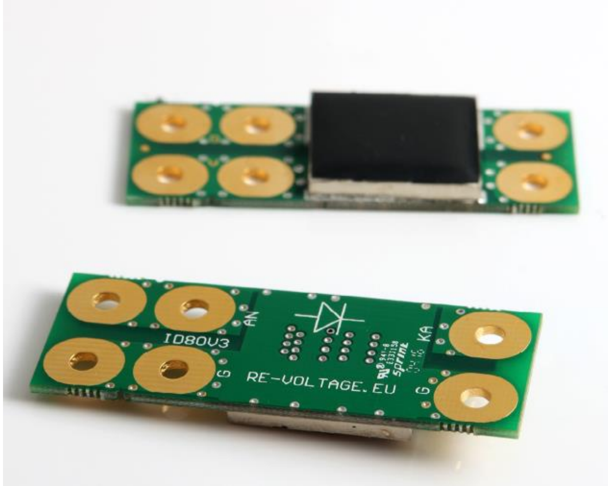
Ideal Diode ID80V3

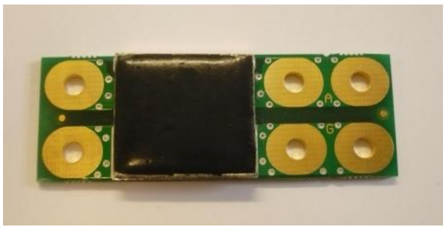
Datasheet – December 2016

Multi-purpose ideal diode module



9 - 90 V working

30 A Forward Current



Description

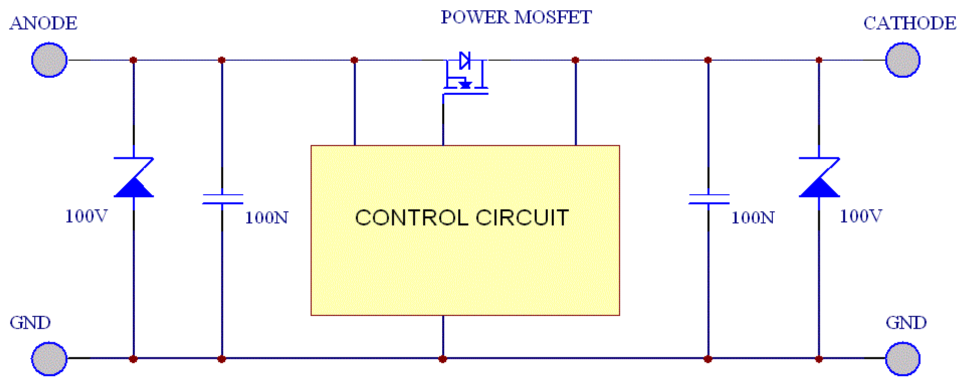
The ID80V3 is a diode module that eliminates the forward voltage drop seen with a conventional diode. Thus it can carry high forward currents without significant heat dissipation.

Applications

- Battery combining systems
- Back up power supplies
- Battery charging systems
- Solar PV cell arrays
- Battery/PSU isolators
- Electric vehicles
- RV and Boat electric systems

The ID80V3 is electrically similar to the ID80V2 but with an improved mechanical arrangement and a lower resistance internal FET.

Block Diagram



Principle of operation

The control circuit detects whether the diode is forward or reverse biassed and controls the FET gate voltage accordingly. In reverse mode the inverse voltage handling is set by the FET rating. In forward mode the FET is turned on and the voltage drop from a conventional PN junction is eliminated.

Performance Data

Peak Inverse Voltage	90	V
Peak Forward Current	75	A
Continuous Forward Current (no heatsinking)	15	A
Continuous Forward Current (with heatsinking)	30	A
Supply current (reverse biassed mode)	1	mA
Supply current (forward biassed mode)	1.5	mA
Minimum operating voltage	9	V
Maximum operating voltage	90	V

