

OPTOCOUPLER FEEDBACK DRIVE TECHNIQUES

The use of optocouplers in the feedback path of switch-mode power supplies is probably one of the most common practices in the industry. Benefits of this method include low component cost, high voltage isolation and simplicity of design and implementation. Although adequate for many existing designs, the need for additional loop gain bandwidth occurs as switching frequencies are pushed towards the megahertz region.

One of the most popular ways to drive an optocoupler utilizes a TL431 Adjustable Shunt Regulator. It is configured on the output side of the power supply to modulate the optocoupler's photo diode current as a function of the power supply output voltage. Across its isolation boundary, the optocoupler transistor is connected to the PWM controller's error amplifier on the primary side of the power supply. Variations in the output voltage are optically transferred back to the error amplifier and control loop for correction. Providing additional features like over current protection or external shutdown require extra optocouplers and drive mechanisms, thus increasing the circuit complexity.

A linear regulator control IC, such as the UC3832, UC3833 or UC3836 can be substituted for the '431 while providing numerous additional features besides regulating the output. Overcurrent limiting and fault protection can be combined with the error voltage to drive the optocoupler and override it when necessary. Handshaking with external control logic, such as shutdown and sequencing is greatly simplified since the control IC is referred to the same ground. The most obvious benefit, however, is the introduction of the supplementary error amplifier in the feedback loop with programmable compensation.

Depending on the specific application, current limiting can be tailored to accommodate a programmable fold-back characteristic, constant current or complete over-current shutdown. The UC3832 and UC3833 provide an addition level of versatility by offering a programmable duration event timer in the current limit circuitry. An adjustable trip threshold to accommodate varying load demands can be facilitated with the UC3832. For additional information, please consult application note U-116 and the respective device data sheets.

