Precision High Side Current Sense Amplifiers

LT1999: High Voltage Bidirectional Current Sense Amplifier
- Buffered Output with 3 Gain Options:
  - 10V/V, 20V/V, 50V/V
- AC CMRR > 80dB at 100kHz
- Gain Accuracy: 0.5% Max
- Input Common Mode Voltage Range: –5V to 80V
- Smooth Continuous Operation Over Entire Common Mode Range
- Low Power Shutdown <1µA
- –55°C to 150°C Operating Temperature Range
- 8-Lead MSOP and 8-Lead SO (Narrow) Packages

The LT1999 accurately measures fast switching currents in H-bridge motor controls, switching power supplies, solenoids and battery chargers. It features a –5V to 80V input common mode voltage range, 2MHz bandwidth, less than 1.5mV offset voltage and 0.5% gain error over temperature. With more than 80dB common mode rejection at 100kHz, the LT1999 maintains outstanding accuracy even in the presence of large square wave input voltages.

LTC6102: Zero-Drift High Side Current Sense Amplifier
- Supply Range:
  - 4V to 60V, 70V Maximum (LTC6102)
  - 5V to 100V, 105V Maximum (LTC6102HV)
- ±10µV Input Offset Maximum
- ±50nV/°C Input Offset Drift Maximum
- Fast Response: 1µs Step Response
- PSRR 130dB Minimum
- Operating Temperature Range: –40°C to 125°C
- 8-Lead MSOP and 3mm x 3mm DFN Package

The LTC®6102 zero-drift high side current sense amplifier has the precision to resolve microamps from amps of load current. Its outstanding accuracy can be used to attain high precision with a lower value sense resistor, resulting in less power loss and heat dissipation in the sense element.

<table>
<thead>
<tr>
<th>Part</th>
<th>LT1999</th>
<th>LT6102</th>
<th>LT6101</th>
<th>LT6106</th>
<th>LT6107</th>
<th>LT6105</th>
<th>LT6103</th>
<th>LT6104</th>
<th>LT6107HV</th>
<th>LT6100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Features</td>
<td>High Speed AC</td>
<td>Zero-Drift</td>
<td>VCM to 105V</td>
<td>Lowest Cost</td>
<td>–55°C to 150°C</td>
<td>VCM Incl. GND</td>
<td>Dual</td>
<td>Gain Set Each Direction</td>
<td>Bidirectional</td>
<td>Pin-Set Gain</td>
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<tr>
<td>Current Direction</td>
<td>Bidirectional</td>
<td>Unidirectional</td>
<td>Unidirectional</td>
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<td>Unidirectional</td>
<td>Bidirectional</td>
<td>Bidirectional</td>
<td>Unidirectional</td>
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<tr>
<td>Common Mode Voltage</td>
<td>–5V to 80V</td>
<td>4V to 70V</td>
<td>4V to 70V</td>
<td>5V to 105V</td>
<td>2.7V to 44V</td>
<td>2.7V to 44V</td>
<td>-0.3V to 44V</td>
<td>4V to 70V</td>
<td>4V to 70V</td>
<td>2.5V to 40V</td>
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<tr>
<td>Response Time</td>
<td>1µs</td>
<td>1µs</td>
<td>1µs</td>
<td>3.5µs</td>
<td>3.5µs</td>
<td>3µs</td>
<td>1µs</td>
<td>1µs</td>
<td>10µs</td>
<td>40µs</td>
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<tr>
<td>Vos Maximum</td>
<td>750µV</td>
<td>10µV</td>
<td>300µV</td>
<td>250µV</td>
<td>250µV</td>
<td>300µV</td>
<td>450µV</td>
<td>450µV</td>
<td>100µV</td>
<td>300µV</td>
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<tr>
<td>Vos Drift</td>
<td>5µV/°C</td>
<td>25µV/°C</td>
<td>1µV/°C</td>
<td>1µV/°C</td>
<td>1µV/°C</td>
<td>0.5µV/°C</td>
<td>1.5µV/°C</td>
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<td>0.5µV/°C</td>
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<tr>
<td>Ios Maximum</td>
<td>175µA</td>
<td>3nA</td>
<td>170nA</td>
<td>40nA</td>
<td>40nA</td>
<td>25µA</td>
<td>170nA</td>
<td>170nA</td>
<td>20nA</td>
<td>10µA</td>
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<tr>
<td>Gain</td>
<td>10, 20, 50V/V</td>
<td>R-Set</td>
<td>R-Set</td>
<td>R-Set</td>
<td>R-Set</td>
<td>R-Set</td>
<td>R-Set</td>
<td>R-Set</td>
<td>8V/V</td>
<td>Pin-Set</td>
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<tr>
<td>PSRR Minimum</td>
<td>80dB @ 100kHz</td>
<td>120dB</td>
<td>118dB</td>
<td>106dB</td>
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<td>100dB</td>
<td>110dB</td>
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<td>120dB</td>
<td>105dB</td>
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I²C Temperature, Voltage and Current Monitor
The LTC®2990, a temperature, voltage and current monitor for 3V to 5.5V systems, integrates a 14-bit ADC, 10ppm/°C reference and I²C interface to provide submillivolt voltage resolution, as well as accuracy of ±1°C internally and ±0.5°C remotely when making temperature measurements.

I²C Current and Voltage Monitor
The LTC4151 is a high side power monitor that operates over a wide voltage range of 7V to 80V. In default operation mode, the onboard 12-bit ADC continuously measures high side current, input voltage and an external voltage. Data is reported through the I²C interface when polled by a host.

More Amplifiers for Current Sense Applications
With over 300 amplifiers in our portfolio, we have the tools to solve the most difficult current sense challenges. Visit our website for a comprehensive application note and circuit collection covering low side, high side, unidirectional, bidirectional, negative supply, motor and inductive loads, and many other applications.

Precision Op Amps for Low Side Current Sense

Over-The-Top® Op Amps for High Side Current Sense

Difference Amps for High or Low Side Current Sense

Download our current sense circuit collection and application note at www.linear.com/currentsense