NA-1686

BLF188XR at 41 MHz

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AMPLEON

Application Measurement Report

Document information

Info	Content
Keywords	NA-1686, 41MHz, BLF188XR
Abstract	Demo board for 41 MHz using BLF188XR

Revision history

Rev	Date	Description
1	20121106	
2	20121204	Update mechanical drawings and dxf files
3	20150424	Update for web publication
4	20151005	The format of this document has been redesigned to comply with the new identity guidelines of Ampleon. Legal texts have been adapted to the new company name where appropriate.

1. Introduction

1.1 General Description

This document shows the measurement results of a 41 MHz push pull demo amplifier (Board NA-1686, with one BLF188XR.)

The demo amplifier can generate over 1200 Watts of pulsed (100uSec, 10%DC) to CW output power at efficiencies of about 82 %.

1.1.1 Test object details

Transistor type:	BLF188XR bolted down, using WPS2 compound
Production code:	
Package:	SOT539A
Board:	Output: Coax frafo output circuit 1
	Input: Core trafo input circuit 1
	On full copper cooling base plate, water channel in base plate
Demo number:	NA-1686

2. Design

2.1 Design considerations

The goal was to design a compact circuit for use at 41 MHz using the new BLF188XR LDmosfet. The amplifier should be capable of producing an output power of 1.2 kW and an efficiency of more than 80%. The demo amplifier should be able to survive extreme mismatch conditions as common in laser and plasma generator operation.

To build this design on a standard size base plate of 80 mm * 152 mm the input circuit was designed using a compact 9:1impedance ferrite transformer. This made it possible to shrink the input circuit size and increase space for the output circuit.

Gate biasing is done via the secondary winding of the input transformer.

The Output circuit was designed using a cable transformer and a cable balun.

No ferrite was used in the output circuit, because of concerns the ferrite might saturate under extreme mismatched load conditions. Drain bias is applied using coils directly to the drain, this makes it possible to dampen drain resonances if necessary.

3. Tests

3.1 Used Test signals

Power/efficiency measurements.

Pulsed, 100uS, Duty Cycle=10% and full CW, Measured at 41MHz.

VSWR testing:
Phase unit capable of VSWR 70 – 90 over 140 degrees of phase angle variation. RG213 cable lengths used to shift the phase angle to cover the whole 360 degrees . This RG224 cable is used to add losses to reach lower VSWR test values. This way the whole 360 degrees could be made with VSWR values from abt 10:1 through 90:1

