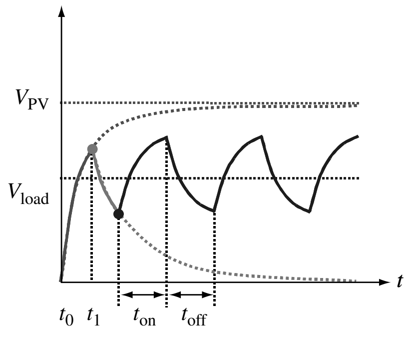

Figure 19.26 Behaviour of the load voltage of a step-down converter

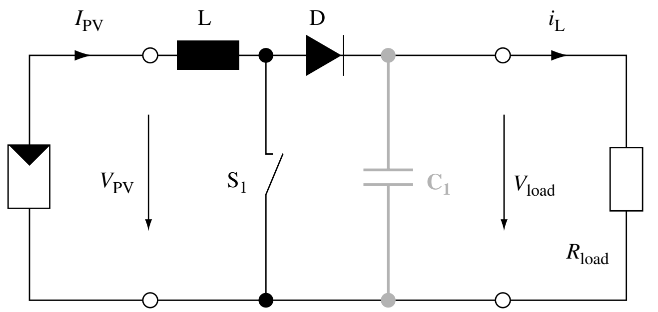

Figure 19.27 Equivalent circuit diagram of a step-up converter

As shown in Figure 19.26, the resulting load voltage obviously has a ripple, which can be smoothed by the additional capacitor C_2. Anyway, its average value (V_{load}) is lower than V_{PV}. In case the switching frequency is increased, for example, up to the kilohertz range, then the necessary inductance can be reduced considerably.

The resulting voltage transformation can be described by the relation of the switching time as follows:

$$\frac{V_{load}}{V_{PV}} = \frac{t_{on}}{t_{off} + t_{on}}$$

19.2.4.3.2 Step-up converter (Boost converter)

By rearrangement of the components of the step-down converter, a step-up converter can be obtained (Figure 19.27). Contrarily, here V_{PV} is stepped up. At a steady state as S_1 is still "off", V_{load} is equal to the V_{PV}, neglecting the voltage across diode.

As shown in Figure 19.28, during "on" state, without C_1 the load voltage drops immediately to zero. The circuit current ($= i_L$) flows through the inductor L and S_1 and rises according to the following equation:

$$\frac{di_L}{dt} = \frac{V_{PV}}{L}$$