ISL70419SEHEV1Z Evaluation Board User Guide

Introduction

The ISL70419SEHEV1Z evaluation platform is designed to evaluate the ISL70419SEH. The ISL70419SEH contains four very high precision amplifiers featuring the perfect combination of low noise vs power consumption vs radiation hardness, providing highly reliable performance in harsh radiation environments. Its excellent noise characteristics coupled with a unique array of dynamic specifications make this amplifier well-suited for a variety of satellite system applications. Manufactured in Intersil's PR40, silicon on insulator, BiCMOS process makes this device immune to Single-Event Latch-up.

Reference Documents

- ISL70419SEH Datasheet
- ISL70419SEH SMD 5962-14226
- ISL70419SEH Radiation Test Report (available on the ISL70419SEH Product Information page)

Ordering Information

PART NUMBER	DESCRIPTION
ISL70419SEHEV1Z	ISL70419SEHEV1Z Evaluation Board User Guide

Evaluation Board Key Features

- Dual supply operation: ±4.5V to ±20V
- Singled-ended or differential input operation with gain (G = 10V/V)
- External VREF input
- Banana jack connectors for power supply and VREF inputs
- BNC connectors for op amp input and output terminals
- Convenient PCB pads for op amp input/output impedance loading

Power Supply Connections

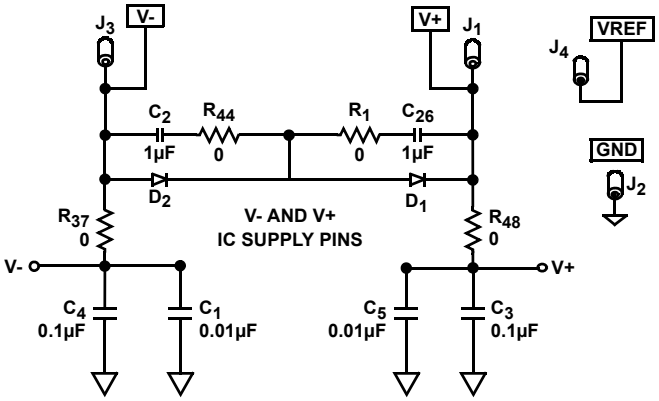


FIGURE 1. POWER SUPPLY CIRCUIT

Figure 1 demonstrates the power supply connections, decoupling and protection circuitry. External power connections are made through the V+, V-, VREF, and GND banana jack connections on the evaluation board. Decoupling capacitors C_2 and C_{26} provide low-frequency power-supply filtering, while additional capacitors, C_1, C_3, C_4 and C_5 which are connected close to the part, filter out high frequency noise and are connected to their respective supplies through R_{37} and R_{48} resistors. These resistors are 0Ω but can be changed by the user to provide additional power supply filtering, or to reduce the supply voltage rate-of-rise time. Anti-reverse diodes D_1 and D_2 protect the circuit in the momentary case of accidentally reversing the power supplies to the evaluation board. The VREF pin can be connected to ground to establish a ground referenced input for split supply operation.

