Module Do's and Don'ts

Electrical Considerations

Gate In and Gate Out Terminals:
Logic Disable

When the Gate In terminal of a driver module is pulled low with respect to $-V_{in}$ **(CAUTION: with off-line applications $-V_{in}$ is not earth ground)**, the module shuts off (see Figure 1, page 9-1). In Logic Disable mode, the Gate In terminal should be driven from either an "open collector" or electromechanical switch that can sink 6 mA when on (Gate In voltage less than 0.65V). If driven from an electromechanical switch or relay, a 1 µF capacitor should be connected from Gate In to $-V_{in}$ to eliminate the effects of switch "bounce". The 1 µF capacitor may be required in all applications to provide a "soft start" if the unit is disabled and enabled quickly. This terminal is not intended for repetitive on/off/on operation.

High Power Arrays

The pulsed signal at the Gate Out terminal of a regulating driver module is used to synchronously drive the Gate In terminal of a companion booster module to effect power sharing between the driver and the booster (refer to Figure 5, page 9-2). Daisy-chaining additional boosters (i.e., connecting Gate Out to Gate In of a succeeding unit) leads to a virtually unlimited power expansion capability. MI/VI-200 series modules of the same family and power level can be paralleled (i.e., DRIVER, VI-260-CU with BOOSTER, VI-B60-CU).

In general:

- Don't drive the Gate In terminal from an "analog" voltage source.
- Don't leave Gate In terminals of booster modules unterminated.
- Don't overload Gate Out; limit load to a single Vicor module Gate In connection, or 1 Kohm, minimum, in parallel with 100 pF, maximum.
- Don't skimp on traces that interconnect module $-V_{in}$ terminals in high power arrays. Gate In and Gate Out are referenced to $-V_{in}$; heavy, properly laid out traces will minimize parasitic impedances that could interfere with proper operation.
- Do use a decoupling capacitor across each module's input (see *Input Source Impedance* below).
- Do use a fuse or breaker on each module's input to prevent fire in the event of module failure.

Input Source Impedance

The converter should be connected to an input source that exhibits low AC impedance. A small electrolytic capacitor should be mounted close to the module's input pins if source impedance is questionable. This will restore low AC impedance, while avoiding the potential resonance associated with "high-Q" film capacitors. The minimum value of the capacitor, in microfarads, should be C (µF) = 400 ÷ V_{in} minimum. Example: V_{in}, minimum, for a VI-260-CV is 200V. The minimum capacitance would be 400 ÷ 200 = 2 µF. For applications involving long line or high inductance additional capacitance will be required.

Input Transients

Don't exceed the transient input voltage rating of the converter. Input Attenuator Modules or surge suppressors, in combination with appropriate filtering, should be used in off-line applications or in applications where source transients may be induced by load changes, blown fuses, etc.

NOTE: On any converter module with a high line rating in excess of 250Vdc, do not allow the rate of change of input voltage to exceed 10V/µs for any input voltage change in excess of 250V.

The level of transient suppression required will depend on the severity of the transients. A zener diode, TRANSZORB™ or the like will provide suppression of transients of under 100 µs, act as

Electrical Considerations (cont)

a voltage clipper for DC input transients and provide reverse input protection. It may be necessary to incorporate an LC filter for larger energy transients. This LC filter will integrate the transient energy while the zener clips the peak voltages. The Q of this filter should be kept low to avoid potential resonance problems. Please see Section 14, *VI-IAM/MI-IAM Input Attenuator Module*, for additional information on transient suppression.

