Self-Powered Dummy Load Checks Out Multiple-Output Power Supplies

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As the author points out, this incredibly straightforward active current load covering a 20-mA to 20-A range derives operating power from the devices under test (DUTs). For this particular design, the target DUTs are multiple-output power supplies, including those with floating outputs. Load current is adjustable via a 10-turn potentiometer while an analog panel meter displays voltage levels across the loads, allowing users to monitor several dummy loads simultaneously.

The utter simplicity of the circuit—a power Darlington, voltage reference/op amp, a few resistors, diode, current-select switch, 10-turn pot, two or four dummy loads, and an analog meter—reeks of reliability for basic and volume testing. With a bit of tweaking, it can find use in other power applications, i.e., multichannel audio amplifiers, where a modicum of accuracy is required on a tight budget

–MAT DIRJISH | Technology Editor

This spartanly simple, adjustable, active current load for the 20-mA to 20-A range is powered by the very current it controls. A benchtop box with two to four of these loads makes an excellent instrument for checking out multiple-output power supplies. Such power supplies would include those with floating outputs, in which the loads are electrically independent of one another.

The current through the load is set by a 10-turn potentiometer via a turns-counting dial, which provides a direct readout to the user. The voltage across the load is displayed on an analog panel meter. In this way, it's easy to visually monitor several dummy load channels simultaneously.

To operate the load, start with the dials set to draw reasonable currents from the various outputs of the power supply under test. Then, slowly increase the load current on one channel until any one of the voltages drops, indicating overload on the corresponding channels. (In a multi-output supply, the maximum current available on one output typically depends on how much current is drawn from the other outputs.) Switch S1 is used to momentarily clear the load. Otherwise, in case of foldback current-limiting, the dials would need to be turned all the way down to allow the power supply to recover and then back up again to resume testing.

The entire circuit consists of a power Darlington transistor (the MJ11012), which acts as the current "faucet;" a 0.01-Ω resistor for current sensing; the 10-turn potentiometer for the current setpoint; and
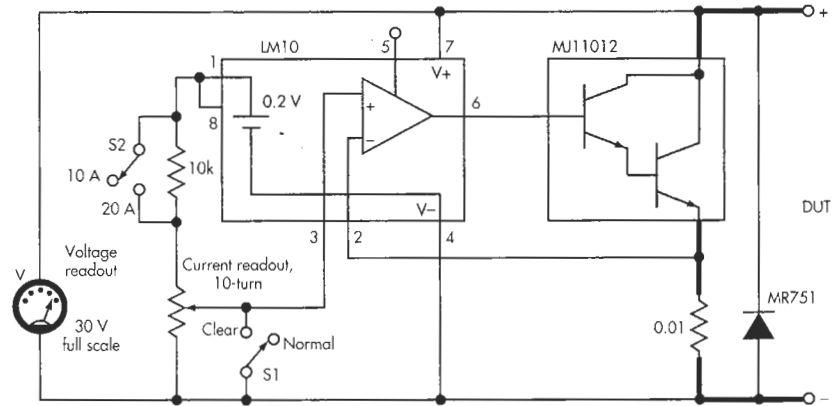
This ultrasimple, self-powered active load, which servos the load current flowing through the main loop (bold line) to the control-panel pot setting, is useful for specifying and testing multiple-output power supplies.

an LM10 voltage reference/op amp. The pot scales down the 0.2-V reference voltage. This target voltage then is compared with the voltage on the sensing resistor by the op amp, whose output directly drives the transistor.

With switch S2 off, the 10-turn dial reads 0 to 10 A. With the switch on, the reading is scaled up by 2 (i.e., 0 to 20 A). The Darlington transistor must be provided with adequate heatsinking. Power diode MR751 simply protects the load from the accidental application of reverse voltage.

Of course, if the power-supply output drops below a certain threshold, the actual load current will no longer be able to track the dial setting. With our self-powered approach, this threshold is about 3 V, which is usually well below the range for most testing.