Technical Article

The Difference between Hysteretic-mode Converters and Traditional Regulators

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When designing a power circuit, many of the selections available on the market, such as traditional voltage and current-mode regulators, look similar. You know it will do a certain job - for example, step-down DC/DC conversion - but you may not know how the many choices compare to each other.

If you haven't considered it before today, my recommendation is a hysteretic-mode converter.

Hysteretic-mode converters are branded in many different ways, including D-CAP™, D-CAP+™, D-CAP2™, D-CAP3™, constant-on-time, or DCS-Control.

When you're deciding between the many choices, you probably do what I do; search online and find a comparison report, or find a site with reviews to see recommendations and complaints.

To help you in this effort, I authored a 3-part series of articles "Hysteretic-Mode Converters Demystified" aimed at comparing a hysteretic-mode step-down switching regulator with traditional voltage-mode and current-mode regulators. This series in Power Electronics Technology magazine is based on lots of measurement data behind the scenes (see example in Figure 1) and includes unbiased comparisons as much as possible.

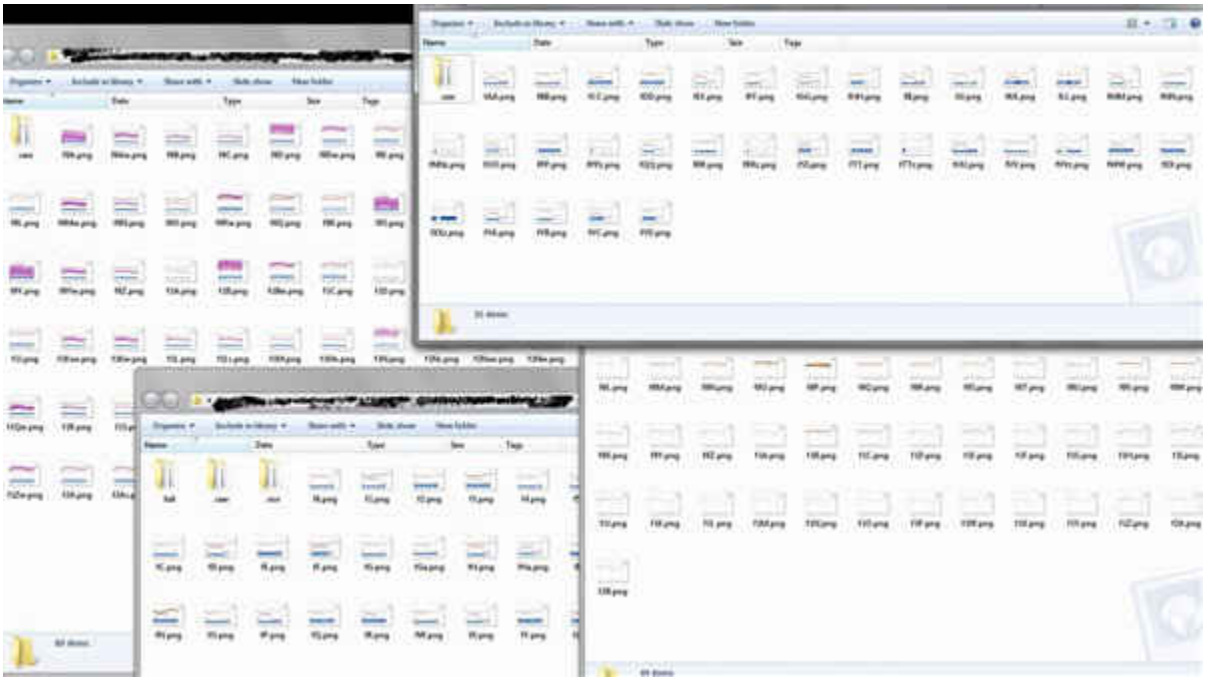

Figure 1. Screenshot of the Many Measurement Plots I Compiled for the Comparison.

I kick off part 1 of the article series "Hysteretic-Mode Converters Demystified" by reviewing basic operation differences of hysteretic-mode, voltage-mode and current-mode converters. This part illustrates the fundamental differences and also points out similarity of converters.

In part 2 "Voltage and Current Mode Control," I compare large signal load and line transient behavior. This section reviews the many technical plots pictured above to highlight the differences between control modes.

In part 3 “Regulator Stability,” I examine small signal behavior and stability. This part reviews three different small signal measurements (Bode plot, output impedance and small signal load transient) so you can get good idea of how hysteretic-mode converters perform.

I hope you enjoy the article series and I look forward to answering any questions you may have. If you are a more visual learner, view the seven-part video series based on these articles “Fixed Frequency vs Constant On-Time Control of DC/DC Converters”.

Additional resources:

- Consider one of TI’s SWIFT™ point-of-load DC/DC converters for your next design.
- Watch the video “Buck regulator architectures - overview” for an overview on a variety buck regulators.

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