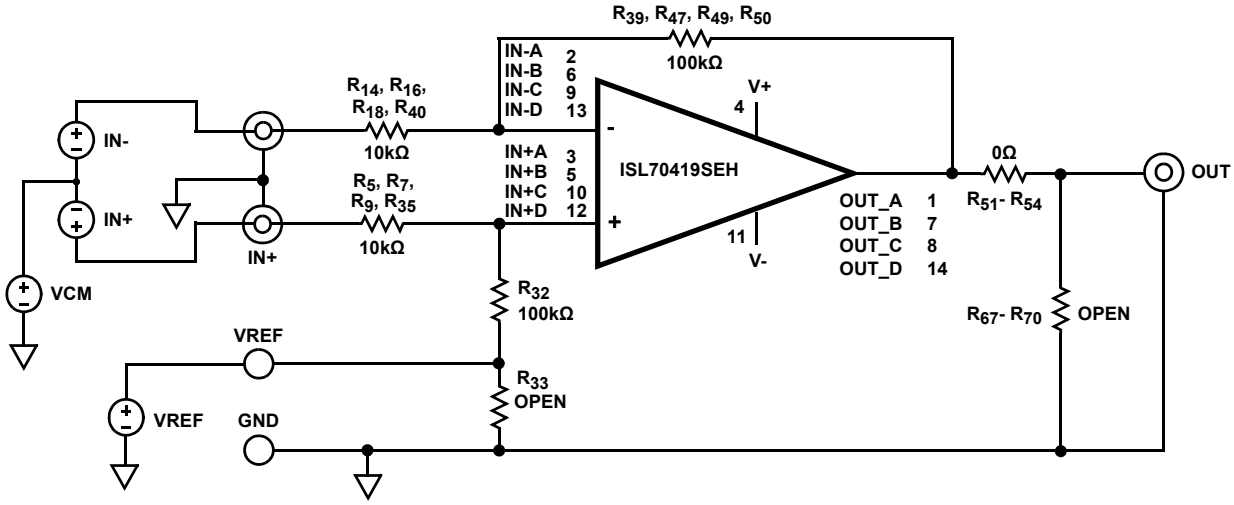


FIGURE 2. BASIC DIFFERENTIAL AMPLIFIER EVALUATION BOARD CONFIGURATION

Amplifier Configuration

A simplified schematic of the evaluation board is shown in Figure 2. The input stage for channel A with the components supplied, is shown in Figure 3. The circuit implements a Hi-Z differential input with unbalanced common mode impedance. The differential amplifier gain is expressed in Equation 1:

$$V_{OUT} = (V_{IN+} - V_{IN-}) \bullet (R_F / R_{IN}) + V_{REF} \quad \text{(EQ. 1)}$$

For single-ended input with an inverting gain G = -10V/V, the IN+ input is grounded and the signal is supplied to the IN- input. VREF must be connected to a reference voltage between the V+ and V- supply rails. For non-inverting operation with G = 11V/V, the negative input (IN-) is grounded and the signal is supplied to the positive input (IN+). The non-inverting gain is strongly dependent on any resistance from IN- to GND. For good gain accuracy, a 0Ω resistor should be installed on the empty R_{11} pad.

User-selectable Options

Component pads are included to enable a variety of user-selectable circuits to be added to the amplifier inputs, the VREF input, outputs and the amplifier feedback loops.

A voltage divider can be added to establish a power supply-tracking common mode reference using the VREF input. The inverting and non-inverting inputs have additional resistor and capacitor placements for adding input attenuation or feedback capacitors (Figure 3).

The outputs (Figure 4) also have additional resistor and capacitor placements for filtering and loading.

NOTE: Operational amplifiers are sensitive to output capacitance and may oscillate. In the event of oscillation, reduce output capacitance by using shorter cables, or add a resistor in series with the output.

