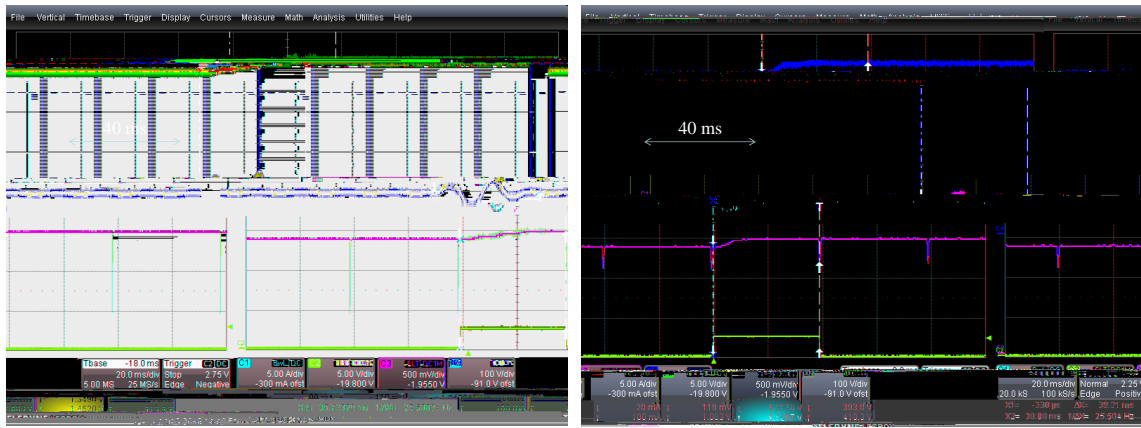


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a) 115 V, 60 Hz

b) 230 V, 50 Hz

Figure 2. Active Part of Soft-SKIP Operation in Low- (Left) and High-line (Right) Conditions

**Optimizing Zero Current Detection and Redundant
OVP**

This pin is designed to monitor a signal from an auxiliary
winding. It is intended to be connected to the auxiliary

Winding 1. It is intended to be connected to the auxiliary winding 1. It is intended to be connected to the auxiliary winding 1.

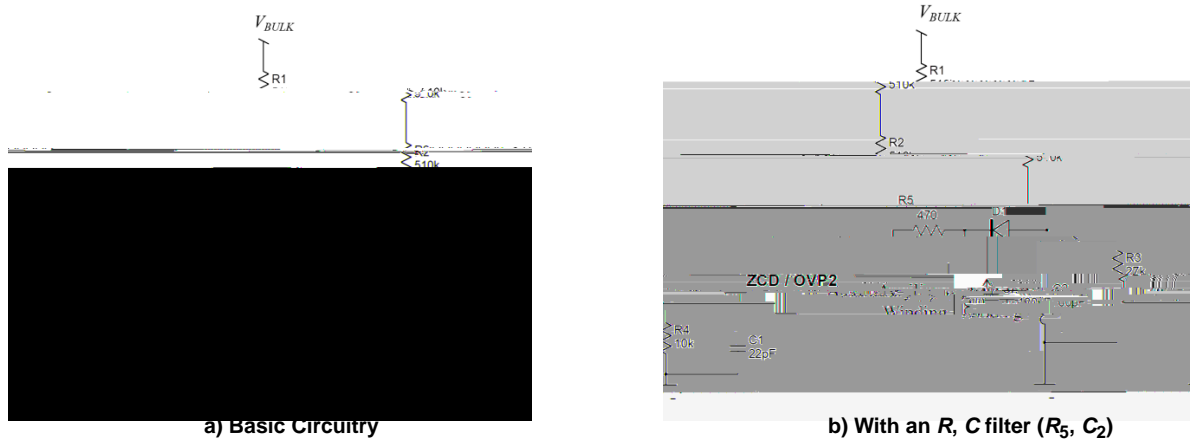


Figure 5. ZCD/OVP2 Circuit where the Bulk Voltage is Sensed for Redundant OVP

- When the MOSFET is on, the auxiliary winding voltage is negative and equal to $(\frac{V_{BULK}}{N_p})$. Thus the voltage V_{demag} of Figure 5a) is also $(\frac{V_{BULK}}{N_p})$ if we neglect $V_{CE(sat)}$ voltage drop. It is hence necessary to select R_3 high enough not exceed the -2 mA , $+5\text{ mA}$ max ratings of the ZCD pin (see data sheet). Practically, R_3 should be selected higher than $(\frac{V_{BULK}}{2\text{ mA}})$. For instance, if N_p is 0.1 and V_{BULK} is 400 V, resistance must be greater $(\frac{0.1 \times 400}{2 \times 10^{-3}})$ that is 20 k Ω .
- Signal V_{ZCD} of Figure 5a) is clamped to V_{ZCD} by R_4 . During the off-time, the ZCD/OVP2 voltage is then clamped to $(V_{ZCD} - V_{CE(sat)})$. Hence, when the difference between the bulk and input voltages is smaller than the OVP2 threshold, OVP2 cannot trip. Practically, if N_p is 0.1, the OVP2 will not be able to trip when $(V_{BULK} - V_{in}) < V_{ZCD} - V_{CE(sat)}$.

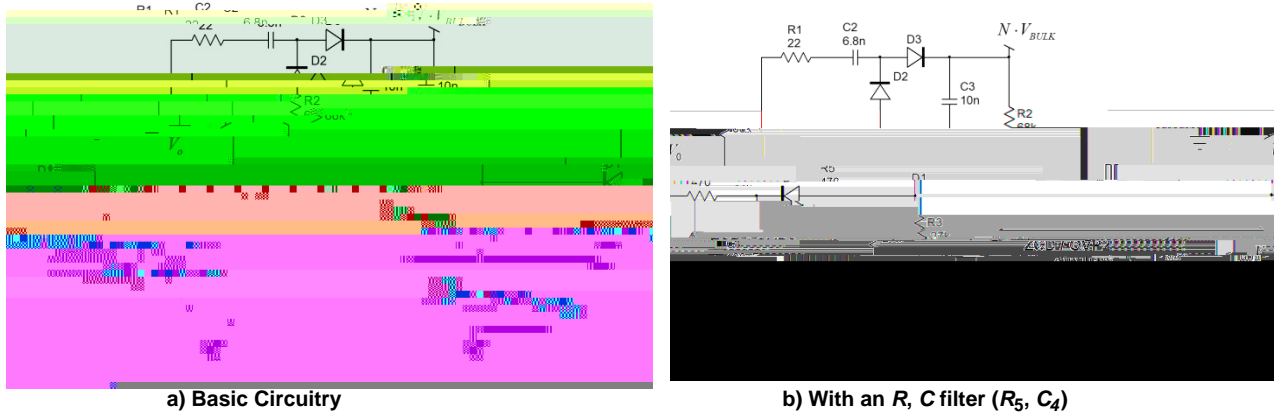


Figure 6. ZCD/OVP2 Circuit where the Bulk Voltage is Reconstructed from the Auxiliary Winding

Note that if OVP2 is not useful, the simple circuit of Figure 7 can be used. A 3.3 V Zener diode is added to prevent the ZCD/OVP2 pin from reaching the OVP2 threshold and

triggering the OVP2 protection. Capacitor C_1 is optional. It can be implemented to delay the ZCD signal if necessary to detect the very valley of the MOSFET drain–source voltage.



Figure 7. ZCD Circuit without OVP2

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