

The CLC730068 evaluation board is designed to aid in the characterization of Comlinear's 5-pin, monolithic amplifiers, that are available in the SOT23-5 package.

The CLC730068 evaluation board is designed for non-inverting gains. Inverting gains or other circuit configurations can be obtained with slight modifications to the board. Use the evaluation board as a:

- Guide for high frequency layout
- Tool to aid in device testing and characterization

### Basic Operation

Figure 1 shows the non-inverting schematic for the board. The input signal is brought into the board through SMA connectors to the non-inverting input of the amplifier. The resistor  $R_{in}$  is used to set the input termination resistance to the op amp. The non-inverting gain is set by the following equation:

$$\text{Non-inverting Gain: } 1 + \frac{R_f}{R_g}$$

The value of the feedback resistor,  $R_f$ , has a strong influence on AC performance. Refer to the product data sheet for feedback resistor selection. The output of the op amp travels through a series resistance,  $R_{out}$ , and then leaves the board through an SMA connector. The series resistance,  $R_{out}$ , matches transmission lines or isolates the output from capacitive loads.

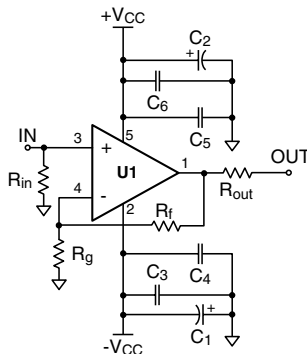


Figure 1: Non-inverting Gain Configuration

### Inverting Gain Operation

The evaluation board can be modified to provide an inverting gain configuration. Complete these steps to modify the board:

1. Cut the input trace prior to pin 3
2. Use  $25\Omega$  for  $R_{in}$
3. Terminate  $R_g$  at the input trace instead of ground
4. Add  $R_t$  for desired input impedance (input impedance =  $R_g || R_t$ )

Figure 2 illustrates the inverting schematic for the board.

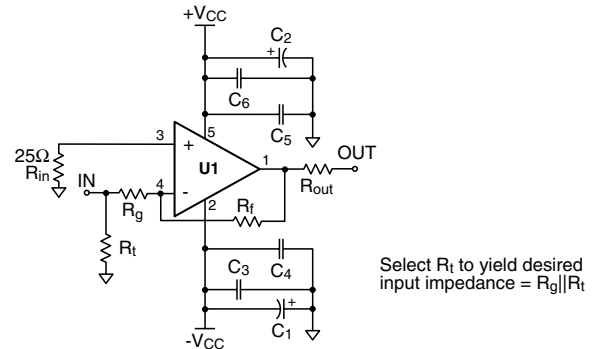


Figure 2: Inverting Gain Configuration

### Layout Considerations

General layout and supply bypassing play major roles in high frequency performance. When designing your own board, use the evaluation board as a guide and follow these steps as a basis for high frequency layout:

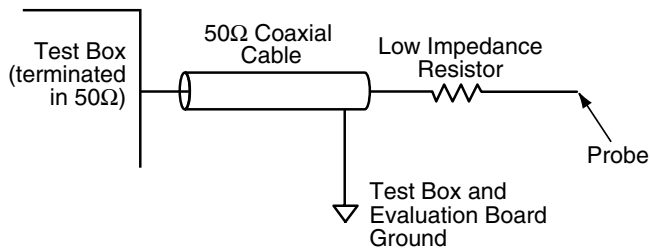
1. Use a ground plane.
2. Include  $6.8\mu\text{F}$  tantalum and  $0.1\mu\text{F}$  ceramic capacitors on both supplies.
3. Place the  $6.8\mu\text{F}$  capacitors within 0.75 inches of the power pins.
4. Place the  $0.1\mu\text{F}$  capacitors less than 0.1 inches from the power pins.
5. Remove the ground plane under and around the part, especially near the input and output pins to reduce parasitic capacitance.
6. Minimize all trace lengths to reduce series inductances.
7. Use individual flush-mount sockets, for prototyping.

### Measurement Hints

If  $50\Omega$  coax and  $50\Omega$   $R_{in}/R_{out}$  resistors are used, many of the typical performance plots found in the product data sheets can be reproduced.

