1. Overview

The ISL71218MEVAL1Z evaluation platform is designed to evaluate the ISL71218M. The ISL71218 is a single supply, rail-to-rail output, dual amplifier with ground sensing inputs that allow the common-mode input voltage to swing 0.5V below the V- rail. The ISL71218 can operate from a single or dual supply with a 3V to 40V supply range. The ISL71218 features very low power, low offset voltage, and low temperature drift, making it ideal for applications for precision instrumentation, current sensing, and power supply and industrial process controls.

1.1 Key Features

- Wide $V_{\text{IN}}$ range single or dual supply operation
  - +1.8V/-1.2V to ±20V
  - 3.0V to 40V
- Singled-ended or differential input operation
- 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

1.2 Specifications

- $V^+$ range: 1.8V to 20V
- $V^-$ range: -1.2V to -20V

1.3 Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISL71218MEVAL1Z</td>
<td>ISL71218MEVAL1Z evaluation board</td>
</tr>
</tbody>
</table>

1.4 Related Literature

- For a full list of related documents, visit our website
  - ISL71218M product page
Figure 1. Basic Differential Amplifier Configuration
2. Functional Description

2.1 Power Supply Connections

Figure 2 shows 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, C2 and C26, provide low-frequency power-supply filtering, while additional capacitors (C1, C3, C4, and C5, connected close to the part) filter out high-frequency noise, and are connected to their respective supplies through R37 and R48 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, D1 and D2, protect the circuit in case of momentarily reversing the power supplies accidentally to the evaluation board. The VREF pin can be connected to ground to establish a ground referenced input for split supply operation.

2.2 Amplifier Configuration

A simplified schematic of the evaluation board is shown in Figure 1 on page 3. The input stage 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:

\[ V_{OUT} = (V_{IN+} - V_{IN-}) \times (R_F/R_{IN}) + V_{REF} \]  

(EQ. 1)

For a single-ended input with an inverting gain \( G = -10\text{V/V} \), 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 a non-inverting operation with \( G = 11\text{V/V} \), 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 R11 pad.
2.3 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 noninverting 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.
3. **PCB Layout Guidelines**

Analog circuits can conduct noise through paths that connect it to the “outside world”. To minimize the effects of any noise through the power lines, it is recommended to decouple the power supply pins (V+ and V-). If the trace lines to the power supply pins are long, it is recommended to place high frequency decoupling capacitors (such as 0.1µF) right next to the power supply in, and a larger capacitor value (such as 1µF) at the point of entry for the power supply.

3.1 **ISL71218MEVAL1Z Evaluation Board**

![Figure 5. ISL71218MEVAL1Z Evaluation Board](image-url)
3.2 ISL71218MEVAL1Z Schematic Diagram

Figure 6. ISL71218MEVAL1Z Schematic
### 3.3 Bill of Materials

#### Table 1. ISL71218SRHMEVAL1Z Components Parts List

<table>
<thead>
<tr>
<th>Device #</th>
<th>Description</th>
<th>Comments</th>
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<tbody>
<tr>
<td>C2, C4</td>
<td>CAP, SMD, 1210, 1µF, 50V, 10%, X7R, ROHS</td>
<td>Power supply decoupling</td>
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<tr>
<td>C3, C6</td>
<td>CAP, SMD, 0805, 0.1µF, 50V, 10%, X7R, ROHS</td>
<td>Power supply decoupling</td>
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<tr>
<td>C5, C7</td>
<td>CAP, SMD, 0603, 0.01µF, 50V, 10%, X7R, ROHS</td>
<td>Power supply decoupling</td>
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<td>C1, C8-C12</td>
<td>CAP, SMD, 0603, DNP-PLACE HOLDER, ROHS</td>
<td>User selectable capacitors - not populated</td>
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<tr>
<td>D1</td>
<td>DIODE-RECTIFIER, SMD, SOD-123, 2P, 40V, 0.5A, ROHS</td>
<td>Reverse power protection</td>
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<tr>
<td>U1</td>
<td>ISL71218MBZ, DUAL OP-AMP, 8Ld, SOIC</td>
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<tr>
<td>R1, R2, R5-R8, R14, R20, R23, R24</td>
<td>RESISTOR, SMD, 0603, 0.1%, MF, DNP-PLACE HOLDER</td>
<td>User selectable resistors - not populated</td>
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<tr>
<td>R3, R20-R22</td>
<td>RES, SMD, 0603, 0Ω, 1/10W, TF, ROHS</td>
<td>Zero ohm user selectable resistors</td>
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<tr>
<td>R4, R10, R17, R18</td>
<td>RES, SMD, 0603, 10k, 1/10W, 1%, TF, ROHS</td>
<td>Gain resistors</td>
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<tr>
<td>R10, R12, R13, R16</td>
<td>RES, SMD, 0603, 100k, 1/10W, 1%, TF, ROHS</td>
<td>Gain resistors</td>
</tr>
</tbody>
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### 3.4 Board Layout

![Figure 7. Silkscreen](image-url)
Figure 8. Top Layer

Figure 9. Bottom Layer
4. Typical Performance Curves

Figure 10. Gain vs Frequency vs $R_L$, $V_S = \pm 15V$

Figure 11. Gain vs Frequency vs $R_L$, $V_S = \pm 5V$

Figure 12. Output Voltage Swing vs Load Current, $V_S = \pm 15V$

Figure 13. Output Voltage Swing vs Load Current, $V_S = \pm 5V$

Figure 14. Large Signal 10V Step Response, $V_S = \pm 15V$

Figure 15. Large Signal 4V Step Response, $V_S = \pm 5V$
Figure 16. Small Signal Transient Response, $V_S = \pm 5V, \pm 15V$
5. Revision History

<table>
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<th>Rev.</th>
<th>Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Aug 17, 2017</td>
<td>Initial release</td>
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