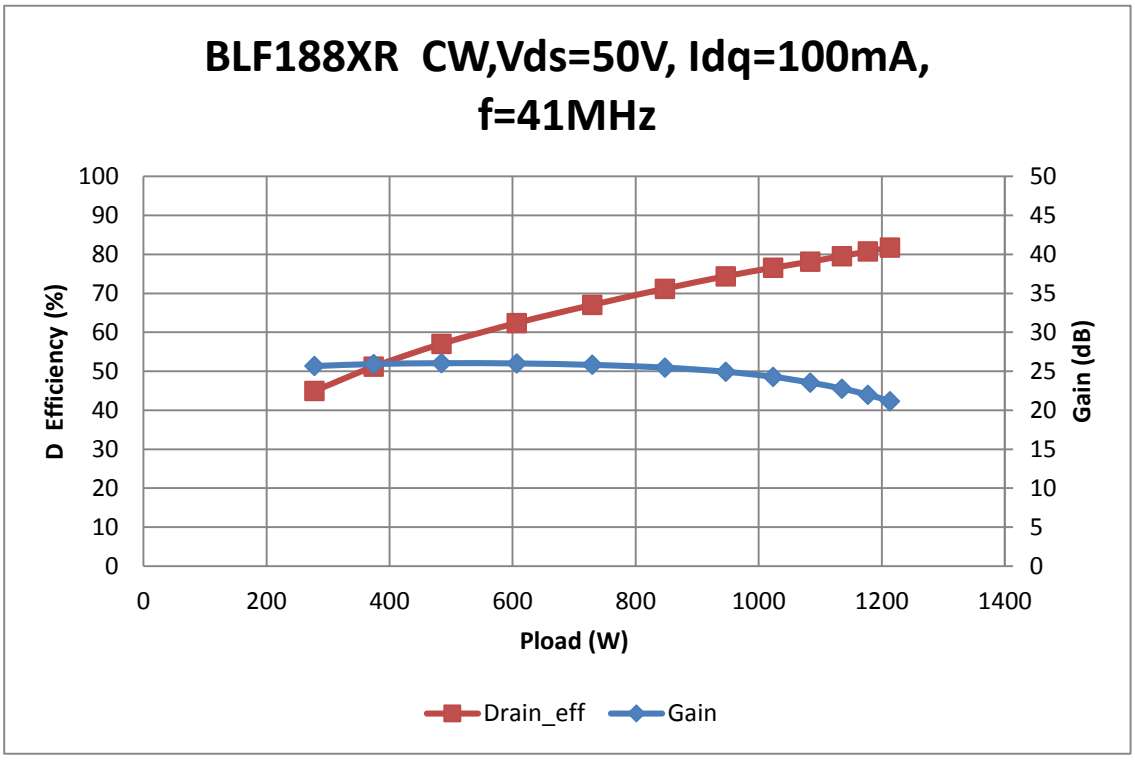
3.2 Circuit details

The test circuit has been designed on Taconic RF35, h=0.76mm, e r=3.5, 2x35um copper. Supply voltage (drain-source) is typical 50V. To set the drain quiescent current, slowly increase Vg until the total Idq is 100mA.

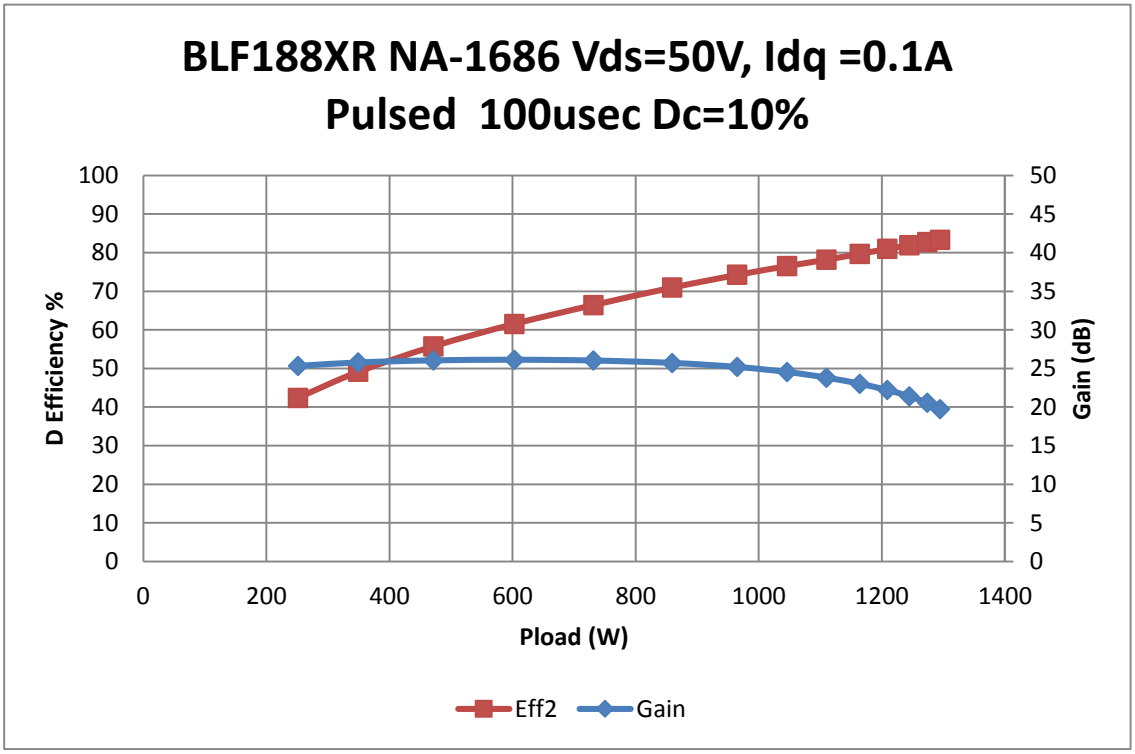
The demo circuit produces an output power of over 1200 Watts (abt 5dB compressed) , at 82 % efficiency at 41MHz.

4. Measurement Results

4.1 CW/Pulsed – Power Sweep and VSWR testing.



a.