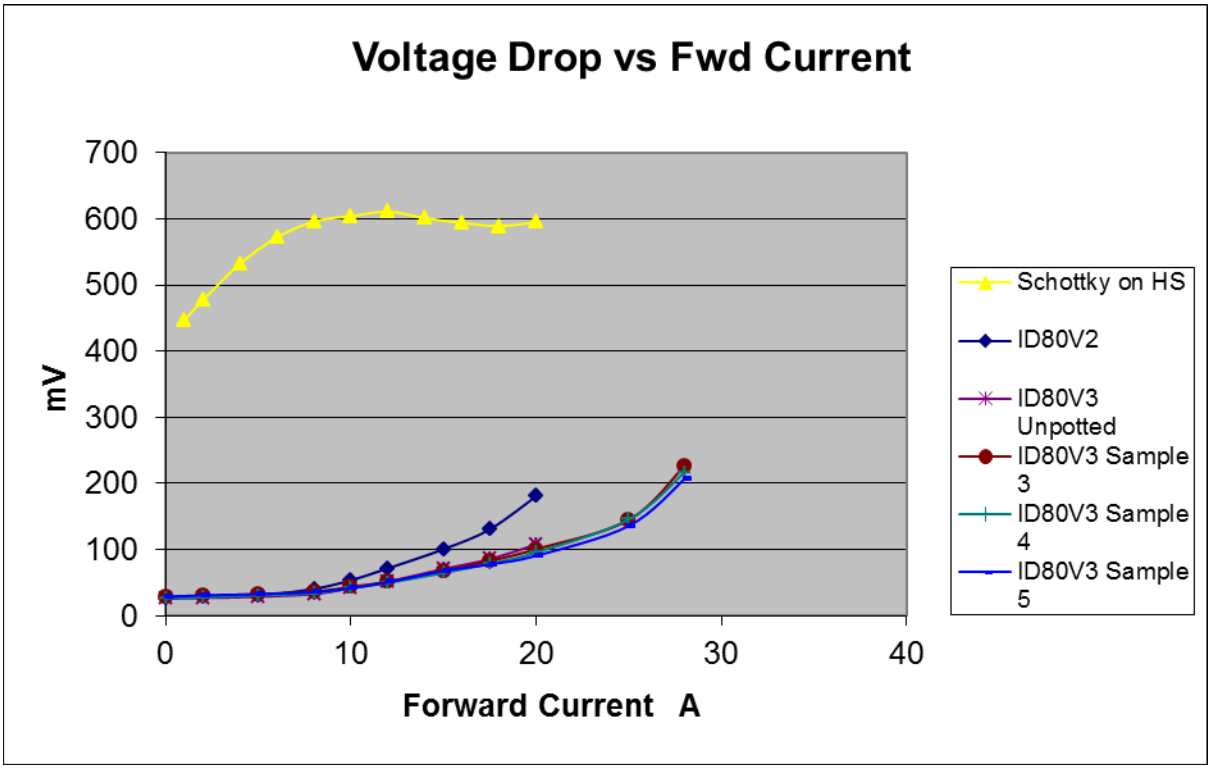
Notes:

The continuous forward current rating is set by thermal considerations. Up to 15 A no heatsinking is required.

The module is protected by 100 V threshold transient protection diodes. A minimum of 9 V difference between cathode and ground is needed for the control circuit to turn on the FET. The operating range is therefore 9 to 90 V, making the module suitable for 12 to 72 V battery systems. A nominal 72 V battery pack can be up to 90 V fresh off the charger.

Forward voltage drop

The plot below shows the forward voltage drop versus current without heatsinking.

