

AR201176

BLP15H9S100G, 325-352MHz

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AMPLEON
Application Report

Document information	
Status	Public
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Abstract	Measurement results of a Class AB design for the 325-352MHz band with the BLP15H9S100G

1. Revision History

Table 1: Report revisions

Revision	Date	Description	Author
0.1	20200827	Initial document	Tom Brinkman
1.0	20200831	Final	Tom Brinkman
1.1	20200915	Typo in BOM corrected	Tom Brinkman
1.2	20201027	Typo in titles corrected	Tom Brinkman

2. Contents

- 1. Revision History..... 2**
- 2. Contents 2**
- 3. List of figures 3**
- 4. List of tables 3**
- 5. General description 3**
- 6. Biasing 4**
- 7. Performance Indication 325-352MHz..... 4**
- 8. Performance Details 5**
- 8.1 CW signal Power sweeps 5
- 8.1.1 Gain and efficiency (3dB sweep) 325-352 MHz 6
- 8.2 CW Signal performance over 325-352 MHz..... 7
- 8.2.1 3dB compressed power 7
- 8.2.2 Gain 7
- 8.2.3 Efficiency..... 8
- 8.2.4 Return loss..... 9
- 8.3 Harmonics..... 9
- 8.4 Thermal behavior 10
- 9. Hardware..... 11**
- 9.1 Mechanical drawing 11
- 9.2 Board Image 12
- 9.3 Board layout..... 12
- 9.3.1 Input & Output..... 12
- 9.4 Bill of materials..... 13
- 9.4.1 Input & Output..... 13
- 9.5 Board material..... 14
- 9.6 Device markings..... 14
- 10. Legal information 15**
- 10.1 Definitions 15
- 10.2 Disclaimers 15
- 10.3 Trademarks 15
- 10.4 Contact information 15

3. List of figures

Figure 1	Demo	Front view	3
Figure 2	BLP15H9S100G_PS_CW_200826_1746	Gain&Eff vs Pout[W]	6
Figure 3	BLP15H9S100G_PS_CW_200826_1746	P3dB[W] vs Freq	7
Figure 4	BLP15H9S100G_PS_CW_200826_1746	MaxGain vs Freq	7
Figure 5	BLP15H9S100G_PS_CW_200826_1746	Eff (90W) vs Freq	8
Figure 6	BLP15H9S100G_PS_CW_200826_1746	Eff (P3dB) vs Freq	8
Figure 7	BLP15H9S100G_PS_CW_200826_1746	IRL vs Pout	9
Figure 8	Thermal picture		10
Figure 9	Support block	Mechanical drawing	11
Figure 10	Demo	Top View	12
Figure 11	Demo	PCB component placement	12

4. List of tables

Table 1:	Report revisions	2
Table 2:	Performance indication, sampled at 325-352MHz	4
Table 3:	CW Performance	5
Table 4:	CW Performance at Pout = 90Watts	5
Table 5:	Bill of Materials input	13
Table 6:	Bill of Materials output	13
Table 7:	Board specifications	14
Table 8:	Device specifics	14

5. General description

This report presents the measurement results of the Class AB demo AR201176. The device used is a 100W, 9th generation LDMOS, the BLP15H9S100G. The presented demo is tuned for the frequency range: 325-352MHz.

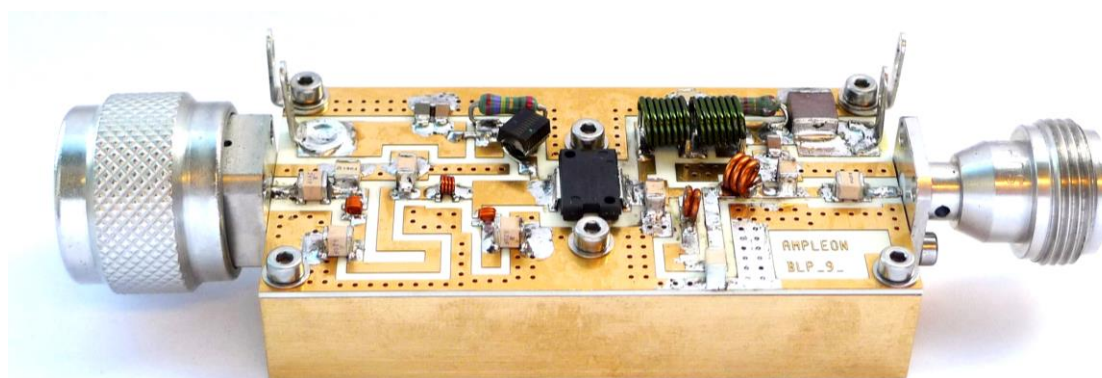


Figure 1 Demo Front view

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:

