

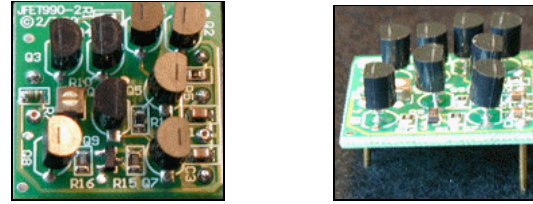
F(t)
Forsell Technologies



JFET990-2 Discrete Class A Operational Amplifier

Application Notes and Technical Information
Version 1.03

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General Description

The JFET990-2 is a Class A, Discrete Junction Field Effect Transistor (JFET), Operational Amplifier. It is housed in 1.1" x 1.10" x 0.50" potted module with 0.040" diameter pins providing all electrical connections to and from the opamp. Surface mount metal film resistors, ferrite beads and power supply bypass capacitors are used throughout the JFET990-2 module. All critical resistors are Beyschlag metal film MELF resistors, while less critical resistors are Vishay thick film resistors. Power supply bypass is provided by multiple parallel single resonate point monolithic capacitors. No additional power supply bypass capacitors are required. However, additional off-module electrolytic capacitors are encouraged. Please see the "Power Supply Bypassing" section of this document for more information.

The JFET990-2 is a high performance, wide bandwidth, low noise amplifier with a 2 megohm input impedance. It is designed to operate with a bipolar power supply voltage of 12 to 24 VDC per polarity. Power consumption is approximately 30 milliamps per polarity regardless of supply voltage. A low noise regulated power supply is highly recommended.

Module Footprint and Pin Functions

Figure 1 shows a top view footprint of the JFET990-2 and its pin assignments.

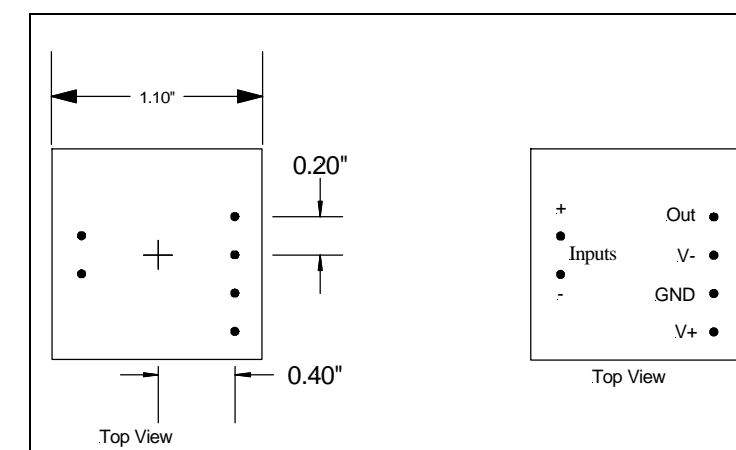


Figure 1

We recommend mounting the module so that air can circulate freely between the bottom of the module and the printed circuit board on which it is mounted. Using Mill-Max 0344-219013427100 pin sockets will allow approximately a quarter of an inch for circulation. If vertical space is at a premium, Mill-Max 0327-015013427100 will allow a nearly flush mount fitting of the JFET990-2 module. Mill-Max products are available from Digi-Key Corp, Allied-Avnet Company and other distributors.

Application Information

The JFET990-2 has a maximum open loop gain of 67 dB. Closed loop gains to unity are possible if a compensation capacitor is used across the feedback resistor. A 10-33pf capacitor is usually adequate for this purpose. Adding a 49 ohm resistors in series with the output (after the feedback pick-off point) will help stabilize the JFET990-2 when driving capacitive loads.

