ISL70417SEH SPICE Macro-Model

AN1813
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# Introduction

The ISL70417SEH 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 an unique array of dynamic specifications make this amplifier well-suited for a variety of satellite system applications. Manufactured in Intersil PR40, silicon on insulator, BiCMOS process makes this device immune to Single Event Latch-up.

The SPICE model for the ISL70417SEH, rad hard quad op amp, was developed to help system designers evaluate the operation of this IC prior or in conjunction with proto-typing a system design. This model accurately simulates typical performance characteristics at room temperature (+25°C) such as frequency analysis, noise analysis, and slew rate analysis. Behaviors not supported are the bias current cancellation circuit and some temperature analysis. Functionality has been tested on ORCAD 10.0 and CADENCE ORCAD 16.5. Other SPICE simulators may be used, however, the model may require translation.

# Reference Documents

- ISL70417SEH Data Sheet; FN7962
- ISL70417SEH SMD 5962-12228

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# Project Files

The zip file: **ISL70417SEH.zip** contains the project file ISL70417SEH.opj to be used in ORCAD simulator. The project file has the model definition file (.lib), symbol file (.olb) and the schematic page as shown in Figure 1. The simulation profile is set up for AC analysis and sweeps parameter RF for various gain configurations. Figures 2-13 show a comparison of the simulation results versus bench results for various tests and it can be seen that the model approximates the IC very well.