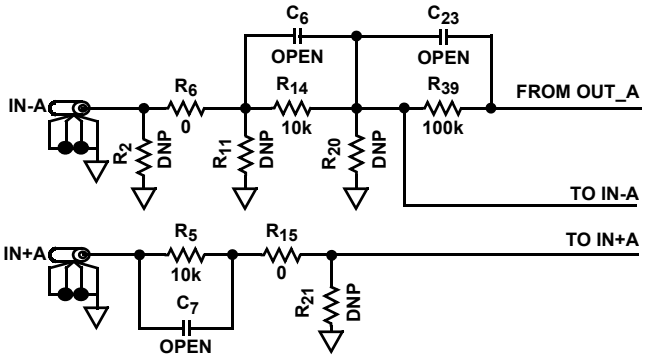


FIGURE 3. INPUT STAGE CHANNEL A

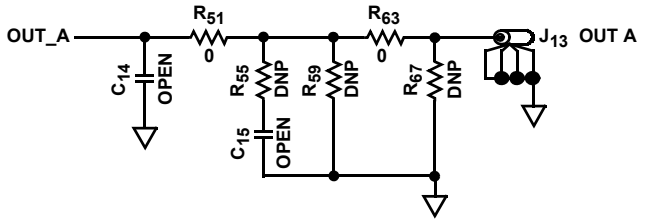
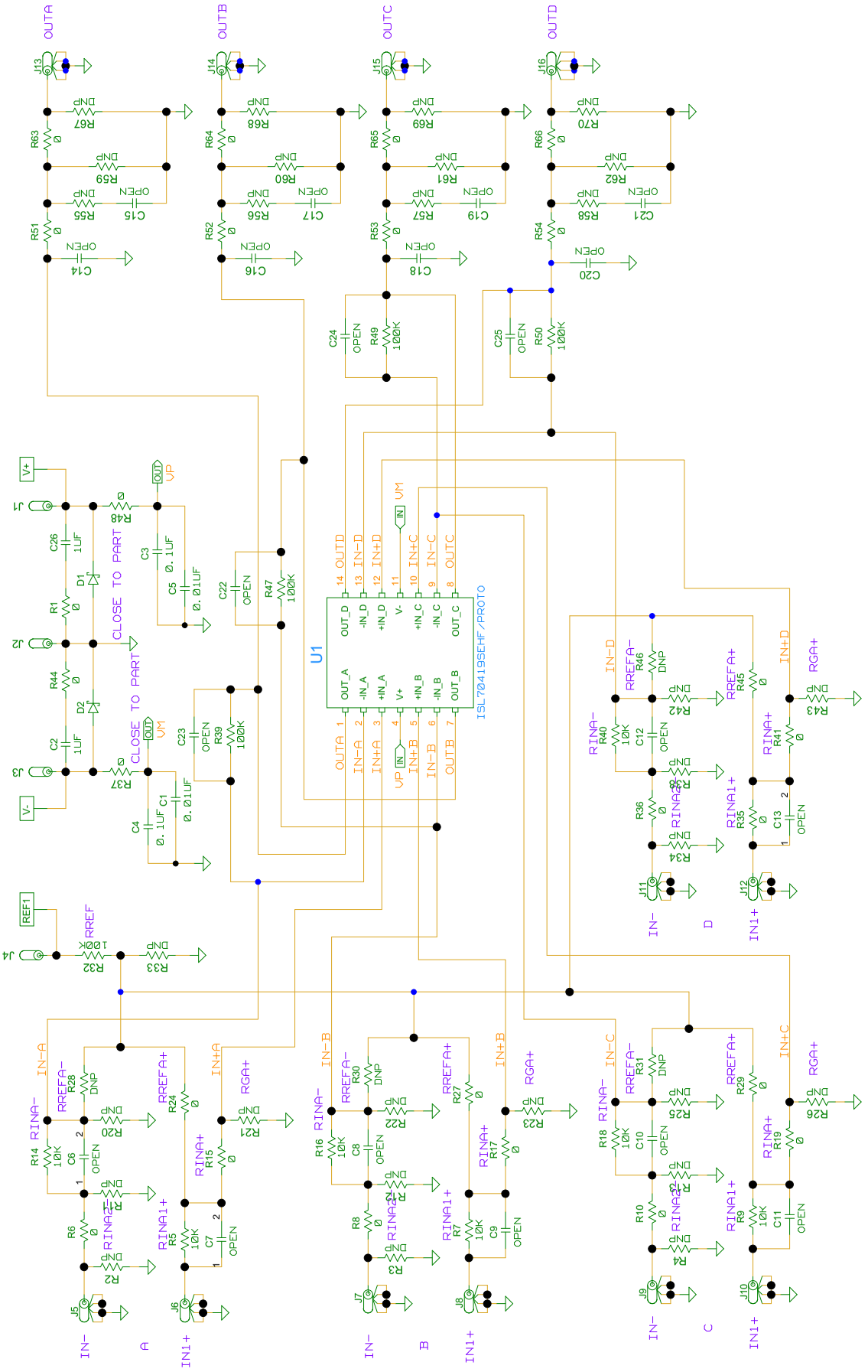