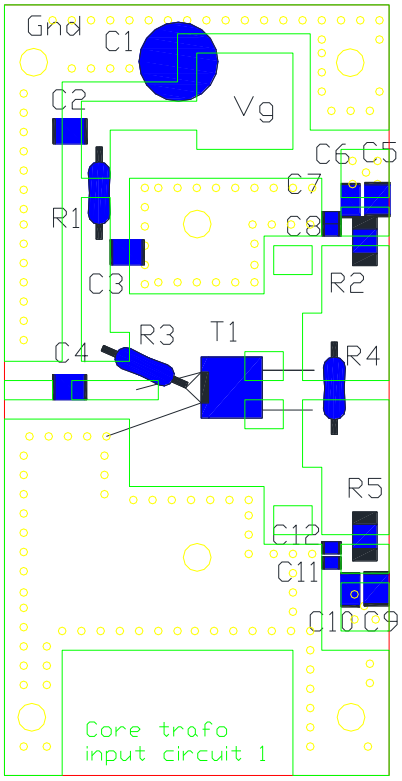
VSWR testing results

VSWR testing NA1686 Pulsed Tp=100uSec, Duty cycle=10% 70MHz mismatch unit used with cables Vswr 10:1 through 90:1 all phases Vds=50 Volts, Idq=200mA complete amplifier						
Pload (W)	10:1	20:1	30:1	60:1	80:1	60-90:1
1000	pass	pass	pass	pass	pass	pass
1100	pass	pass	pass	pass	Pass	pass
1200	pass	pass	pass	pass	pass	pass