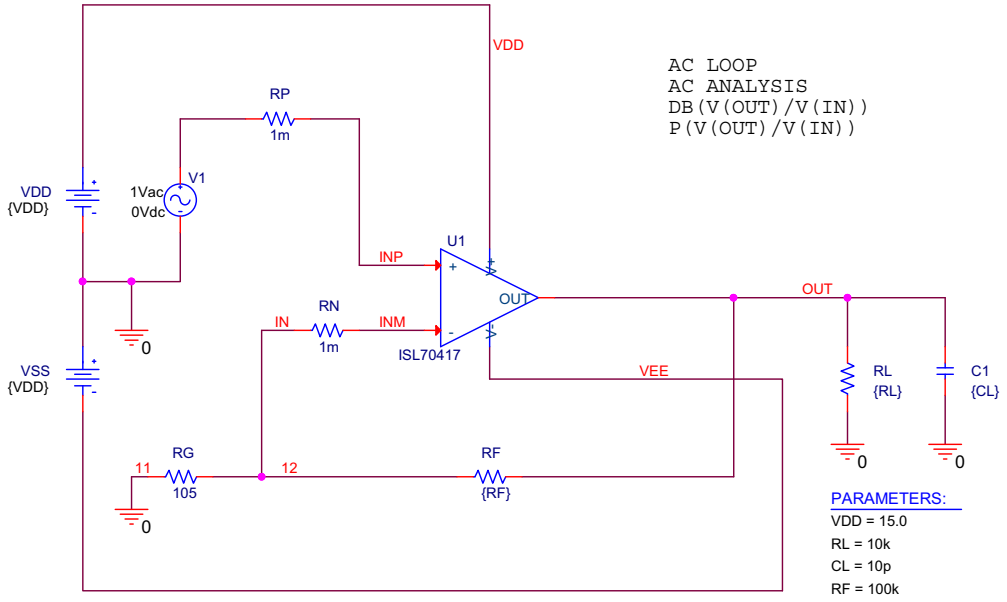


**FIGURE 1. BASIC NON-INVERTING GAIN CONFIGURATION IN ORCAD SPICE FOR AC ANALYSIS**

# Simulation Performance Curves

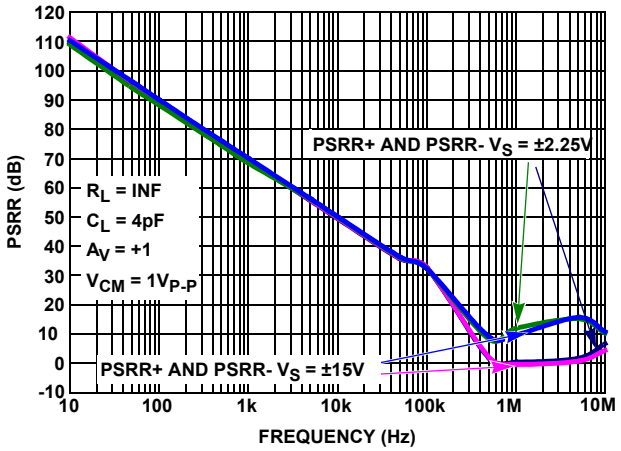


FIGURE 2. PSRR vs FREQUENCY, $V_S$ = ±5V, ±15V

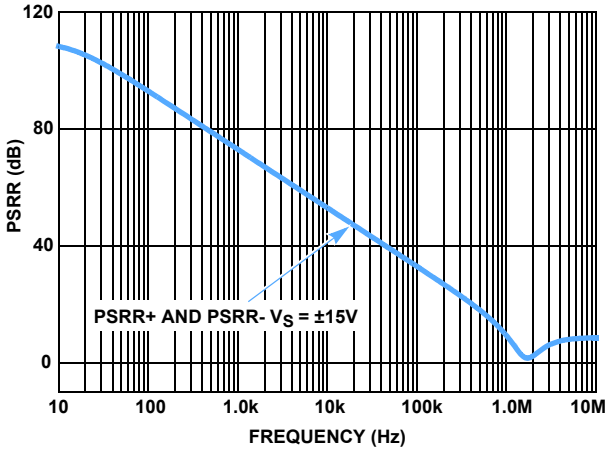


FIGURE 3. SIMULATED PSRR vs FREQUENCY, $V_S$ = ±15V

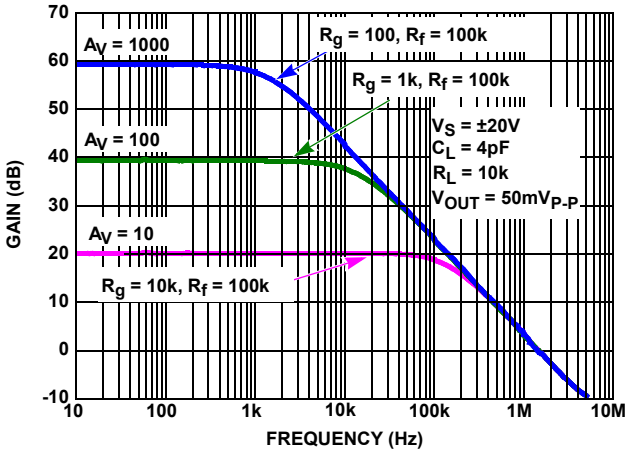


FIGURE 4. FREQUENCY RESPONSE vs GAIN

