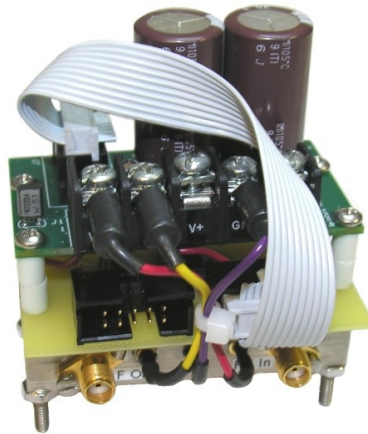




PA15W RF Power Amplifier

Owner's Manual



SpinCore Technologies, Inc.
<http://www.spincore.com>

PA15W RF Power Amplifier

**Congratulations and *thank you* for choosing a design from
SpinCore Technologies, Inc.**

We appreciate your business!

**At SpinCore we try to fully support the needs of our customers. If you
are in need of assistance, please contact us and we will strive to provide
the necessary support.**

© 2010 SpinCore Technologies, Inc. All rights reserved.

SpinCore Technologies, Inc. reserves the right to make changes to the product(s) or information herein without notice. RadioProcessor™, PulseBlaster™, SpinCore, and the SpinCore Technologies, Inc. logos are trademarks of SpinCore Technologies, Inc. All other trademarks are the property of their respective owners.

SpinCore Technologies, Inc. makes every effort to verify the correct operation of the equipment. This equipment version is not intended for use in a system in which the failure of a SpinCore device will threaten the safety of equipment or person(s).

Table of Contents

I. Precautions.....	4
<i>Connecting & Disconnecting Power Amplifiers.....</i>	<i>4</i>
<i>Power Considerations.....</i>	<i>4</i>
II. PA15W – 15 W Power Amplifier Module.....	5
1. Overview.....	5
2. Electrical Specifications.....	5
3. Connector Information.....	6
4. Typical Performance Data.....	8
5. Typical Performance Curves.....	9
6. Packaging Options.....	10
1. PA15W RF Module – no enclosure.....	10
2. PA15W RF module with enclosure.....	10
III. Contact Information.....	12
IV. Document Information.....	12

I. Precautions

Working with RF power amplifiers can be dangerous and even fatal if not handled properly. Output voltages can reach values greater than 90 V peak-to-peak (for the PA15W) and can be fatal. Follow these steps to avoid damaging the amplifier or inflicting serious injuries.

Connecting & Disconnecting Power Amplifiers

When connecting the power amplifier, follow these steps in order to avoid damaging the amplifier or inflicting serious injuries.

- 1) Apply the load to the amplifier (make sure a load is ALWAYS present when working with power amplifiers).
- 2) Apply the DC power to the amplifier.
- 3) Apply the RF input to the amplifier.

Repeat the steps in reverse order when disconnecting the amplifier.

Power Considerations

Make sure the following considerations have been made before applying power to the amplifier.

- 1) Be sure your load can appropriately dissipate the maximum power being applied by the amplifier.
- 2) When applying an RF signal, work with low duty cycles to limit the power being dissipated.

II. PA15W – 15 W Power Amplifier Module

1. Overview

The PA15W RF power amplifier comes in a very compact broadband module capable of delivering over 15 Watts RMS into a 50-ohm load. It has a 3 dB bandwidth from 4 MHz to 100 MHz. The PA15W has standard female SMA jack connectors for RF input and output, and a has screw terminal connectors for DC input power.

The product comes with blanking circuitry – the blanking circuitry keeps the PA15W blanked (turned off) until a TTL input (logical high) is applied. The blanking circuitry helps to conserve power, keeps the amplifier cool under typical operating conditions, and provides noise reduction during the reception of NMR signals. To deblank the power amplifier, a TTL pulse needs to be applied to the control circuitry at least 15 μ s prior to the RF pulse being applied at the input.

