The resulting voltage transformation then becomes

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

19.2.4.3.3 Step-down/step-up converter (Buck/Boost or inverting converter)

This circuit (Figure 19.31) enables both step down and step up of a DC voltage. During the "on" state, the energy given by the source (PV generator, in this case) is stored in the inductor L (Figure 19.32). The stored energy in the inductor L is then delivered to R_{load} during the "off" state (Figure 19.33). With the help of the diode D, the current flows through the inductor L only in one direction during both "on" and "off" states. As a result, V_{load} obviously has an opposite polarity to V_{PV}. Therefore, the circuit is also called an inverting converter. Equations describing the proceeding of the circuit currents can be derived in the same way to both converters mentioned before and will not be done here. As stated earlier, the capacitor C_1 supports the supply voltage V_{PV} and C_2 smoothes V_{load}. In conclusion, the amplitude of V_{load} can be either lower or higher than V_{PV} depending on the adjusted t_{on} and consequently t_{off} [4]:

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

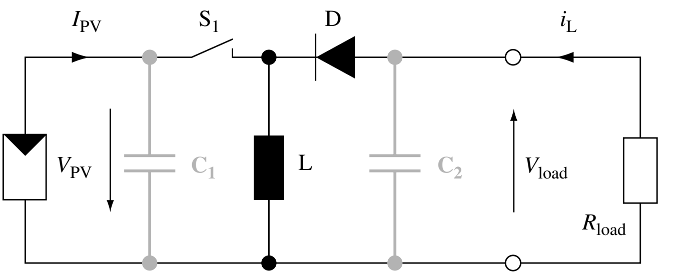

Figure 19.31 Equivalent circuit diagram of a step-down/step-up converter

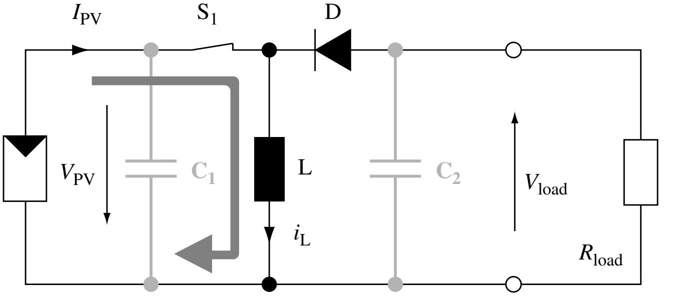

Figure 19.32 Step-down/step-up converter during "on" state