

## 6 Troubleshooting Tips

### 6.1 Minimizing Leakage Current When Protection FETs are Off

During normal operation, the protection FETs are ON and the host system is powered by the battery. In this configuration, when the protection FETs turn OFF then the host system powers down. However, in systems where there is an alternative power supply for the host, when the battery protection FETs are turned OFF there is a leakage path between PACK+ (TBD) and BAT- through the I/O connection between the pack and the system. This is commonly seen when the battery electronics are in development.

If this current is of concern, the following changes (Figure 10) can be made to the circuit so each I/O is floated when the FETs are OFF, regardless of the pull up state on the host-system side of the I/O.

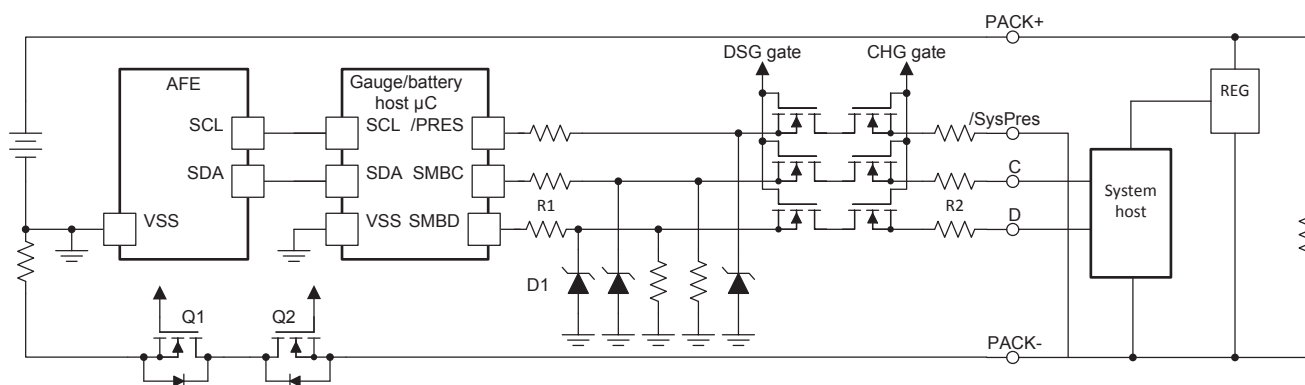


Figure 10. Circuit Changes

### 6.2 Gauging Error Tips

The gas gauging Compensated End of Discharge Voltage (CEDV) algorithm has many different sources of error, some are obvious and some are not. Listed are some of those sources and details on how to improve the performance.

#### 6.2.1 Gauging Error at Extreme Temperatures

This could be related to several factors:

1. CEDV Coefficients are temperature related. If the normal operating temperature is low or high, it is best to calculate the CEDV coefficients with data in the expected use range. If the expected use range of temperature is wide, then there will be variation in gas gauging accuracy.
2. Sense resistor choice can affect coulomb counting at extreme temperatures. The parts per million (ppm) / °C rating of the sense resistor should be accounted for in the gas gauging error budget, a 75 ppm or better sense resistor is recommended for optimal accuracy.

#### 6.2.2 Accuracy After Reset is Poor until a Learn Cycle

This source of error can be corrected easily by setting the **QMAX Pack** value to one close to the real QMAX of the battery pack. If this value is over or under estimated, it can cause the initial values loaded into *RemainingCapacity()* to be inaccurate.

#### 6.2.3 Avoiding System Shutdown When Gauging Error is Unavoidable

The reserve capacity feature is intended to allow for some capacity to remain in the battery, even after *RemainingStateOfCharge() = 0%*. This capacity can be used for a controlled shutdown after 0% has been reached or to offset any expected error in the *RSOC()* value.