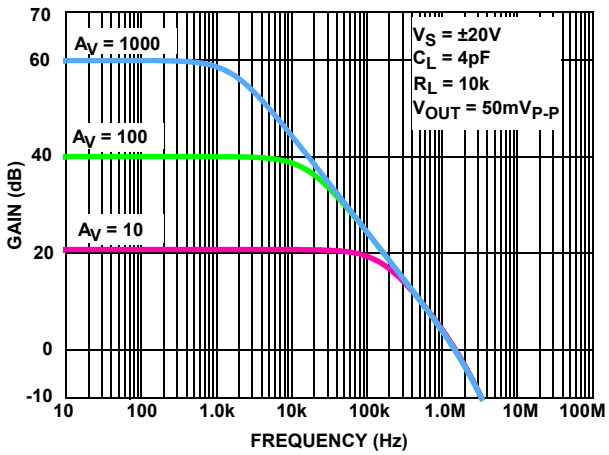


FIGURE 5. SIMULATED FREQUENCY RESPONSE vs GAIN

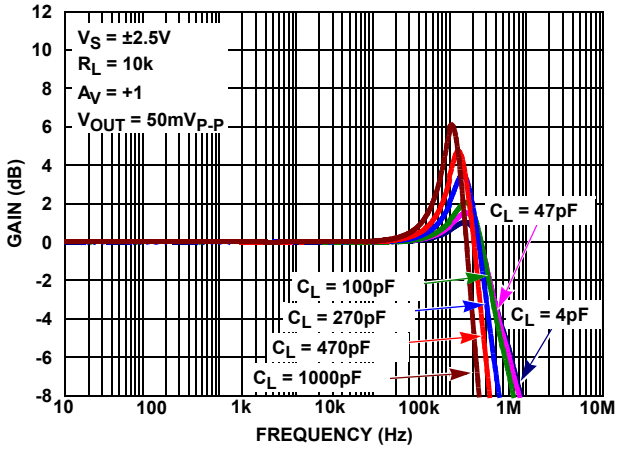


FIGURE 6. GAIN vs FREQUENCY vs $C_L$

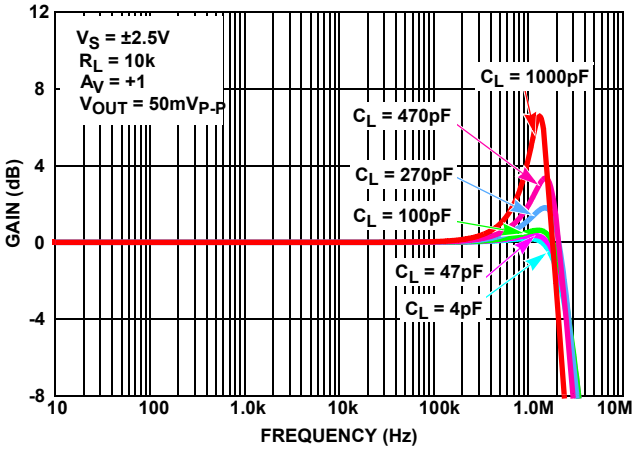


FIGURE 7. SIMULATED GAIN vs FREQUENCY vs $C_L$

## Simulation Performance Curves (Continued)

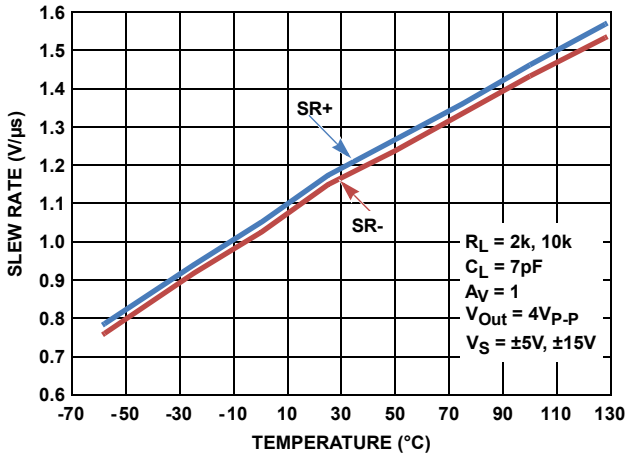


FIGURE 8. SLEW RATE vs TEMPERATURE

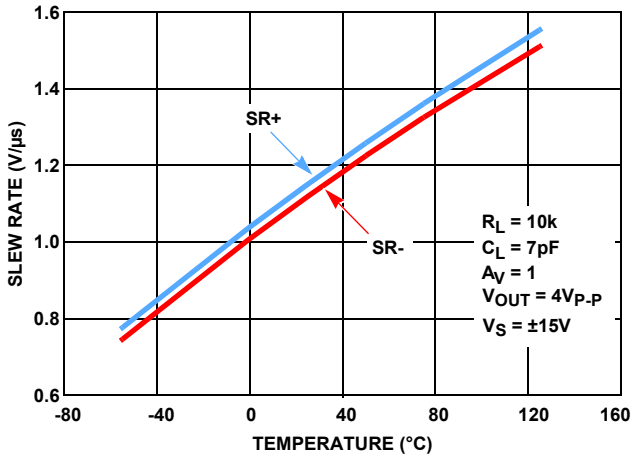


FIGURE 9. SIMULATED SLEW RATE vs TEMPERATURE

