

# TOP242-249

## Multiple Output, 60 W, 185-265 VAC Input Power Supply

Figure 44 shows a multiple output supply typical for high end set-top boxes or cable decoders containing high capacity hard disks for recording. The supply delivers an output power of 45 W cont./60 W peak (thermally limited) from an input voltage of 185 to 265 VAC. Efficiency at 45 W, 185 VAC is  $\geq 75\%$ .

The 3.3 V and 5 V outputs are regulated to  $\pm 5\%$  without the need for secondary linear regulators. DC stacking (the secondary winding reference for the other output voltages is connected to the cathode of D10 rather than the anode) is used to minimize the voltage error for the higher voltage outputs.

Due to the high ambient operating temperature requirement typical of a set-top box (60 °C) the TOP246Y is used to reduce conduction losses and minimize heat sink size. Resistor R2 sets the device current limit to 80% of typical to limit overload power. The line sense resistor (R1) protects the TOPSwitch-GX from line surges and transients by sensing when the DC rail voltage rises to above 450 V. In this condition the TOPSwitch-GX stops switching, extending the input voltage withstand to 496 VAC which is ideal for countries with poor power quality. A thermistor (RT1) is used to prevent premature failure of the fuse by limiting the inrush current (due to the relatively large size of C2). An optional MOV (RV1) extends the differential surge protection to 6 kV from 4 kV.

Leakage inductance clamping is provided by VR1, R5 and C5, keeping the DRAIN voltage below 700 V under all conditions. Resistor R5 and capacitor C5 are selected such that VR1 dissipates very little power except during overload conditions. The frequency jittering feature of TOPSwitch-GX allows the circuit shown to meet CISPR22B with simple EMI filtering (C1, L1 and C6) and the output grounded.

The secondaries are rectified and smoothed by D7 to D11, C7, C9, C11, C13, C14, C16 and C17. Diode D11 for the 3.3 V output is a Schottky diode to maximize efficiency. Diode D10 for the 5 V output is a PN type to center the 5 V output at 5 V. The 3.3 V and 5 V output require two capacitors in parallel to meet the ripple current requirement. Switching noise filtering is provided by L2 to L5 and C8, C10, C12, C15 and C18. Resistor R6 prevents peak charging of the lightly loaded 30 V output. The outputs are regulated using a secondary reference (U3). Both the 3.3 V and 5 V outputs are sensed via R11 and R10. Resistor R8 provides bias for U3 and R7 sets the overall DC gain. Resistor R9, C19, R3 and C4 provide loop compensation. A soft-finish capacitor (C20) eliminates output overshoot.

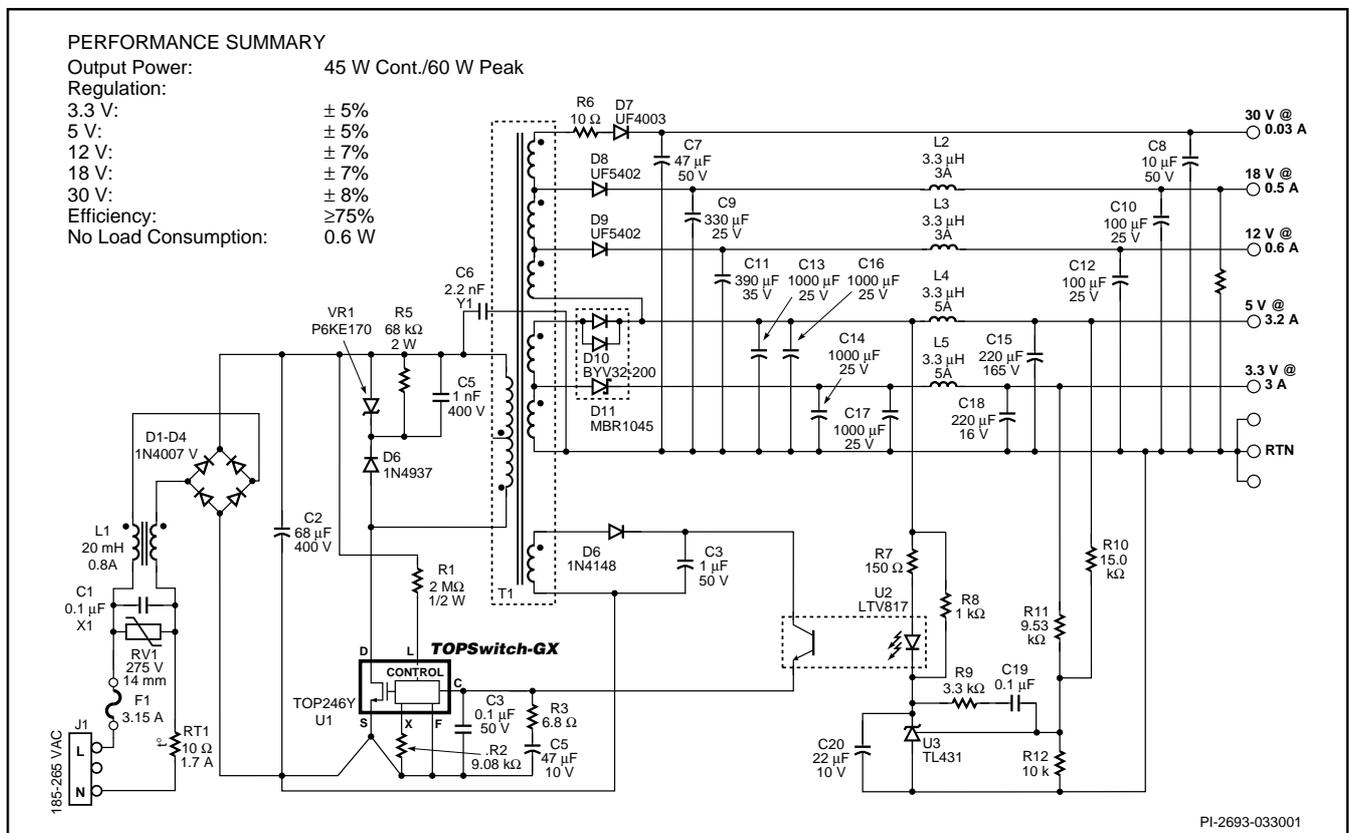


Figure 44. 60 W Multiple Output Power Supply using TOP246.

