

Remote Sensing Adds Voltage Stability to DC/DC Converter Outputs

As distributed power DC/DC converters have gotten smaller and more powerful, certain functions, such as remote sense are sometimes not included in standard products. If a design has a long and resistive cable run and/or is routed through a connector, voltage drops at the end of the run is an issue. The only option in the past was to trim the voltage at the converter output high so that at the end of their cable, the voltage never got too low. The circuit below was developed to provide remote sense. The circuit consists of a TL431 active reference which senses the voltage directly at the load, level shifts the output via a 2N3906 transistor and feeds a voltage to the DC/DC converters trim pin. With the converter shown in Figure 1, the output voltage may be trimmed up approximately 5% from its nominal value of 5, 12 or 15 volts. Most commercial converters use a value of 5% or 10% for their trim pin's sensitivity. Also, most converters use the polarity that if the trim pin is pulled low the output gets higher. In fact, for this circuit to work correctly, the converter it is applied to must have this polarity.

This design also has some advantages over conventional remote sensing circuits. If the sense lines are disconnected on a conventional internal remote sense design, the output voltage usually climbs high enough to either activate the internal overvoltage circuit or cause system damage. Because the added circuit works at the trim pin's input, and that input is limited to typically moving the output up 5 to 10% (depending on the converter), the output voltage cannot, under any circumstances, cause an unbounded overvoltage condition; even if the sense pins are connected backwards. In the example shown, a 20 watt, 5 volt at 4 amp converter can deliver 4 amps into a total line resistance of 75 milliohms (0.3 volt total drop) and still keep the voltage at the load at 5.0 volts. Without the circuit, the voltage at the load would be 4.7 volts.

Conclusion

A simple to add circuit can enhance the operation of high density DC/DC converters that have an output trim function but no output voltage remote sensing circuitry. This circuit can be applied to 5, 12 or 15 volt output power supplies.

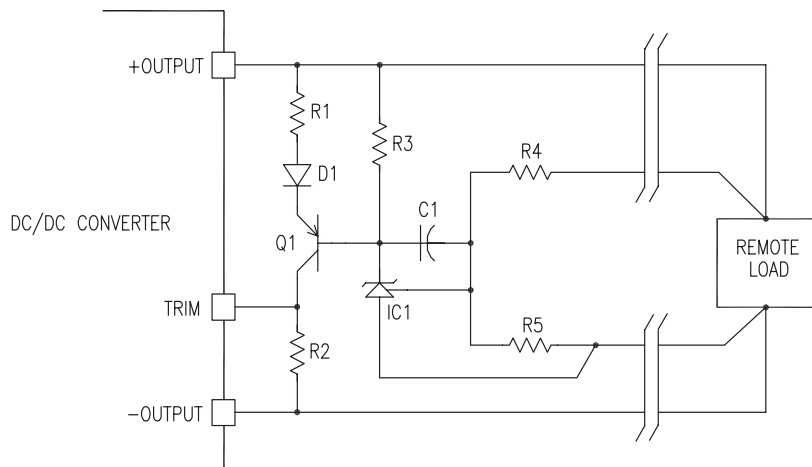


Figure 1.

| Parts List | | | |
|----------------|----------------------------|-----------------|-----------------------|
| Ref Designator | Description | Ref. Designator | Description |
| R1 | 470 ohm, 1/4 W, 5% | C1 | 0.01µF, 100V, Ceramic |
| R2 | 1.0K, 1/4W, 5% | D1 | 1N4448 |
| R3 | 2.4K, 1/4W, 5% | Q1 | 2N3906 |
| R5 | 4.99K, 1/4W, 1% | IC1 | TL431CLP |
| R4 | FOR 5V 4.99K, 1/4W, 1% | | |
| | FOR 12V 19.1K, 1/4W, 1% | | |
| | FOR 15V 24.9K, 1/4W, 1% | | |