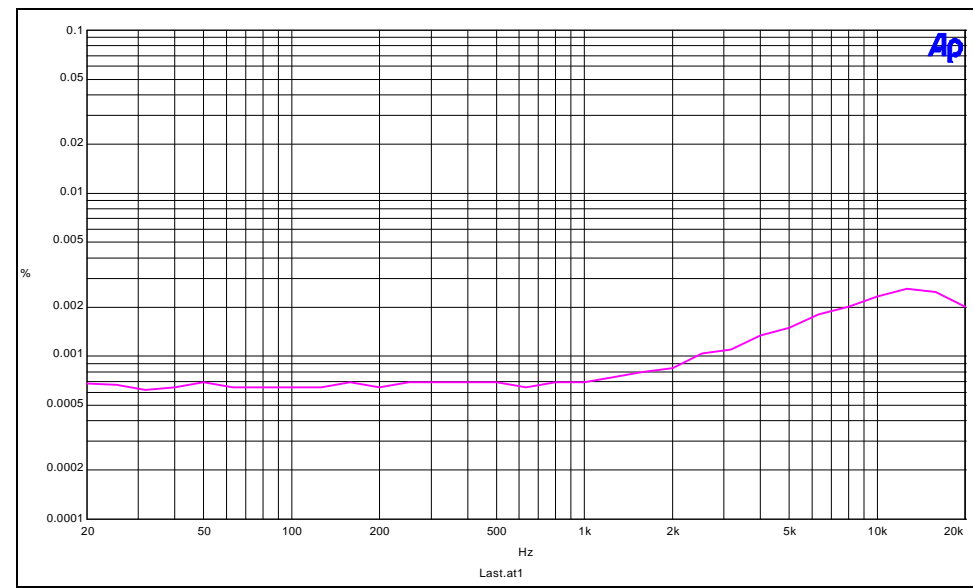
While the DC offset of the JFET990-2 is low, if extremely low DC offset performance is required, it is advisable to use either a high quality capacitor or a servo amplifier to couple the output of the JFET990-2 to its load.

Please see the applications schematics section of this manual for more information.

