



PA75W RF Power Amplifier

Owner's Manual



SpinCore Technologies, Inc.

<http://www.spincore.com>

PA75W RF Power Amplifier

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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.**

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I. Precautions

Working with RF power amplifiers can be dangerous and even fatal if not handled properly. Output voltages can reach values greater than 173 V peak-to-peak 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. The duty cycle ratio should be below 1% for safe operation. If you would like to operate at high duty cycles or in continuous operation, please inquire with SpinCore Technologies.

II. PA75W – 75 W Power Amplifier

1. Overview

The PA75W RF power amplifier comes in a very compact broadband module capable of delivering up to 75 Watts RMS into a 50-ohm load. It has a 3 dB bandwidth from 0.6 MHz to 40 MHz. The PA75W has standard female SMA jack connectors for RF input and output, and screw terminal connectors for DC input power.

The product comes with blanking circuitry attached to the module – the blanking circuitry keeps the PA75W 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 65 ns prior to the RF pulse being applied at the input.

The PA75W module measures 5.6" x 3.4" x 2.5" (142.5 mm x 86.6 mm x 63.3 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 PA75W. See the "Packaging Options" section later in this document for more information and contact SpinCore Technologies. The use of a low pass (or band pass) filter at the output of the PA75W is recommended to reduce high frequency noise and improve performance.

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2. Electrical Specifications

The table below shows the electrical specifications for the PA75W module.

Table 1: Basic electrical specifications for the PA75W power amplifier module.

Parameter	Specification	Units
DC Power Input	12 ¹	V (DC)
Max. RF input power	15 ²	mW
Max. RF output power	75 ³	W (RMS)
TTL Input	2 - 3.3 ⁴	V

3. Typical Performance Data

The following performance data were obtained with the RF input of 0.8 V peak to peak at 50 Ohms.

Table 2: Typical PA75W RF module performance from 0.6 MHz to 40 MHz

Frequency (MHz)	RF output power (W)
0.6	31.36
0.8	42.25
0.9	50.41
1	59.29
2	75.7
5	65.6
7	62.41
10	65.61
13	72.25
16	71.4
20	74
30	64
40	64.02
60	44.9
70	34.2

1. Strictly required.

2. At 15 mW, the peak-to-peak voltage is 2.5 V. There are also models with a maximum input power level of 5 mW, corresponding to 1.5 Vpp.

3. Adequate heat dissipation required.

4. Any voltage greater than 3.3 V will damage the control circuitry.

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Figure 1 represents the typical PA75W RF module performance in graphical form.

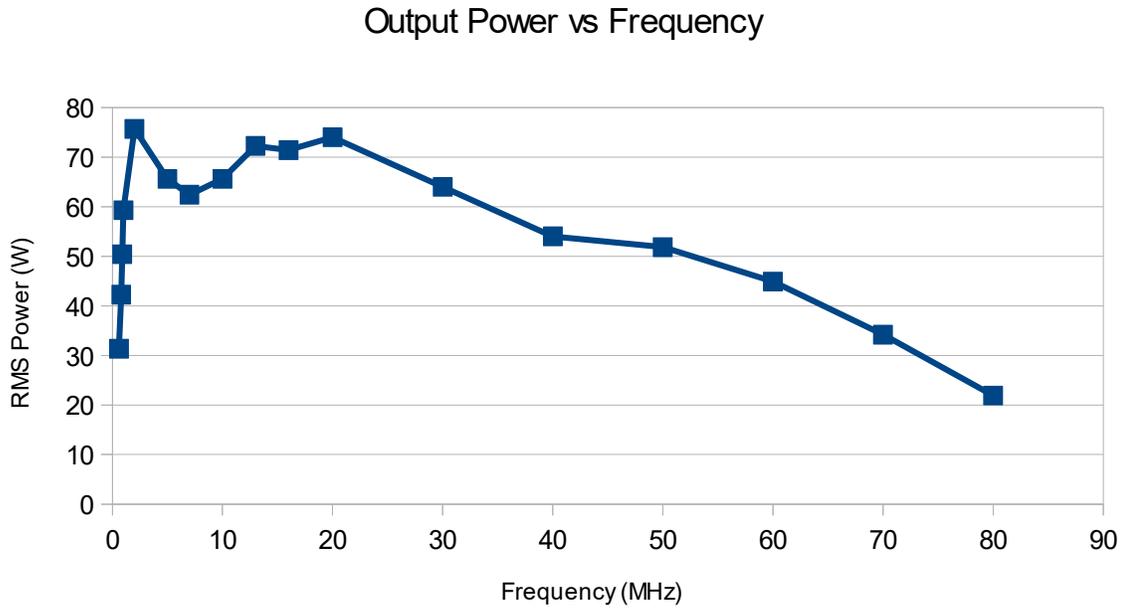


Figure 1: Output Power vs. Frequency of the PA75W RF Power Amplifier.

4. Connector Information

Figure 2 below shows the connectors necessary to use the PA75W module.

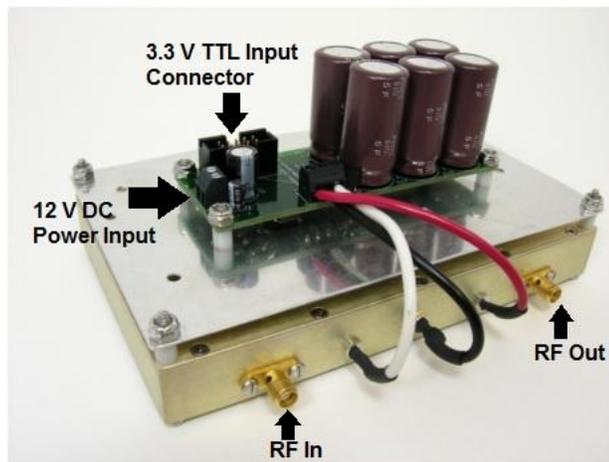


Figure 2: PA75W Connections (Front View)

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Information about each of the connectors is listed below.

