



APPLICATION NOTE 69

## Micropower Circuit Monitors Positive Supply Current

*Abstract: The following application note shows a circuit that converts the load current of a positive power supply into a ground referenced signal voltage using the ICL7612 operational amplifier.*

The inexpensive circuit of **Figure 1** converts the load current of a positive power supply to a ground-referenced signal voltage, without recourse to the instrumentation amplifier, extra power supply, and matched sets of resistors typical of such circuits. The output current  $I_O$  (proportional to supply current) flows through  $R_O$  to produce  $V_O$ . Because  $I_O$  is generated by a true current source, you can reference  $V_O$  to ground or to any reasonable level within the supply range. The measurement is independent of variations in the supply voltage.

Because the op amp's common-mode range includes the supply rails, it can sense small voltages near the positive rail, such as those across  $R_S$ . Feedback resistor  $R_F$  should equal  $100R_S$  or  $1000R_S$ . The op amp drives P-channel MOSFET  $Q_1$ , whose drain-source current produces a voltage across  $R_F$  equal to that across  $R_S$ , subject to an error of  $\pm V_{OS}$ . As a result,

$$I_O = (I_L R_S)(1/R_F) \text{ and,}$$

$$V_O = (I_L R_S)(R_O/R_F).$$

The component values shown provide a  $V_O$  range of 0 to 1V for the supply-current range 0 to 1A. You can add a trimming potentiometer to null  $V_{OS}$ . The remaining gain error depends on the tolerance of  $R_S$ ,  $R_F$  or  $R_O$ . The op amp draws 20 $\mu$ A and operates with a voltage as low as 2.5V. This op amp supply is produced by the five diodes, which are biased by  $R_Z$  and the input supply voltage as shown in the table.

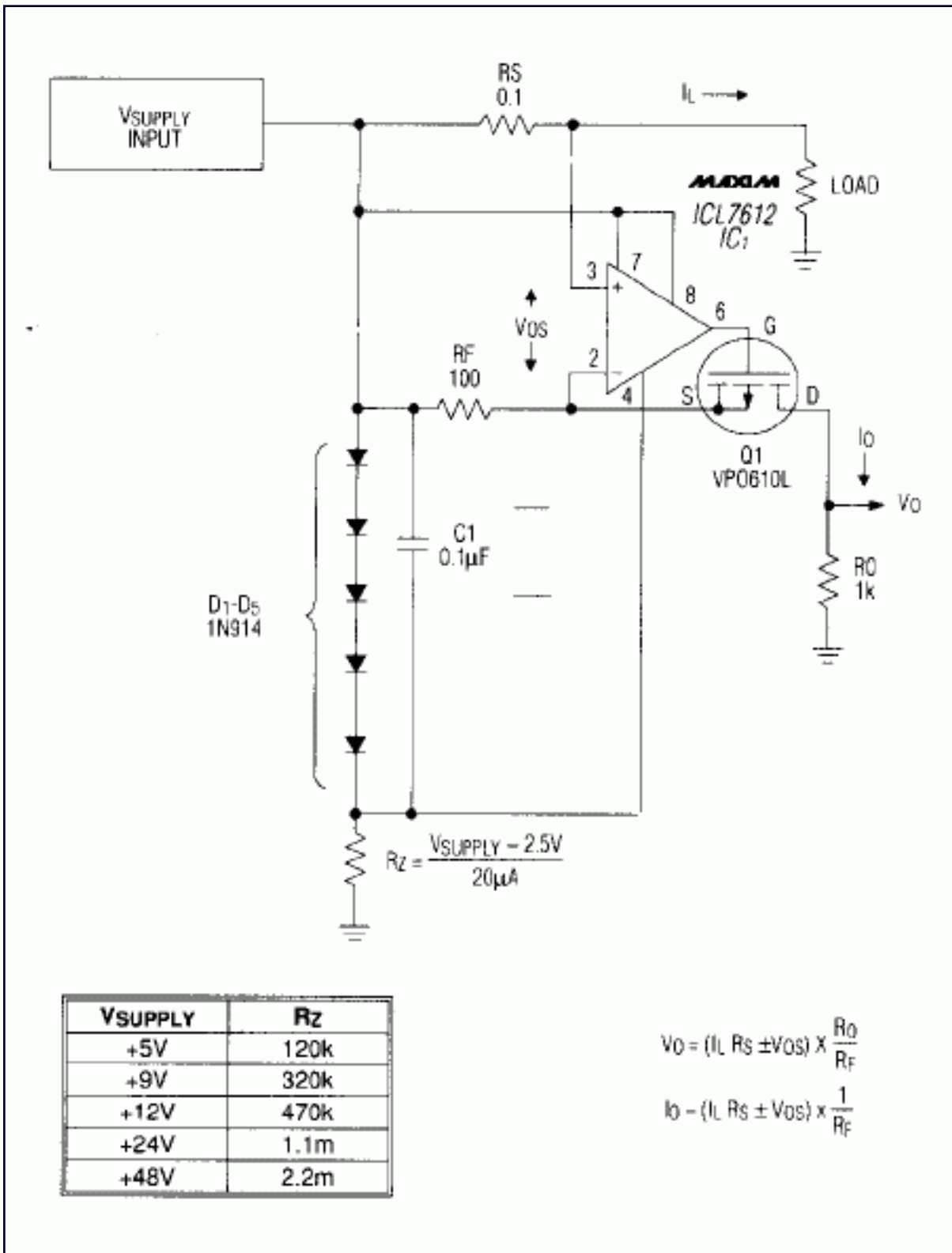


Figure 1. This simple load-current monitor produces a proportional signal voltage  $V_O$ .

Application Note 69: <http://www.maxim-ic.com/an69>

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**Related Parts**

ICL7612: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)

*AN69, AN 69, APP69, Appnote69, Appnote 69*

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