FIGURE 4. OUTPUT STAGE CHANNEL A

TABLE 1. ISL70419SEHEV1Z COMPONENTS PARTS LIST

DEVICE #	DESCRIPTION	COMMENTS
C1, C5	CAP, SMD, 0805, 0.01µF, 50V, 10%, X7R, ROHS	Power Supply Decoupling
C2, C26	CAP, SMD, 1210, 1µF, 50V, 10%, X7R, ROHS	Power Supply Decoupling
C3, C4	CAP, SMD, 0805, 0.1µF, 25V, 10%, X7R, ROHS	Power Supply Decoupling
C6-C25	CAP, SMD, 0603, OPEN-PLACE HOLDER, ROHS	User Selectable Capacitors - Not Populated
D1, D2	40V SCHOTTKY BARRIER DIODE	Reverse Power Protection
J1-J4	Johnson Components Standard Type Banana Jack, 108-0740-001	Power Supply and Reference Voltage Connector
J5-J16	AMPHENOL BNC Connector, 31-5329-52RFX	Connections for Input and Output
R32	RESISTOR, SMD, 0603, 100kΩ, 1%, ROHS	VREF Resistor Divider
R5, R7, R9, R14, R16, R18, R35, R40	RESISTOR, SMD, 0603, 10kΩ, 1%, 1/16W, ROHS	Gain Setting Resistor
R39, R47, R49, R50	RESISTOR, SMD, 0603, 100kΩ, 1%, 1/16W, ROHS	Gain Setting Feedback Resistor
R2, R3, R4, R11, R12, R13, R20, R21, R22, R23, R25, R26, R28, R30, R31, R33, R34, R38, R42, R43, R46, R55, R56, R57, R58, R59, R60, R61, R62, R62, R67, R68, R69, R70	RESISTOR, SMD, 0603, DNP-PLACE HOLDER, ROHS	User Selectable Resistors - Not Populated
U1	ISL70419SEHF/PROTO, 36V RADIATION HARDENED AND SET ENHANCED, LOW NOISE QUAD OPERATIONAL AMPLIFIER	

