

PowerAmp Design

EVALUATION KIT FOR MODELS PAD128/ PAD129

EVAL129

Rev G

INTRODUCTION

The EVAL129 assembled evaluation kit provides a convenient method to become familiar with the operation of the PAD128 and PAD129 operational amplifiers before your application circuit is committed to production. Some assembly is required since some 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 several PCB mounting options available.

Critical connections for power supply bypassing and compensation are pre-wired. Connections are also provided for implementing fold-over current limit as well as standard current limit with the optional PAD125 Current Limit Accessory Module. Fold-over current limit components are not provided since each application will have different requirements. Connections are provided for the optional PAD130 or PAD132 Power Supply Accessory Modules and also the PAD131 Fan Controller Accessory Module. Diode clamps on each power supply and the output connections are provided for those applications in which significant inductive kickback may be found. 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. Note that some heavy PCB copper planes and some heavy component leads are soldered in this kit. This may require a larger soldering iron tip and/or higher soldering iron temperatures than might normally be used. These steps are marked with an asterisk (*). Refer to the Illustrated Parts List for the components mentioned in each assembly step.

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

□ 2. 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



Assembled EVAL129 with amplifier mounted. Optional accessory modules PAD125, PAD132 and PAD131 also shown.

the datasheet for the CJS01 on the PAD website under the "Accessory Modules" tab.

□ 3. Refer to "Jumper Selection" below the Circuit Diagram for the EVAL129 on page 4. Read all the options for the jumpers you will need installed or removed. Note that the kit comes wired with options 2 and 3. Install or remove jumpers as required at the locations indicated depending on the options you have chosen. Refer to the data sheet for the PAD125 for complete information on current limit options. Refer to the data sheet for the PAD130 or PAD132 for details on its operation and applications.

□ 4.* This step may require a soldering temperature higher than normal and/or a larger soldering iron tip. Three current limiting sense resistors, R_S , are provided; one 0.005 Ω , one 0.010 Ω and one 0.015 Ω . Refer to the data sheet for the current limit module to determine which resistor value best fits your application (if you have chosen not to use the current limit module select the 0.005 Ω resistor or install a length of heavy buss wire into the outer two holes at the location for the sense resistor R_S). Smear a small amount of heat sink grease on the back of the selected resistor and then attach the resistor to heat sink HS1 at R_S with a 4-40 X 1/2" screw and nut. The plastic nut driver supplied with this kit will help here. Tighten the 4-40 resistor mounting hardware. Solder the resistor from the "CIRCUIT SIDE" of the PCB making sure that the holes are completely filled with solder.

□ 5. D3 and D5 are transient voltage suppressor diodes and are not supplied since the type (breakdown voltage) varies with the application. They are not necessary for every application. They are most commonly used in application circuits where kickback from the load may force the supply voltage above the limits of the amplifier.

□ **6.** The evaluation kit PCB can be mounted in several ways:
Option 1- Chassis mount. Use #6 x 1/4" M/F hex standoffs, and #6 nut (neither supplied) attached to the PCB at the four corners of the PCB and the chassis. Use another similar standoff at the center area where the amplifier is mounted.

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.

Option 3- DIN rail mount. The PCB can be mounted to either 1 or 2 DIN rails. For mounting the PCB to one DIN rail press the adaptors into the PCB in the holes at the edges of the PCB at locations 1 and 2 from the "CIRCUIT SIDE" of the PCB. Make sure that the plastic tines have fully spread out on the "DUT SIDE" of the PCB. If mounting to 2 DIN rails is desired, mount DIN rail adaptors at locations 3, 4, 5 and 6 in a similar manner. The center to center dimension of the DIN rails is to be 2.00" [50.8mm].

□ **7.** Components for locations R1-R7, D1, D2 are for the optional fold-over current limiting and are not supplied. Refer to the datasheet of the amplifier to find out how to apply circuits that require these components.

□ **8.** Remove the 4 hex nuts from the mounting spacers of the amplifier.

□ **9.** 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.

□ **10.** 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.

