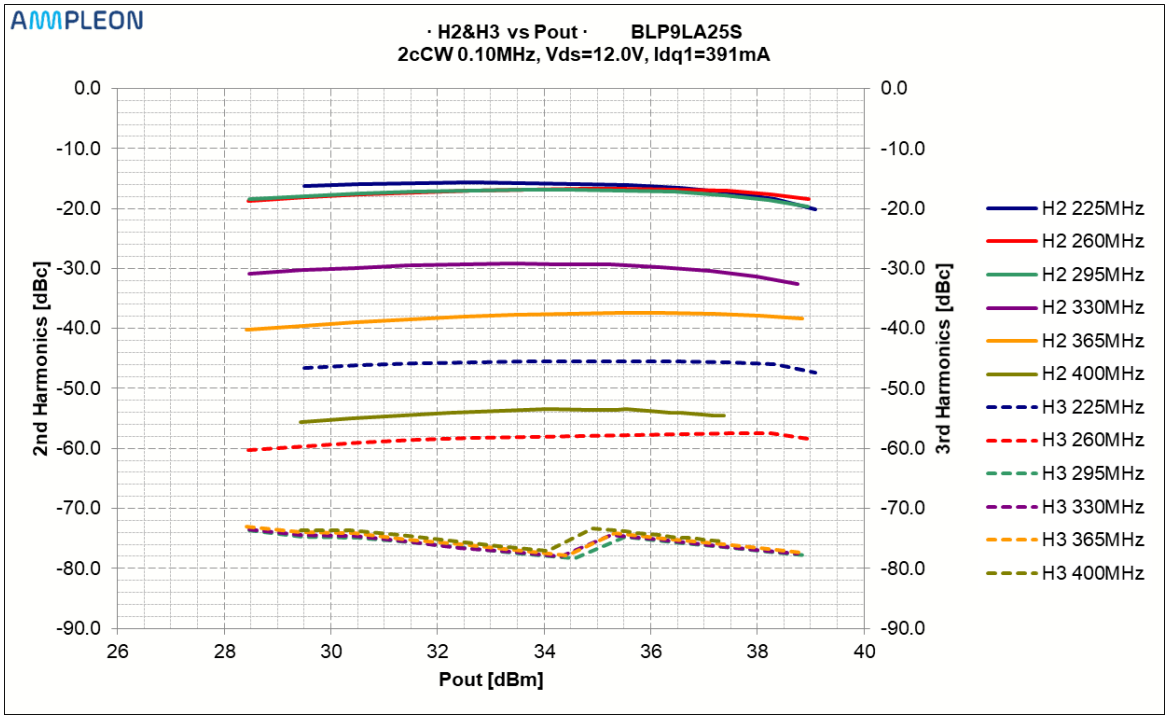


Figure 7 BLP9LA25S_PS_CW_200303_1620 2nd and 3rd Harmonic vs Pout

8.4 Two Carrier signal Intermodulation 225-400 MHz

8.4.1 Gain and efficiency power sweep (two carrier)

Up to 0.5dB Gain compression with two carrier separation of 100kHz.