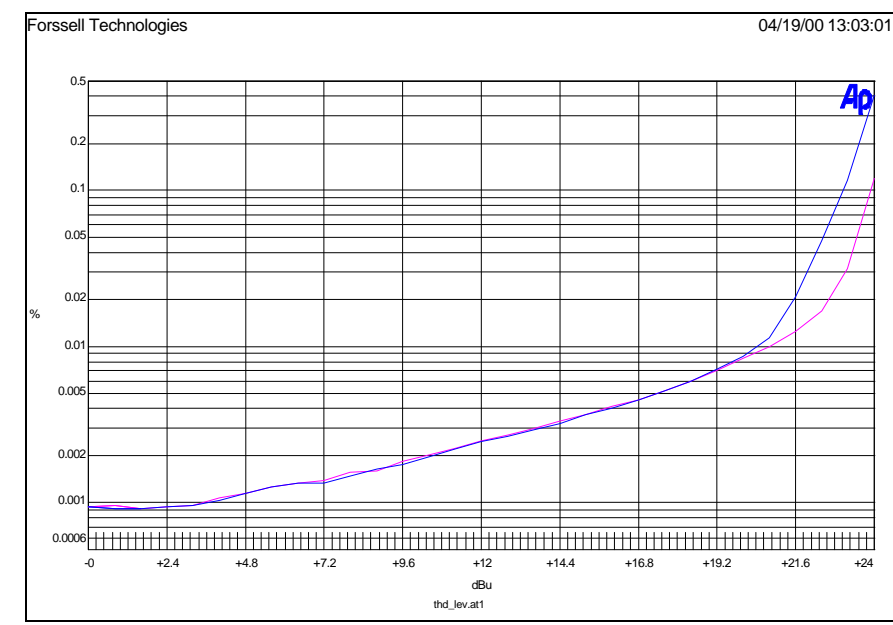
General Specifications

| |
|--|
| Open Loop Gain = 68 dB (typical) Open Loop HF - 3dB point = 35 KHz Open Loop Output Impedance = 6 ohms Power Supply Voltage Range = Bipolar 12 - 25 VDC Current Draw = approx 30 milliamps each supply |
| <i>Typical Closed Loop Performance</i> <i>Unless otherwise noted...</i> CL Gain = 6 dB Load = 10K .001 mfd Generator Source Impedance = 25 ohm Measurement Bandwidth = 22 - 22 KHz |
| THD+N @ 0 dBu Output = .001% Noise Floor = -105 dBu High Freq - 3 dB = > 2 Megahertz Phase Margin < -2 degrees @ 20 KHz CMRR > 90 dB (2 volt RMS common mode voltage applied), typically > 110 dB Max Output Level (1% THD+N) with bipolar 24 VDC = > +24 dBu into 600 ohms or greater. |

