

# PowerAmp Design

EVALUATION KIT FOR MODEL PAD189

EVAL189

Rev B

## INTRODUCTION

The EVAL189 evaluation kit provides a convenient method to become familiar with the operation of amplifier model PAD189 before your application circuit is committed to production. Some assembly is required since user selections are needed depending on the application. For example, a current limit resistor value needs to be selected by the user. Also, there are two PCB mounting options available.

Critical connections for power supply bypassing and compensation are pre-wired. Terminal strips are also provided for input and output signals and power.

## ASSEMBLY STEPS

*Please note that the #1 cause of problems for evaluation kit users is not reading and following the directions (all of them). The #2 cause of problems is poor solder joints (cold or bridging). Don't become a statistic. ✓ each step.*

Refer to the Illustrated Parts List for the components mentioned in the assembly steps.

**❑ 1. This evaluation kit is intended for use by professional engineers well familiar with the concerns of high voltage circuits. Be constantly aware that there are places on the circuit board where as much as 1000V may be exposed. On the circuit board these nodes are marked with a  $\Delta$  symbol. Do not touch the circuit board unless you are sure the power supplies are turned off. Do not attach probes to the circuit unless the power is turned off. Be sure that any probes attached to the circuit can withstand 1000V. Do not leave the circuit unattended while powered up. While we have designed the board to be as safe as practical it is still your responsibility to guard your safety and that of others.**

**❑ 2.** Notice that the printed circuit board (PCB) is labeled on one side as the "DUT SIDE" and the other side as "CIRCUIT" side.

**❑ 3.** As shown in the illustrated parts list, one or more of PAD's accessory cage jack strip CJS01 was used in the assembly of this kit. It may be advisable to use the cage jack strips in your production circuit board as well. The CJS01 cage jack sockets provide a convenient and inexpensive socket. Soldering and/or de-soldering the amplifier from the circuit board can be extremely difficult due to the high thermal conductivity of the amplifier's pins and substrate. You can find the datasheet for the CJS01 on the PAD website under the "Accessory Modules" tab.

**❑ 4.** Three current limiting sense resistors,  $R_S$ , are provided; one 1 $\Omega$ , one 4.7 $\Omega$  and one 10.0 $\Omega$ . There are two locations on the PCB for these resistors. The PCB ties the locations in parallel. The resistors can be used individually at either



Assembled EVAL189 with amplifier installed.

location or two can be used to fine tune the final value desired. See the datasheet for the amplifier to determine the best value for your application. Solder the resistor(s) from the "CIRCUIT SIDE" of the PCB.

**❑ 5.** The evaluation kit PCB can be mounted in two ways. **Option 1- Chassis mount.** Use #6 standoffs and screws (not supplied) attached to the PCB at the four corners of the PCB and also at the center of the amplifier mounting area.

**Option 2- Bench-top mount.** Use the five rubber bumpers supplied. These are "stick-on" components. Remove the release paper from each bumper and apply the bumper to the square outlines on the "CIRCUIT SIDE" of the PCB.

**❑ 6.** Remove the 4 hex nuts from the mounting spacers of the amplifier.

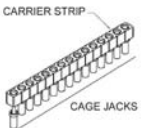

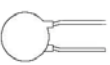





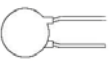
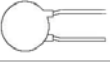






**❑ 7.** Align the 4 studs of the mounting spacers with the mounting holes in the PCB. Be sure that the amplifier's pin 1 aligns with pin 1 on the PCB. Slowly lower the amplifier into the PCB, making sure that the pins of the amplifier and the cage jacks mate. Push the amplifier into the PCB until the mounting spacers meet the PCB.

**❑ 8.** Fasten the amplifier to the PCB with the 4 hex nuts previously removed. Do not over-tighten the nuts as this may strip the mounting studs. The provided plastic nut starter can assist you here.