□ **11.** 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". Or, if you plan to use the PAD131 Fan Controller Accessory Module, insert the fan wires similarly into the "+" and "-" cage jacks at the location marked "Fan Control". Do not solder the fan wires into the PCB.

□ **12.** Add components as necessary to evaluate your application circuit. You can utilize the evaluation kit schematic and PCB views to map out your circuit and components. **Remember, if you are using the current limit accessory module additional components or jumpers will be needed to program the operation of the module. See the PAD125 datasheet.**

□ **13.** Connections for R8 and R9 (see the schematic of the evaluation board) are for building a Howland Current Pump (a transconductance circuit). See application note *AN-42 Using Evaluation Kits to Implement Current Source Circuits* available on the web site under the Application Notes tab.

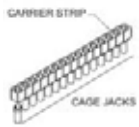








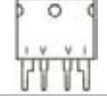


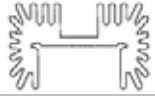
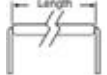




□ **14.** The amplifier **must** be compensated to operate correctly. See the amplifier datasheet on Page 4 under PHASE COMPENSATION. Your selected phase compensation capacitor will be installed at "C_C" on the evaluation kit PCB. A 470pF compensation capacitor has been installed but this may not be the best value for your application. If another value is better remove and replace C_C as necessary. The kit also includes a 100pF capacitor. C_C must be a 200V rated capacitor and temperature stable, for example an NPO or X7R type.

□ **15.** If you have chosen to use the current limit module and/or power supply accessory module and PAD131 fan controller module install them at this time making sure that pin 1 on each module is aligned with the pin 1 marking on the PCB. The heat sink tabs on the PAD130 or PAD132 may be soldered to the PCB.

□ **16.** The evaluation kit assembly is complete. Be sure you have read and followed all the assembly steps. Do not forget any jumpers that need to be installed. Inspect the circuit board for solder shorts or poor solder joints. An illuminated magnifier is helpful.