ISL70419SEHEV1Z Schematic Diagram



ISL70419SEHEV1Z Board Layout

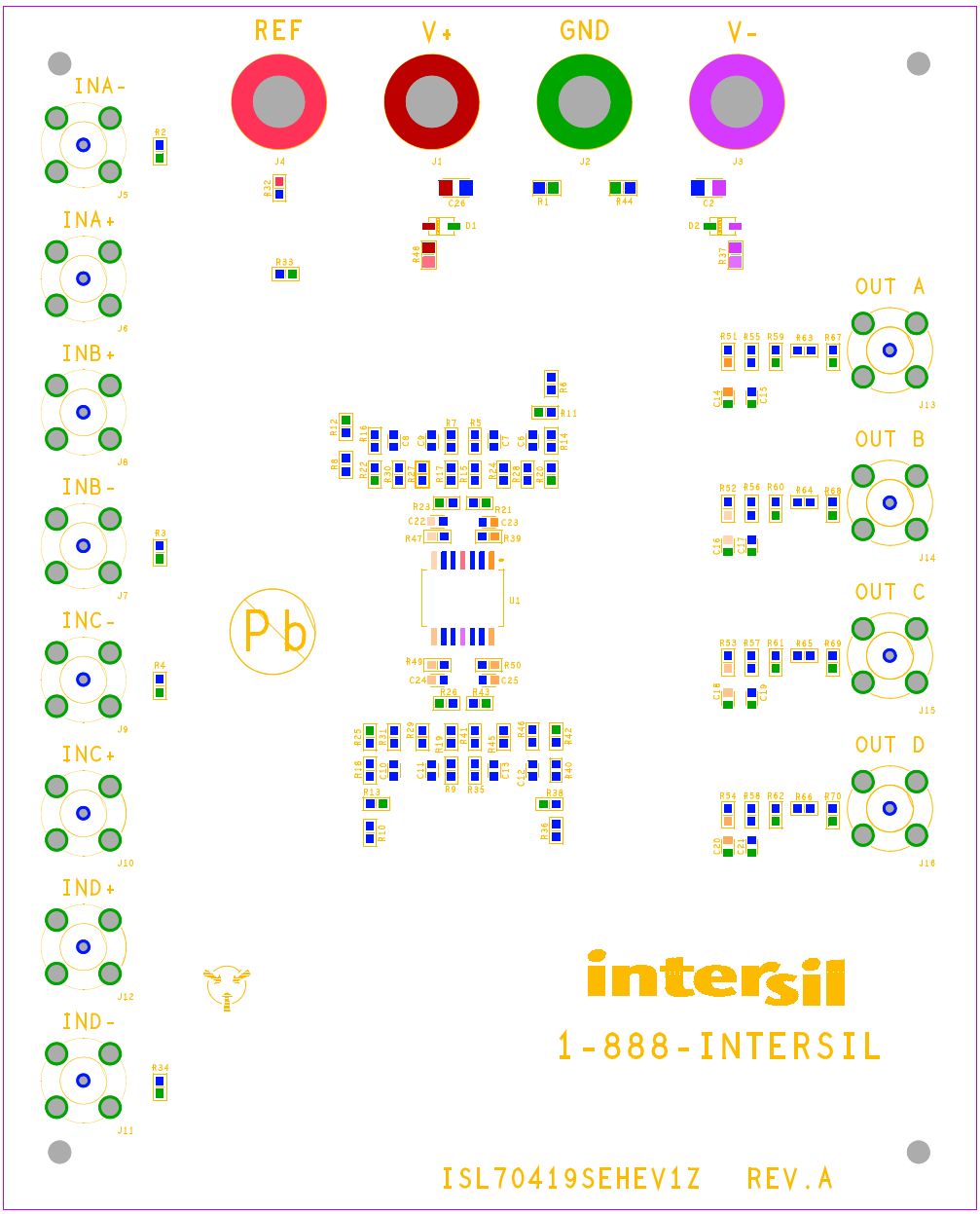


FIGURE 5. SILKSCREEN TOP

ISL70419SEHEV1Z Board Layout (Continued)