5. PCB Layout, Component list

5.1 PCB Layout Drawings

Input circuit, pcb with components

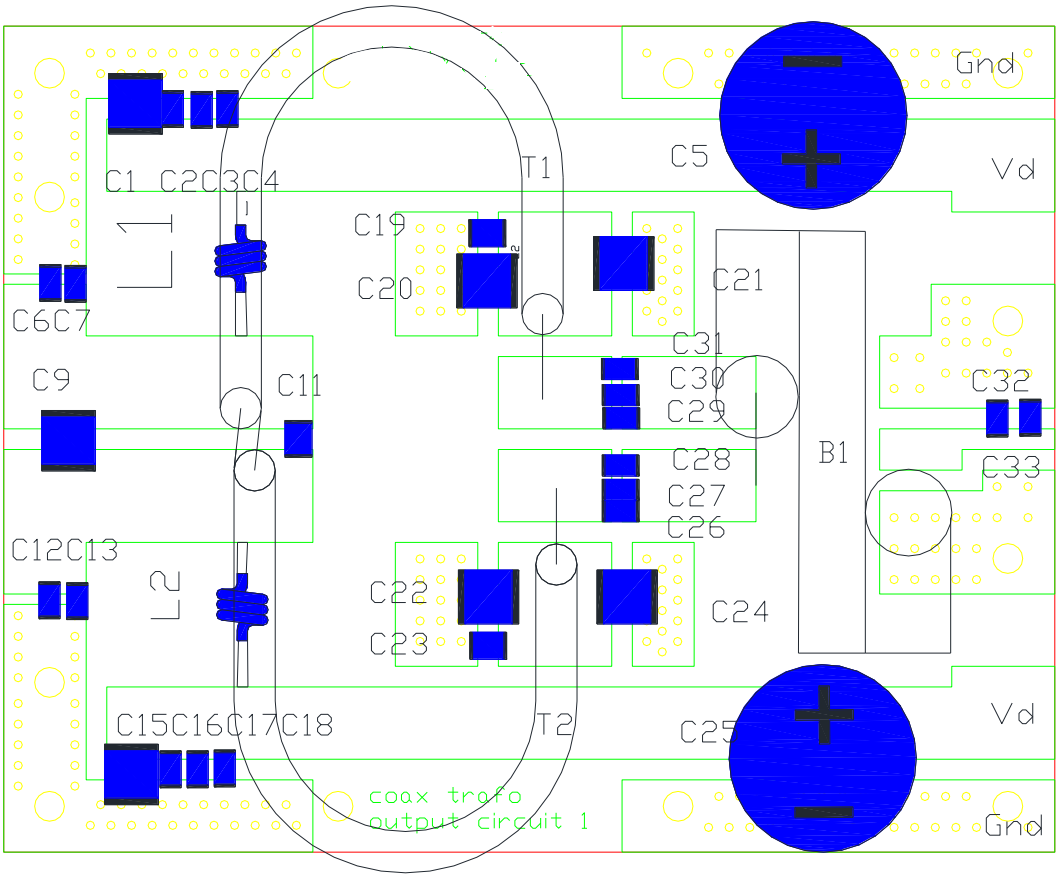


Input circuit, layout with components

5.2 Component list

Components list input circuit.			
C1	220uF	Electrolitic	63V
C2, C3,C4	1nF	ATC100B	
C5,C9	4.7uF	murata	50V
C6,C10	100nF	tdk	
C7,C11	100nF	murata	100V
C8,C12	1nF	ATC700A	
R1,R3	27 Ω	Wired Resistor 0.25W	
R4	2x22Ω	1W wired	Resistors parallel
R2,R5	10Ω	1208 smd	
T1	Two hole core 14x13mm	BM61-202 Material	9:1 transformer P: 1.5wnd isolated wire S: 0.5wnd0.8mm enamel wire
PCB Material: Taconic RF35, Thickness 0,76 mm, εR = 3.5, Cu = 35 micron, double sided copper			