$$V_{DD} = 50V$$

$$V_{GS} = 2.03V, \text{ leading to an } I_{DQ} = 335mA$$

7. Performance Indication 325-352MHz

Table 2: Performance indication, sampled at 325-352MHz

Parameter	Condition	Unit	CW
V_{DD}		V	50
S11 at connector		dB	-8
P_{1dB}^1	$G_{MAX}-1dB$	W	80
P_{3dB}^1	$G_{MAX}-3dB$	W	95
P_{OUT} of operation	P_o^2	W	90
Gain	@ P_o	dB	>25
Drain Efficiency	@ P_o	%	>61
Drain Efficiency	@ 3dB comp.	dB	>64

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 [%]*
325.00	28.4	83.97	106.73	64.4
337.50	28.1	83.86	106.09	66.9
352.00	27.5	79.51	94.91	68.8
27.0	0.822	4.464	11.813	4.435

Table 4: CW Performance at Pout = 90Watts

Freq [MHz]	Gain [dB] @	Eff [%] @	Compr [dB] @	IRL [dB] @
325.00	27.0	60.9	-1.37	17.3
337.50	26.7	63.1	-1.41	7.7
352.00	25.4	67.8	-2.18	11.8
27.0	1.634	6.889	0.812	9.605

8.1.1 Gain and efficiency (3dB sweep) 325-352 MHz

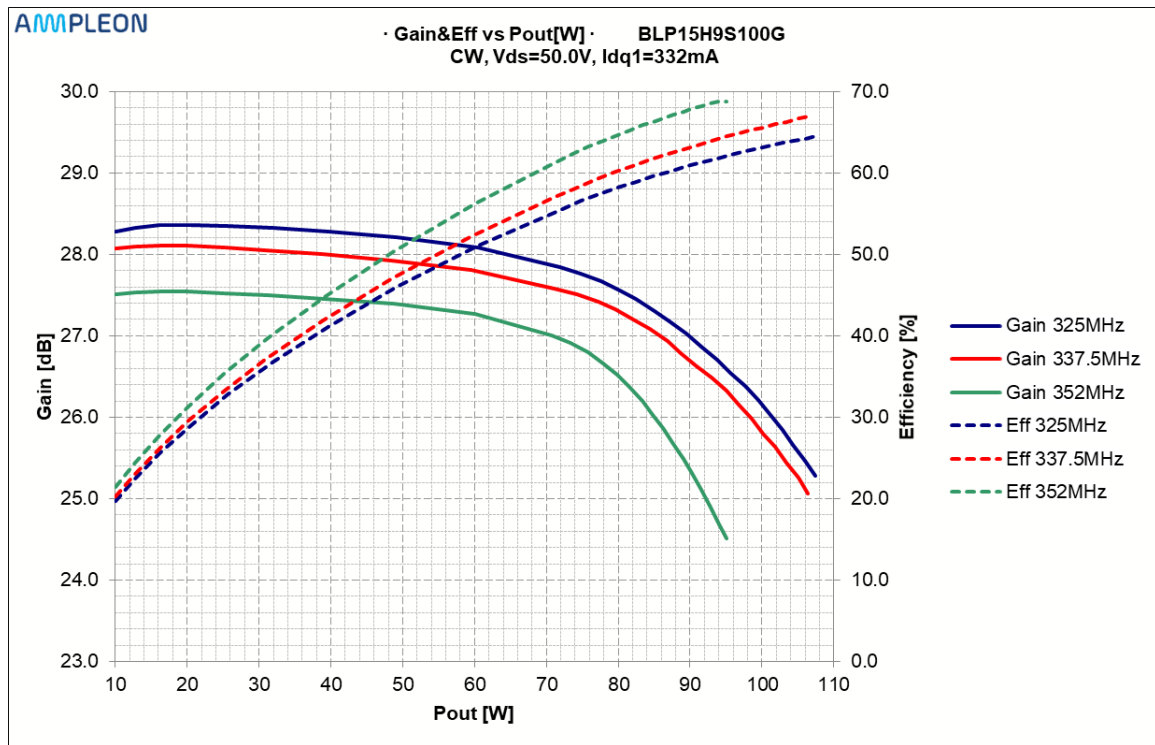


Figure 2 BLP15H9S100G_PS_CW_200826_1746

Gain&Eff vs Pout[W]