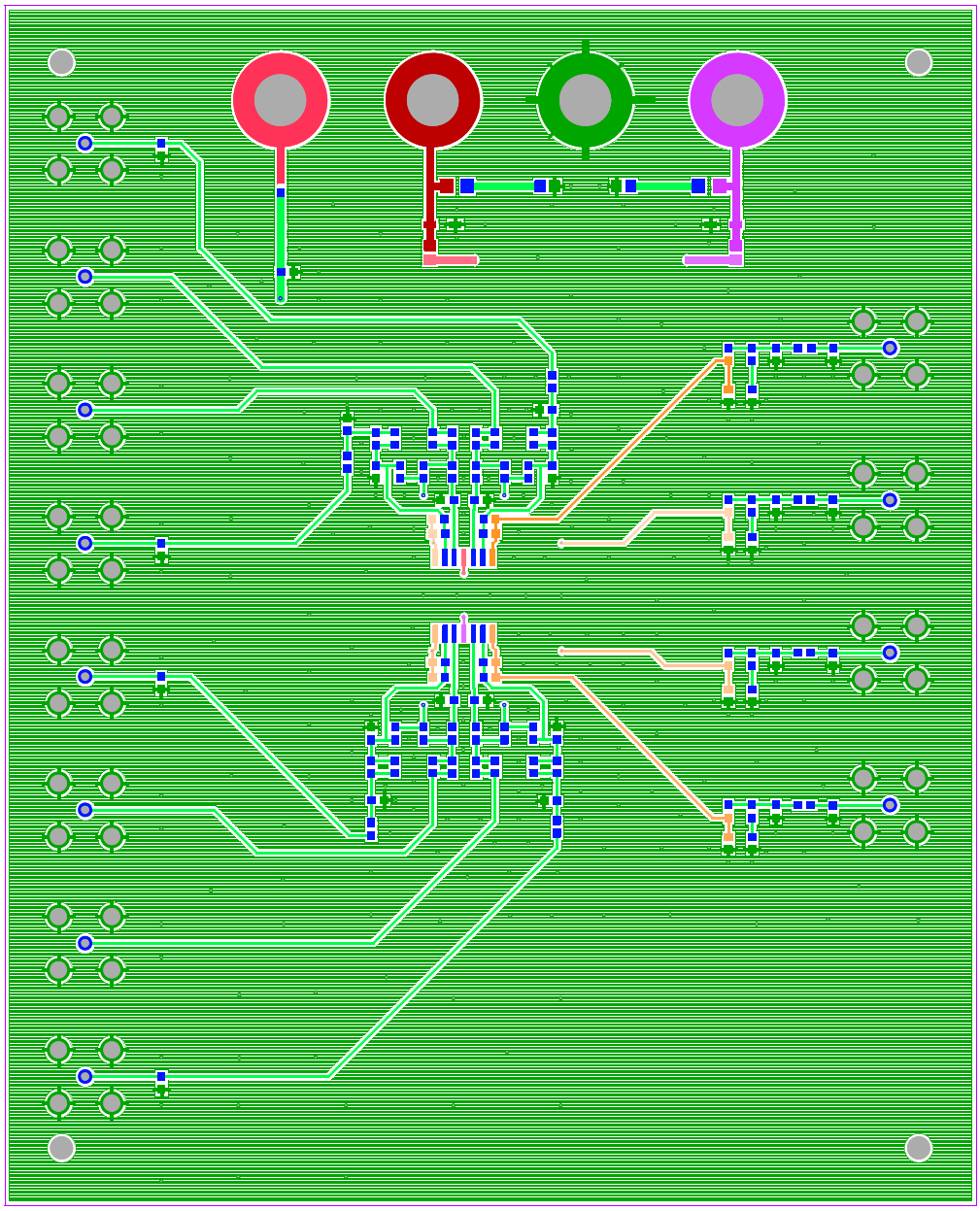


FIGURE 6. TOP LAYER

ISL70419SEHEV1Z Board Layout (Continued)