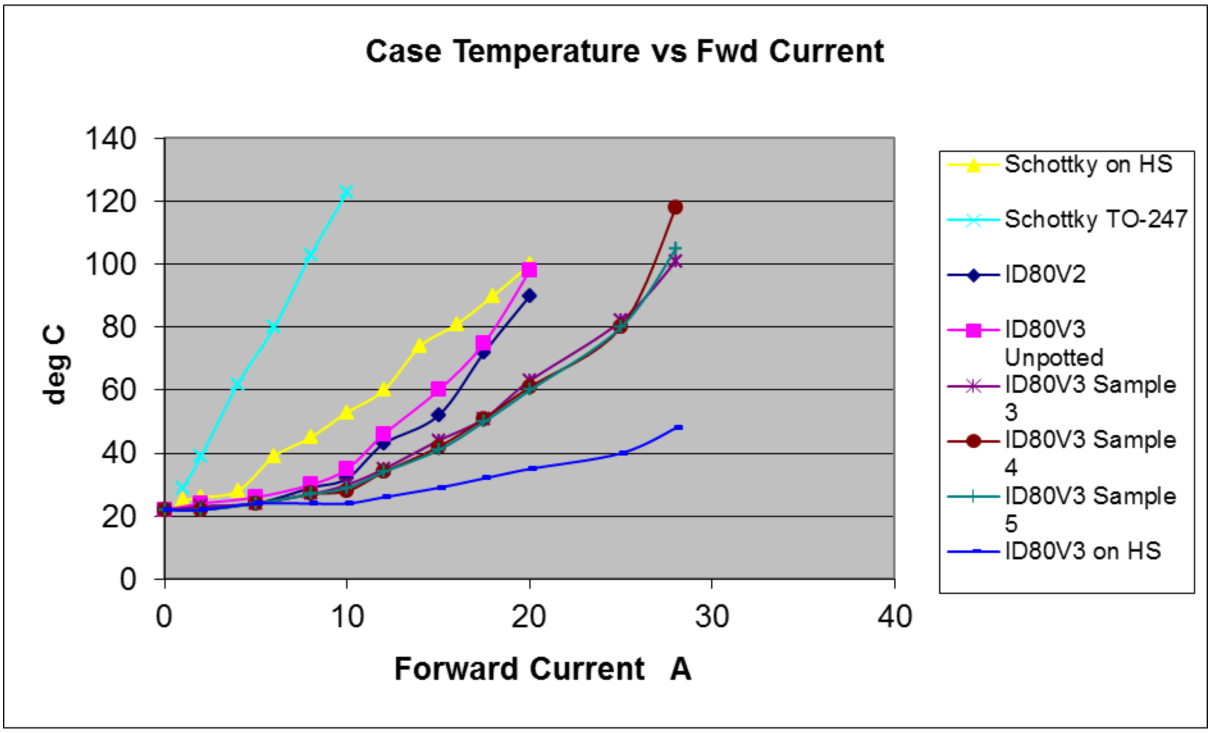


The voltage drop is measured from terminal to terminal of the module.

A TO-247 package Schottky diode is shown for comparison.

Thermal performance

The plot below shows the temperature that the ID setttles at with various currents and levels of heatsinking. The temperatures plotted are approximate values in still air taken with a IR thermometer.



Again, a Schottky diode with and without heatsinking is included for comparison, as is the earlier ID80V2.

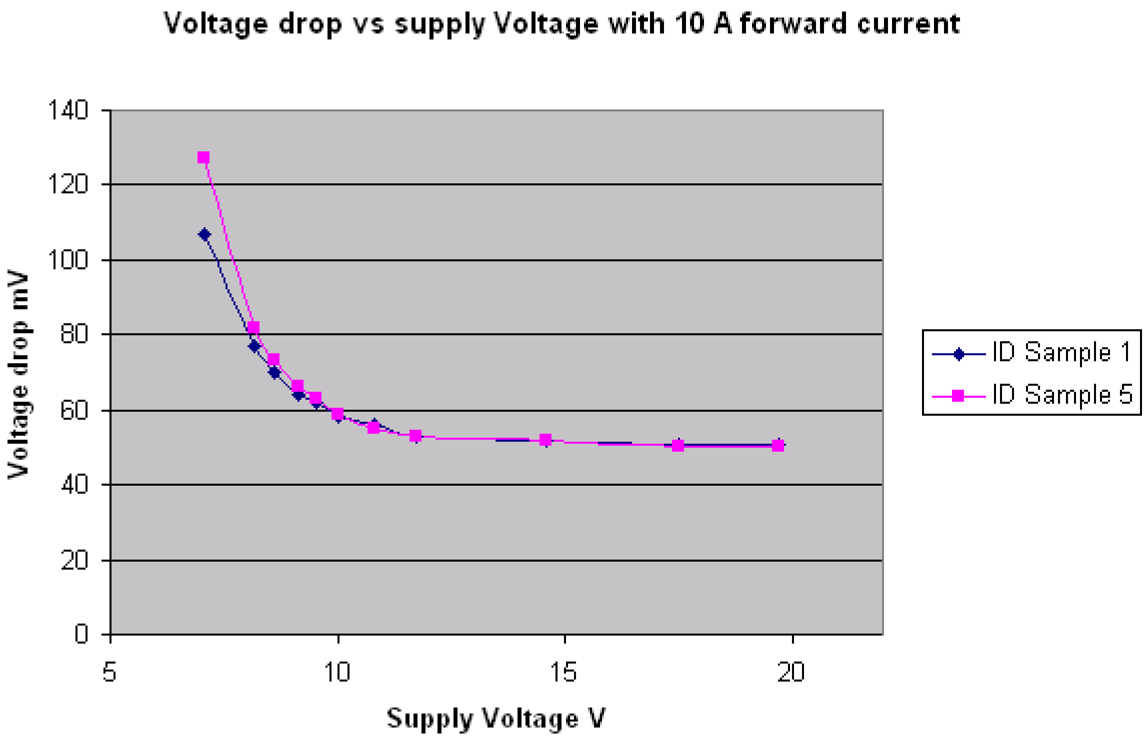
The maximum continuous current depends on the permissible temperature rise, the level of heatsinking and the air circulation around the module.

