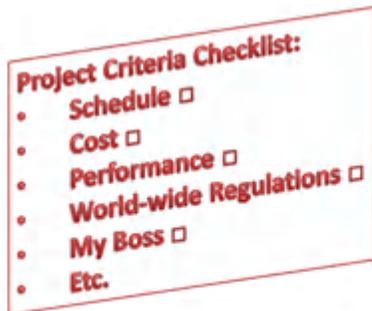


When Should You Use PWM Controllers?



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Start with a simple choice – PWMs are used everywhere!

PWM is a control method that can be applied to many power-supply topologies. And because power supplies, regardless of topology, are used in an endless set of applications, they have the reputation of being used everywhere; PWMs are used in a wide variety of applications.

PWM is short for pulse-width modulation. In the context of a switched-mode power supply, PWM is the scheme used to regulate an output such as an output voltage and reject variation from the input voltage to a system. This system concept describes a switched-mode power supply. The inputs and outputs can be DC, sinusoidal (AC) or even some other periodic waveform.

Consider two very popular PWM controller families, the [UC3842/UC3843/UC3844/UC3845](#) (UCx84x) and the [UC1525A/UC2525A/UC3525A/UC3846](#) (UCx525A). [Figure 1](#) and [Figure 2](#) show these families' block diagrams, respectively.

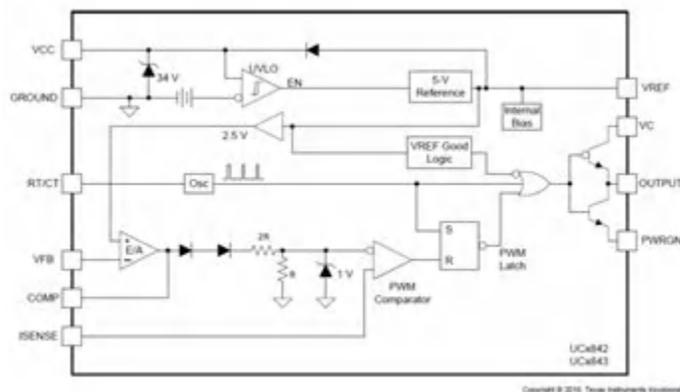


Figure 1. UCx84x Block Diagram

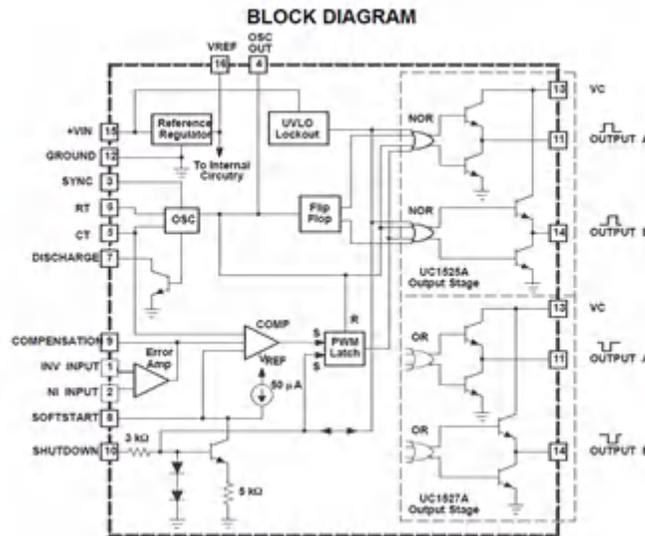


Figure 2. UCx525A Block Diagram

Both figures highlight a common PWM control method, where an error signal compared to a fixed-frequency ramp produces a PWM output that drives the switches in a switched-mode power-supply topology. The error signal can control current, voltage, both current and voltage, or some other significant property in the end application. The topology can involve a single switch, as found in buck, boost, flyback or forward topologies; the UCx84x is a good PWM controller to consider for these types of topologies. Consider the Ucx525A for topologies (excluding synchronous rectification) that have more than two switches, like the Fly-Buck™ converter, active clamp forward, push-pull or half bridge. At times, a MOSFET gate driver is needed in order to drive the MOSFET. These two families of PWMs are very basic controllers, with uncomplicated logic and just the right amount of extra features, making them easy to implement in many applications.

Applications with PWMs include welding, appliances, motor drives, personal electronics, inverters, electric vehicles, uninterruptable power supplies, solar power, audio amplifiers and car heaters. In general, where switched-mode power supplies are used and you don't need the complexities of a more advanced topology, think about using a simple generic PWM controller.

Using your favorite PWM controller in many applications can decrease development time while you build power-supply design confidence with a set of proven designs tucked up your sleeve. One final advantage in using a PWM is that it can be leveraged across multiple designs, keeping your procurement team excited about a high-volume sourced component.

Improvements in the process technology used to manufacture the generic purpose PWM controllers from a bipolar technology to a current Bi-CMOS technology can improve critical design parameters. A quick comparison between the UC284X/UC384X and the UCC28C4X/UCC38C4X details improvements due to the process change on a controller architecture that has remained the same: lower supply current from 11 mA to 2.3 mA at 50 kHz, rise/fall times from 50 ns to 25 ns and reference voltage accuracy from $\pm 2\%$ to $\pm 1\%$. Even the operating frequency is increased from 500 kHz to > 1 MHz to name a few areas of improvement.

Visit our [PWM and resonant controller overview page](#) to see other PWM controllers and explore application and design ideas. You can also start a design in [WEBENCH high voltage designer](#) with TI's high performance, current mode PWM controllers.

Additional Resources

- PWM design concepts have been explored in-depth since the beginning of the [TI Power Supply Design Seminar](#), proving that PWM is a workhorse for the power-supply industry. Read Bob Mammano's paper, "[Switching Power Supply Topology Voltage Mode vs. Current Mode.](#)"
- Read our [Power Topologies Quick Reference Guide](#).
- Get to know [TI's MOSFET and IGBT Gate drivers](#).

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