Power-Supply Load Regulation Measurements

TECHNICAL BRIEF

February 20, 2013

Summary

Power supply specifications include a large number of load-dependent parameters including load or output regulation. Teledyne LeCroy oscilloscopes offer parameter math, which helps measure load regulation directly.

Power-Supply Load Regulation Measurement Tools

Parameters and parameter math make it easy to measure power supply load or output regulation.

Load regulation of the output voltage, V, is defined as:

$$\Delta V / V_{FULL\ LOAD} \times 100\%$$

Where

$$\Delta V = V_{NO\ LOAD} - V_{FULL\ LOAD}$$

Figure 1 shows a typical load-regulation measurement on a small flyback power supply.

Figure 1: Using parameters and parameter math to measure load regulation

The trace C2 is the output current, and in this case a square wave load variation has been applied. Trace C3 is the output voltage which is nominally 5V. Vertical zoom has been applied to C3 in trace Z3 so the ripple due to the load variation is visible. The parameter P1 is measuring the mean output voltage which is 4.96V. Parameters P2 measures the top or higher mean output value of the output: this is the nominal no-load

output. Parameter P3, base, reads the mean loaded output voltage. P4 is the amplitude of the output variation due to the load and is the difference between the top and the base values. This is the ΔV in our equation.

Parameter math in P5 and P6 is used to calculate load regulation. P5 takes the ratio of the amplitude (P4) to the loaded output voltage (P3). The ratio in P4 is multiplied by 100% using the parameter rescale math function in P6. The output units are changed to % to reflect this calculation. The reading P6, 0.8%, is the load regulation.

By combining automatic measurement parameters with parameter math, we are able to read out load regulation directly from our measurement of the output voltage waveform.

Channel 2 shows the output current.