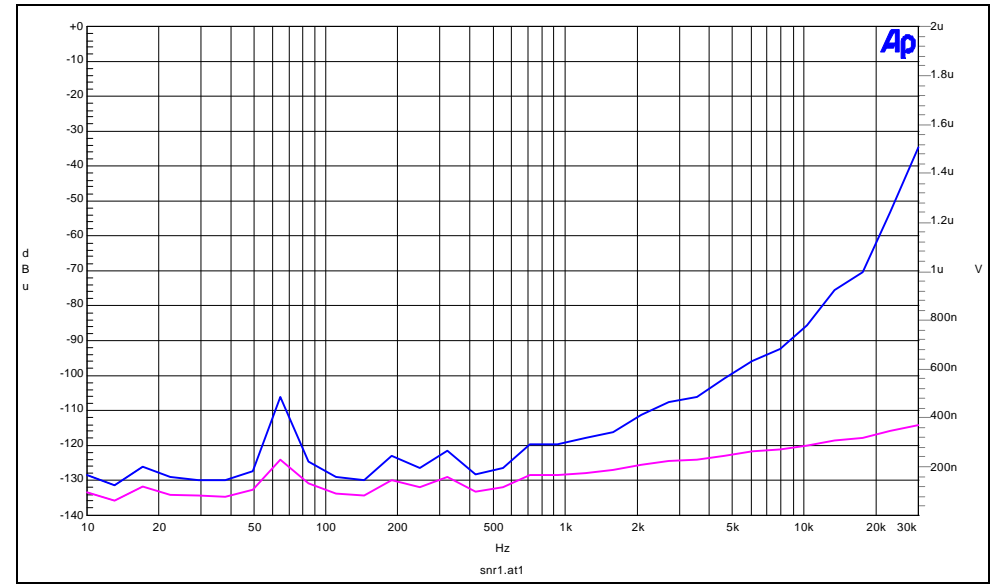
Performance Test Data



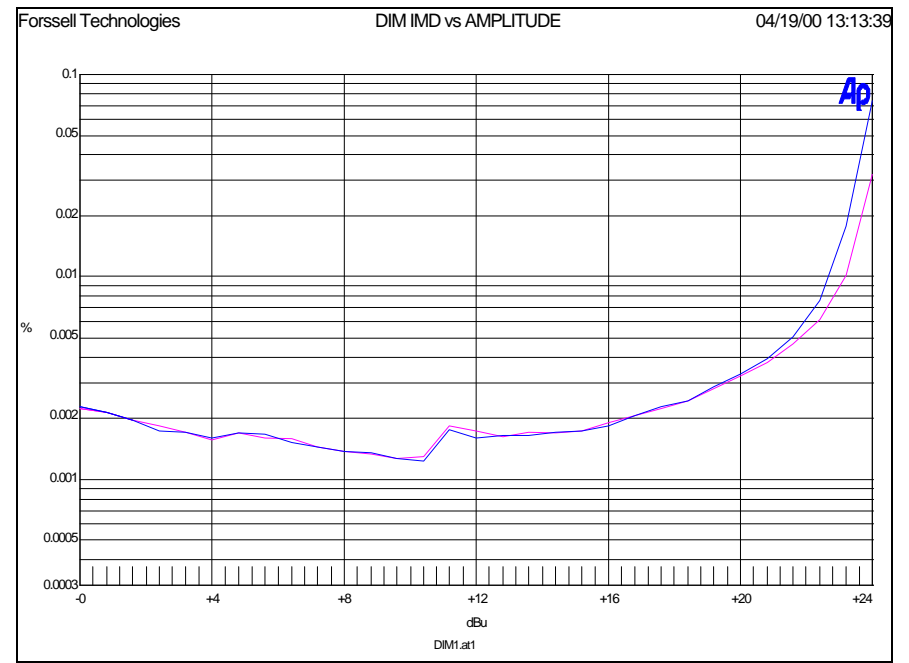
THD+N vs Frequency



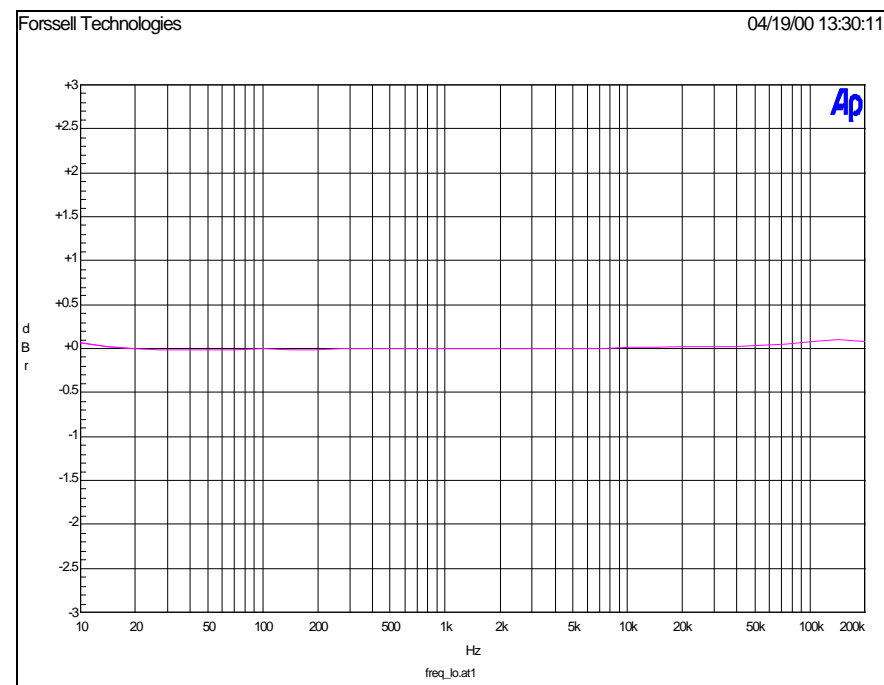
THD vs. Output Level Magenta = 10k, Blue = 600 ohm



Unity Gain Output Noise Floor. Blue = Noise Vrms, Magenta = dBu
 Note... This test uses a 1/3 oct bandpass filter swept from 10 Hz - 30 kHz



DIM (dynamic Distortion) vs. Level Magenta = 10k, Blue = 600 ohm Load



Frequency Response

Typical Application Schematics and Power Supply Connections

Figure 2 and Figure 3 show typical configuration schematics for the JFET990-2. In Figure 2 the power supply connections are connected directly to the JFET990-2 and include external power supply decoupling electrolytic capacitors. These capacitors should be Panasonic HFS series capacitors. In Figure 3 the power supply connections are made via 10 ohm build-out resistors. Either one of these schemes seems to work fine.

The best way to determine the value of the phase lag compensation capacitor is to adjust its value for minimal peaking at high frequencies in a specific application. This can be done by monitoring square wave performance (using properly terminated cables), or by plotting the high frequency response of the circuit. Typically, the value of this capacitor is between 10 and 68 picofarads. Additionally, the use of a 49.9 ohm load isolator resistor is encouraged. If used, be sure to place this resistor downstream from the feedback pick-off point.

