LNA125 Data Sheet

Features

- High gain
- Low noise figure across the pass band
- Bias Tee option
- Low current draw
- 50 Ω operation
- Thin PCB substrate
- High quality SMA female connectors
- High linearity
- Works directly with RTL-SDR
- Open design
- Easy to modify for your requirements

Applications

- For LRPT reception from METEOR, NOAA, etc. satellites
- Enhance airband reception
- Block strong FM interference
- Improving EME and DX receptions
- Receive crisp SSTV images from the ISS

General Description

The LNA125 is a low noise amplifier that employs the PGA-103+ from Minicircuits. It is designed to operate in the VHF band starting from 125MHz to 160MHz. The LNA125 amplifier covers the air band, weather satellite LRPT band and the 2-meter amateur radio band. It provides excellent noise figure performance and very good linearity while strongly rejecting the overpowering FM broadcast band. This amplifier can be powered via the coaxial line or through two pin headers, providing flexibility in power options. It operates with a voltage range of 5V to 12V and draws minimal current to operate efficiently. The open design of the LNA125 allows for easy modification and component replacement, enabling users to enhance the performance even further by upgrading individual parts.

The LNA125's robust design ensures durability and reliability in various environments. Its compact form factor makes it suitable for integration into a wide range of systems, from hobbyist projects to professional applications. The amplifier's high-quality SMA connectors ensure secure and stable connections.

Whether you're enhancing air band reception, blocking strong FM interference, or improving EME and DX receptions, the LNA125 provides the performance and flexibility needed to achieve optimal results. Additionally, the device's compatibility with RTL-SDR and other software-defined radio platforms makes it a versatile tool in your lab or your shack. Oh, not to mention crisp SSTV images from the ISS!

There are a few tips at the end to allow you to solder alternate parts and boost the LNA's performance even more.

Electrical Specifications

All specifications are in $-40°C \leq T_A \leq 85°C$ unless otherwise noted.

Table 1: LNA125 electrical specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit
Gain	G	17.0	18.0	19.0	dB
Input RF power	RF_{in}			+20	dBm
Noise Figure	NF		0.5		dB
Ouput IP3	$OIP3$		35.0		dBm
Device current	I_d	6.5	7	8	mA
Lower cut-off (-3dB)	F_L	122.0	125.0		MHz
Upper cut-off (-3dB)	F_H		155.0	160.0	MHz
Lower Roll-off	R_L		128		dB/octave
Higher Roll-off	R_H		50		dB/octave