**❑ 9.** If necessary, strip 1/8" of insulation from the wires connected to the fan. Twist and tin the wire ends. Insert the red wire into the cage jack labeled "+" and the black or blue wire into the jack marked "at the location marked "FAN". Do not solder the fan wires into the PCB. Connect the 12V power for the fan at JP4. The  $\infty$  connection for the fan power may be left floating or tied to circuit COM at JP3 as desired.

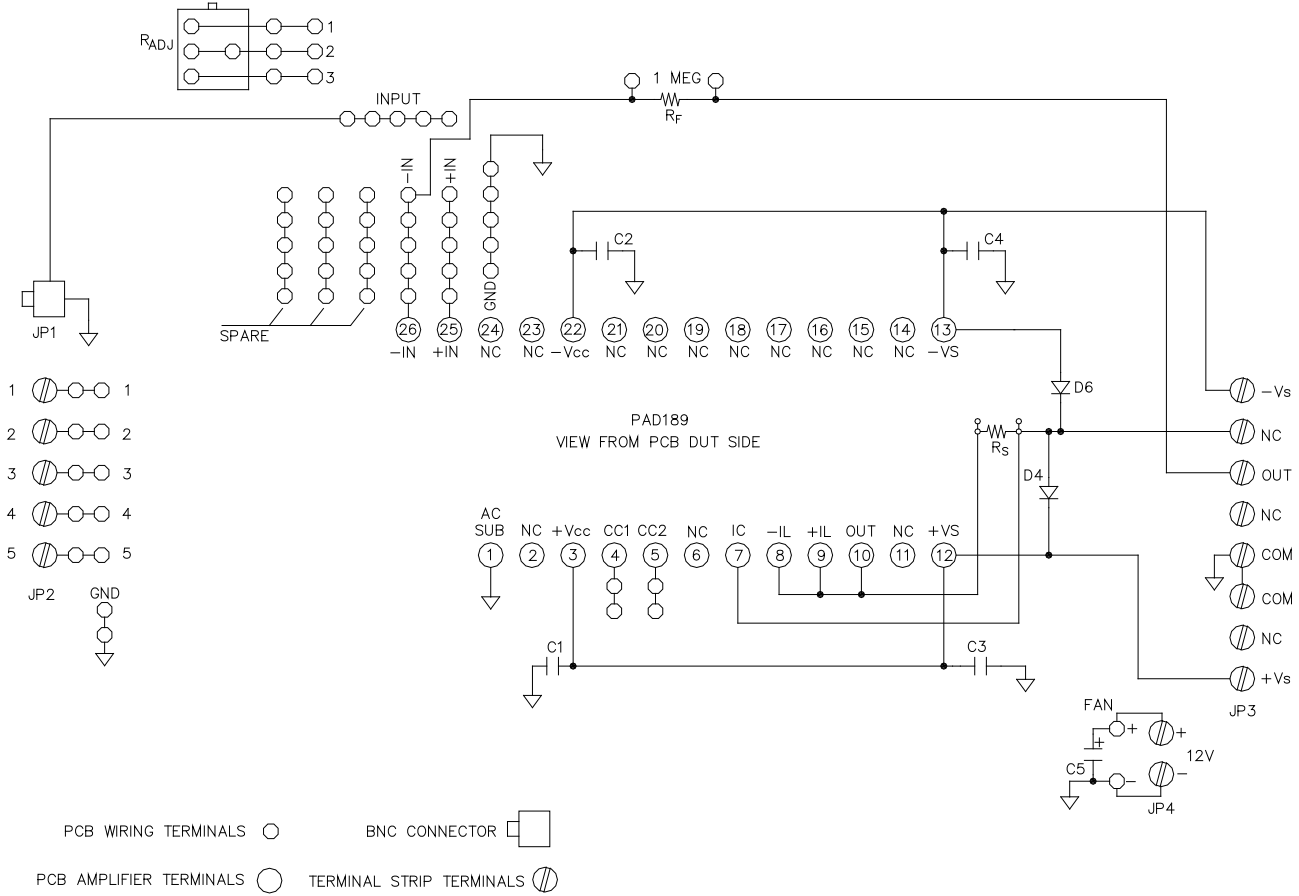
- **10.** Notice that “R<sub>F</sub>” is a 1 MΩ high voltage rated resistor. As much as 1000V may appear across this resistor and that much voltage may destroy normally rated components. If you need to replace this resistor with a component of some other value pay special attention to the voltage rating of that component.
- **11.** Use the bread-boarding area to add the external components necessary to program the amplifier gain and other circuit requirements to evaluate your application circuit. You can use the evaluation kit schematic and PCB views to map out your circuit.
- **12.** Remember that the amplifier must be compensated to operate correctly. See the amplifier datasheet on Page 4, under PHASE COMPENSATION. The selected phase compensation capacitor will be installed at “C<sub>C</sub>” on the evaluation kit PCB. A 470pF capacitor has already been installed in your kit. Another value may better suit your application. Remove and replace the capacitor as necessary for your application. 10pF, 33pF and 100pF capacitors are also included with the kit. C<sub>C</sub> must be rated for at least 500V. A temperature stable type capacitor is required—an X7R ceramic, for example, or an NPO type (preferred).
- **13.** The evaluation kit assembly is complete. Be sure you have read and followed all the assembly steps. Inspect the circuit board for solder shorts or poor solder joints. An illuminated magnifier is helpful. It is also helpful to use a solder with a water soluble flux and to wash and dry the board after your assembly is complete.
- **14.** Note that the EVAL189 is intended for use in a lab type environment with normal atmospheric pressure, normal temperature and humidity conditions. Operation in other types of environments may lead to high voltage arching across circuit boards traces or circuit elements. The amplifier circuit itself is conformal coated except for the leads where the amplifier is connected to the user’s circuit board.
- **15.** **Before applying power to your circuit set the power supply for ±50V and set the power supply current limit to approximately 20mA. Use little or no load at first. Apply an input signal and check the output with an oscilloscope to verify proper functionality. This step can prevent damaging the amplifier or the circuit board should there be some mistake in assembly.**