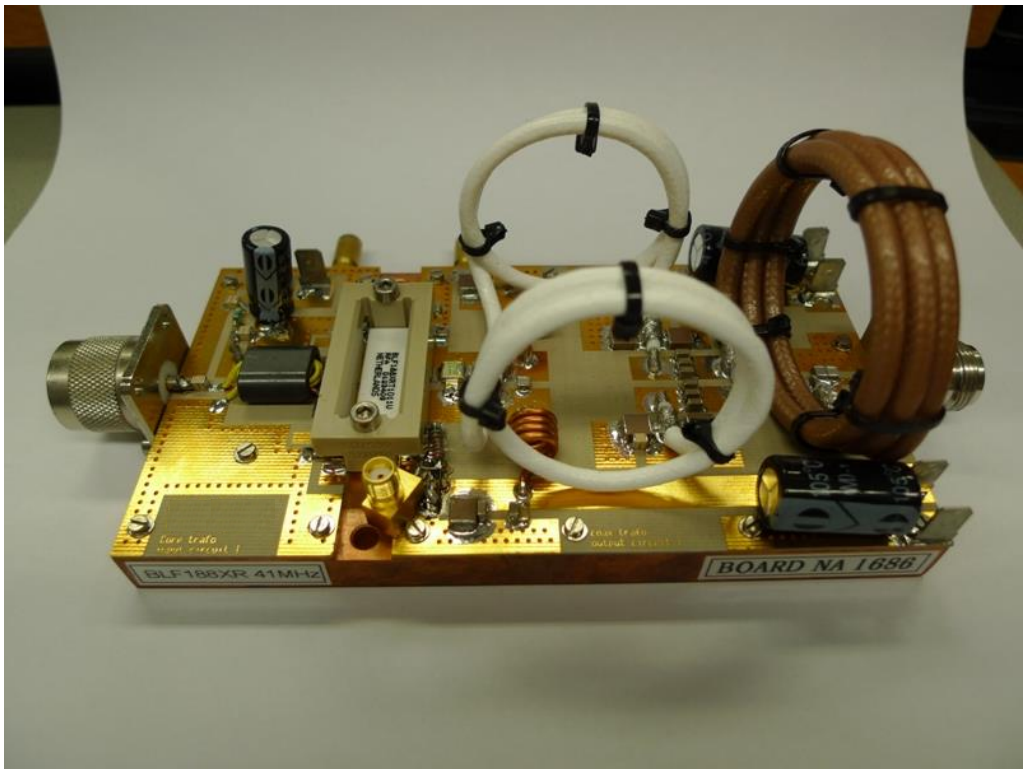
Outputcircuit, pcb with components

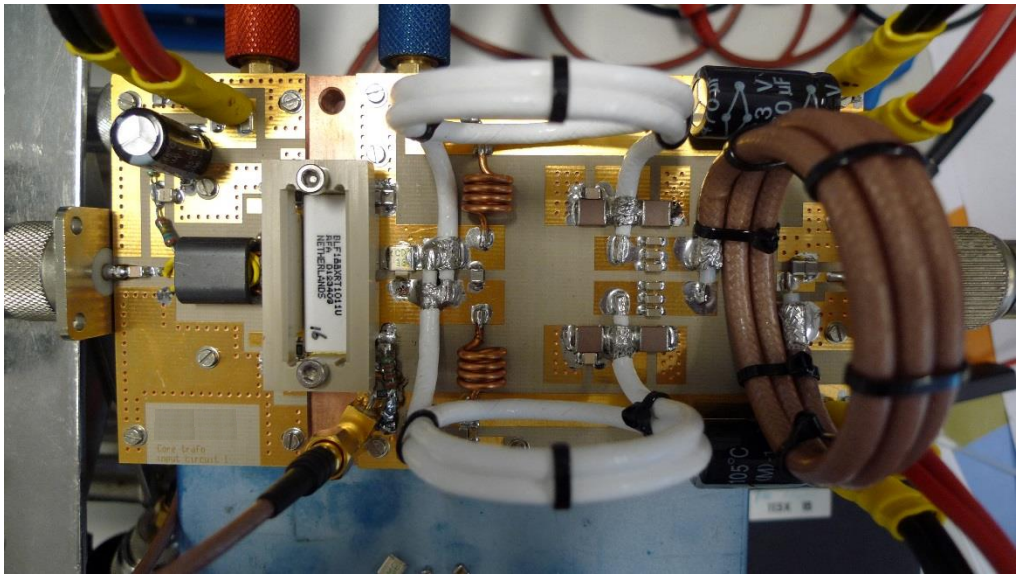


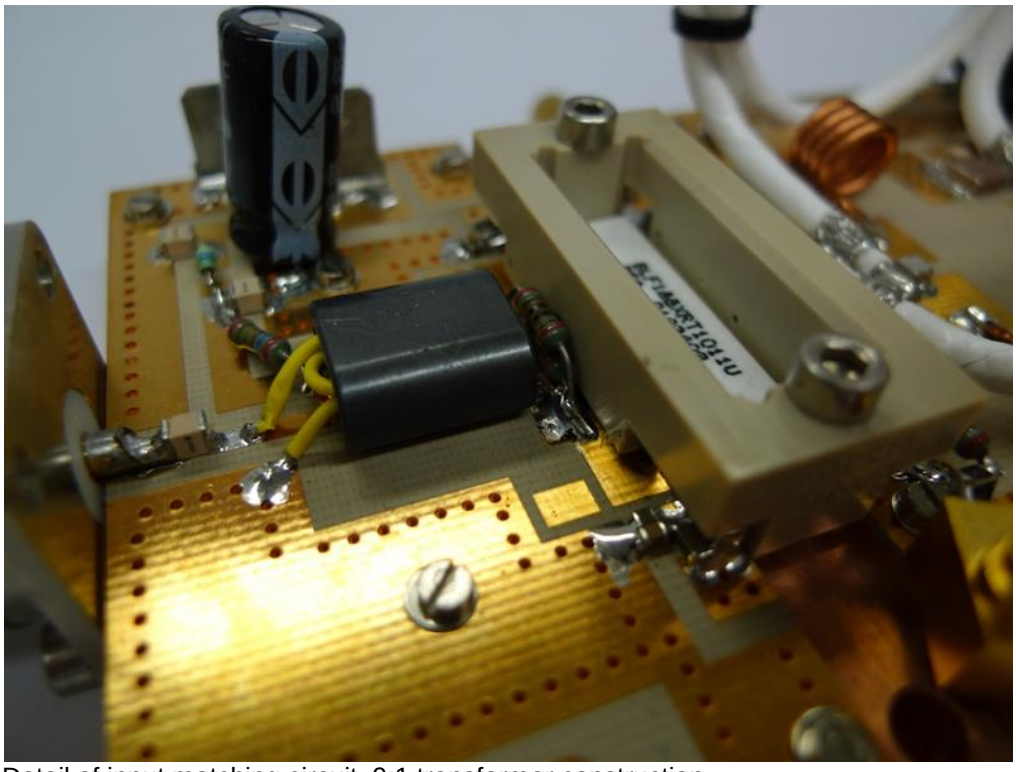
Components Output circuit

Components list output circuit.			
C1,C15	4.7uF	TDK	100V
C2,C16	1nF	ATC800B	
C3,C17	1uF		
C4,C18	220nF		
C5, C25	470uF		
C6, C12	75 pF	ATC800B	
C7, C13	100pF	ATC800B	
C9	36pF	CDE min300V	
C11	24pF	ATC800B	
C20,21,22,24	4.7uF	TDK	100V
C19,23	1nF	ATC100B	
C26 –C31	1nF	ATC100B on side	
C32	33pF	ATC800B	
C33	43pF	ATC800B	
L1,2	4turns 6mm inner diameter	1.5mm enamel wire	Close wound
T1,T2	Coax 12Ohms	Sucoform_F L=300mm	Wound up to make 1.5 winding
B1	50 ohms one line	RG142 L=500mm	Wound up to make 3windings.
PCB Material: Taconic RF35, Thickness 0,76 mm, εR = 3.5, Cu = 35 micron, double sided copper			