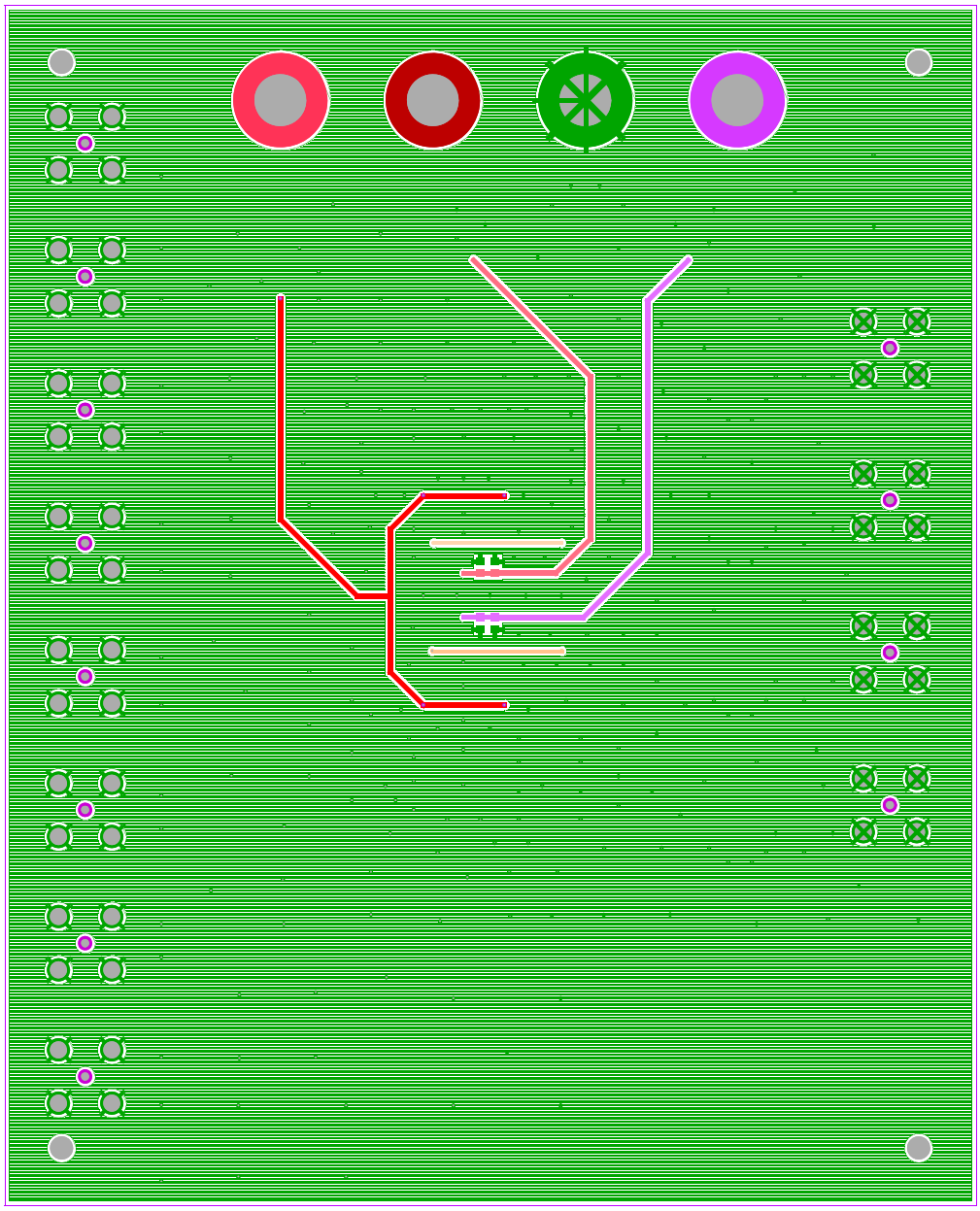


FIGURE 7. BOTTOM LAYER

Typical Performance Curves

V_S = ±15V, V_{CM} = 0V, R_L = Open, T_A = +25°C, unless otherwise specified.

