

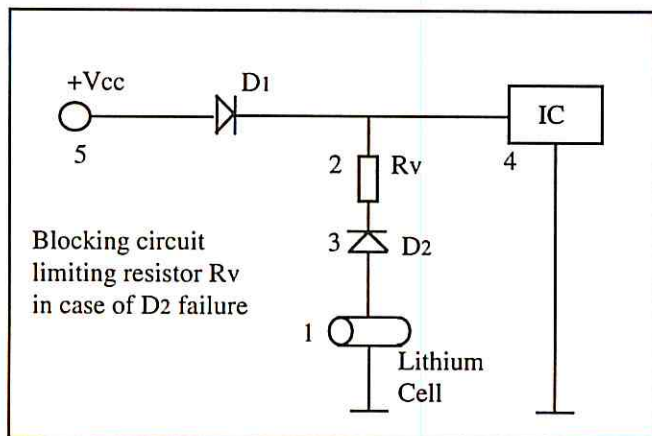
Electrochem Lithium Batteries

Lithium Battery Design Considerations

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Charging any type of primary battery can result in safety hazards. If a sufficiently high charging voltage is applied to a primary cell, the charging current can cause the cell to leak, vent or explode. Therefore, diode protection is recommended in the design of power supplies where primary cells may be exposed to charging currents.

The following examples for using protective diodes and resistors are meant to provide basic precautionary information on designing with lithium batteries. Too many possibilities exist to issue a general guideline for all applications. All questions concerning protective diodes and resistors should be referred to an authorized Electrochem representative.



Applications

Shown above is an example of a memory backup circuit using an Electrochem Lithium Battery.

- 1) Electrochem Lithium Battery
- 2) Battery protective resistor
- 3) Blocking diode
- 4) Equipment memory device
- 5) DC power supply

Lithium Battery Packs

When an application requires more capacity or higher voltage than a single cell can deliver, a multicell pack design is used. Single cells connected in parallel will yield capacity proportional to the number of cells. Single cells connected in series will yield voltage proportional to the number of cells. For applications which require higher voltage *and* higher capacity, a battery pack can be constructed using a combination of series and parallel cells.

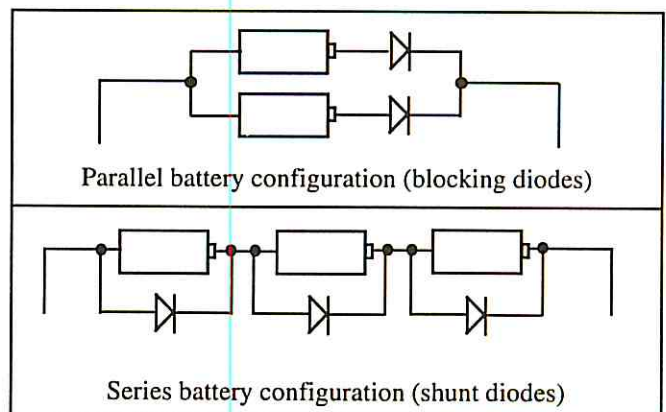
Parallel Battery Pack Configurations

In the design of battery packs where batteries are connected in parallel, consideration is given to the fact that each battery string, or leg, may not be at the same voltage throughout the life of the battery pack. This imbalance may occur as a result of unequal discharge or some other malfunction. A situation could arise where a battery string is subjected to a charging condition or reverse current. This condition is avoided by the use of diodes. The function of the diode in a parallel battery pack configuration is to prevent a battery from seeing the charging currents of another string.

Series Battery Pack Configurations

In the design of battery packs where batteries are connected in series, the same considerations are given to possible circuit malfunctions. In the case of batteries connected in series, parallel or shunt diodes are often used to protect the batteries. Too many possibilities exist for using protective diodes in packs with cells connected in series. Therefore, a general explanation cannot be addressed here. We recommend you contact an authorized Electrochem representative for more information regarding the use of protective diodes in series battery configurations.

The following diagram illustrates the placement of blocking diodes in a parallel configuration and shunt diodes in a series battery configuration.



Please remember, this information is provided as general precautions for the use of diodes in lithium battery power supplies. The designer should be aware of other factors that enter into the overall designs of battery packs, including: thermal management, adequate electrical insulation, fusing, and provisions for cell expansion.