The PA15W module measures 2.5" x 2.75" x 3" (63 x 70 x 76 mm). There are multiple packaging options available, such as enclosures with integrated AC power supplies and complete mobile NMR, NQR and MRI systems that include preamplifiers, filters and SpinCore's RadioProcessorUSB board along with the PA15W. See the "Packaging Options" section later in this document for more information. The use of a low pass (or band pass) filter at the output of the PA15W is recommended to reduce high frequency noise and improve performance.

2. Electrical Specifications

Parameter	Specification	Units
DC Power Input	8 to 25	V (DC)
Max. RF input power	20	mW
Max. continuous RF output power	15	W (RMS)
Minimum deblanking time	15	μ s

Table 1. Basic electrical specifications for the PA15W power amplifier module.

3. Connector Information

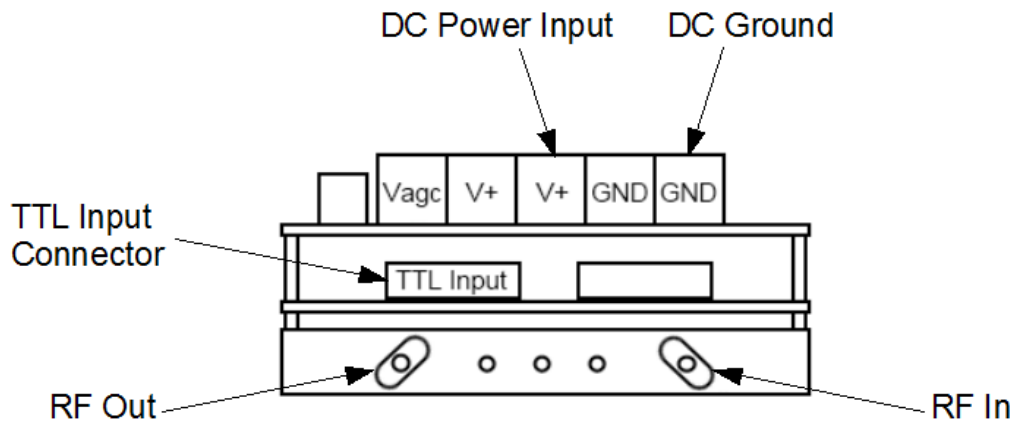


Figure 1. PA15W Connections (Front View).

Figure 1 above shows the connectors necessary to use the PA15W. Information about each of the connectors is listed below:

- DC Power Input - #6 screw terminal connector. Do not exceed 25 V DC.
- DC Ground - #6 screw terminal connector.
- RF In – SMA jack connector (do not exceed 20 mW RF input power)
- RF Out – SMA jack connector. A 50 Ω load must be connected to RF Out.
- TTL Input Connector – 10-pin IDC header. The deblanking signal should be connected to pin 8 of the IDC connector (with pin 7 as the corresponding ground). See Figure 2 below for pinout information.

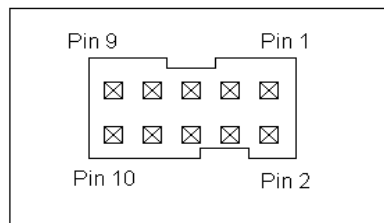


Figure 2. 10-pin IDC connector (Digi-Key part A33159-ND). Mates with Digi-Key part HKC10H-ND or similar.

PA15W RF Power Amplifier

The timing diagram of a typical application of PA15W with the deblanking pulse applied prior to the RF pulse is presented in Figure 3, below. When working with short RF pulses, on the order of 1 μ s or so, triggering the oscilloscope on the falling edge of the deblanking pulse will help identifying and capturing the RF pulse on the scope.

