Three basic dc-dc converters
Fig. 1. Basic stepdown converter circuit with operating parameters.

1. **Controller**
   - $V_{in} = 7V \rightarrow 24V$
   - $V_{out} = 2V$
   - $I_{out\text{ max}} = 7A$
   - $f_{sw} = 300\text{ KHz}$

2. **Role of D**
   - Low $V_{out}$ and $I_{out}$

3. **PMOSFET**

4. **Role of C**
   - You compare to $V_{in}$
Fig. 2. In the synchronous buck converter, when Q1 is ON the voltage across it is close to zero, and Vsw is high. When Q1 is OFF, the voltage across it is almost Vin, and Vsw is low. During the switching transition region T1, the voltage and current changes across Q1 result in the power dissipation.
Fig. 6. Power loss caused by the freewheeling diode should be eliminated to increase the converter's efficiency.