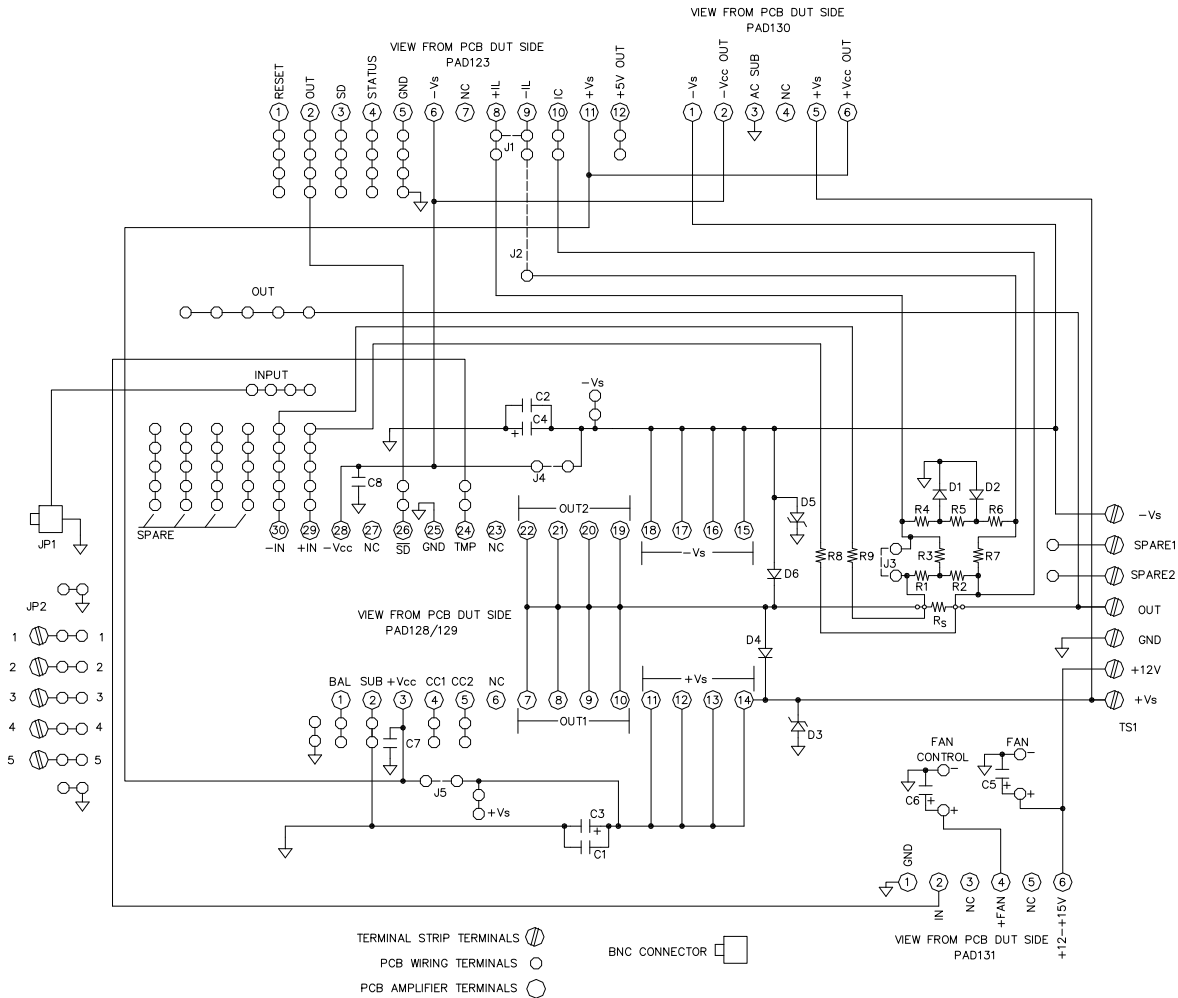
□ **17. Before applying power to your circuit set the power supply for ±20V and set the power supply current limit to approximately 100mA. Use little or no load at first. Apply an input signal and check the output with an oscilloscope to verify proper functionality. This step can prevent damaging the amplifier or the circuit board should there be some mistake in assembly. If you have chosen to build the Howland Current Pump make sure that the amplifier setup has the voltage compliance range needed for the load you have chosen.**

Note that amplifier and accessory modules are purchased separately.

✓	Ref	Qty	Description	Mfg/Distributor	Mfg. Part Number	Illustration (not to scale)
<input type="checkbox"/>	Amplifier Pins 1-30 + TPs	3	Cage Jacks w/carrier strip 32 wide	Power Amp Design	CJS01	
<input type="checkbox"/>	C1, 2, 7,8	4	Capacitor, 0.47µf, 250V	Murata	FK22X7R2E474K	
<input type="checkbox"/>	C3, 4	2	Electrolytic Capacitor, 330µF, 200V	Panasonic/Digi-Key	EET-ED2D331BA	
<input type="checkbox"/>	C5,6	2	Electrolytic Capacitor, 47µF 35V	Panasonic/Digi-Key	EEU-FC1V470	
<input type="checkbox"/>	JP1	1	BNC Jack	AMP/Digi-Key	5221123-2	
<input type="checkbox"/>	Cc	1	Capacitor 100pF 200V	Kemet/Mouser	C052K101K2X5CA	
<input type="checkbox"/>	Cc	1	Capacitor 470pF 200V	Kemet/Mouser	C052K471K2X5CA	
<input type="checkbox"/>	JP2	1	Terminal Block	Phoenix/Digi-Key	1729157	
<input type="checkbox"/>	TS1	1	Terminal Strip	Molex/Newark	38660-7807	
<input type="checkbox"/>	R _s	3	Sense Resistor	Isotek Isotek Isotek	PBV-R005-1.0 (5mΩ) PBV-R010-1.0 (10mΩ) PBV-R015-1.0 (15 mΩ)	
<input type="checkbox"/>	D4, 6	2	Diode, Fast Recovery	ON Semi/Digi-Key	MUR410RL	
<input type="checkbox"/>	NA	5	Rubber Bumper	3M/Digi-Key	SJ5518	
<input type="checkbox"/>	HS1	1	Heat Sink	Wakefield/Mouser	67720ABP	
<input type="checkbox"/>	NA	15 (5ea)	Jumper	3M/Mouser	923345-01-C (0.1 in) 923345-02-C (0.2 in) 923345-03-C (0.3 in)	
<input type="checkbox"/>	NA	1	Nut Starter	Menda/Jensen Tool	200	
<input type="checkbox"/>	NA	1	Heak Sink Grease	NTE/Jameco	NTE303	
<input type="checkbox"/>	NA	1	4-40X1/2" screw & 4-40 nut	NA	NA	
<input type="checkbox"/>	NA	4	35mm DIN Rail Adaptor	Scidyne	121-0014	
<input type="checkbox"/>	NA	1	PCB	Power Amp Design	EVAL129	NA

