Phantom Powered Microphone Preamplifier - Low Noise - Professional Quality

The project presented here is a professional quality Phantom powered Microphone pre-amplifier. The project is built using the INA163 chip from TI. The Chip is a very low-noise, low-distortion, monolithic instrumentation amplifier. R2 and R3 provide a current path for a conventional 48V phantom power source for a remotely located microphone. A slide switch SW1 allows phantom power to be disabled. C6 and C8 block the phantom power voltage from the INA163 input circuitry. Additional input protection against ESD and hot-plugging, four 1N4148 diodes D1, D2, D3, D4 connected from the input to supply lines. R7 and R8 provide a path for the input bias current of the INA163. Gain is set with a variable resistor, PR1, in series with R4. R4 determines the maximum gain. The total resistance, R4 + PR1, determines the lowest gain. A special reverse-log taper potentiometer for PR1 can be used to create a linear change (in dB) with rotation. LED D5 is used as a power indicator. L1, L2, C7, C10, and C11 components protect the inputs from EMI and RFI noise.

Optional DC Output Control Loop

Input offset current (typically 100nA) creates a DC differential input voltage that will produce an output offset voltage. This is generally the dominant source of output offset voltage. With a maximum gain of 1000 (60dB), the output offset voltage can be several volts. This may be entirely acceptable if the output is AC-coupled into the subsequent stage. An optional circuit provided to tackle this problem. An inexpensive FET-input op amp U2A in a feedback loop drives the DC output voltage to 0V. Op-Amp is not in the audio signal path and does not affect signal quality.

Install Following Components for DC Output Control Loop

- U2A = OPA2134 SOIC8
- C9 = Ceramic Capacitor 0.1uf/50V SMD Size 0805
- R6 1Mega Ohm 5% SMD Resistor Size 0805
- Omit Resistor R5

Connections and Other Details

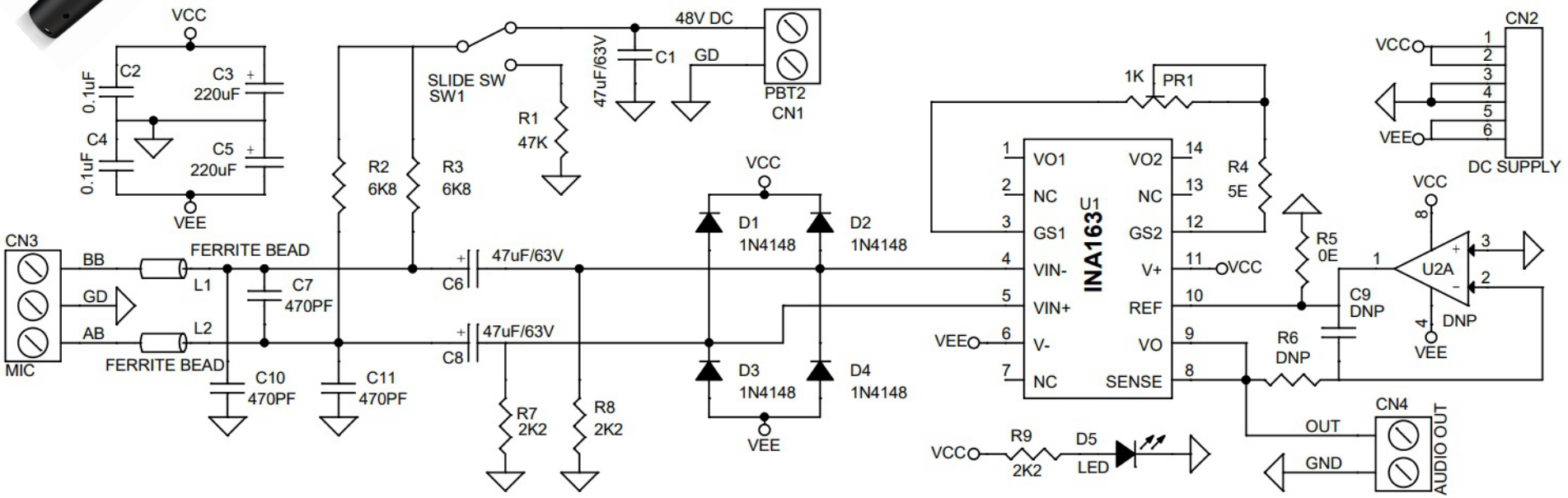
- CN1: Pin 1 = +48V DC Phantom Power Input, Pin 2= GND
- CN2: Pin 1-2 = VCC +15V DC, Pin 2-3 = GND, Pin 4-5 VEE -15V DC
- CN3: Pin 1 = BB Microphone - VIN, Pin 2 = GND, Pin 3 = AB Microphone + VIN
- CN4: Pin 1 = Audio Output, Pin 2 = GND
- D5: Power LED
- SW1: Phantom Power Enable/Disable Switch

Note: Non-polarized capacitors should be used for C1 and C2 if phantom power is to be disabled.