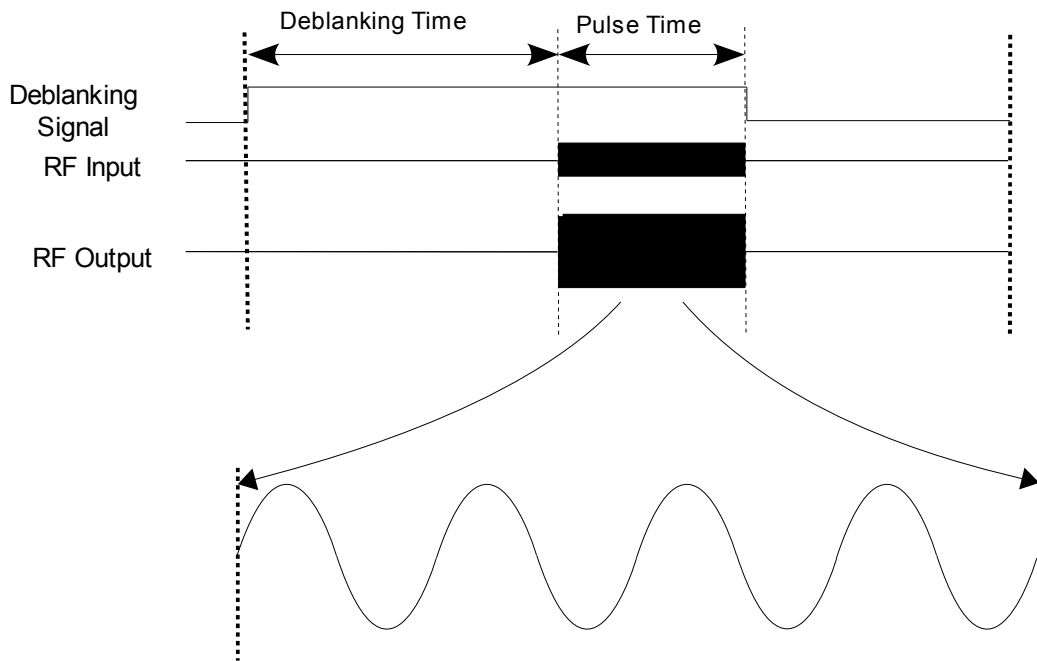


Figure 3. Representation of the deblanking and RF input and output signals to the PA15W. The PA15W requires at least 15 μ s deblanking time prior to the RF pulse for full output power. Note: when operating the power amplifier the duty-cycle for the deblanking signal should be kept low to avoid damage to the amplifier.

PA15W RF Power Amplifier

4. Typical Performance Data

When powered by 25 V DC, driven by 1.8 V peak-to-peak (7.81 mW) RF input, and with the output impedance matched to 50 ohms, the PA15W provides the following performance values.

Frequency (MHz)	Output Voltage (V pk-pk)	Output power (W RMS)	Output power (dBm)	Gain (dB)
1	45.52	5.18	37.6	28.22
5	66.45	11.04	40.44	31.42
10	69.22	11.98	40.8	31.86
20	70.37	12.38	40.94	32
30	72.39	13.1	41.18	32.25
40	73.65	13.56	41.33	32.4
50	82.78	17.13	42.35	33.41
60	91.37	20.87	43.21	34.27
70	86.93	18.89	42.77	33.84
80	83.55	17.45	42.43	33.49
90	83.5	17.43	42.28	33.34
100	80.8	16.32	42.14	33.2

Table 2. Typical PA15W performance from 1 MHz to 100 MHz

5. Typical Performance Curves

The plots below show typical performance curves for the PA15W when powered by 25 V DC, driven by 7.81mW RF input, and with the output impedance matched to 50 ohms.

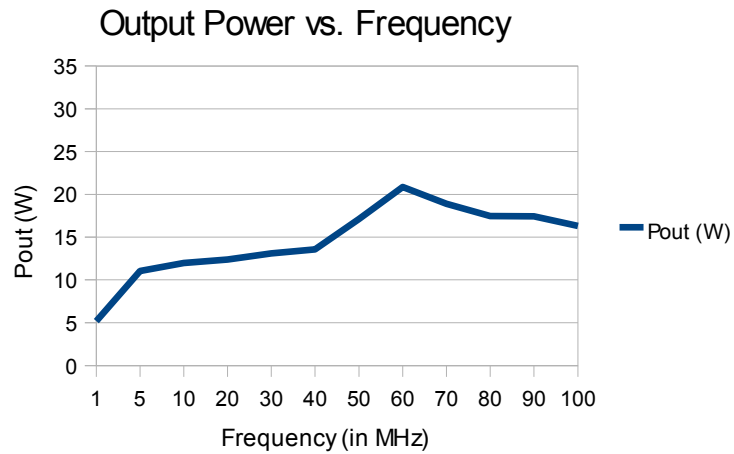


Figure 4. Output Power vs. Frequency.

