DEM-VCA-SO-1A Demonstration Fixture

1 Description

The DEM-VCA-SO-1A demonstration fixture is a generic, unpopulated printed circuit board (PCB) for voltage-controlled amplifiers (VCAs) in SO-8 packages. Figure 1 shows the package pinout for this PCB. For more information on VCAs and good PCB layout techniques, see the individual VCA data sheets available for download at www.ti.com.

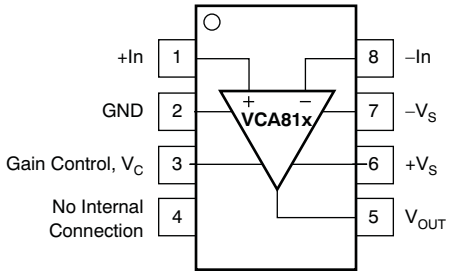


Figure 1. SO Package Pinout, Top View

2 Circuit

The circuit schematic in Figure 2 shows the connections for all possible components. Each configuration uses only some of the components.

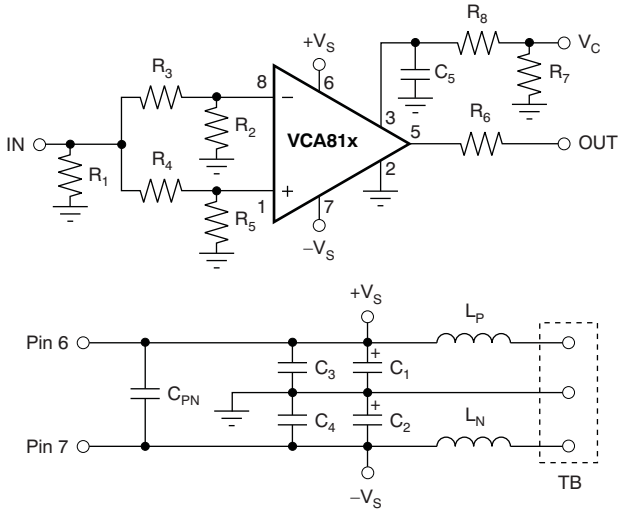


Figure 2. Schematic for DEM-VCA-SO-1A

3 Components

Components that have RF performance similar to the ones in Table 1 may be substituted.

Table 1. Component Descriptions

PART	DESCRIPTION
C_1, C_2	Tantalum Chip Capacitor, SMD EIA Size 3528, 20V
C_3, C_4, C_{PN}	Multilayer Ceramic Chip Capacitor, SMD 1206, 50V
IN, OUT, V_C	SMA or SMB Board Jack (Amphenol 901-144-8)
L_P, L_N	EMI-Suppression Ferrite Chip, SMD 1206 (Steward LI 1206 B 900 R)
TB	Terminal Block, 3.5mm Centers (On-Shore Technology ED555/3DS)
R_X	Metal Film Chip Resistor, SMD 1206, 1/8W

Please refer to Figure 3 for the location of the following components:

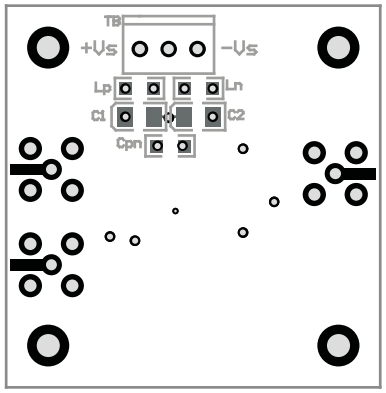
- R_1 is the input resistance matching the source impedance.
- Use either R_3 or R_4 to select the inverting or noninverting input of the VCA81x.
- R_2 or R_5 allow the user to connect the unused input to ground.
- R_6 is the output resistor.
- R_7 provides matching impedance to the source driving the control voltage pin V_C.
- R_8 and C_5 are added to provide low-pass filtering, if required.
- L_P and L_N are ferrite chips that can reduce interactions with the power supply at high frequencies; if not desired, they can be replaced with 0Ω resistors.

The power supplies are each bypassed with two capacitors:

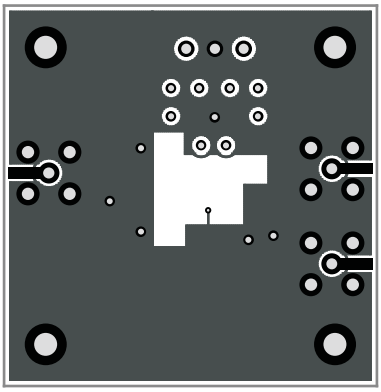
- C_1 and C_3, respectively, for the positive supply.
- C_2 and C_4 for the negative supply.
- C_1 and C_2 are usually set between 2.2μF and 6.8μF, whereas C_3 and C_4 are 0.1μF ceramic capacitors.
- C_{PN}, usually set at 10,000pF, is connected between the positive and negative power supplies.

4 Board Layout

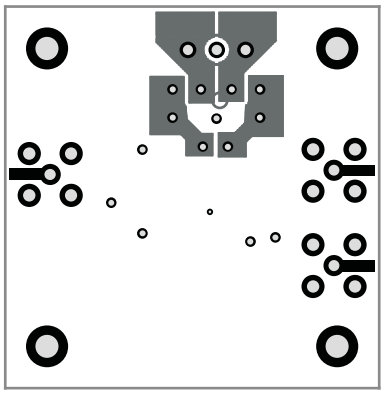
This demonstration fixture is a four-layer PCB. It uses both a ground plane and power traces on the inner layers. The ground plane has been opened up around op amp pins that are sensitive to capacitive loading. Power-supply traces are laid out to keep current loop areas to a minimum. The SMA (or SMB) connectors may be mounted either vertically or horizontally onto the board edge. The location and type of capacitors used for power-supply bypassing are crucial for high-frequency amplifiers. The tantalum capacitors, C_1 and C_2, do not need to be close to pins 6 and 7 on the PCB and may be shared with other amplifiers. See the individual VCA data sheet for more information on proper board layout techniques and component selection.



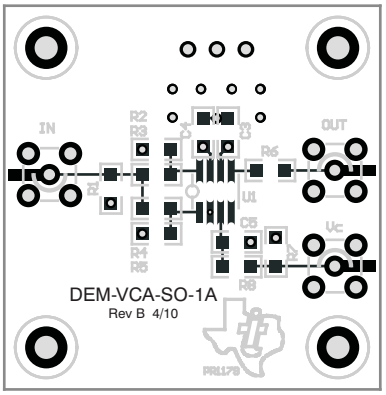
(a) Bottom Layer, Bottom View



(b) Mid Layer 1, Top View (Ground plane)



(c) Mid Layer 2, Top View (Power plane)



(d) Top Layer, Top View

Note: The board name shown in the silkscreen for an earlier version of the fixture is DEM-VCA81xD with the Revision A design finalized in May 2004.

Figure 3. DEM-VCA-SO-1A Demonstration Board Layout

5 Measurement Tips

This demonstration fixture, with the component values shown, is designed to operate in a 50Ω environment; most data sheet plots are obtained in this manner. It is easy to change the component values for different input and output impedance levels. However, do not use high-impedance probes; they represent a heavy capacitive load to the VCAs, and will alter the device response. Instead, use low-impedance (≤ 500Ω) probes with adequate bandwidth. The probe input capacitance and resistance set an upper limit on the measurement bandwidth. If a high-impedance probe must be used, place a 100Ω resistor on the probe tip to isolate its capacitance from the circuit.

REVISION HISTORY

Changes from A Revision (February, 2006) to B Revision	Page
• Changed silkscreen image in Figure 3	3

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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