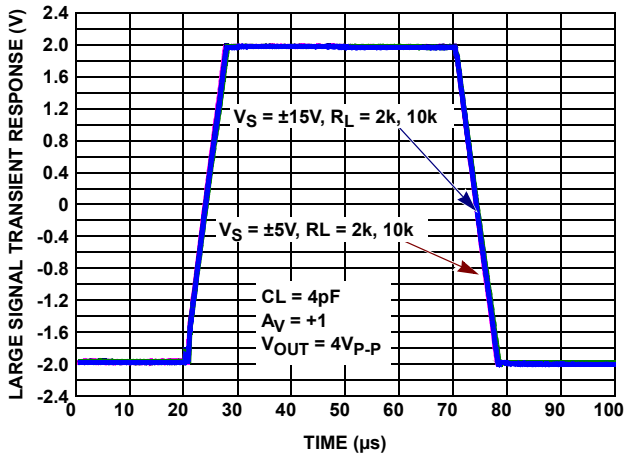


FIGURE 10. LARGE SIGNAL STEP RESPONSE

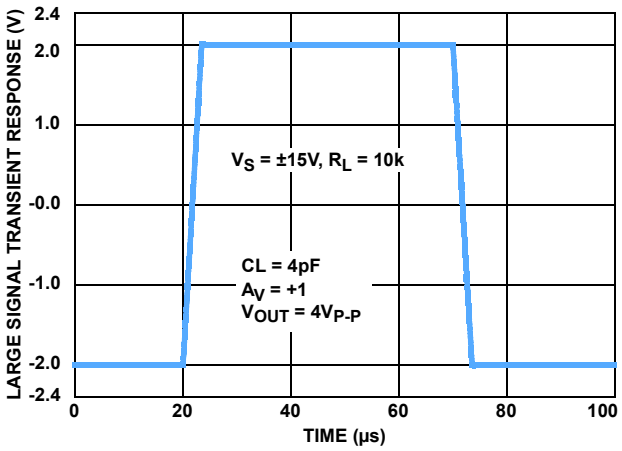


FIGURE 11. SIMULATED LARGE SIGNAL STEP RESPONSE

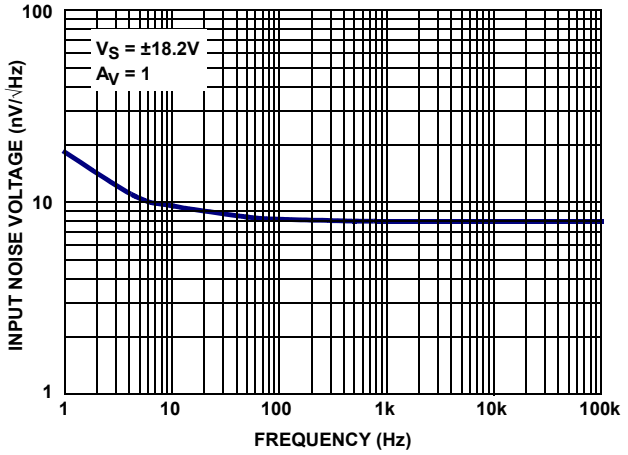


FIGURE 12. INPUT NOISE VOLTAGE SPECTRAL DENSITY

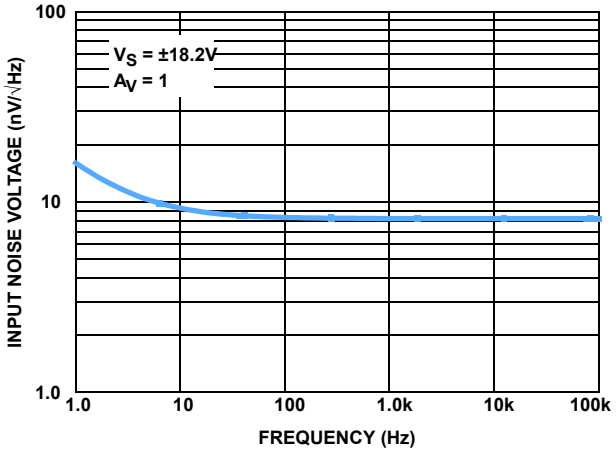


FIGURE 13. SIMULATED INPUT NOISE VOLTAGE SPECTRAL DENSITY

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