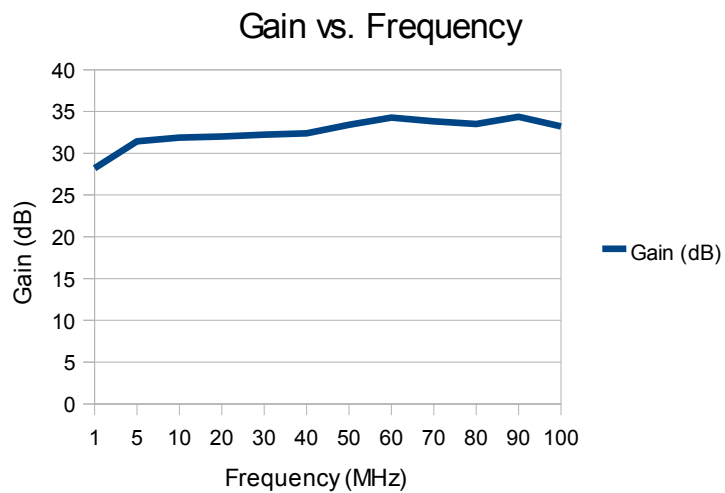


Figure 5. Gain vs. Frequency.

6. Packaging Options

Multiple packaging options are available when ordering the PA15W RF power amplifier unit.

1. PA15W RF Module – no enclosure

This is the simplest option, shown in Figure 6, which along with the power amplifier module includes only the switching circuitry mounted on top of the power amplifier to enable it when a TTL pulse is applied to the input pin.

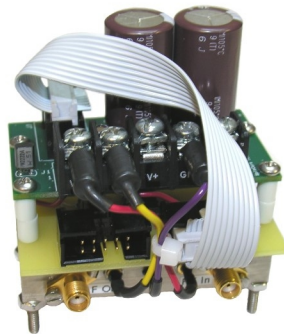


Figure 6. PA15W RF power amplifier – no enclosure.

2. PA15W RF module with enclosure

The PA15W RF power amplifier can also be delivered in various external enclosures which protect the RF power amplifier circuitry and include an AC/DC power supply, internal RF cables and output low-pass (or band-pass) filter (please specify your operating frequency at the time of purchase). The power input is 90-264 V AC, the RF input/output signals are provided on external BNC connectors, and the TTL inputs are routed through female DB-9 input connectors. The active TTL signal needs to be connected to pin 4 of the DB-9 connector, with the corresponding ground line connected to pin 8. Two standard enclosure configurations are available:

PA15W RF Power Amplifier

i) PA15W in a single-bay enclosure

Single bay enclosure additional specifications include:

- Excellent EMI/RFI shielding meets FCC & CE regulations.
- Built-in 4x4 cm quiet cooling fan.
- High quality 50 Watt AC input switching power supply.
- Dimensions are approximately 10.25" x 7.75" x 2.25" (26 x 19.5 x 6 cm).



Figure 7. A sample photo of a PA15W RF power amplifier in a single-bay enclosure.

ii) PA15W enclosed with iSpin-NMR™ system

iSpin-NMR™ enclosure additional specifications include:

- Metal body with streamlined plastic front panel.
- Built-in 8x8 cm quiet cooling fan.
- High quality 80 Watt AC input switching power supply.
- Dimensions are approximately 11" x 7" x 6.75" (28 x 18 x 17 cm).



Figure 8. PA15W RF power amplifier – enclosed with iSpin-NMR system.

III. Contact Information

SpinCore Technologies, Inc.
4631 NW 53rd Avenue, SUITE 103
Gainesville, Florida 32653
USA

Telephone: +1-352-271-7383

Web: <http://www.spincore.com/>

IV. Document Information

Document Title:	PA15W RF Power Amplifier Manual
Document Number:	DA-118

For more information on revision history please contact SpinCore Technologies, Inc., at the address above.