Measuring Line and Load Regulation

For Rantec HDM DC-DC Converters

General Description

Line regulation is the HDM DC-DC converters ability to maintain a constant output voltage as the line (input) voltage changes. Load regulation is the module's ability to maintain a constant output voltage as the load current changes.

Line and load regulation are two of the most common types of power supply measurements. Although straightforward, there are some simple guidelines that will help ensure accurate readings.

To check the module for regulation, measure the output voltage at the sense pins (+SENSE and -SENSE), as this is the point of regulation for the module. There is virtually no current flowing through the sense leads, and consequently no appreciable voltage drop is apparent. Therefore, measuring at the sense pins is equivalent to measuring at the point where the sense leads are connected to the output leads.

In contrast, there can be a significant voltage drop between the module's output terminals and the load. This voltage drop, which varies with load current, can cause erroneous regulation values.

The remote sense terminals must always be connected to the output either at the output terminals or at the load. (Connect -SENSE to -OUT and +SENSE to +OUT).

Measuring Line Regulation

Connect a digital voltmeter (DVM) to the sense terminals. Vary the input voltage from the minimum input voltage (low line) to the maximum input voltage (high line). The output voltage change, as a percentage of the output voltage measured at the rated (nominal line) input line voltage is the regulation. See Figure 1.

Note: Line regulation is typically measured under the full rated load of the module. Also, it is common practice to take the absolute value of the line regulation.

$$\%\,\text{Line Reg} = \frac{V_o\ (\text{Highline}) - V_o\,(\text{Lowline})}{V_o\,(\text{Nominal line})}\ x100\%$$

Highline = maximum input voltage
Lowline = minimum input voltage
Nominal Line = Rated input voltage

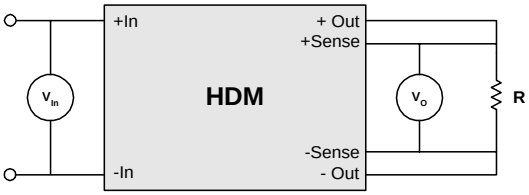

Figure 1: Line regulation measurement circuit.

Measuring Load Regulation

Connect a DVM to the sense terminals. Vary the output load current from full load to minimum load. The output voltage change as a percentage of the output voltage at nominal output load current is the load regulation. See Figure 2.

Note: Full load is normally defined as the maximum rated load current. Minimum load is normally defined as no load current, and nominal load current is normally defined as one half of the full load current. Again, it is common practice to represent the load regulation as an absolute value.

$$\%\,\text{Load Reg} = \frac{V_o\ (\text{Full load}) - V_o\,(\text{Min. load})}{V_o\,(\text{Nominal load})}\ x100\%$$

Full Load = Maximum rated current
Min. Load = Minimum rated current
Nominal Load = ½ Maximum rated current

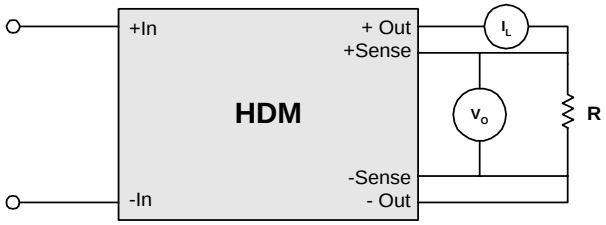

Figure 2: Load regulation measurement circuit

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