Up to 15 A, no heatsink or special precautions are necessary.
Up to 20 A, some means of carrying a small amount of heat away is recommended, eg., a small heatsink, forced airflow, connection to a busbar or stacked with another ID not carrying the same current.
At 25 A a means of carrying heat away is needed.
30 A and over is possible with careful heatsinking. Above 25 A, however, it is worth considering paralleling modules. For instance, 2 modules in parallel will carry 30 A with no heatsink, whereas a single module will require a heatsink.

With continuous currents of greater than 20 A, the potential for thermal runaway must be considered. The resistance of the ID shows a positive thermal coefficient; as it heats up the resistance increases and the power dissipation increases, leading to a greater heating effect.

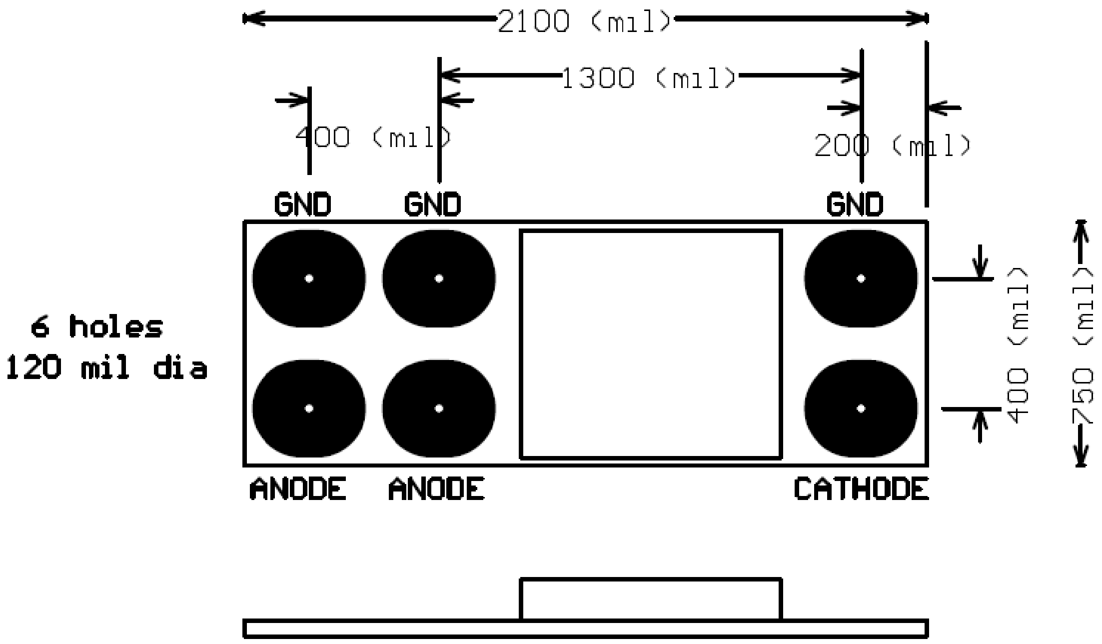
In the plot above, at 25 A with no heatsink and still air at 20 C, the ID settles at 80 C (for comparison the value for the ID80V2 was 100-120 C). This is not a recommended operating condition as a small increase in current or a reduction in heat flow away can trigger a thermal runaway. The heat generated at 25 A is less than 4 W so only a small heatsink is required.