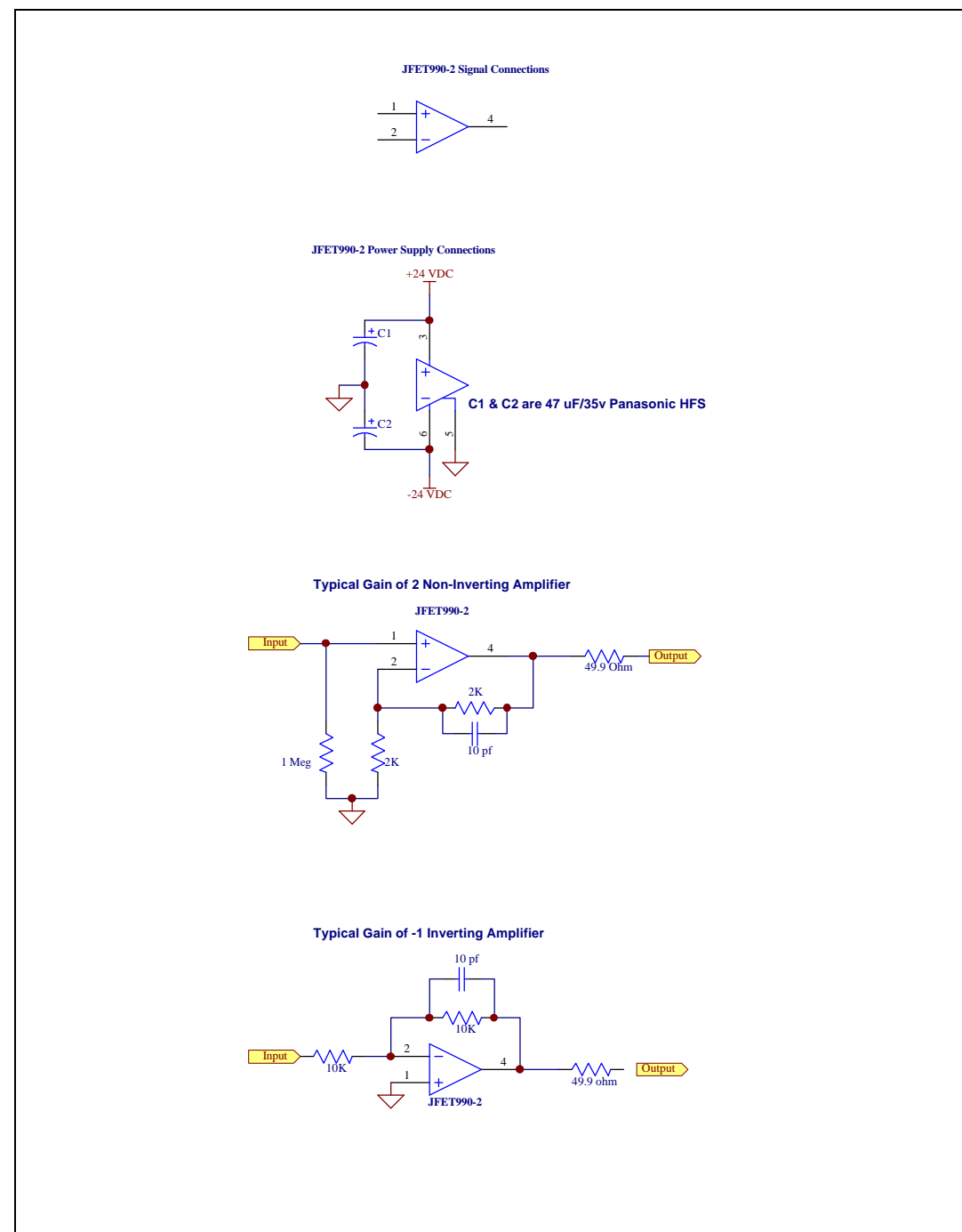


Figure 2

