Technical Article

Choosing the Right Flyback Controller for Your Design

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If every industry has one common goal, it's the push to do more with less. How do you make something lighter, smaller, faster and stronger? Power is no exception.

With the ever-increasing demand for smaller power supplies to do more, designers have adapted by integrating key features that boost efficiency while saving space and budget. In order to meet modern requirements, power-supply controllers evolved from a few general-purpose controllers to a large portfolio of application-specific controllers. In the past, any designer looking to build consumer chargers found a general-purpose pulse-width modulation (PWM) controller a great solution for their needs.

Today, that same consumer charger requires a specialized flyback controller to meet regulatory requirements such as Department of Energy (DoE) Level VI and Code of Conduct (CoC) Tier 2. These flyback controllers have advanced features, like AM/FM control laws, that help them achieve high efficiency and power density. On the other hand, advanced features can cause the price to skyrocket.

For charger applications that require low standby power, having a controller with an integrated startup high-voltage field-effect transistor (FET) is worth the cost. But for applications like electricity meters, smoke detectors or electric vehicle (EV) charging piles, this feature is overkill. Although the improved performance is nice, it can cause the cost of the power supply to become prohibitively expensive.

TI's flyback controllers mix and match various features to meet the specifics of your design, whether you need to prioritize your budget or efficiency or density requirements. Table 1 lists frequently used flyback controllers.

Table 1. Flyback Controller Family Highlights

	Typical power (W)	Regulation	Operation mode	Internal high-voltage startup	Package	Pricing 1Ku
UCC28722	10	Primary-Side Regulation (PSR)	Discontinuous Conduction Mode (DCM)	No	Small-outline transistor (SOT)23-6	$0.28
UCC28704	30	PSR	DCM	No	SOT23-6	$0.34
UCC2863x	150	PSR	Continuous Conduction Mode (CCM)/DCM	Yes	Small-outline integrated circuit (SOIC)-7	$0.68
UCC28740	30	Secondary-Side Regulation (SSR)	DCM	Yes	SOIC-7	$0.42
UCC28742	30	SSR	DCM	No	SOT23-6	$0.25
LM5021	100	SSR	Fixed-frequency	No	VSSOP-8	$0.57
UCC28600	150	SSR	Quasi-resonant	No	SOIC-8	$0.46
UCC28780	100	SSR	Active clamp	No	Quad flat no-lead (QFN) SOIC-16	$0.60

But how do you differentiate between these devices? Even controllers that seem very similar may make a difference in an application. For example, the UCC28742 is in a smaller package than the UCC28740 and does not have the high-voltage pin 700V startup FET included in UCC28740's larger package. For devices that do not need to meet a ≤10mW standard, the UCC28742 will save space and budget. However, if meeting this standard is one of your requirements, you would select the UCC28740. The UCC28742 might be preferable in applications such as electricity meters, smoke detectors and small household appliances, while the UCC28740 might be a better choice for charger applications.

Overall, these devices, like the rest of the flyback family, use the same control laws and features that result in highly efficient controllers with reduced generated electromagnetic interference (EMI) and robust fault conditions.

To learn more about TI's AC/DC flyback family and find out which device is for you, see ti.com/flyback and check out these resources:

- The "Making power supplies smaller: An overview of the active clamp flyback" chipset training video walks through the active clamp flyback topology.
- The "Multiple Output Flybacks: How to Improve Cross Regulation" training video reviews why the flyback is common in multiple-output designs and shows various techniques for improving cross-regulation.
- The "Troubleshooting TI PSR Controllers" application note provides further detail on design and use.

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