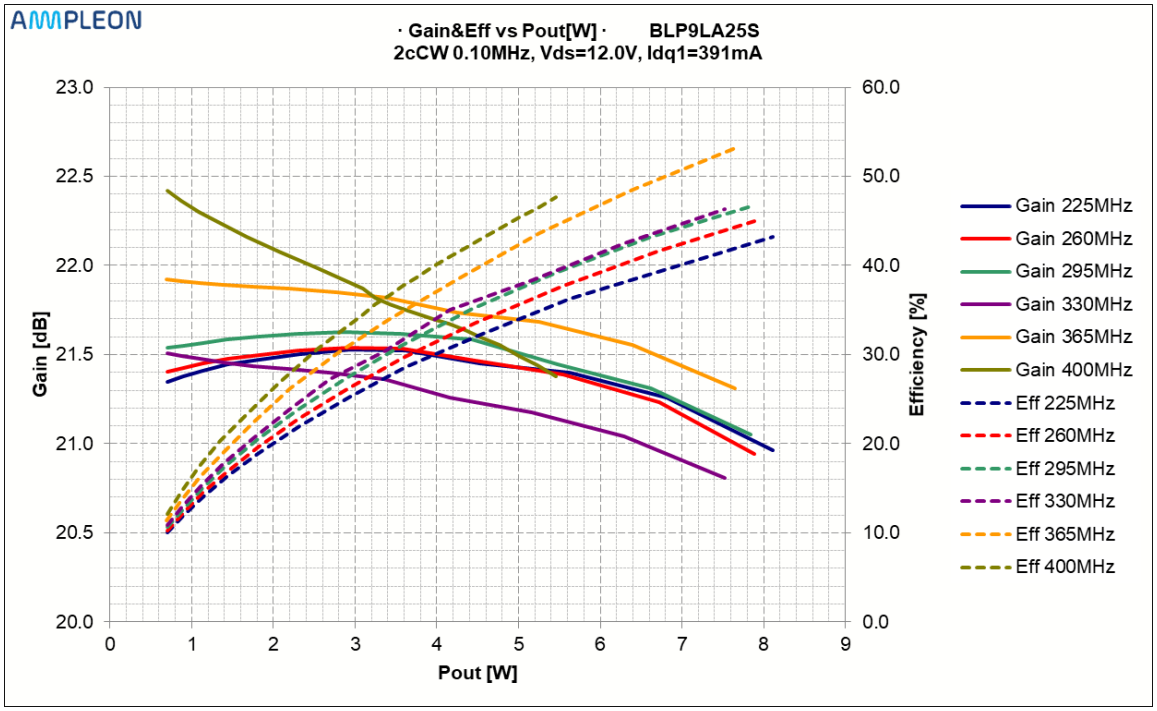


Figure 8 BLP9LA25S_PS_CW_200303_1620 Two carrier Gain&Eff vs Pout[W]