5.3 Photos of Demo Board

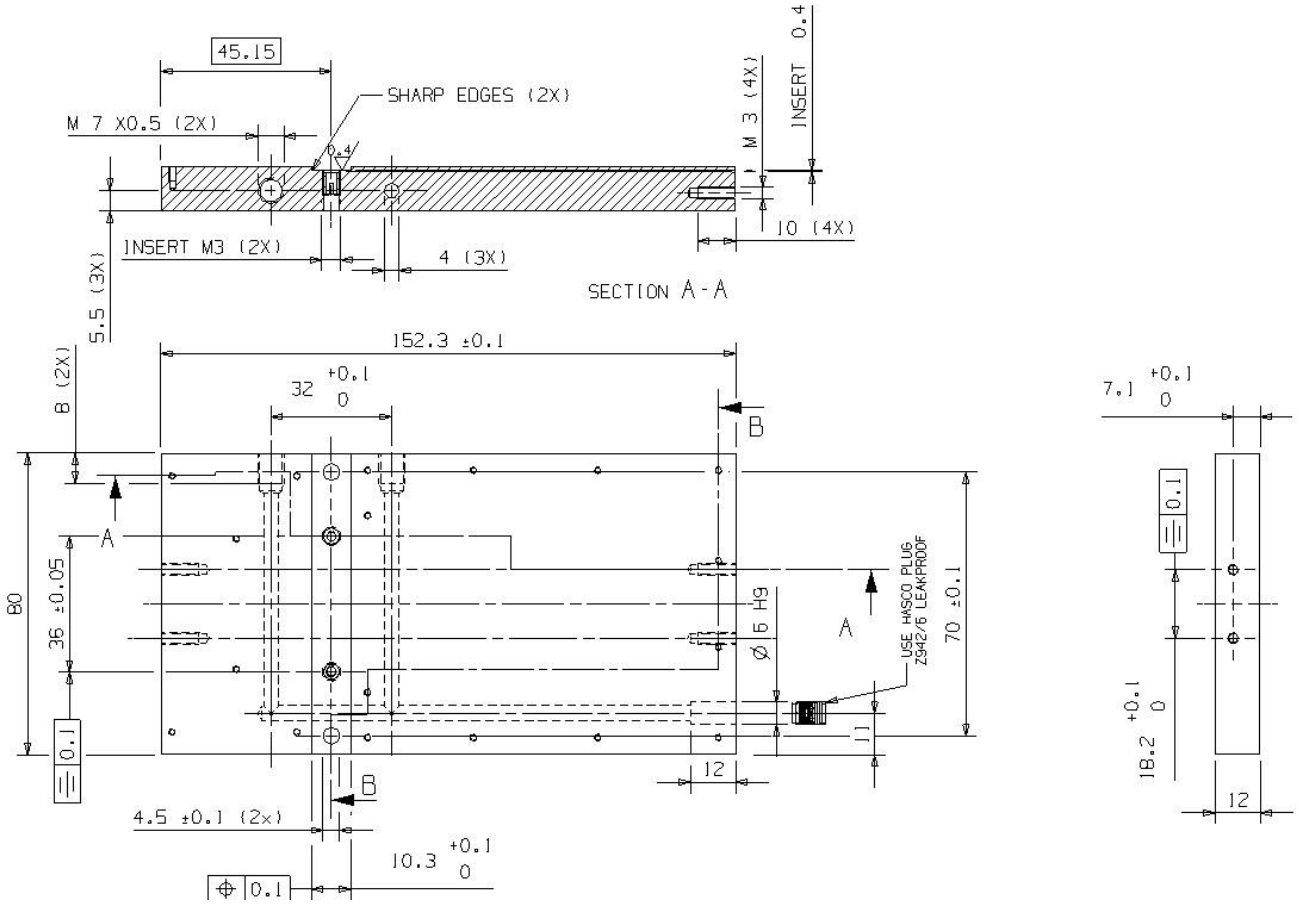






Detail of input matching circuit, 9:1 transformer construction.

5.4 Base plate mechanical drawings



6. Attachments

Please see the attachment for the support files.

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