*Note that the amplifier is purchased separately.*

✓	Ref	Qty	Description	Mfg/Distributor	Mfg. Part Number	Illustration (not to scale)
<input type="checkbox"/>	Amplifier Pins 1-26	2	Cage Jacks w/carrier strip 32 wide	Power Amp Design	CJS01	
<input type="checkbox"/>	C3, 4	2	Polyester Film Capacitor, 0.33μF, 1000V	Kemet/Mouser	MMK22.5334K1000D16L4	
<input type="checkbox"/>	C1,2	2	Capacitor, 4700pF, 1000V, X7R	Murata/Mouser	DEHR33A472KA3B	
<input type="checkbox"/>	JP1	1	BNC Jack	AMP/Digi-Key	5221123-2	
<input type="checkbox"/>	C5	1	Electrolytic Capacitor, 47μF 35V	Panasonic/Digi-Key	EEU-FC1V470	
<input type="checkbox"/>	JP2	1	Terminal Block	Phoenix/Digi-Key	1729157	
<input type="checkbox"/>	JP4	1	Terminal Block	Phoenix/Digi-Key	1729128	
<input type="checkbox"/>	JP3	4	Terminal Block	Phoenix/Mouser	1714955	
<input type="checkbox"/>	Cc	1	Capacitor, 470pF 1kV	Vishay/Mouser	562R10TST47	
<input type="checkbox"/>	Cc	1	Capacitor, 100pF 1kV	Vishay/Mouser	562R10TST10	
<input type="checkbox"/>	Cc	1	Capacitor, 33pF 1kV	Vishay/Mouser	561R10TCCQ33	
<input type="checkbox"/>	Cc	1	Capacitor, 10pF 1kV	Vishay/Mouser	561R10TCCQ10	
<input type="checkbox"/>	R <sub>S</sub>	3	Sense Resistor	Xicon/Mouser Xicon/Mouser Xicon/Mouser	262-4.7-RC (4.7Ω) 262-1.0-RC (1.0Ω) 262-10.0-RC (10.0Ω)	
<input type="checkbox"/>	D4, 6	2	Diode, Fast Recovery	ON Semi/Digi-Key	STTH812D	
<input type="checkbox"/>	NA	5	Rubber Bumper	3M/Digi-Key	SJ5518	
<input type="checkbox"/>	NA	1	Nut Starter	Menda/Jensen Tool	200	
<input type="checkbox"/>	NA	1	PCB	Power Amp Design	EVAL189 R-A	NA

