



The VCC and BAT pins will tap into the cell voltage for IC power and battery-voltage measurement. A low-value sense resistor is placed at the ground end of the battery cell so that the voltage across the sense resistor can be monitored by the gas gauge's high-impedance SRP and SRN inputs. The current through the sense resistor helps determine the amount of energy that has been charged to or discharged from the battery. When selecting a sense resistor value, the designer must consider that the voltage across it should be no more than 100 mV. A resistor value that is too low may introduce errors at low currents. A board layout must ensure that the connections from SRP and SRN to the sense resistor are as close as possible to the sense resistor's ends; i.e., they are Kelvin connections.

The HDQ/SDA and SCL pins are open-drain devices that each require an external pull-up resistor. The resistor should be on the host or main application side so that the sleep function of the gas gauge is enabled whenever a battery pack is disconnected from the portable device. A recommended pull-up resistor value is 10 k $\Omega$ .

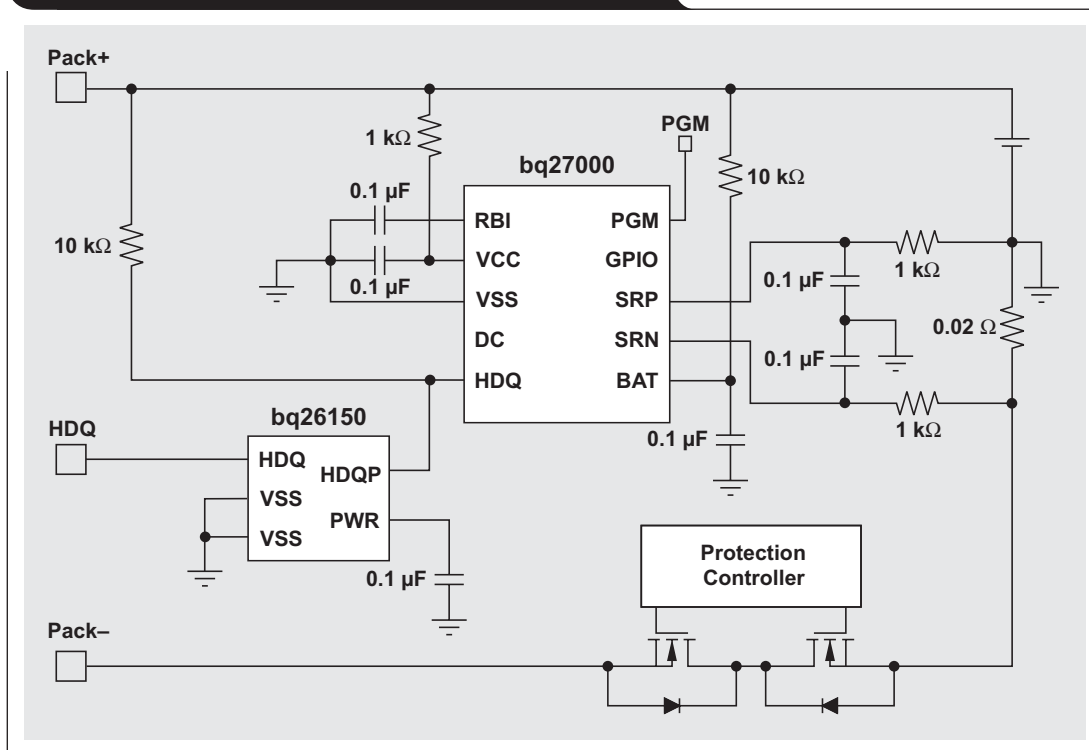
## Battery-pack authentication

Rechargeable batteries for a portable device must be replaced before the life of the device expires. This has opened up a huge market for counterfeiters to supply cheap replacement batteries that may not have the safety and protection circuits required by the original equipment manufacturer.

Therefore, in addition to gas-gauging functionality, a battery pack may include an authentication feature (see Figure 2). The host challenges the battery pack, which contains an IC (TI's bq26150) that calculates a cyclic redundancy check (CRC). This CRC is based on the challenge and the CRC polynomial secretly defined within the IC. The host also calculates the CRC and compares values to determine if authentication is successful. If not, the host decides whether to try again or disallow powering of the system through the battery.

Once the battery is authenticated, the bq26150 is given a command to ensure that all communication through the data line is relayed between the host and the gas gauge.

**Figure 2. Circuit with bq27000 and authentication IC**





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