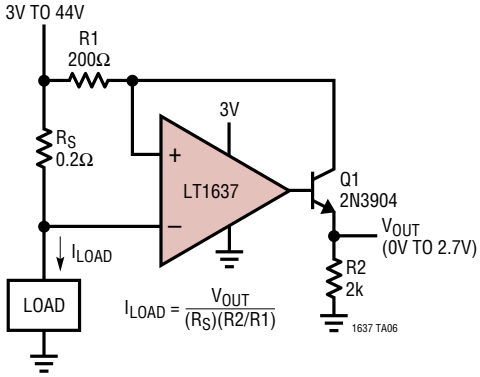
Level Shifting

Quite often it is required to sense current flow in a supply rail that is a much higher voltage potential than the supply voltage for the system electronics. Current sense circuits with high voltage capability are useful to translate information to lower voltage signals for processing.

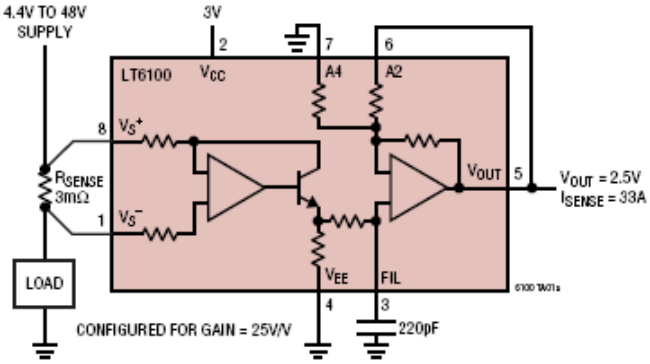
To see other chapters in this Application Note, return to the Introduction.

Over-The-Top Current Sense



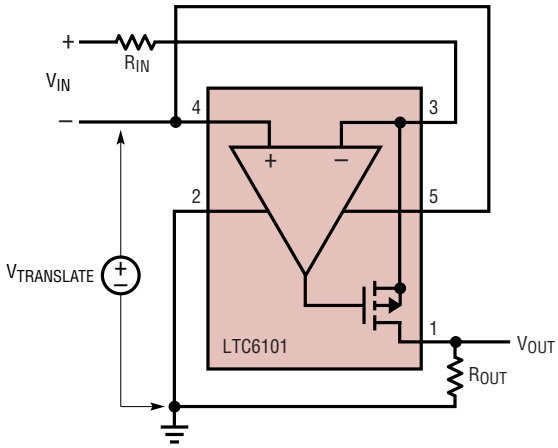
This circuit is a variation on the "classic" high-side circuit, but takes advantage of Over-the-Top input capability to separately supply the IC from a low-voltage rail. This provides a measure of fault protection to downstream circuitry by virtue of the limited output swing set by the low-voltage supply. The disadvantage is V_{OS} in the Over-the-Top mode is generally inferior to other modes, thus less accurate. The finite current gain of the bipolar transistor is a source of small gain error.

V+ Powered Separately from Load Supply



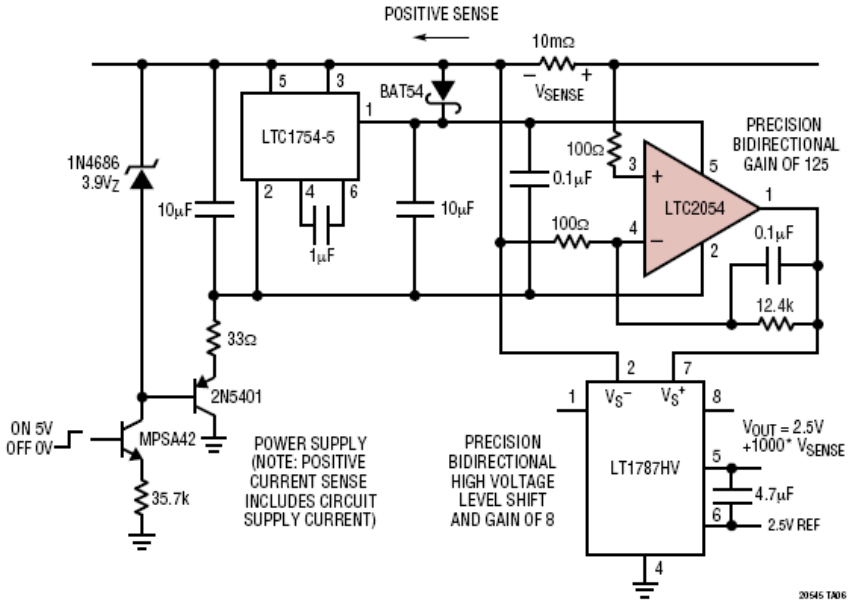
The inputs of the LTC6101 can function from 1.4V above the device positive supply to 48V DC. In this circuit the current flow in the high voltage rail is directly translated to a 0V to 3V range.

Voltage Translator



This is a convenient usage of the LTC6101 current sense amplifier as a high voltage level translator. Differential voltage signals riding on top of a high common mode voltage (up to 105V with the LTC6101HV) get converted to a current, through R_{IN}, and then scaled down to a ground referenced voltage across R_{OUT}.

Low Power, Bidirectional 60V Precision Hi Side Current Sense



Using a very precise zero-drift amplifier as a pre-amp allows for the use of a very small sense resistor in a high voltage supply line. A floating power supply regulates the voltage across the pre-amplifier on any voltage rail up to the 60V limit of the LT1787HV circuit. Overall gain of this circuit is 1000. A 1mA change in current in either direction through the 10mΩ sense resistor will produce a 10mV change in the output voltage.