
Frequency Response Debug

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Abstract:

This video explores the frequency response behavior of a switching power converter under varying line and load conditions. While most operating points produced clean, predictable responses—featuring a 20 dB/decade gain slope crossing 0 dB and approximately 65° of phase margin—the low-line, maximum-load corner yielded only noise. Investigation revealed that at this corner the controller's compensation (COMP) pin had reached its 5 V compliance limit, indicating the control loop was fully saturated.

In this state, the converter was effectively running open-loop because no additional duty cycle was available to respond to further load or line changes. The result is a loss of meaningful frequency response data and a clear demonstration of how controller headroom directly affects stability measurements. This experiment underscores the importance of monitoring COMP pin behavior when troubleshooting unexpected Bode plot results.

Keywords:

frequency stability, duty cycle, DC-DC Converters

References:

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