DC Power Input

- DC input – *Must be stabilized to 12 V (DC)! If voltage applied is higher or lower than 12 V (DC), the power amplifier will fail.* The left screw on terminal block is DC power, which can be identified by the small 1 marked along side it on the board.
- DC Ground – Right screw on terminal block, which can be identified by the small C13 marked along side it on the board.

RF Ports

- RF In – SMA jack connector (do not exceed 15 mW RF input power)
- RF Out – SMA jack connector. A 50 Ω load must be connected to RF Out.

Deblanking Port

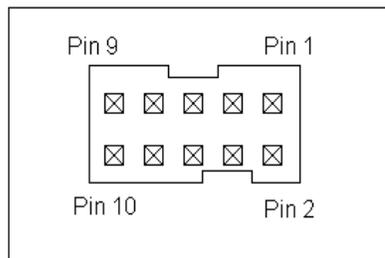


Figure 3: 10-pin IDC connector (Front View: Digi-Key part A33159-ND). Mates with Digi-Key part HKC10H-ND or similar.

- TTL Input Connector – 10-pin IDC header. *Must be 3.3V **NOT** 5V!* The input impedance is 100 Ω . The deblanking signal should be connected to pin 8 of the IDC connector (with pin 7 as the corresponding ground). See Figure 3 above for pinout information.

The timing diagram of a typical application of PA75W with the deblanking pulse applied prior to the RF pulse is presented in Figure 4 on the next page. 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 with identifying and capturing the RF pulse on the scope.

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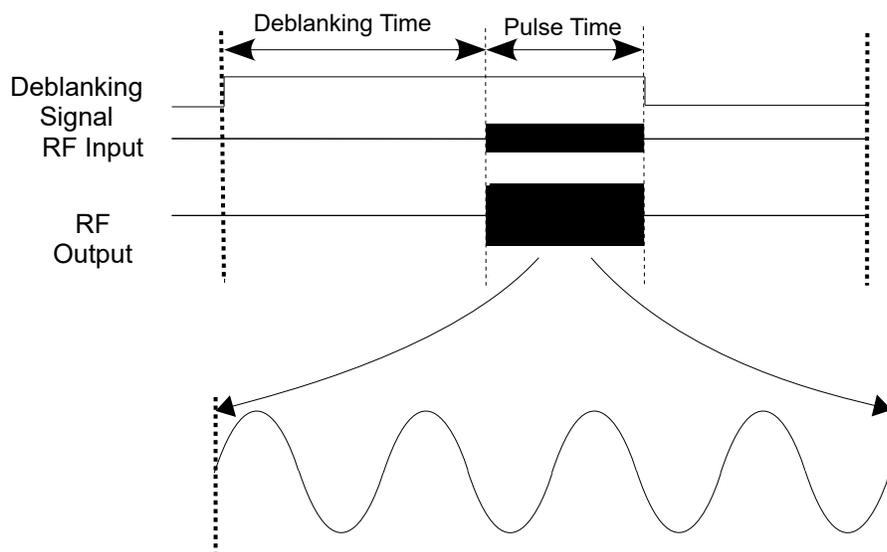


Figure 4: The RF output has a rise time of approximately 1.5 μ s until full output power is achieved. A deblanking signal is needed to trigger the RF pulse, and no deblanking interval is needed. The timing in the diagram is exaggerated to illustrate the deblanking signal. NOTE: when operating the power amplifier the duty-cycle for the deblanking signal should be kept low to avoid damage to the amplifier.

5. Packaging Options

The PA75W RF power amplifier can be delivered in various external enclosures which protect the RF power amplifier circuitry and include an AC/DC power supply and internal RF cables.

The typical enclosure is a CD-ROM type dual-bay enclosure with the following characteristics:

- Metal body with streamlined plastic front panel.
- Built-in 8x8 cm quiet cooling fan.
- High quality 80 Watt AC input universal switching power supply.
- Dimensions are approximately 11" x 7" x 6.75" (28 x 18 x 17 cm).
- Optional heatsink and fan assembly to allow continuous operation of the amplifier.
- Available as part of a complete iSpin-NMR™ system or as a standalone PA75W.

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Figure 5: PA75W RF power amplifier

The AC power input is 90-264 V, the RF input/output signals are provided on external BNC connectors, and the TTL inputs are routed through female DB-9 input connector (shown in Figure 6 below). The active TTL signal needs to be connected to pin 4, with the corresponding ground line connected to pin 8.

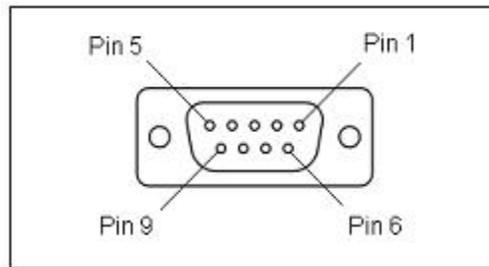


Figure 6: DB-9 Female Input Connector

III. Related Products and Accessories

1. Alternate RF output power levels available: 10 Watts, 15 Watts, and 100 Watts. For more information, please visit the URL <http://www.spincore.com/products/RFPA/>
2. iSpin-NMR: The complete, simple, intuitive, effective and portable NMR System. For more information, please visit <http://spincore.com/products/iSpinNMR/>
3. If you require a custom power level or a custom enclosure, please inquire with SpinCore Technologies through our contact form, which is available at <http://www.spincore.com/contact.shtml>

IV. Contact Information

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V. Document Information

Revision history available at SpinCore.