Features

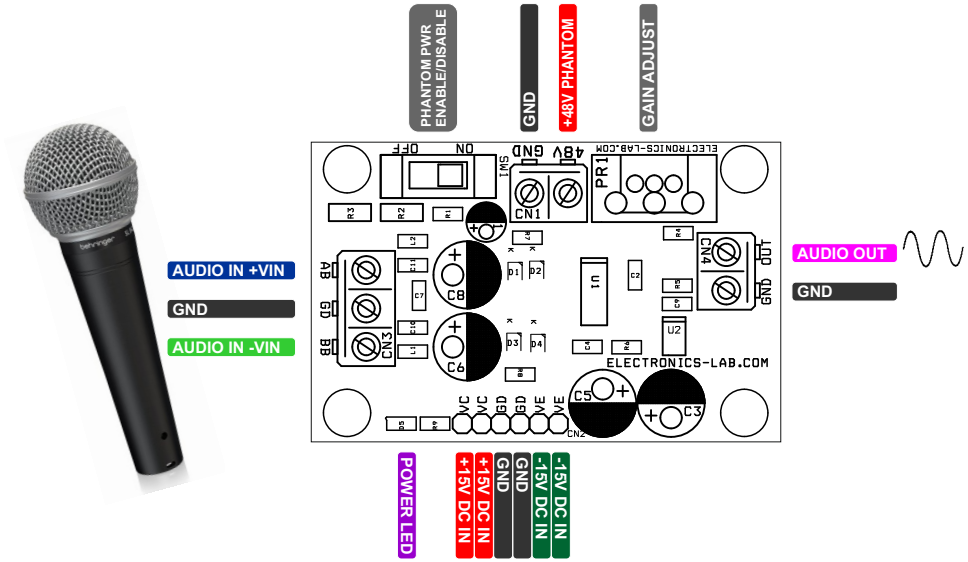
- Power Supply Dual 15V DC (+/-15V DC)
- On Board Power LED
- Slide switch for Phantom Power Enable/Disable
- 3 Pin Screw Terminal for Microphone Connections
- 2 Pin Screw Terminal for Audio Output
- 2 Pin Screw Terminal for Phantom Power Input 48V DC
- 6 Pin Male Header for Power Input

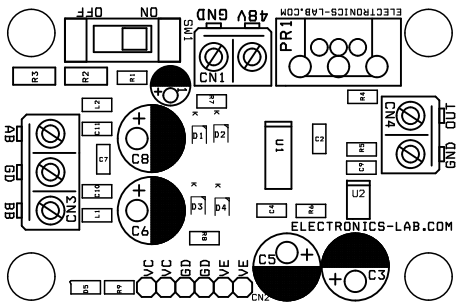
- Gain Up to 1000/V (60dB)
- Potentiometer PR1 Gain Adjust
- PCB Dimensions 60.17 X 39.85MM
- 4 X 3MM Mounting Holes



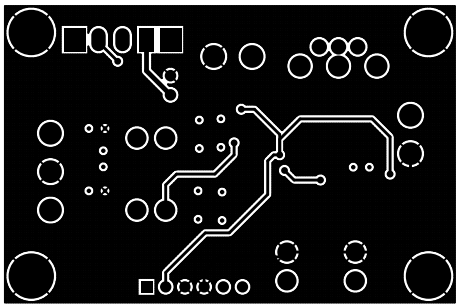
USE NON POLAR CAPACITOR C6, C8 IF PHANTOM POWER IS TO BE TURNED OFF

FOR OPTIONAL DC OUTPUT CONTROL LOOP U1 OPA2134, C9 0.1uF, R6 1M OHM, R5 OMIT

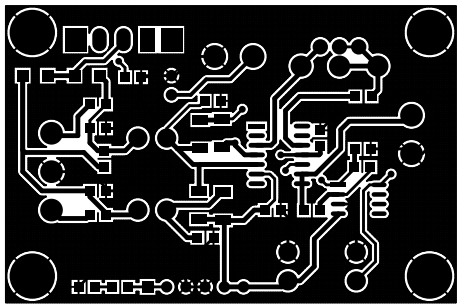

PHANTOM PWR ENABLE/DISABLE
GND
+48V PHANTOM
GAIN ADJUST
AUDIO IN +VIN
GND
AUDIO IN -VIN
AUDIO OUT
GND
POWER LED
+15V DC IN
+15V DC IN
GND
GND
-15V DC IN
-15V DC IN
ELECTRONICS-LAB.COM



SILK SCREEN TOP



BOTTOM LAYER



TOP LAYER

PCB DIMENSIONS 60.17 X 39.85MM

BOM

NO.	QNTY.	REF.	DESC.	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
1	1	CN1	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
2	1	CN2	6 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5319-ND
3	1	CN3	3 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1248-ND
4	1	CN4	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
5	3	C1,C6,C8	47uF/63V ELECTROLYTIC OR READ NOTE 6.3MM OR 8MM	CORNEL DUBILIER	DIGIKEY	1572-1736-ND
6	2	C2,C4	0.1uF/50V CERAMIC SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
7	2	C3,C5	220uF/25V ELECTROLYTIC 8MM/13MM	RUBYCON	DIGIKEY	1189-3720-1-ND
8	3	C7,C10,C11	470PF/63V CERAMIC SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
9	3	U2,R6,C9	DNP/OPTIONAL			
10	4	D1,D2,D3,D4	1N4148 SMD	MICROCHIP	DIGIKEY	1086-15206-ND
11	1	D5	LED RED SMD SIZE 0805	OSRAM	DIGIKEY	475-1278-1-ND
12	2	L1,L2	FERRITE BEAD SMD SIZE 0805	LAIRD	DIGIKEY	240-2394-1-ND
13	1	PR1	1K POTENTIOMETER 17MM LOG	ADAFRUIT	DIGIKEY	1528-5265-ND
14	1	R1	47K 5% SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
15	2	R2,R3	6K8 1% SMD SIZE 1206	MUARATA/YAGEO	DIGIKEY	
16	1	R4	5E 1% SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
17	1	R5	0E SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
18	3	R7,R8,R9	2K2 5% SMD SIZE 0805	MUARATA/YAGEO	DIGIKEY	
19	1	SW1	SLIDE SW	E-SWITCH	DIGIKEY	EG1916-ND
20	1	U1	INA163 SOIC14	TI	DIGIKEY	INA163UA-ND