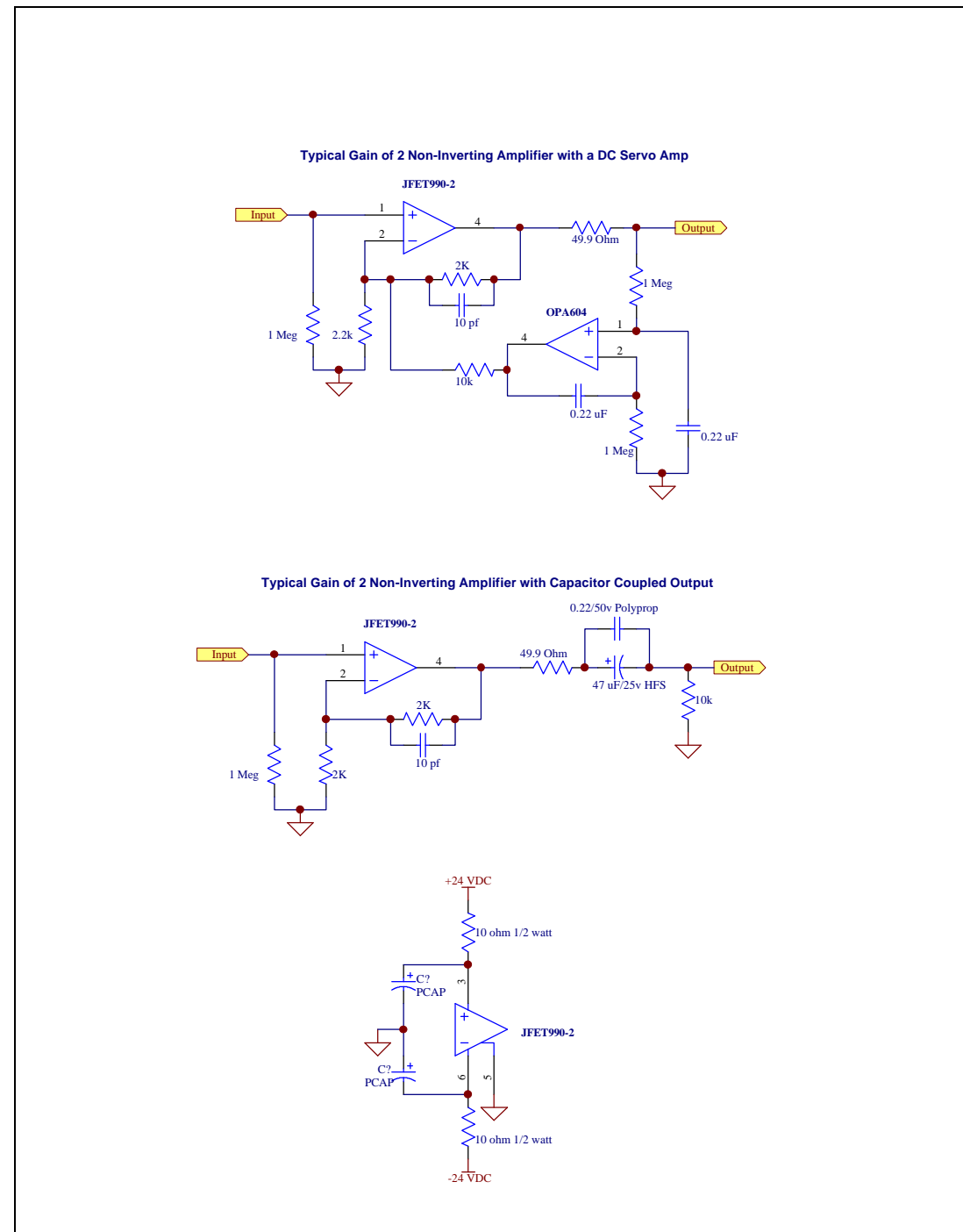


Figure 3