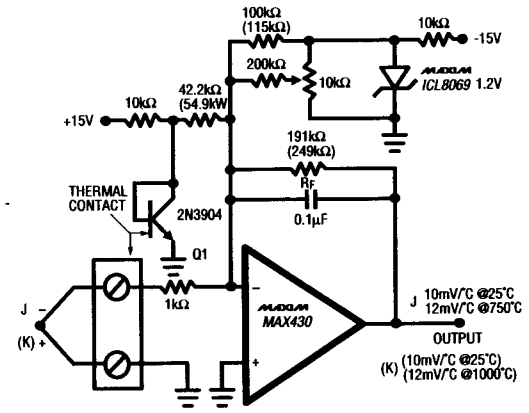
DESIGN SHOWCASE

Thermocouple Preamp

The MAX430 is operated at a gain of 191 to convert the 52µV/°C output of the type J thermocouple to a 10mV/°C signal. The -2.2mV/°C tempco of the 2N3904 is added into the summing junction with a gain of 42.2 to provide cold junction compensation. The ICL8069 is used to remove the offset caused by the 600mV initial voltage of the 2N3904. Adjust the 10K trimpot for the proper reading with the 2N3904 and isothermal connection block at a temperature near the center of the circuit's operating range.

Use the component values shown in parentheses when using a type K thermocouple.



Derive 12V From 8 to 15V Input

You can't derive a regulated 12V output from a 12V lead-acid battery by using a simple boost converter because it can't accept an input voltage that is greater than its output voltage. Conversly, a buck converter won't work either. A buck/boost converter is a combination of buck and boost circuitry that successfully addresses the challenge of the wide input-voltage swing associated with the sealed lead-acid battery.

The circuit of the MAX641 is a buck/boost converter that provides 100mA at 12V and accepts 8 to 16V inputs. Both ends of the circuit's inductor are switched by separate power MOSFETs, which the MAX641 drives directly via its Lx and EXT outputs. These outputs operate out of phase, so the p- and n-channel FETs turn on at the same time. When both the n- and p-channel FETs turn off, the two Schottky diodes steer the coil's discharge current to the 12V output. A slight drawback of this circuit is that the converter's efficiency is less than that of a pure buck or boost converter, because the two MOSFETs and two diodes increase losses in the charge and discharge current paths. Nevertheless, the circuit still delivers 100mA at a respectable 70% efficiency figure.

An additional benefit of this type of circuit is that you can control its operation with a TTL-level signal. Overriding the V_{FB} input with a high-level TTL signal (such as the diode-coupled inverter output shown) fools the MAX641's internal feedback circuitry into thinking that the output is too high, so the chip turns off both MOSFETs. The circuit's idle current is around 400µA.