8.4.2 Normalized Gain Compression (0.5dB sweep) 225-400 MHz

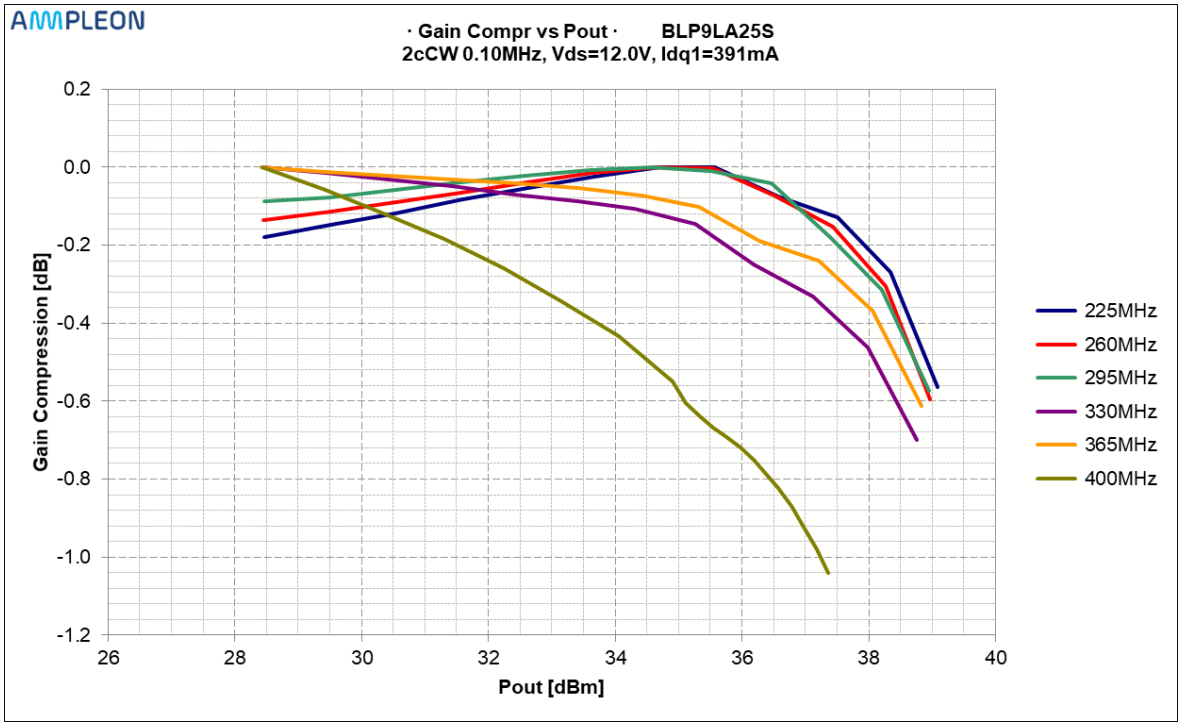


Figure 9 BLP9LA25S_PS_CW_200303_1620 Normalized Gain compression