When SMA connectors and cables are not available to evaluate the amplifier, do not use normal oscilloscope probes. Use low impedance resistive divider probes of 100 to  $500\Omega$ . If a low impedance probe is not available, then a section of  $50\Omega$  coaxial cable and a low impedance resistor ( $10\Omega$  to  $50\Omega$ ) may be used. Follow these 3 steps to create a "cable/resistor" probe:

1. Connect one end of the coax's center to a test measurement box terminated in  $50\Omega$ .
2. Connect the other end of the cable's center conductor to the low impedance resistor. (The open side of the resistor is now a probe.)
3. Connect the ground shield of the cable to evaluation board ground and test box ground.



**Figure 3: "Cable/Resistor" Probe Configuration**

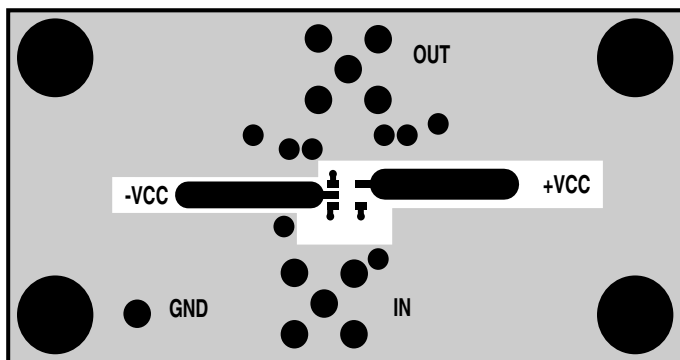
This "cable/resistor" probe, shown in Figure 3, forms a voltage attenuator between the resistor and the 50Ω termination resistance of the test box. This method allows measurements to be performed directly on the output pin of the amplifier.

**Power Supplies**

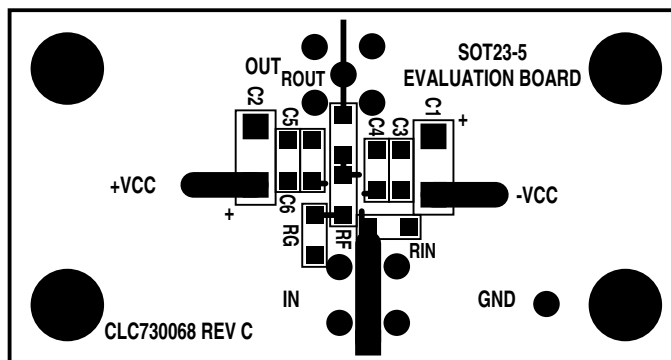
Refer to the product data sheet for the recommended supply voltages.

**Component Values**

- $R_f, R_g$  - Use the product data sheet to select values
- $R_{in}, R_{out}$  - 50Ω (Refer to **Basic Operation** section for details)
- $R_t$  - Optional resistor for inverting gain configurations (Refer **Inverting Gain Operation** section for details)
- C1, C2 - 6.8μF tantalum capacitors
- C3, C6 - 0.1μF ceramic capacitors
- C4, C5 - 0.01μF ceramic capacitors (optional)



**SOT23-5 Evaluation Board – Layer 1**



**SOT23-5 Evaluation Board – Layer 2**

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, a) are intended for surgical implant into the body, or b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



**National Semiconductor Corporation Americas**  
 Tel: 1(800) 272-9959  
 Fax: 1(800) 737-7018  
 Email: support@nsc.com

**National Semiconductor Europe**  
 Fax: +49 (0) 1 80-530 85 86  
 E-mail: europe.support.nsc.com  
 Deutsch Tel: +49 (0) 1 80-530 85 85  
 English Tel: +49 (0) 1 80-532 78 32  
 Francais Tel: +49 (0) 1 80-532 93 58  
 Italiano Tel: +49 (0) 1 80-534 16 80

**National Semiconductor Asia Pacific Customer Response Group**  
 Tel: 65-25-2544466  
 Fax: 65-2504466  
 Email: sea.support@nsc.com

**National Semiconductor Japan Ltd.**  
 Tel: 81-3-5639-7560  
 Fax: 81-3-5639-7507

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.