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CIRCUIT DIAGRAM



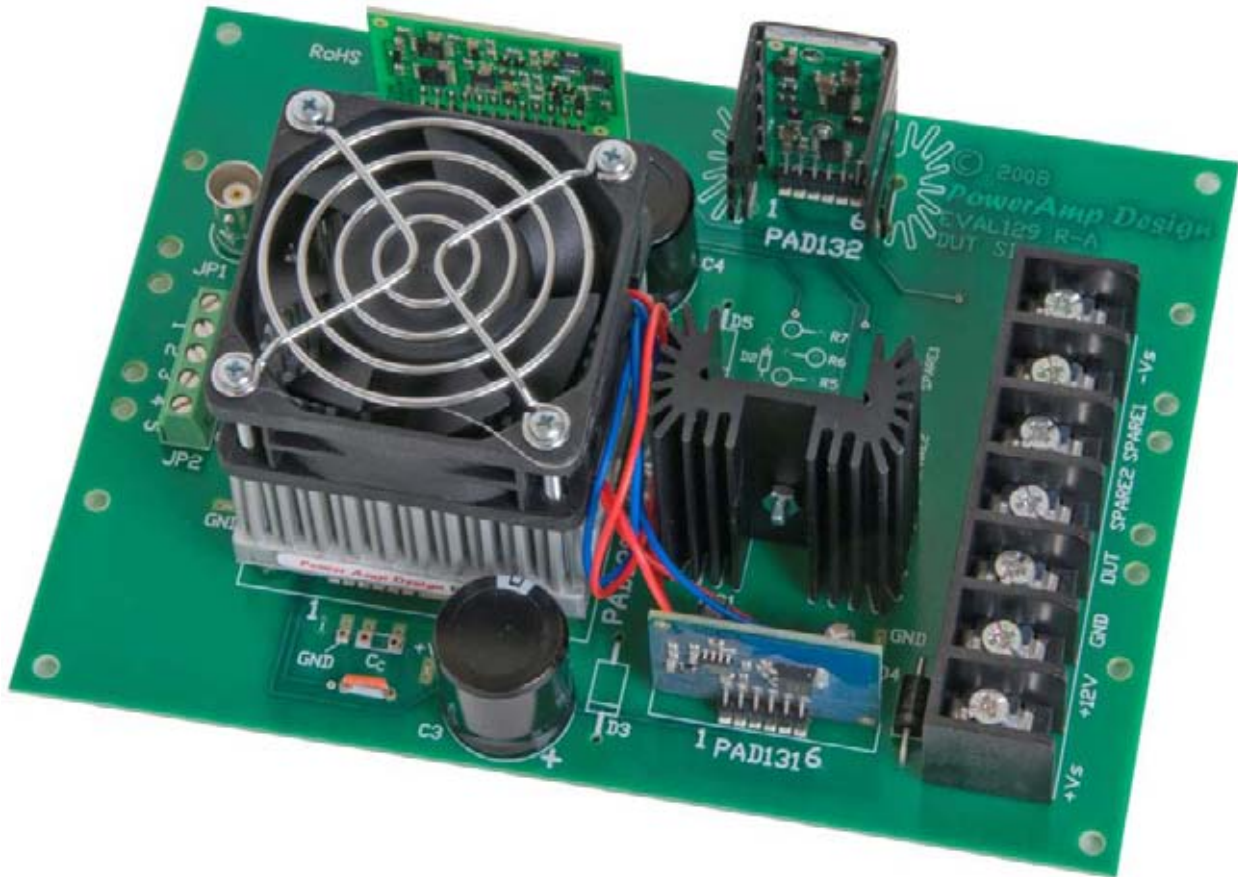
JUMPER SELECTION (USE ALL OPTIONS THAT APPLY)

Note that options 2 and 3 are the default options.

