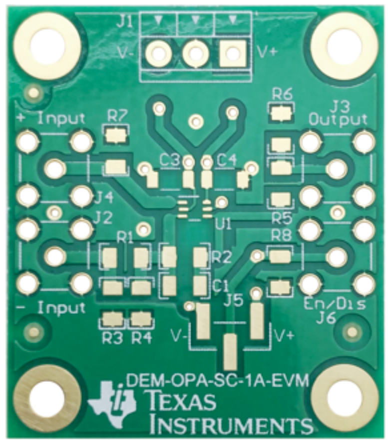
User's Guide
SBOU232 – October 2019

DEM-OPA-SC-1A-EVM Evaluation Module



1 Description

The DEM-OPA-SOT-1A demonstration fixture is a generic, unpopulated printed circuit board (PCB) designed to provide an optimized layout when evaluating wideband operational amplifiers in the tiny SC70 package. Figure 1 shows the package pinout for this PCB. For more information on these op amps, as well as good PCB layout techniques, see the individual amplifier data sheets.

Only a few components are necessary to be assembled onto the board to set up the operational amplifier in either an inverting or noninverting configuration. To avoid parasitic component inductance the board only accepts surface mount resistors and capacitors. The actual values of the components, especially the resistors, depend on the type of operational amplifier used and the intended mode of operation. The board was designed to accommodate a variety of amplifiers: voltage feedback types or current feedback types. The layout includes an optional function pin for those amplifiers featuring a disable function. Figure 4 (top layer view) illustrates that the user has the option to jumper the connection to the positive or negative supply, or connect it to an external SMA connector.

For a detailed discussion on the individual op amp and the appropriate selection of the recommended feedback and gain resistors, see the respective data sheets. As a reminder, the frequency response performance of a current feedback amplifier is determined by the feedback resistor value. Also note that the feedback resistor compensates for the package parasitics, and therefore its value usually varies for different packages.

All high-frequency devices have a common sensitivity to component and layout parasitics that may alter the AC performance. Therefore, slight adjustments of the feedback resistor, the gain resistor, or both might be necessary to obtain the final desired frequency response. For current feedback amplifiers, increasing RF from its nominal value will reduce the achievable bandwidth, while decreasing RF will cause the frequency response to peak more. However, at higher gains, it might be advantageous to decrease RF to optimize for bandwidth.

For voltage feedback amplifiers, changing the impedance level (increasing or decreasing RF and RG) can also control the amount of peaking.

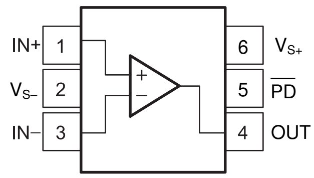


Figure 1. SC70 (DCK) Package Pinout, Top View

2 Circuit

The circuit schematic in Figure 2 shows the connections for all possible components. Each configuration uses only some of the components. The power-supply bypassing capacitors are crucial components for high-frequency amplifiers and should not be omitted during evaluation. Typically, each supply should be bypassed by a parallel combination of a ceramic 0.1-µF capacitor and a tantalum 2.2-µF capacitor. Those bypass capacitors are located on the board such that the return path to the power connector is very short. Any larger transient currents will have a short loop, and will not reflect to the input and cause an increase in distortion.

