Absolute Maximum Ratings

Exceeding the specified absolute maximum ratings may severely damage the module. These ratings are intended for absolute worst case operating conditions and are not to be interpreted as a recommended operating condition.

Fusing Considerations

Encapsulated DC/DC modules can be used in a variety of applications, ranging from simple stand-alone operation to an integrated part of a sophisticated power architecture. To preserve maximum flexibility, internal fusing is not included. However, to achieve maximum safety and system protection, DC inputs should always be fused.
In general, a slow-blow fuse with 150% to 200% of the maximum input current is used see figure 1.
Whether a fast or slow blow fuse is required depends upon the application. Generally, a slow blow fuse will provide adequate protection and the module's internal circuitry will handle any short period transient faults. A fast blow fuse is recommended for redundant systems to prevent a failed unit form shorting the input bus.

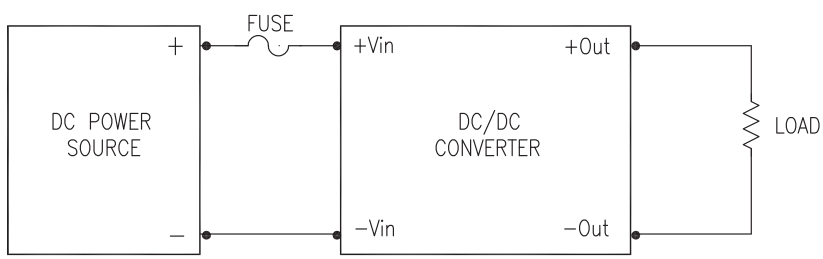


Figure 1

Maximum Operating Temperature

The maximum operating temperature for a power converter is determined by the internal temperature rise of its components. In a DC/DC converter, a small portion of the input power is not converted to out put power but is dissipated as heat inside the module. The amount of power dissipated depends on the efficiency of the converter, defined as the ratio of useful output power to supplied input power.

At an ambient temperature of 70ºC, the internal temperature of some components may be over 100ºC. The internal temperature of any component must never exceed its maximum operating temperature and for this reason, many DC/DC converters specify derated outputs at higher operating temperatures. In other cases the power converter is specifically designed with special components and thermal techniques to allow operation at full load to 71ºC with no derating.

Whether or not a unit is derated at higher temperatures, it is a good idea to provide additional cooling above 50ºC ambient temperature. It not only keeps a power converter operating within its specified operating area but increases its reliability.

For normal operation, the power module should not be run at the maximum allowable temperatures since the Mean Time Between Failures (MTBF) will reduce sharply as temperature increases.

Power Line Transients

Power line transients can cause damage to a DC/DC converter. If voltage transients exceed the maximum rated input voltage of a DC/DC converter, it may be necessary to provide external protection devices.

Figure 2 shows transient protection methods commonly used. A DC/DC converter input is protected by a fuse and a TVS (or power zener diode). The TVS effectively absorbs and dissipates transient voltae above its breakdown voltage.

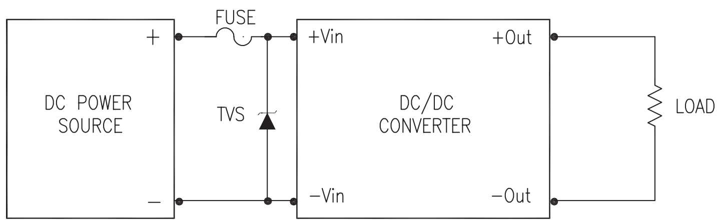


Figure 2

No Load Operation

The problem with no load operation of an unregulated DC/DC converter is the output voltage will exceed specified tolerance, maybe +20% or more. In fact, output voltage is undefined when loading below 10% of maximum output current.

Keep 10% loading on the output to ensure the output voltage remains within a specefied tolerance. However, to achieve maximum safety, 2% loading is necessary.

Maximum Capacitive Load

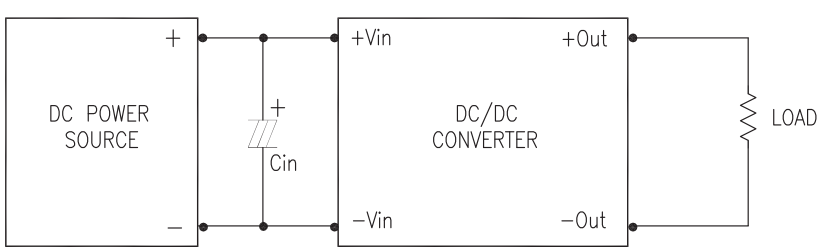
Each model has a maximum allowable capacitance connected at the output. If the limit is exceeded the power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time.
For optimum performance a maximum capacitive load is specified for each model. Current limiting maximum capacitance can be found in the datasheet.

Over Current Protection

To provide protection in a fault (output overload) condition, fully regulated converters are equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limiting inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

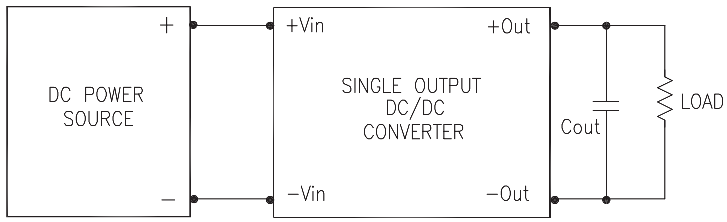
Input Source Impedance

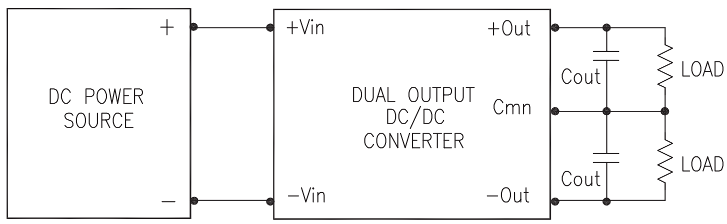
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
A capacitor mounted close to the power module helps ensure stability of the unit. It is recommended to use a good quality low Equivalent Series Resistance capacitor of 10μF for the 5V input devices, 3.3μF for the 12V input devices and a 2.2μF for the 24V and 48V devices. ESR should be less than 1.0Ω at 100 KHz



Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance.
To reduce output ripple, it is recommended to use the specified capacitors for each series.





Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 90ºC. The derating curves are determine from measurements obtained in an experimental apparatus.