8.4.3 IMD3 & IMD5 (max)

Up to 0.5dB Gain compression with two carrier separation of 100kHz.

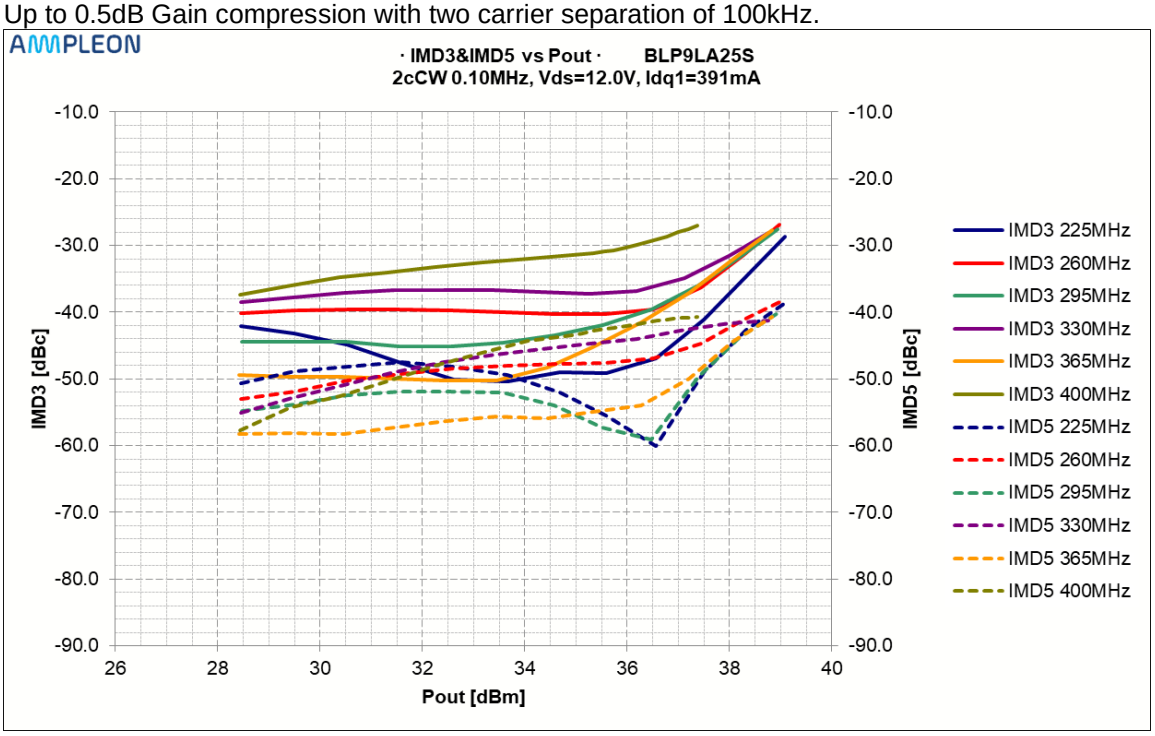
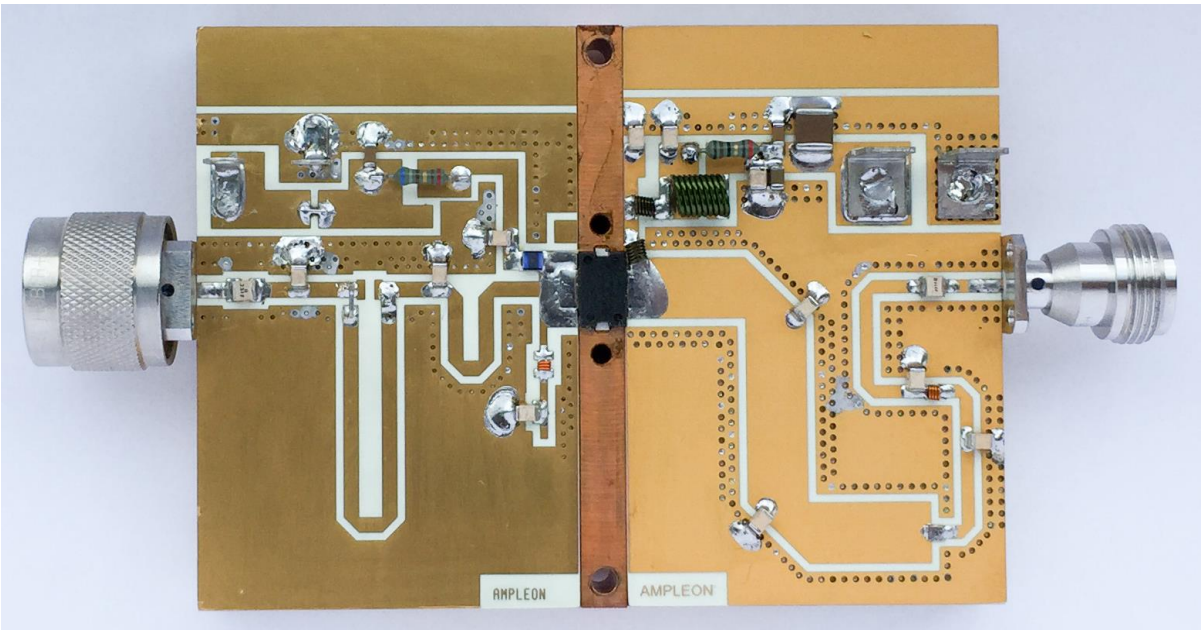