8.2 CW Signal performance over 325-352 MHz

8.2.1 3dB compressed power

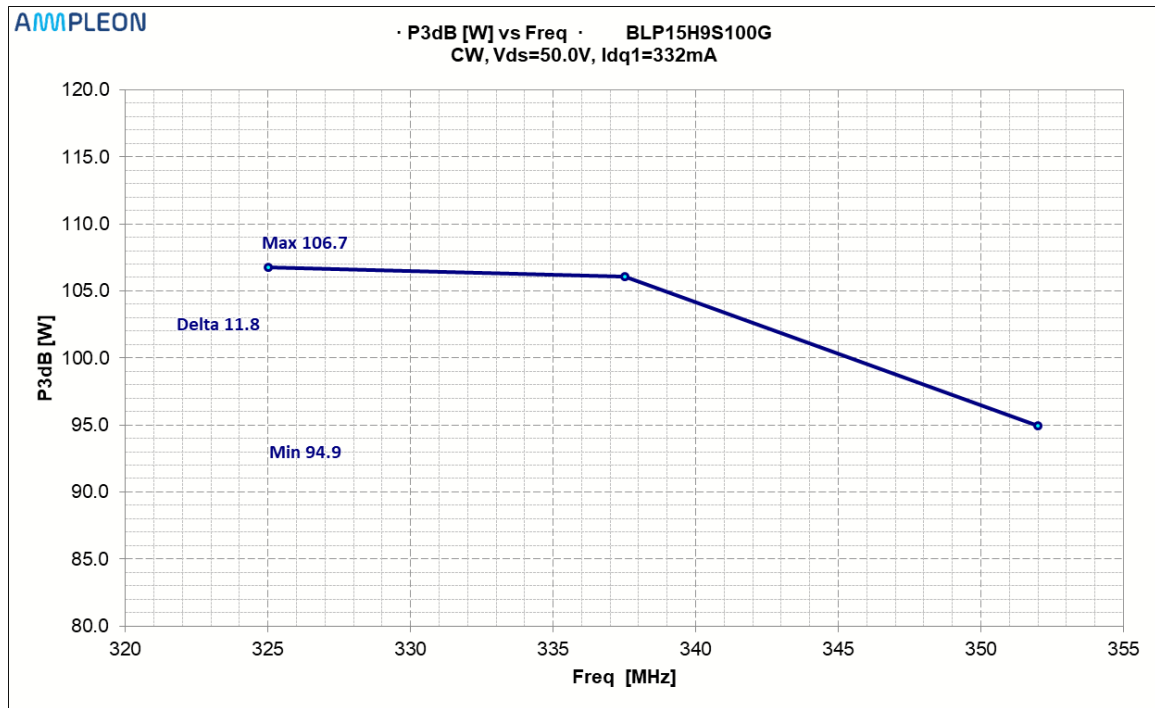


Figure 3 BLP15H9S100G_PS_CW_200826_1746 P3dB[W] vs Freq

8.2.2 Gain

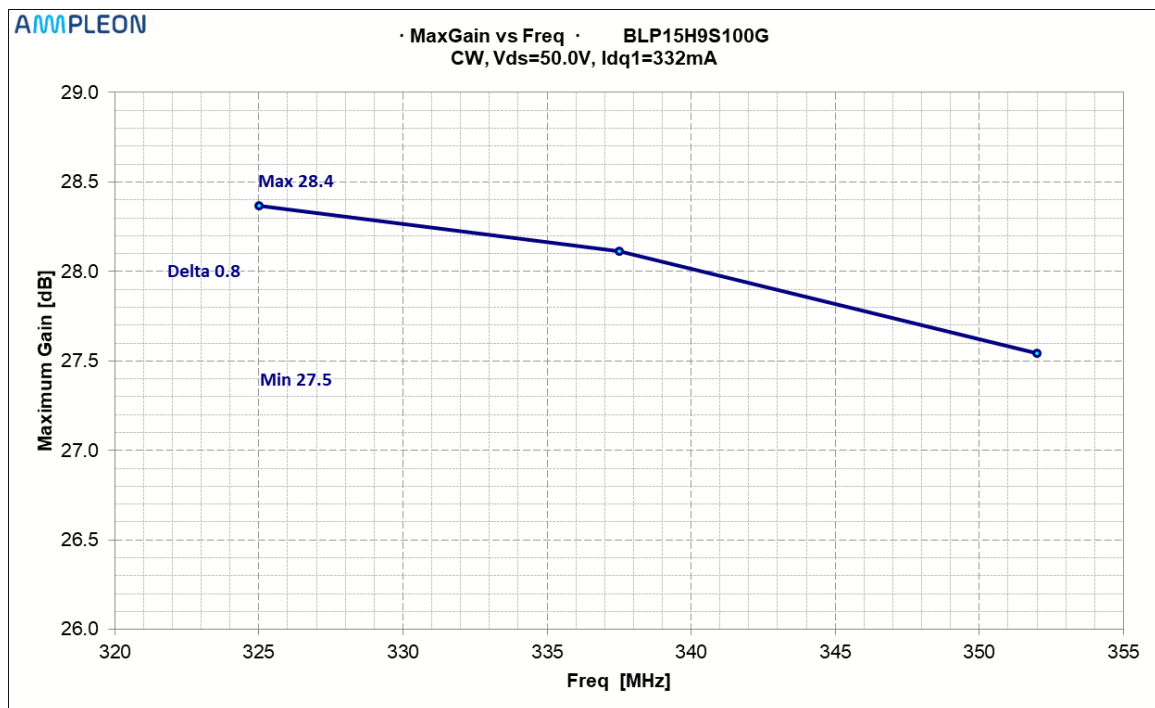


Figure 4 BLP15H9S100G_PS_CW_200826_1746 MaxGain vs Freq

