A High Efficiency, 250 W, 250 – 380 VDC Input Power Supply
The circuit shown in figure 43 delivers 250 W (48 V @ 5.2 A) at 84% efficiency using a TOP249 from a 250 to 380 VDC input. DC input is shown, as typically at this power level a p.f.c. boost stage would preceed this supply, providing the DC input (C1 is included to provide local decoupling). Flyback topology is still useable at this power level due to the high output voltage, keeping the secondary peak currents low enough so that the output diode and capacitors are reasonably sized.

In this example the TOP249 is at the upper limit of its power capability and the current limit is set to the internal maximum by connecting the X pin to SOURCE. However, line sensing is implemented by connecting a 2 MΩ resistor from the L pin to the DC rail. If the DC input rail rises above 450 VDC, then *TOPSwitch-GX* will stop switching until the voltage returns to normal, preventing device damage.

Due to the high primary current, a low leakage inductance transformer is essential. Therefore, a sandwich winding with a copper foil secondary was used. Even with this technique the leakage inductance energy is beyond the power capability of a simple Zener clamp. Therefore, R2, R3 and C6 are added in parallel to VR1. These have been sized such that during normal operation very little power is dissipated by VR1, the leakage energy instead being dissipated by R2 and R3. However, VR1 is essential to limit the peak drain voltage during start-up and/or overload conditions to below the 700 V rating of the *TOPSwitch-GX* MOSFET.

The secondary is rectifed and smoothed by D2 and C9, C10 and C11. Three capacitors are used to meet the secondary ripple current requirement. Inductor L2 and C12 provide switching noise filtering.

A simple Zener sensing chain regulates the output voltage. The sum of the voltage drop of VR2, VR3 and VR4 plus the LED drop of U2 gives the desired output voltage. Resistor R6 limits LED current and sets overall control loop DC gain. Diode D4 and C14 provide secondary soft-finish, feeding current into the CONTROL pin prior to output regulation and thus ensuring that the output voltage reaches regulation at start-up under low line, full load conditions. Resistor R9 provides a discharge path for C14. Capacitor C13 and R8 provide control loop compensation and are required due to the gain associated with such a high output voltage.

Sufficient heat sinking is required to keep the *TOPSwitch-GX* device below 110 °C when operating under full load, low line and maximum ambient temperature. Airflow may also be required if a large heat sink area is not acceptable.

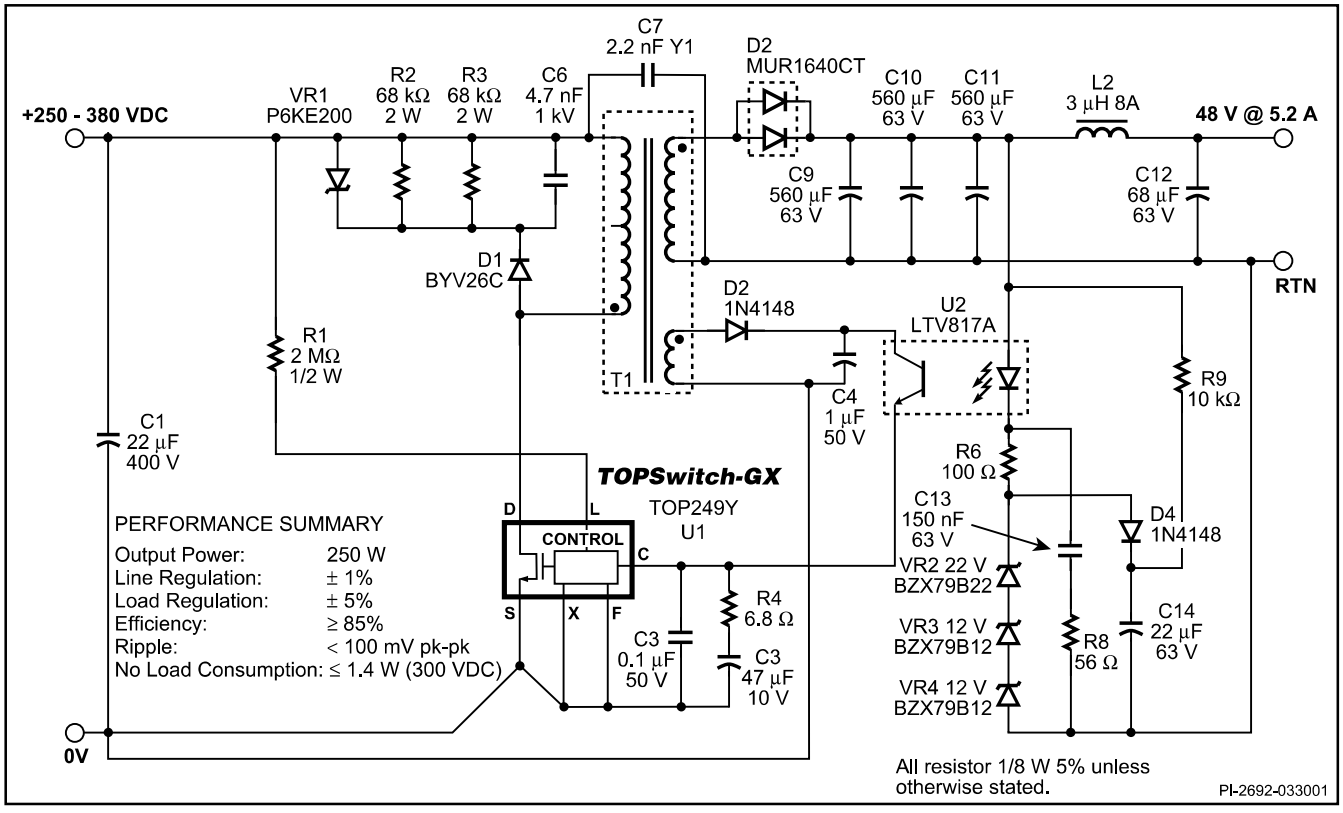

Figure 43. 250 W, 48 V Power Supply using TOP249.