Minimum and maximum operating voltages

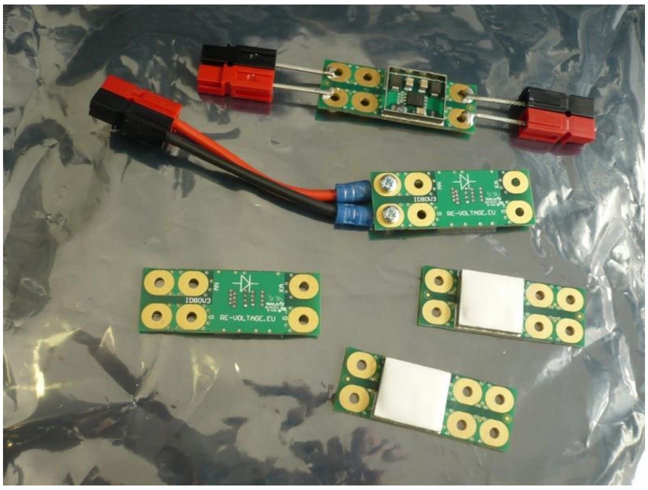


The minimum recommended supply voltage is 9 V. The maximum is 90 V. The module is suitable for battery systems with nominal system voltages from 12 to 72 V.

Dimensions and Pinout



Connections



Cable connections may be made to the module by soldering, or by ring terminals and M3 bolts.

Anderson Powerpole PCB connectors can also be directly soldered to the modules.

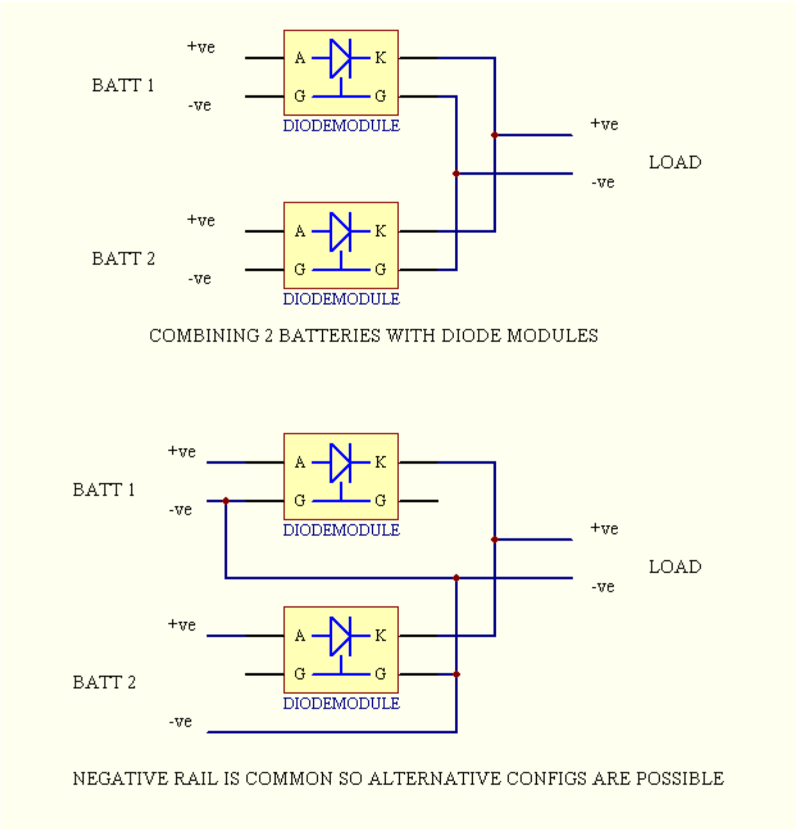
The modules can also be stacked in parallel layers, so that common connections may be made with M3 bolts and spacers.

Dual terminals are provided for the Anode and for Ground at the Anode end. This is to facilitate fitting to busbars. It is possible to stack the modules side by side and run parallel busbars for Anode/Ground/Cathode as required.

The spare terminals at the Anode end can be cut off if not required. Notches on the edge of the PCB show the cut position. Take care to leave a clean cut as it is a multi layer PCB.

Application wiring diagrams

On small electric vehicles, such as e-bikes, it is common to use an additional battery pack to increase range. If the packs are at different states of charge then large damaging cross currents can flow when they are connected. The use of diodes eliminates this problem, and even allows packs of different sizes and/or chemistry to be combined. Normal diodes create a voltage drop which wastes power and requires heat removal. The Ideal Diode modules can be used to protect the battery packs without causing these problems.



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