Output OVP

Each module, with the exception of VI-J00s and MI-J00s, has an internal overvoltage protection circuit that monitors the voltage across the output power terminals. It is designed to latch the converter off at 115% to 135% of rated output voltage. It is not a crowbar circuit, and if a module is trimmed above 110% of rated output voltage, OVP may be activated. **CAUTION**: **when trimming up VI-J00 or MI-J00 modules, additional care should be taken as an improper component selection could result in module failure. Improper connection of the sense leads on VI-J00 or MI-J00 can also result in an over voltage condition and module failure.**

Input Reverse Voltage Protection

The module may be protected against reverse input voltages by the addition of a diode in series with the positive input, or a reverse shunt diode with a fuse in series with the positive input. Input Attenuator Modules (VI-IAMs) provide input reverse voltage protection when used with a current limiting device (fuse).

Thermal/Mechanical Considerations

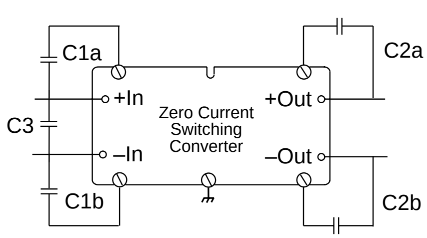
Baseplate

Operating temperature of the baseplate, as measured at the center mounting slot on the $-V_{in}$, $-V_{out}$ side, cannot exceed rated maximum. Thermal compound or a thermal pad should be used when mounting the module baseplate to a chassis or heatsink. All six mounting holes should be used. Number six (#6) machine screws should be torqued to 5-7 in.-lbs., and use of Belville washers is recommended.

EMC Considerations

All applications utilizing DC-DC converters should be properly bypassed, even if no EMC standards need to be met. Bypass V_{in} and V_{out} pins to each module baseplate as shown in Figure 1 below. Lead length should be as short as possible. Recommended values vary depending on the front end, if any, that is used with the modules, and are indicated on the appropriate data sheet. In most applications, C1 is a 4700 pF “Y” capacitor (Vicor P/N 01000) carrying the appropriate safety agency approval; C2 is a 4700 pF “Y” capacitor (Vicor P/N 01000) or a .01 µF ceramic capacitor rated at 500V. In PC board-mount applications, each of these components is typically small enough to fit under the module baseplate flange.

Figure 1.



Safety Considerations

Shock Hazard

Agency compliance requires that the baseplate be grounded or made inaccessible.

Fusing

Internal fusing is not provided in Vicor DC-DC converters. To meet safety agency conditions, a fuse is required. This fuse should be placed in the +input lead, not the –input lead, as opening of the –input lead will cause the gate terminals to rise to the potential of the +input lead, causing possible damage to other modules or circuits that share common Gate In or Gate Out connections.

Safety agency conditions of acceptability require module input fusing. The VI-x7x, VI-x6x and VI-x5x require the use of a Buss PC-Tron fuse, or other DC-rated fuse. See below for suggested fuse ratings. This fuse should be inserted in the (+) input lead, as opening of the (–) input lead will cause the gate terminals to rise to the voltage of the (+) input lead, possibly causing destruction of the connected modules or devices.

VI-27X	PC-Tron 2.5A	VI-J7X	PC-Tron 2.5A
VI-26X	PC-Tron 3A	VI-J6X	PC-Tron 3A
VI-25X	PC-Tron 5A	VI-J5X	PC-Tron 5A
VI-2TX	PC-Tron 5A	VI-JTX	PC-Tron 5A
VI-24X	6A/125V	VI-J4X	PC-Tron 5A
VI-2NX	8A/125V	VI-JNX	PC-Tron 5A
VI-23X	8A/125V	VI-J3X	PC-Tron 5A
VI-22X	8A/60V	VI-J2X	PC-Tron 5A
VI-2WX	12A/50V	VI-JWX	8A/60V
VI-21X	12A/32V	VI-J1X	8A/60V
VI-20X	12A/32V	VI-J0X	8A/60V

MegaMod Family

Please consult Vicor’s Applications Engineering Department for MegaMod fuse values.

This fuse should be inserted in the (+) input lead, as opening of the (–) input lead will cause the gate terminals to rise to the voltage of the (+) input lead, possibly causing destruction of connected modules or devices.