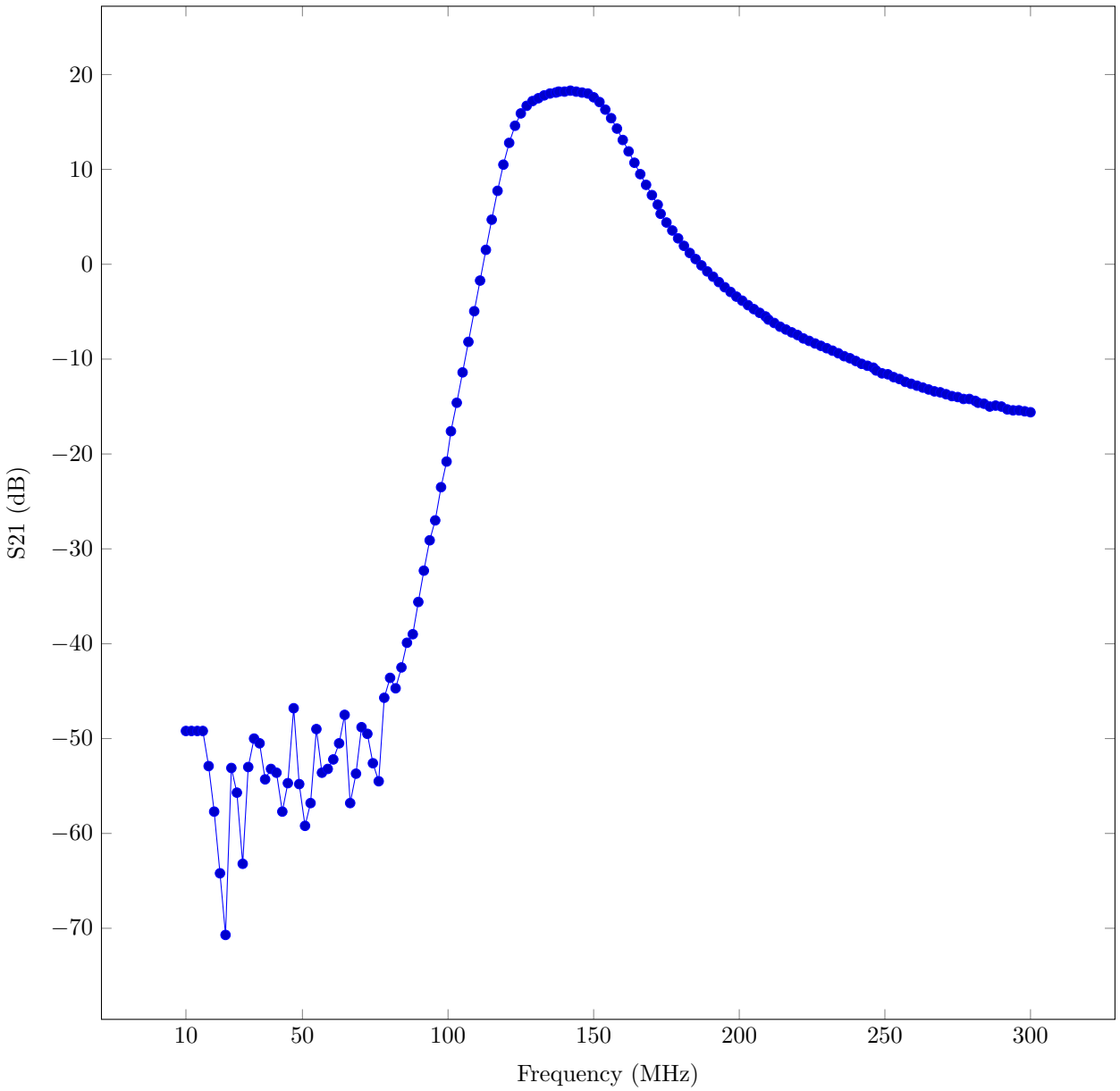
Absolute Maximum Ratings

Table 2: Absolute Maximum Ratings of LNA125

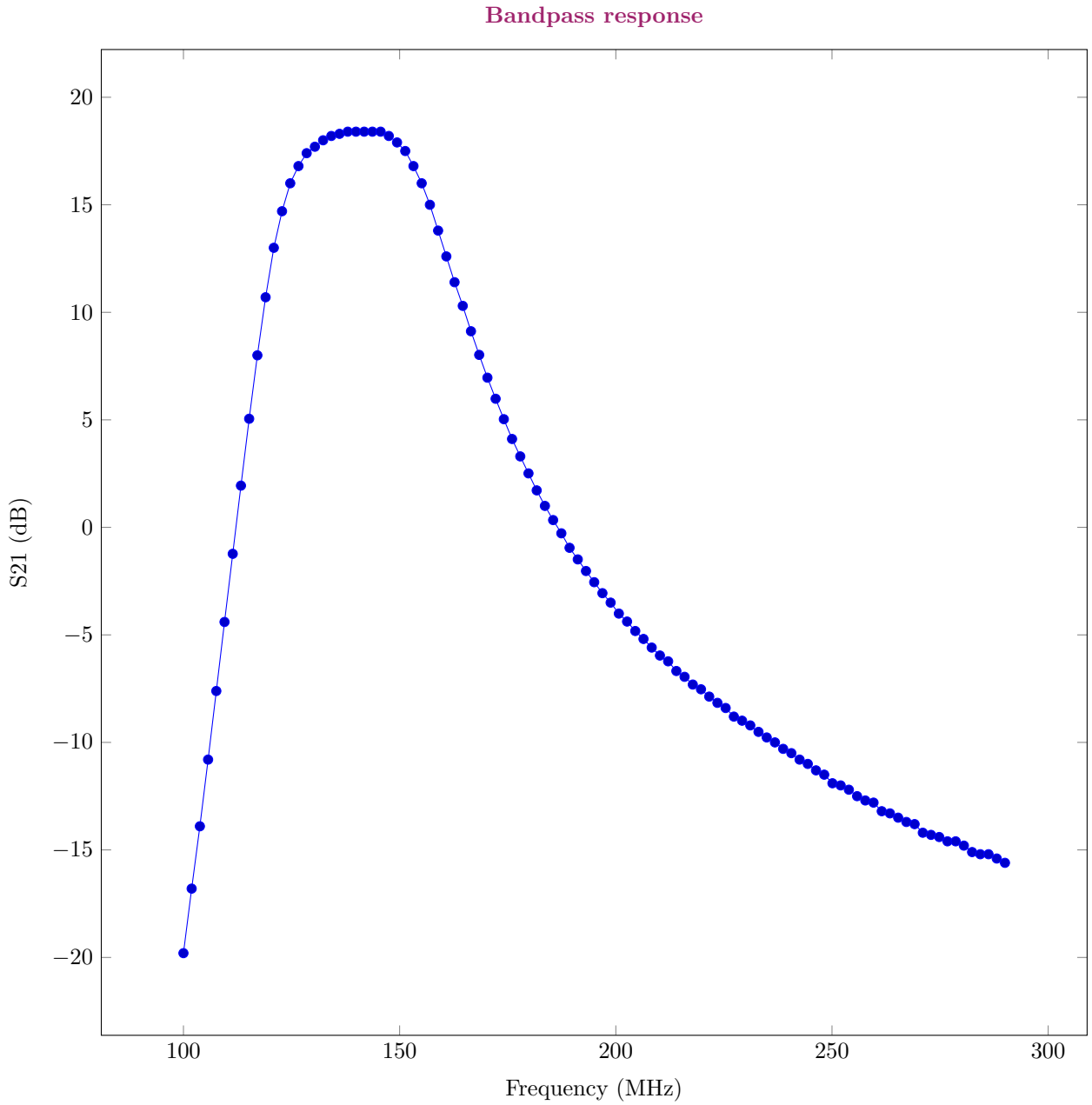
Parameter	Rating
Input Voltage	15V max
Input RF power	+21dBm max
Output RF power	+22dBm max
Operating current	10mA max
Temperature	-40 °to +85 °

Note: Stresses above those listed under Absolute Maximum Ratings can cause permanent damage to the device. This is a stress rating only. Functional operation of the device is not implied in any conditions above those indicated in the Electrical Specifications section.

LNA frequency response



Tested with NanoVNA and TinySA Ultra



Mechanical specifications

Table 3: LNA125 mechanical specifications

Parameter	Symbol	Typ.	Unit
Width	W	40	mm
Height	H	30	mm
Hole dia.	D	3.1	mm

The 3.1mm diameter mounting holes allow the user to firmly screw the circuit board to a sturdy mounting frame, box or a chasis. Additionally, you can also use these holes to assemble appropriate PCB spacers to prevent the bottom of the board from touching anywhere.

Modifications

Filter response

The LNA circuit has a bandpass filter tuned for 125MHz to 157MHz frequency range. This range covers the air band, the LRPT satellite transmissions and the 2 meter ham radio band. If you wish to change the filter response to some other frequency range, you may design your own filter and populate the components marked in the schematic. I followed the Marki Microwave's filter design tool to design the filter.

