Isolated Comparator Detects Failed Telecom Supplies

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Introduction

Often, it is necessary to know when a telecom power supply drops below its nominal value. This generally indicates a failure and may dictate replacement of the supply or some other type of system maintenance. The circuit shown in Figure 1 uses the LTC1531 self-powered, isolated comparator (U1) to monitor two 48V telecom supplies (of either polarity). The comparison is made on the 48V side of the isolation barrier and the data is shipped across the barrier inside the package to the output of the comparator, where it can be checked by a microprocessor or other system monitor.

The LTC1531 has an internal capacitive barrier providing $3000V_{RMS}$ of isolation between the comparator's inputs and output. The part provides UL-rated comparisons without the need for an isolated supply or cumbersome optoisolators, since comparator power and output data are transmitted across the capacitive barrier.

Circuit Description

The two power supplies to be monitored are connected to the –48V input A and –48V input B points shown in the schematic of Figure 1; the returns are connected to the "common" input (not to isolated ground). The –48V inputs are attenuated by the resistor divider and input to the dual comparator at V1 and V2. The V_{REG} pin of U1 provides a 2.5V regulated output, and the voltage divider consisting of the 11.2k and the 8.8k resistors provides approximately 1.1V to the common point for the 48 volt supplies. Connecting V3 and V4 to isolated ground makes the trip point a negative voltage set by the previously mentioned voltage divider to approximately –1.1V. The series 1N4148 diodes act as crude clamps on inputs V1 and V2. Clamping the inputs is necessary since the comparator function is V1 + V2 > V3 + V4, and, if the inputs were not clamped, a high voltage on one input would allow a low voltage on the other input to go undetected. The 866k and 22k resistors provide a small amount of hysteresis to stabilize the output for slow moving inputs.

When the inequality V1 + V2 < V3 + V4 is false (that is, the sum of the power supply voltages when attenuated is greater than the sum of the reference voltages), the comparator sends a signal across the isolation barrier such that the Data output goes low and the LED turns on. Note that the sense of the inequality is reversed because we are sensing negative voltages. The voltages are selected so that when the sum of the two voltages at –48 input A and –48 input B is approximately –72V, the inequality is false and the "supplies OK" LED turns on. Thus, if one supply is "good" at –48V, the other supply will be considered "bad" if it falls below approximately –24V.

Conclusion

The LTC1531 and a handful of resistors and diodes can be used to detect when telecom supplies fall below a predetermined voltage. This "go/no-go" signal can then be sent across an isolation barrier to trigger the appropriate action to solve the problem. The circuit is simple and clean, requiring no unwieldy optoisolators.

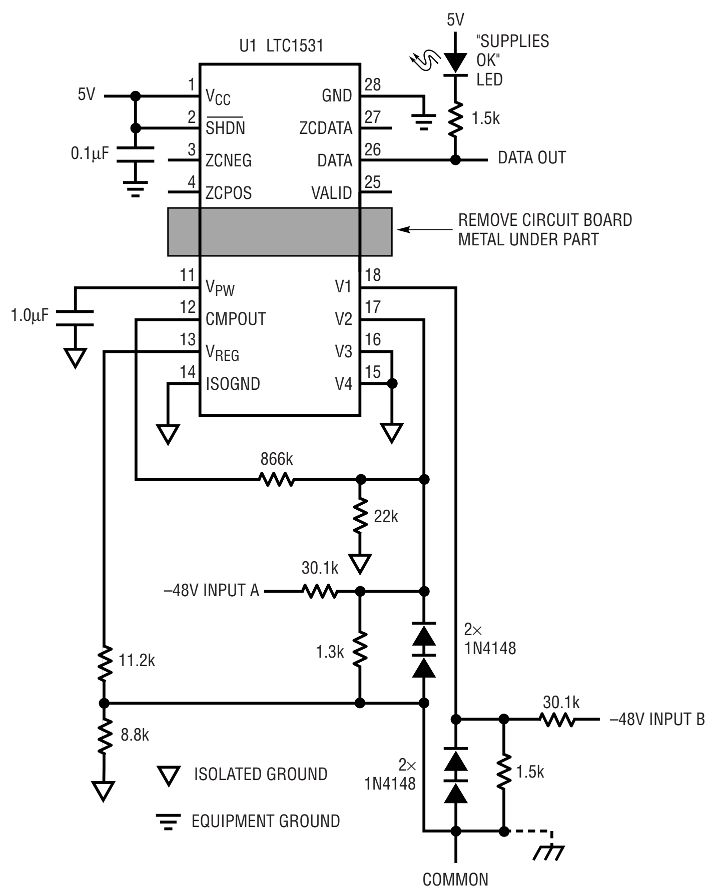

Figure 1. LTC1531 isolated comparator monitors two telecom supplies