

Achieving Low Standby Power and High Efficiency in Flyback Converters



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Ever wonder how the power level of chargers keeps increasing (to take advantage of USB Type-C standards, for example), but are still small in size? There is only so much power you can dissipate inside a sealed plastic box before the charger doubles as a hand warmer and becomes unreliable. You must achieve higher efficiency.

Beyond this need for high efficiency, more strict standards will make meeting efficiency requirements more challenging. The European Code of Conduct (COC) has a new standard that will take effect in January 2016. As shown in [Table 1](#), a 15W low-voltage power supply must achieve better than 81.8% average efficiency and better than 72.5% efficiency at 10% rated power.

Table 1. Energy efficiency criteria for active mode for low voltage external power supplies

Rated Output Power (P_{no})	Minimum Four Point Average Efficiency in Active Mode		Minimum Efficiency in Active Mode at 10 % load of full rated output current	
	Tier 1	Tier 2	Tier 1	Tier 2
	$0.3 < W < 1$	$\geq 0.500 * P_{no} + 0.086$	$\geq 0.517 * P_{no} + 0.091$	$\geq 0.500 * P_{no}$
$1 < W \leq 49$	$\geq 0.0755 * \ln(P_{no}) + 0.586$	$\geq 0.0834 * \ln(P_{no}) - 0.0011 * P_{no} + 0.609$	$\geq 0.072 * \ln(P_{no}) + 0.500$	$\geq 0.0834 * \ln(P_{no}) - 0.00127 * P_{no} + 0.518$
$49 < W < 250$	≥ 0.880	≥ 0.880	≥ 0.780	≥ 0.780

"ln" refers to the natural logarithm. Efficiencies to be expressed in decimal form: an efficiency of 0.88 in decimal form corresponds to the more familiar value of 88% when expressed as a percentage.

In a charger, the component that dissipates the most power is usually the output rectifier diode. One way to increase the efficiency by 5% or more in a 5V phone charger or by 2% or more in a 19.2V notebook or ultrabook adapter is to replace the output diode with a synchronous rectifier (SR) MOSFET and controller.

SR controllers can increase the efficiency in a charger. TI recently released the [UCC24630](#) SR controller with ultra-low standby current. The [UCC24630](#) SR controller can maximize the efficiency increase and have very little impact on standby power. [Figure 1](#) shows a typical application of the [UCC24630](#) chip.

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