8.2.3 Efficiency

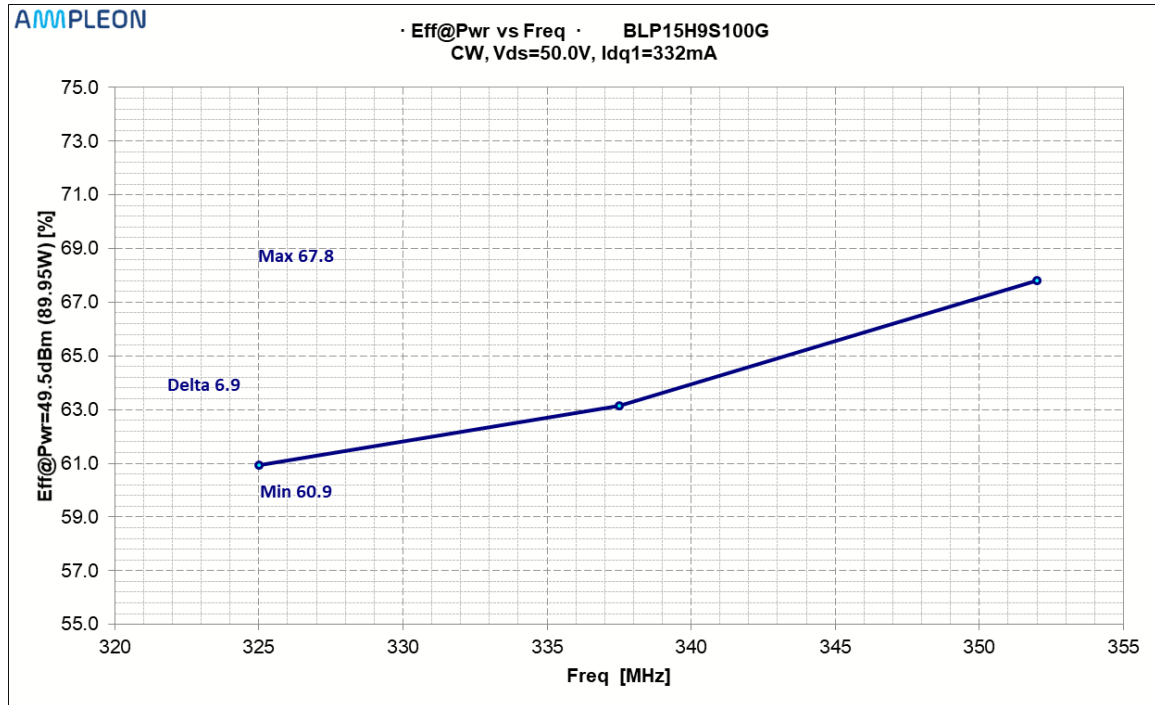


Figure 5 BLP15H9S100G_PS_CW_200826_1746 Eff (90W) vs Freq

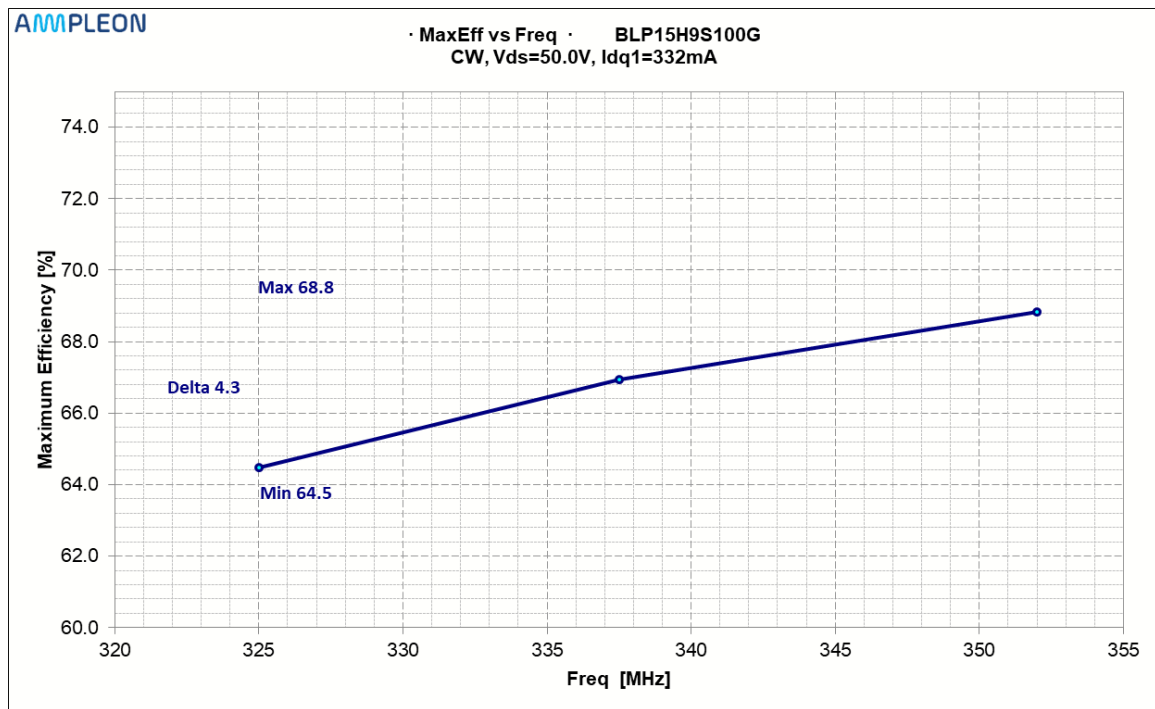


Figure 6 BLP15H9S100G_PS_CW_200826_1746 Eff (P3dB) vs Freq

8.2.4 Return loss