Figure 10 BLP9LA25S_PS_CW_200303_1620 Two carrier IMD3&IMD5 vs Pout[W]

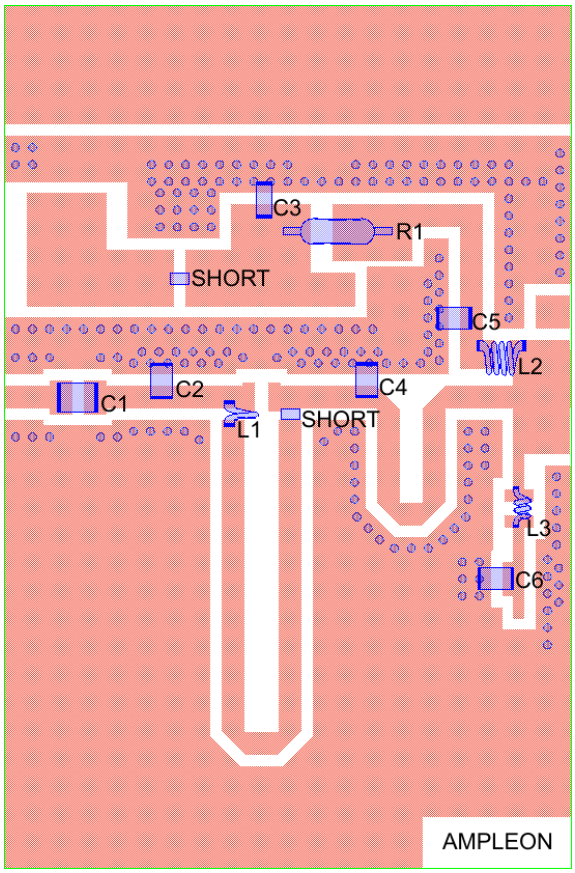
9. Hardware

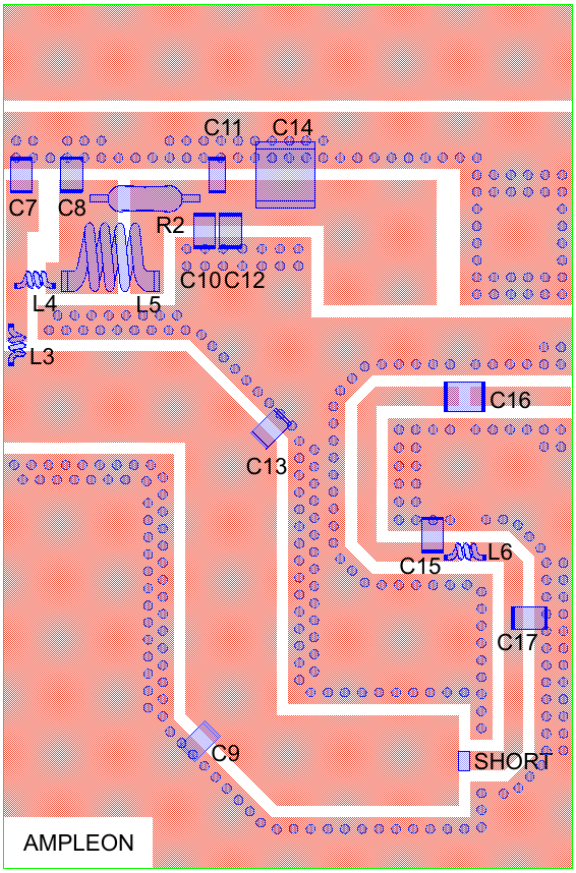
9.1 Board Image



9.2 Board layout

9.2.1 Input & Output





9.3 Bill of materials

Table 5: Bill of Materials input board

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C1	330 pF	ATC	ATC100B
Capacitor	C2	6.8 pF	ATC	ATC100B
Capacitor	C3, C11	100 nF	KEMET	C1206C104K1RAC
Capacitor	C4	30 pF	ATC	ATC100B
Capacitor	C5	100 pF	ATC	ATC100B
Capacitor	C6	91 pF	ATC	ATC100B
Inductor	L1		wire	WD=0.8 mm; Hight=2 mm; L=3.5 mm
Inductor	L2	330 nH	Coilcraft	1008CS-331XJE
Inductor	L3	5.5 nH	Coilcraft	0806SQ-5N5
Resistor	R1	68 Ohm		0.6 Watt

Table 6: Bill of Materials output board

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C7	130 pF	ATC	ATC100B
Capacitor	C8	130 pF	ATC	ATC100B
Capacitor	C9	24 pF	ATC	ATC100B
Capacitor	C10	1 nF	ATC	ATC100B
Capacitor	C12	1 uF / 25V	MURATA	GRM31MR71E105KA01L
Capacitor	C13	22 pF	ATC	ATC100B
Capacitor	C14	10 uF / 50V		50V
Capacitor	C15	8.2 pF	ATC	ATC100B
Capacitor	C16	110 pF	ATC	ATC100B
Capacitor	C17	18 pF	ATC	ATC100B
Inductor	L3	35 nH	Coilcraft	1111SQ36
Inductor	L4	35 nH	Coilcraft	1111SQ36
Inductor	L5	150 nH	Coilcraft	2222SQ161
Inductor	L6	14.7 nH	Coilcraft	0908SQ14
Resistor	R2	11 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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