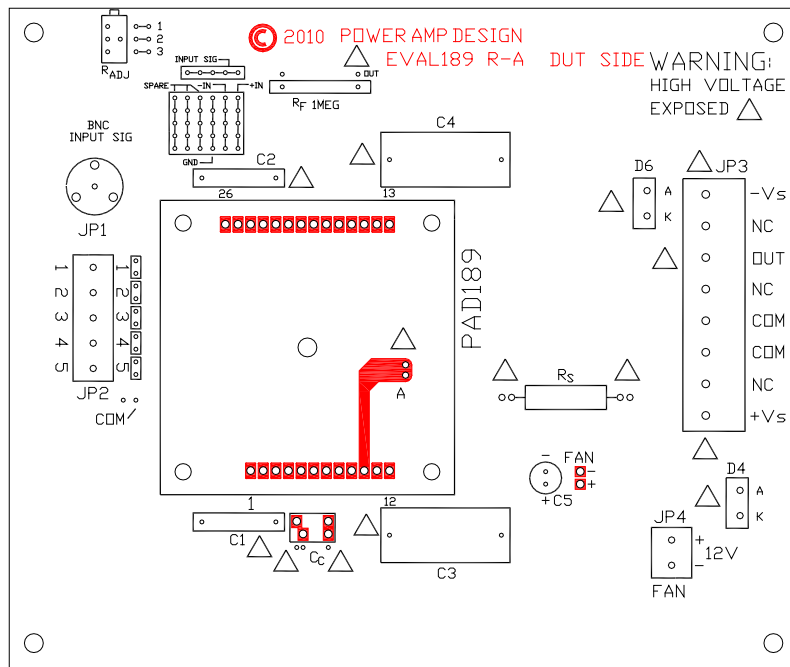
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CIRCUIT DIAGRAM