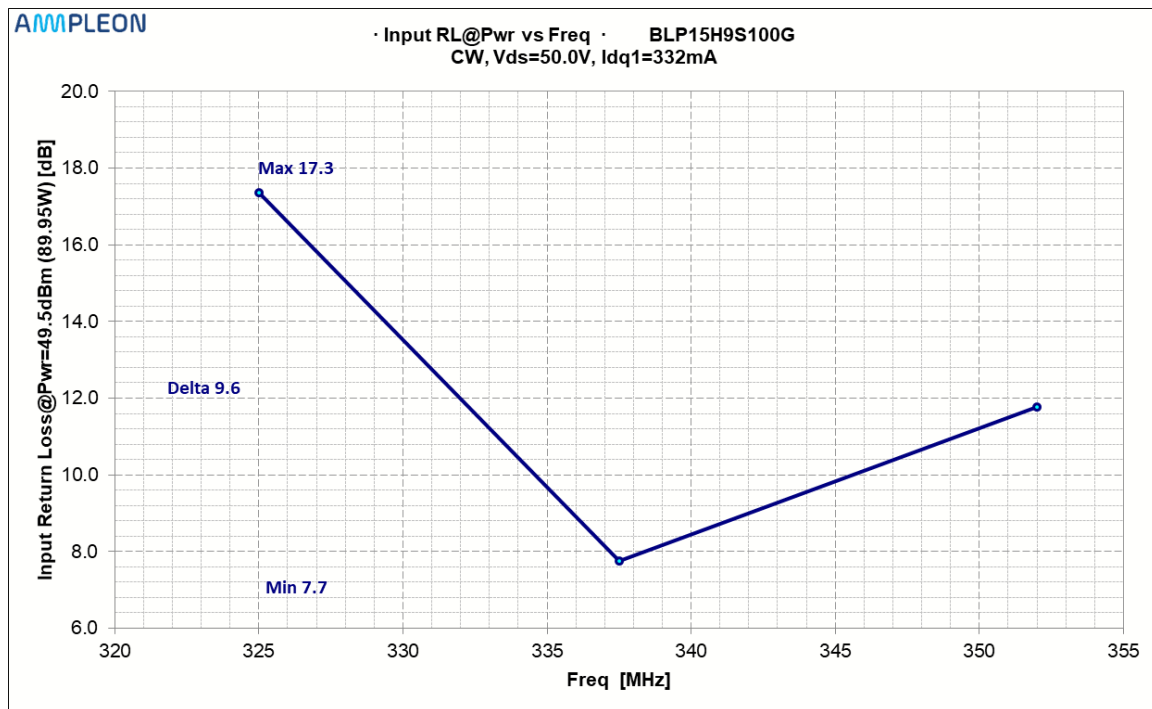


Figure 7 BLP15H9S100G_PS_CW_200826_1746 IRL vs Pout

8.3 Harmonics

Harmonics are more than 40dB suppressed.

8.4 Thermal behavior

The amplifier was operated with a 50 Ohm load delivering an output power of 90W (CW). The gain compression is 1.5dB. The demo circuit was placed on top of a water-cooled copper plate ($T_{WATER} = 20^{\circ}C$). The highest measured temperature was measured on the case of the transistor ($127^{\circ}C$). Operating frequency = 337.5 MHz.