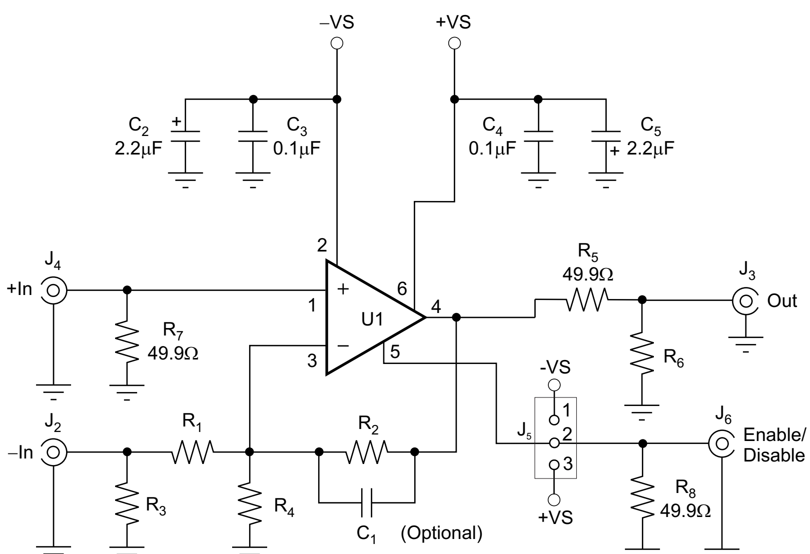


Figure 2. DEM-OPA-SC-1A Schematic

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_4	2.2 µF, 16 V, Size 3548
C_2, C_3	0.1 µF, 50 V, Size 1206
C_1	Feedback capacitor (optional); depends on the application (not used on current feedback op amps)
R_5, R_7, R_8	Typically 50 Ω
R_1, R_3, R_4, R_6	Depends on the application, used for impedance matching or inverting operation
J_5	Power down, Enable jumper
J_2 – J_4, J_6	SMA or SMB connectors

4 Board Layout

This demonstration fixture is a two-layer PCB with the power traces on the bottom layer. Even though both sides have a ground plane, a window has been opened up around the DUT and its surrounding components. The purpose of this window is to reduce the parasitic capacitances between sensitive nodes and the ground planes. The footprint of the SMA connectors were designed to use straight connectors in either a vertical or horizontal mounting position. Note that the center conductor of the SMA must be on the top side of the board when mounted horizontally.

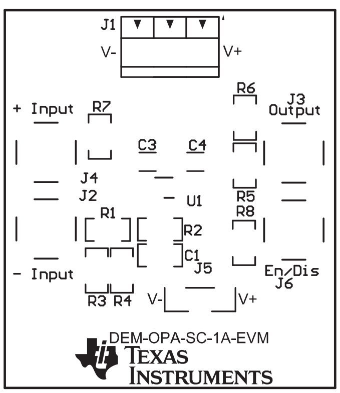


Figure 3. DEM-OPA-SC-1A Top Silkscreen

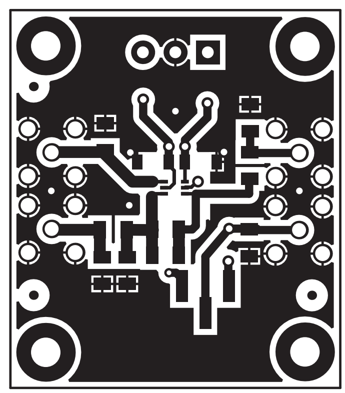


Figure 4. DEM-OPA-SC-1A Top Layer

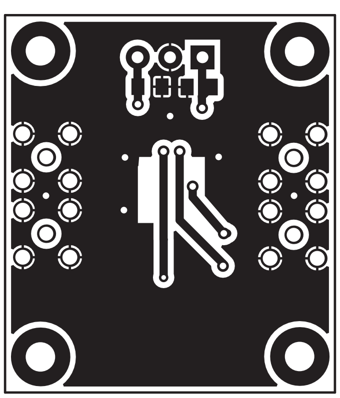


Figure 5. DEM-OPA-SC-1A Bottom Layer

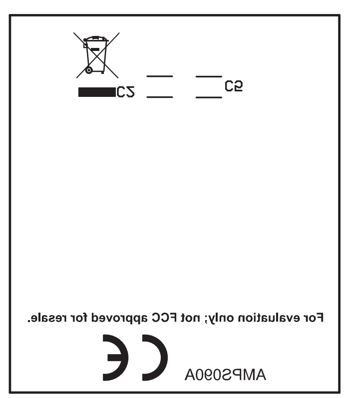


Figure 6. DEM-OPA-SC-1A Bottom Silkscreen

5 Measurement Tips

This demonstration fixture, with the component values shown, is designed to operate in a 50-Ω environment; most data sheet plots are obtained this way. 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 op amp, and will alter the amplifier response. Instead, use low-impedance (≤ 500 Ω) 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 100-Ω resistor on the probe tip to isolate its capacitance from the circuit.

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

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