- Option 1. When **using** the PAD130 or PAD132 **do not** install jumpers J4,5.
This applies whether or not the current limit module PAD125 is installed.
- Option 2. When **not using** the PAD130 or PAD132 **do** install jumpers J4,5.
This applies whether or not the current limit module PAD125 is installed. **The kit comes wired with this option.**
- Option 3. To use the amplifier and current limit module together **without** fold-over current limit insert jumpers J1, 3.
This applies whether or not the PAD130 or PAD132 is installed. **The kit comes wired with this option.**
- Option 4. To use the amplifier and current limit module together **with** fold-over current limit insert jumper J2.
This applies whether or not the PAD130 or PAD132 is installed.

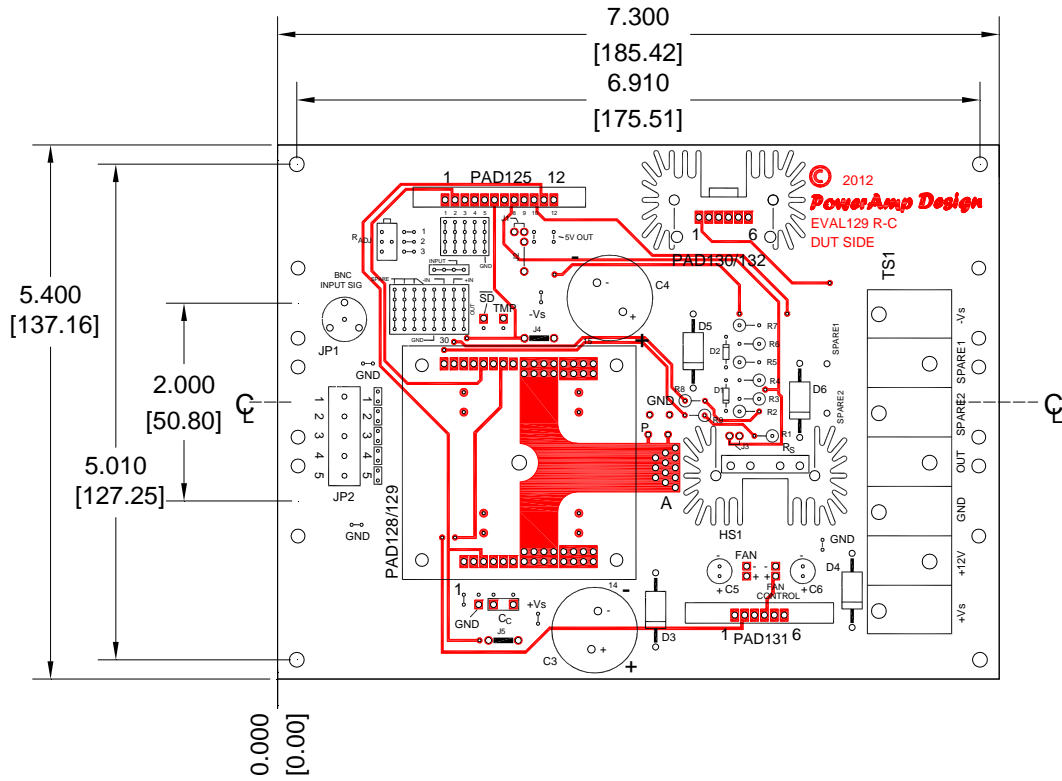
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Assembled EVAL129 with amplifier installed
Optional accessory modules also shown



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BOARD OUTLINE DIMENSIONS



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