Figure 8 Thermal picture

9. Hardware

9.1 Mechanical drawing

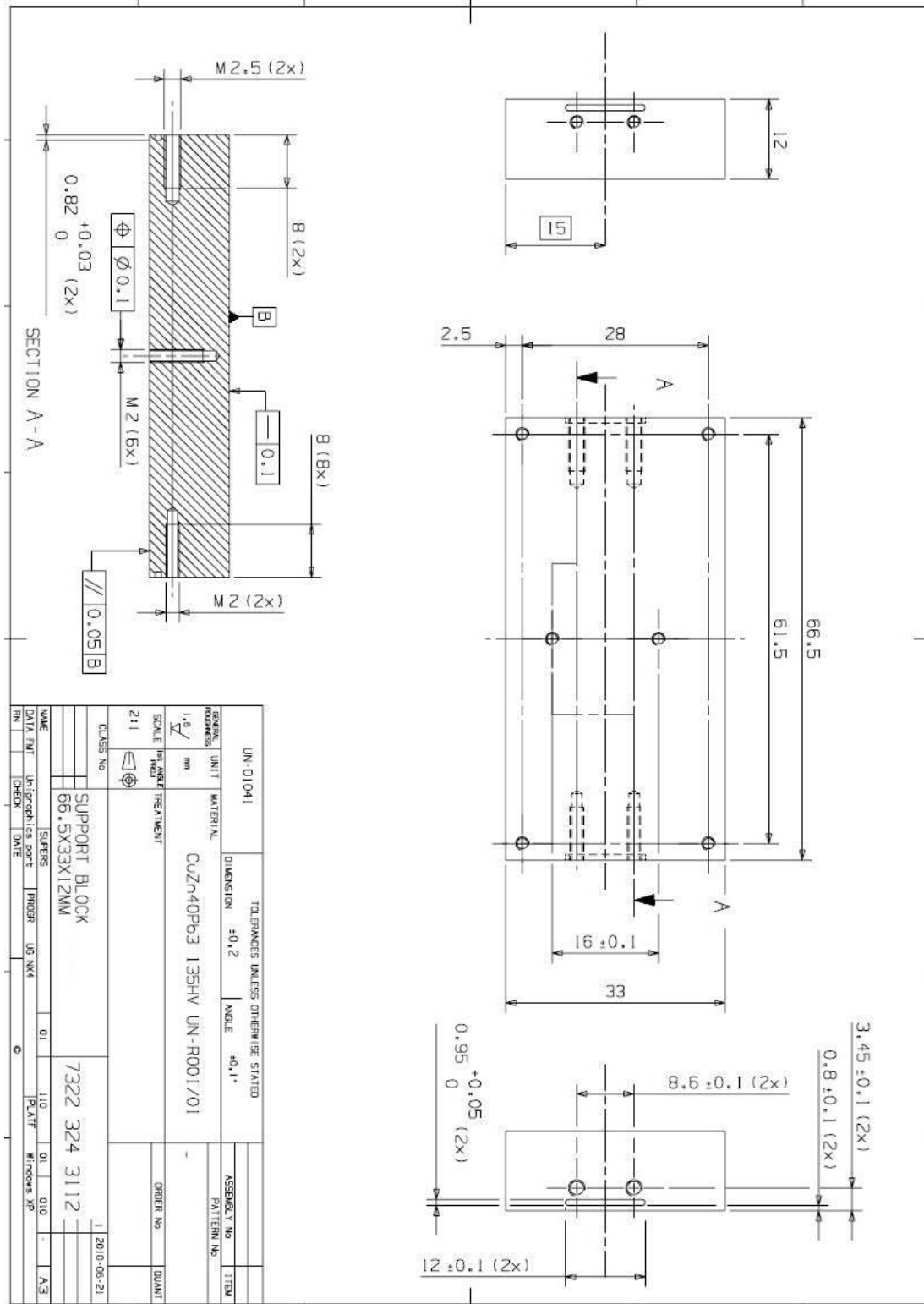


Figure 9 Support block Mechanical drawing

9.2 Board Image

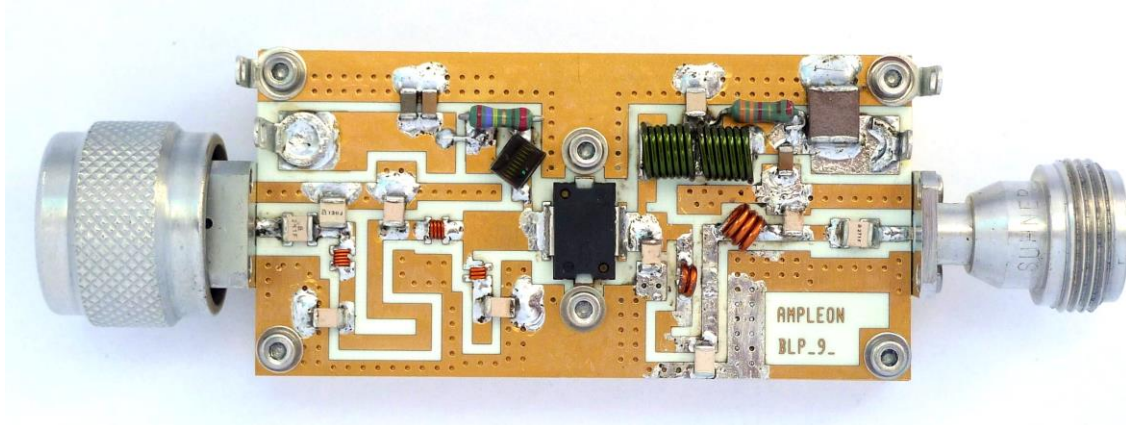


Figure 10 Demo Top View

9.3 Board layout

9.3.1 Input & Output

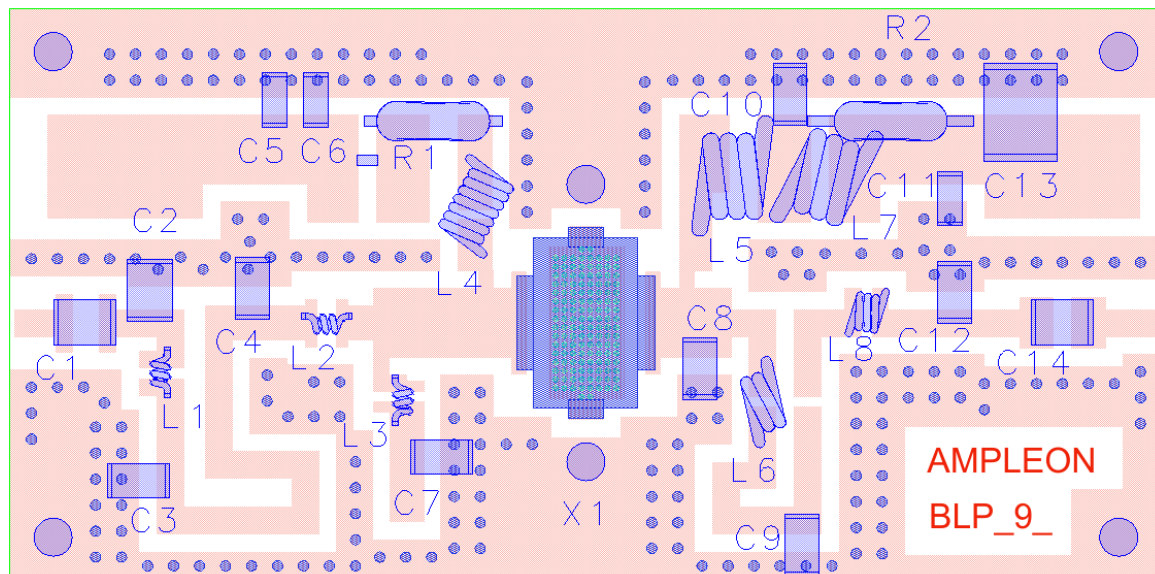


Figure 11 Demo PCB component placement

9.4 Bill of materials

9.4.1 Input & Output

Table 5: Bill of Materials input

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C1	240 pF	ATC	ATC100B
Capacitor	C2	13 pF	ATC	ATC100B
Capacitor	C3, C4, C7	62 pF	ATC	ATC100B
Capacitor	C5	1 uF / 25V	MURATA	GRM31MR71E105KA01L
Capacitor	C6	100 nF	KEMET	C1206C104K1RAC
Inductor	L1	13.7 nH	Coilcraft	0807SQ14N
Inductor	L2	12.3 nH	Coilcraft	0806SQ12N
Inductor	L3	5.5 nH	Coilcraft	0806SQ5N5
Inductor	L4	150 nH	Coilcraft	1812SMSR15GLB
Resistor	R1	27.4 Ohm		0.6 Watt

Table 6: Bill of Materials output

Description	Identifier	Value	Manufacturer	Specification
Capacitor	C8	7.5 pF	ATC	ATC100B
Capacitor	C9	30 pF	ATC	ATC100B
Capacitor	C10	200 pF	ATC	ATC100B
Capacitor	C11	100 nF / 100V	MURATA	GRM188R72A104KA35D
Capacitor	C12	11 pF	ATC	ATC100B
Capacitor	C13	4.7 uF / 100V	TDK	C5750X7R2A475KT/A
Capacitor	C14	270 pF	ATC	ATC100B
Inductor	L5, L7	100 nH	Coilcraft	2222SQ111
Inductor	L6	~8.5 nH	wire wound	WD=0.8 mm; N=1.5; D=1.6 mm; L=2 mm
Inductor	L8	~23 nH	wire wound	WD=0.8 mm; N=3; D=2.4 mm; L=2.4 mm
Resistor	R2	33.2 Ohm		0.6 Watt

9.5 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

9.6 Device markings

Table 8: Device specifics

Parameter	Value
Manufacturer	Ampleon
Device	BLP15H9S100G
Marking	H1951
Comments	Engineering sample

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