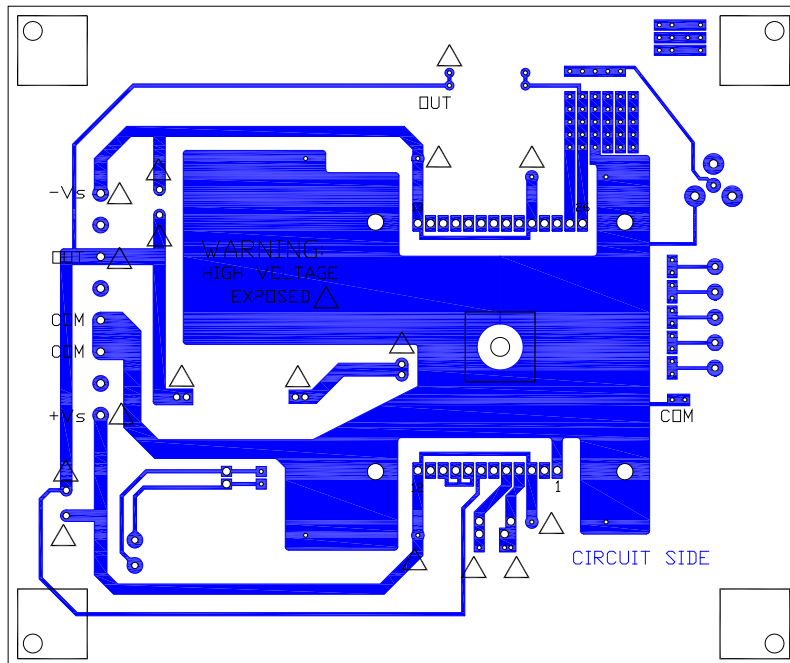


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TOP VIEW



BOTTOM VIEW



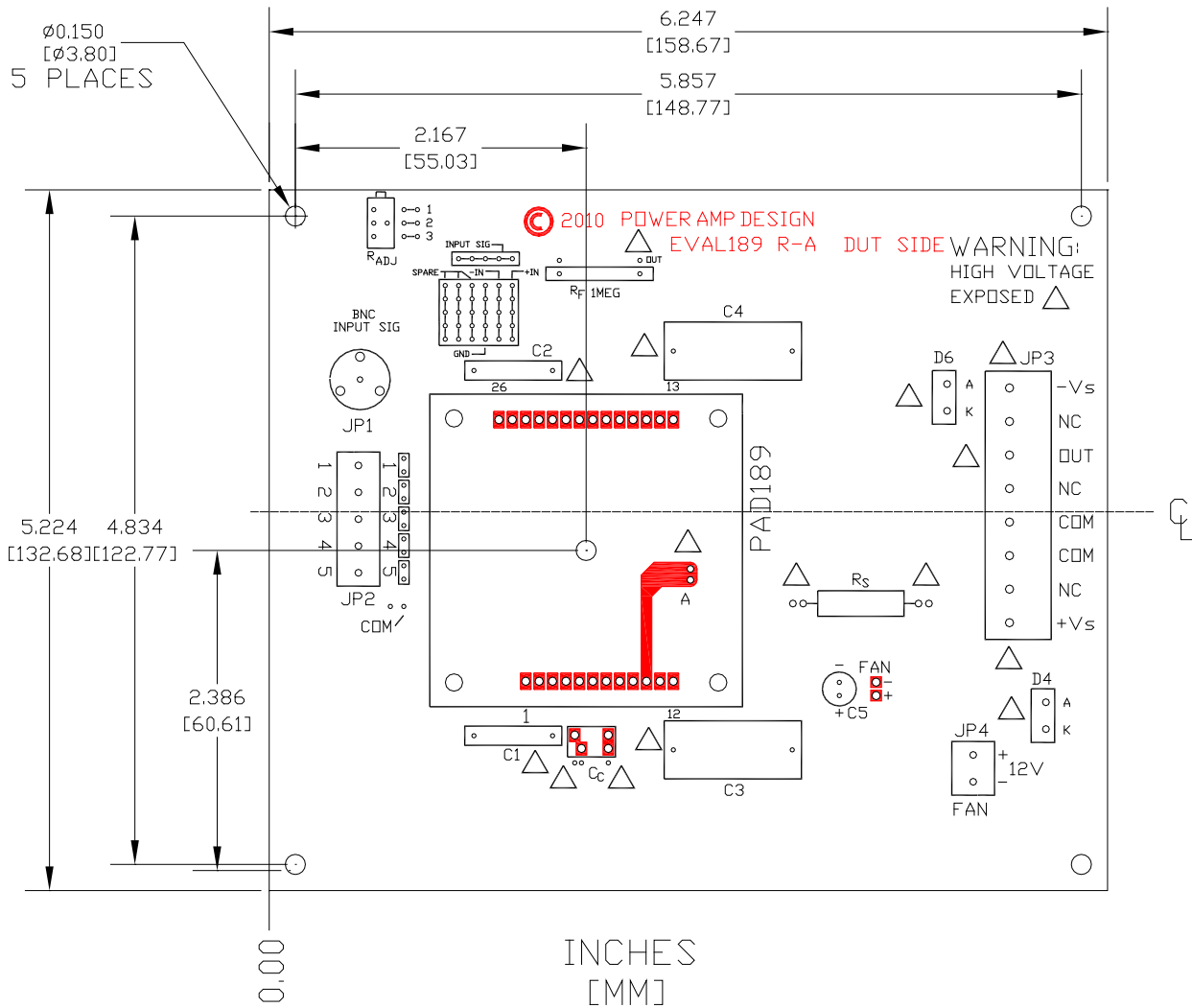
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ASSEMBLED EVAL189 WITH AMPLIFIER INSTALLED



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BOARD OUTLINE DIMENSIONS



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