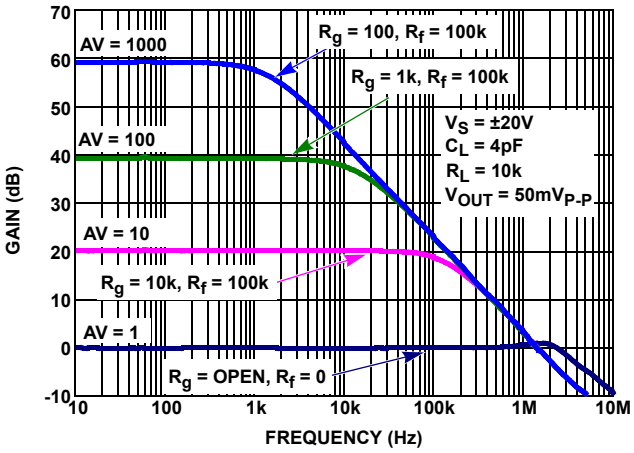


FIGURE 8. FREQUENCY RESPONSE vs CLOSED LOOP GAIN

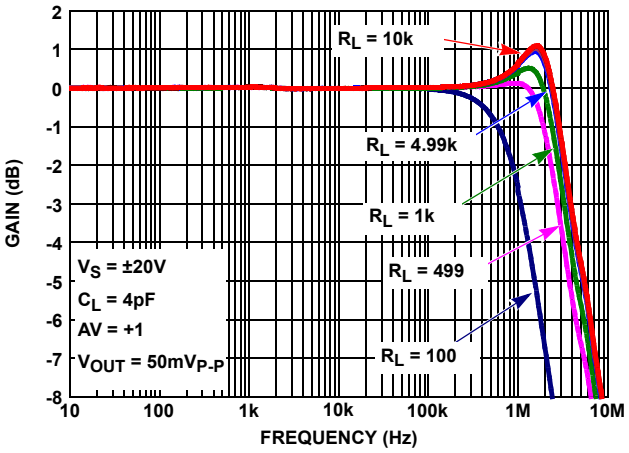


FIGURE 9. GAIN vs FREQUENCY vs R_L

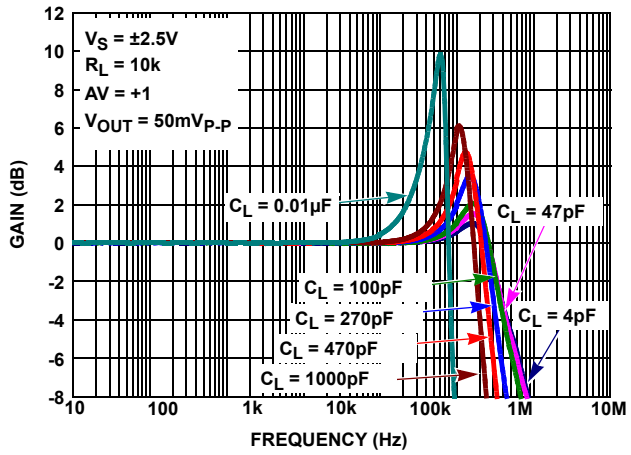


FIGURE 10. GAIN vs FREQUENCY vs C_L

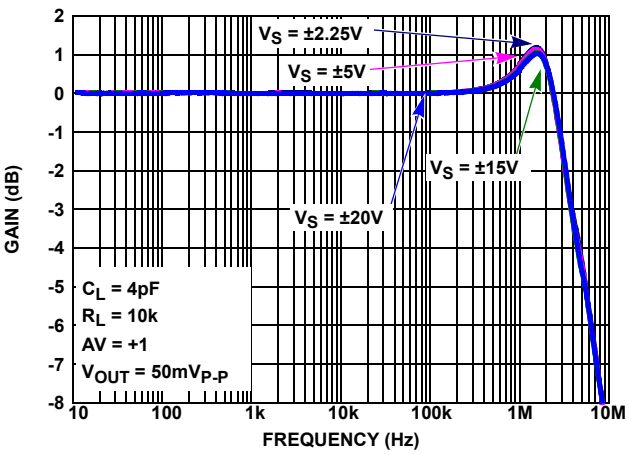


FIGURE 11. GAIN vs FREQUENCY vs SUPPLY VOLTAGE

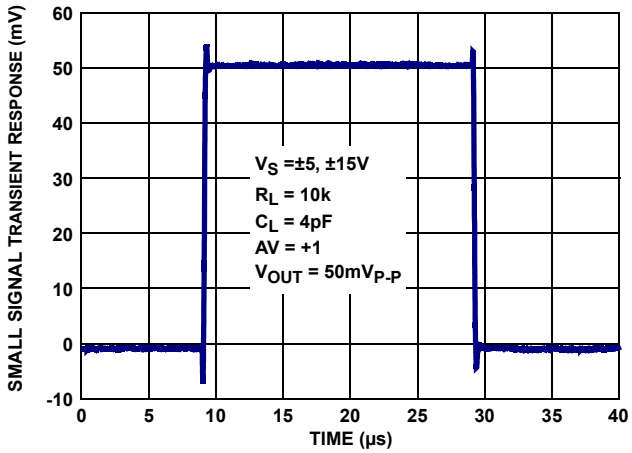


FIGURE 12. SMALL SIGNAL TRANSIENT RESPONSE, V_S = ±5V, ±15V

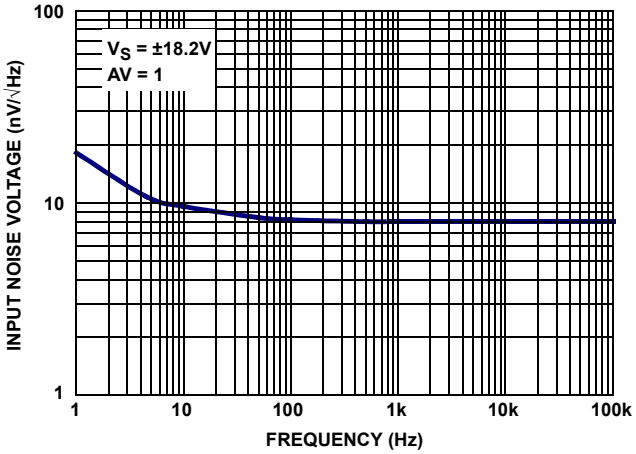


FIGURE 13. INPUT NOISE VOLTAGE SPECTRAL DENSITY