DESIGN IDEA: EFFICIENT CHARGER WITH FOLD-BACK CURRENT-LIMIT USING ACT29

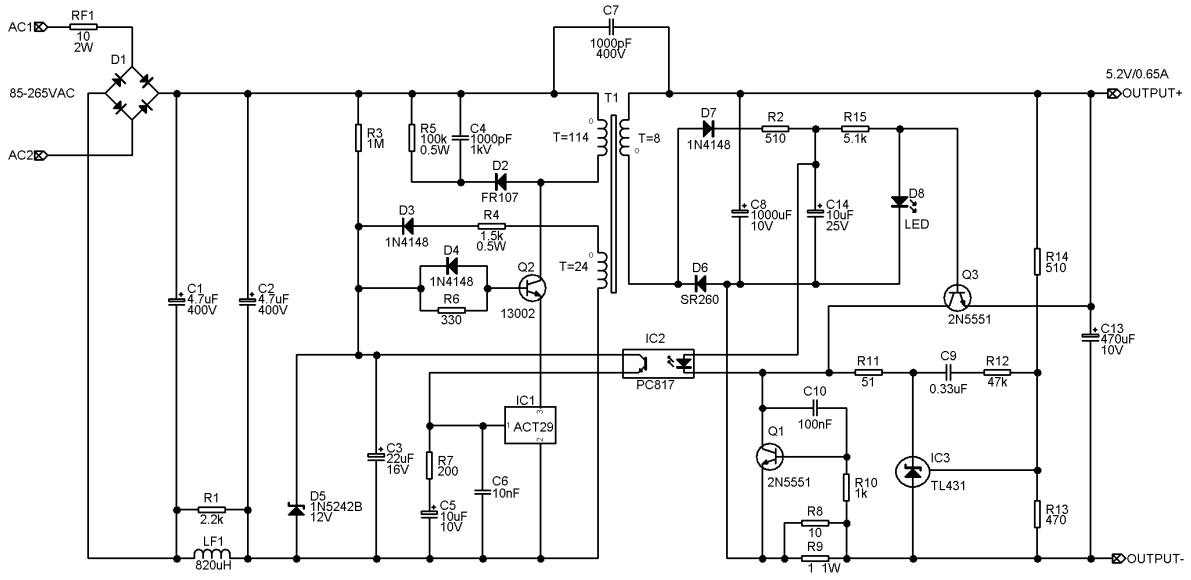
The circuit in Figure 1 is a charger with fold-back current limit in short circuit. The ActiveSwitcher™ ACT29 is a low-cost, higher performance current-mode PWM controller. It drives and external low cost '13002 NPN for switching. Due to its emitter-drive technique, the '13002 can utilize its 600V V_{CBO} breakdown voltage for safe operation.

In this circuit, the opto-coupler and auxiliary voltage bias are supplied during the on-cycle of the PWM controller in order to maintain the supplies even in short circuit. (Note the polarity of auxiliary winding). Use R4=1.5k for 4W output or less. For higher output power, decrease R4 to 1k.

Q3 NPN transistor is normally off when the output voltage is high. When the output voltage is less than the D8 voltage drop minus 0.7V, Q3 turns on to cause an extra current through the opto-coupler LED. This causes the ACT29 to reduce output current. Because C14 is also discharged, the output current pulses but averages at 260mA short circuit current.

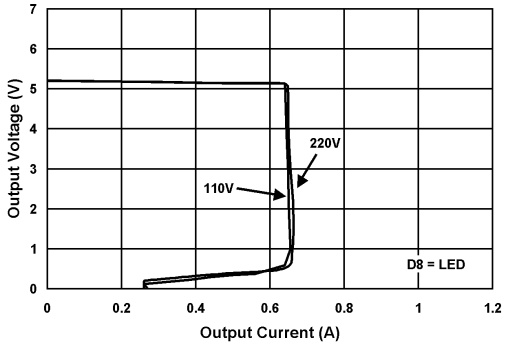
If an LED is not needed, D8 can be replaced with a zener diode such as 1N5226B (anode = ground). To minimize the thermal variation of the current limit, add an NTC thermistor in parallel with R9.

This circuit achieves input power of 0.2W and efficiency of 61%.



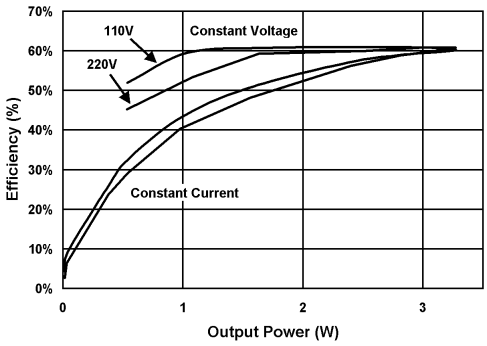
(a)

Output Voltage vs. Current



(b)

Efficiency



(c)

Figure 1. (a) Charger with Current-Limit Fold-back at Short Circuit, (b) V-I Characteristics, (c) Efficiency