Improving the OIP3

The regulator mounted on the PCB outputs 3.3V to bias the amplifier. This gives an OIP3 of roughly 34dBm to 35dBm. The chip employed here is capable of 41dBm+. To achieve better OIP3, replace the regulator with a 5V regulator of the same series. Specifically, TLV1117-50IDCY should be soldered in place of existing regulator.

Output side bias-tee

The output side bias tee can be unpopulated if you are powering the amplifier through the connector J1.

References

[1] https://nuclearrambo.com/wordpress/designing-and-testing-a-low-noise-amplifier-part-1/

[2] https://nuclearrambo.com/wordpress/designing-and-testing-a-low-noise-amplifier-part-2/

BUY

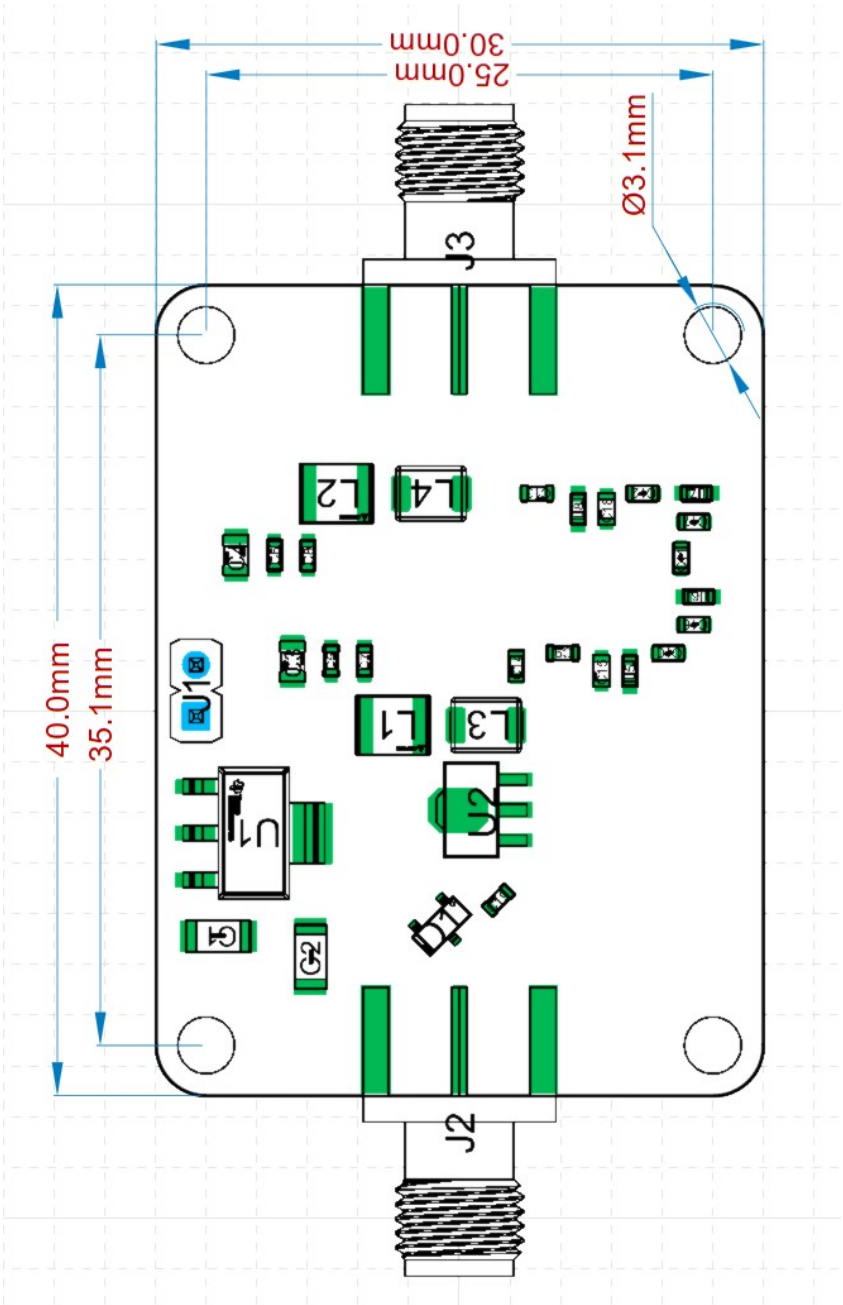


Figure 1: Mechanical Dimensions

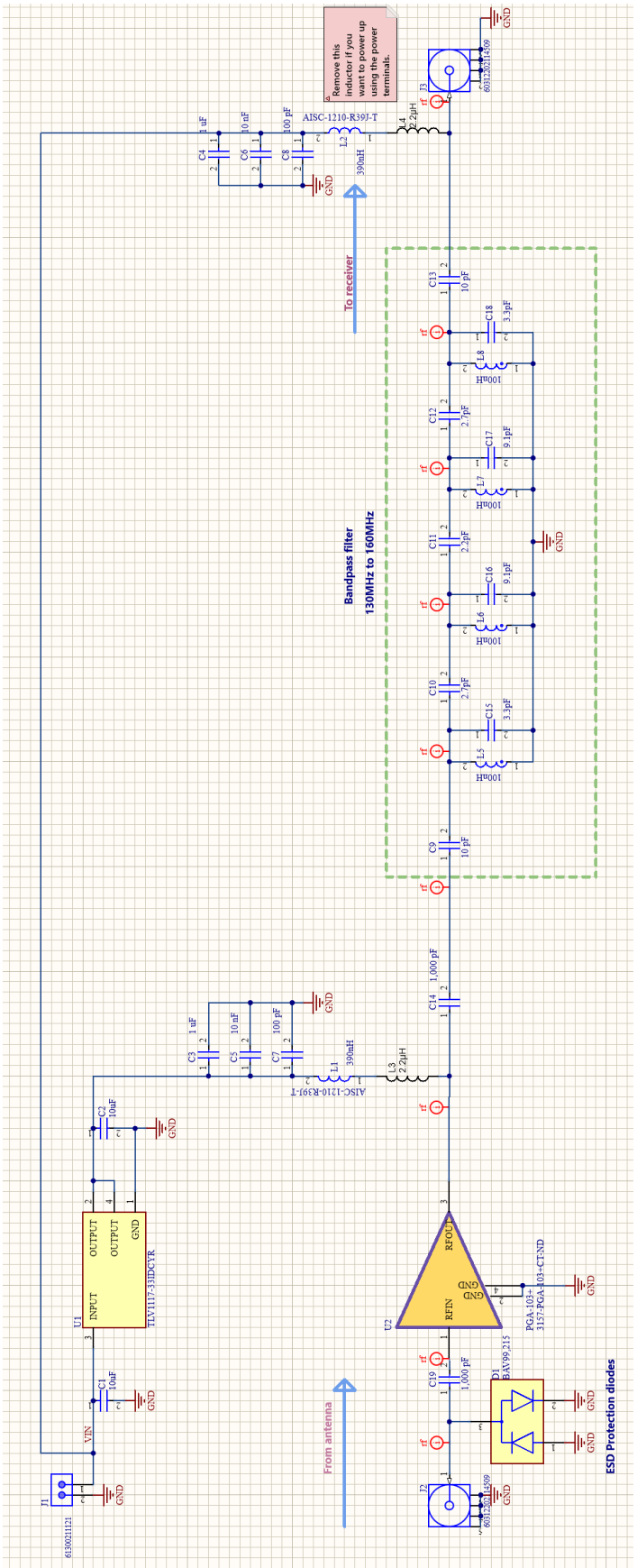


Figure 2: Circuit Schematic

Tested with NanoVNA and TinySA Ultra