

## PROTECTION CIRCUIT MODULES

Safety protection from overheating is a critical component of every [lithium battery pack](#). While it is true that UL has very specific regulations concerning the safety of lithium battery packs there is no substitute for significant experience in deploying electronics and other physical protections to assure safe operation of your end product.



### Primary Safety Circuits

The primary safety circuits manage all the basic safety functions: over-voltage, under-voltage, over-current and sometimes over and under temperature. Additionally, most of the world class designs that we produce also include a secondary safety circuit which is there to protect the cell from charge in the event the primary safety circuit fails.

### Protection Circuits

The protection circuits are contained in what is commonly referred to as the Protection Circuit Module (PCM). While there are many off the shelf PCMs that you can buy, each individual application requires unique parameters are maintained so it is not recommended that these off the shelf modules are used for anything other than lab prototypes.

The PCM is a part of the [battery management system \(BMS\)](#) which manages the electronics of a rechargeable battery pack by monitoring its state,

reporting that data, balancing the cells along with protecting the battery, and controlling its environment.

Battery protection circuits for the most demanding applications are operated mostly by Integrated Circuits (ICs) typically using MOSFETs to switch lithium cells in and out of circuit. The over-current protection is normally provided when the IC detects the upper current limit of the battery being reached and then interrupts the circuit.

### **Fail Safe Environments**

Many of these protections are resettable but in fail safe environments they can be designed so that they are not. The two key manufacturers of these ICs are Texas Instruments (TI) and Sieko, both ICs require system programming based upon the functionality of the specific battery packs. This is why it is critical to work with an experienced company who has a history of these designs which will include a library of the software and firmware that can be transitioned to any application.

### **Importance of Protection Circuit Modules**

As many of the largest battery cell manufacturer's move away from smaller applications to focus on the electric vehicle market, a lot of the newer and smaller companies are now providing cells for critical applications. This is why PCMs using primary and secondary safety mechanism is of the utmost importance for any company that wants to make their device portable and safe to use.