Remote Sensing Adds Voltage Stability to DC/DC Converter Outputs

Application Note 10

As distributed power DC/DC converters get ever smaller and more powerful, certain functions, such as remote sense are sometimes not included in standard products. This is usually done because 90% or more of the people buying the supplies don't actually need remote sensing in their systems. But what about that other 10% of the people? Either their designs have long and resistive cable runs or they must route power through a connector. In this case, they can actually be supplying marginal voltage to the outermost parts of the circuit card. 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.

To include those 10% into the "Stiff Voltage" club, I developed the 45 cent circuit. This little 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, a CALEX NT series 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 CALEX 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, dangerously low for reliable TTL or HCMOS operation.

Conclusion

A simple to add, 45 cent circuit can make life more tolerable with 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 and may be just the ticket in allowing you to use a cost effective standard converter instead of a custom design.

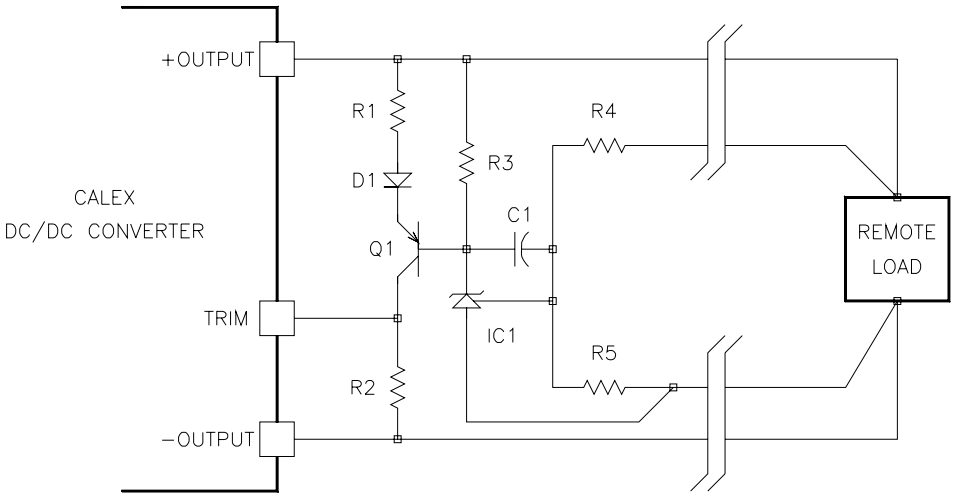

Figure 1.
Remote Sense Circuit.

Parts List

Ref Des.		Description	Ref Des.	Description
R1		470 ohm, ¼ W, 5%	C1	0.01µF, 100V, CERAMIC
R2		1.0K, ¼ W, 5%	D1	1N4448
R3		2.4K, ¼ W, 5%	Q1	2N3906
R5		4.99K, ¼ W, 1%	IC1	TL431CLP
R4	for 5V	4.99K, ¼ W, 1%		
	for 12V	19.1K, ¼ W, 1%		
	for 15V	24.9K, ¼ W, 1%		