1. [25 pts] Boost Converter Layout

An example boost converter schematic is given in Fig. 1, with its PCB layout implemented in Fig.2 and shown again in Fig. 3. You may assume the following:

- Connections to V_{bat}, V_{bus}, and ground are made externally to the board through banana jacks
- The gate driver input *In* and supply V_{dd} are connected externally through the header P1
- C_1 and C_2 as well as C_3 and C_4 have sufficient capacitance value to achieve the designed voltage ripples on V_{bat} and V_{bus}, respectively
- All other devices and components are sized appropriately for their intended operation
- All electrical connections in the schematic have been made in the PCB layout
- There are no errors in DFM or DRC for the layout
- The PCB layout is *one-layer* only

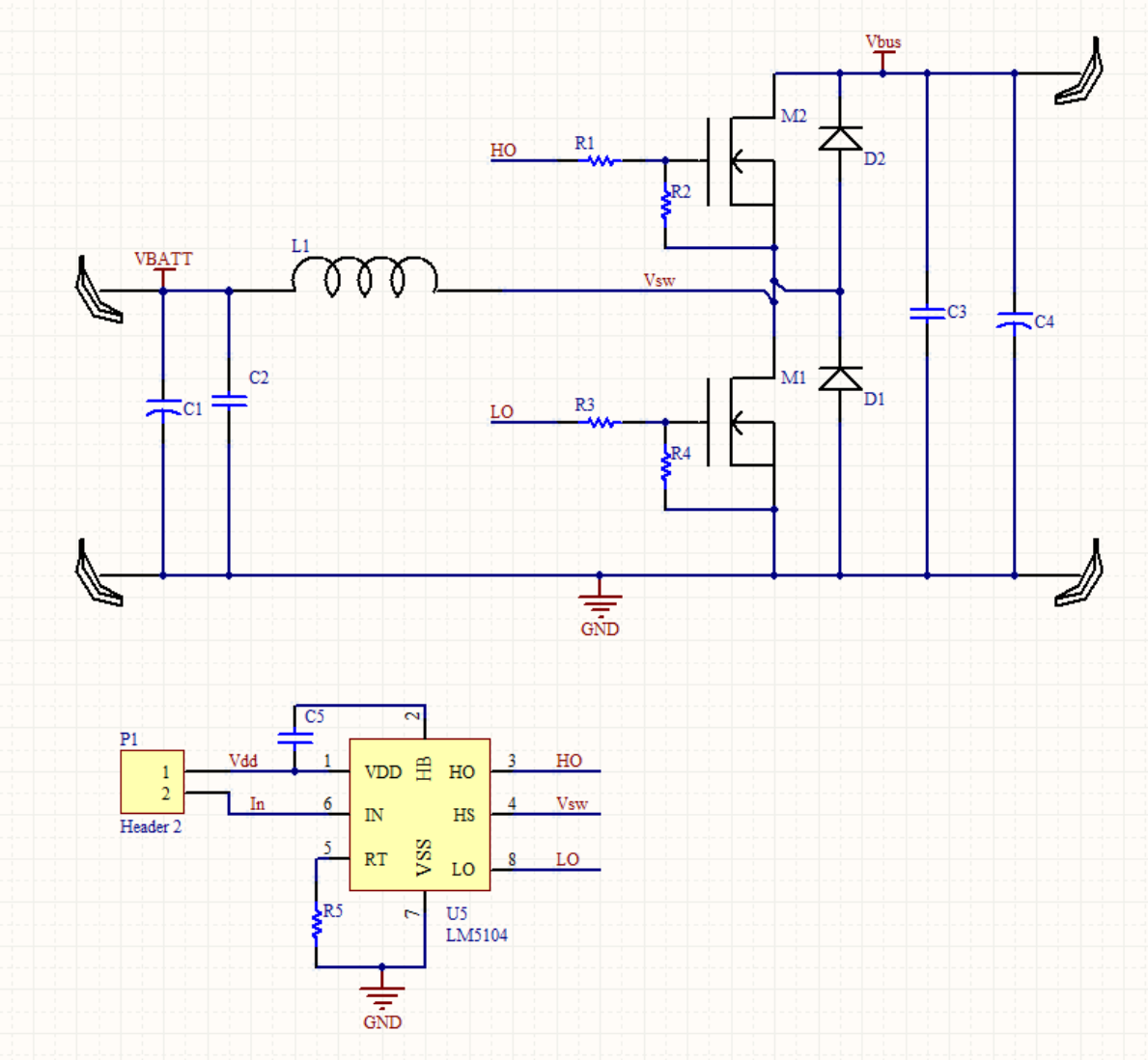

Figure 1: Boost converter schematic diagram

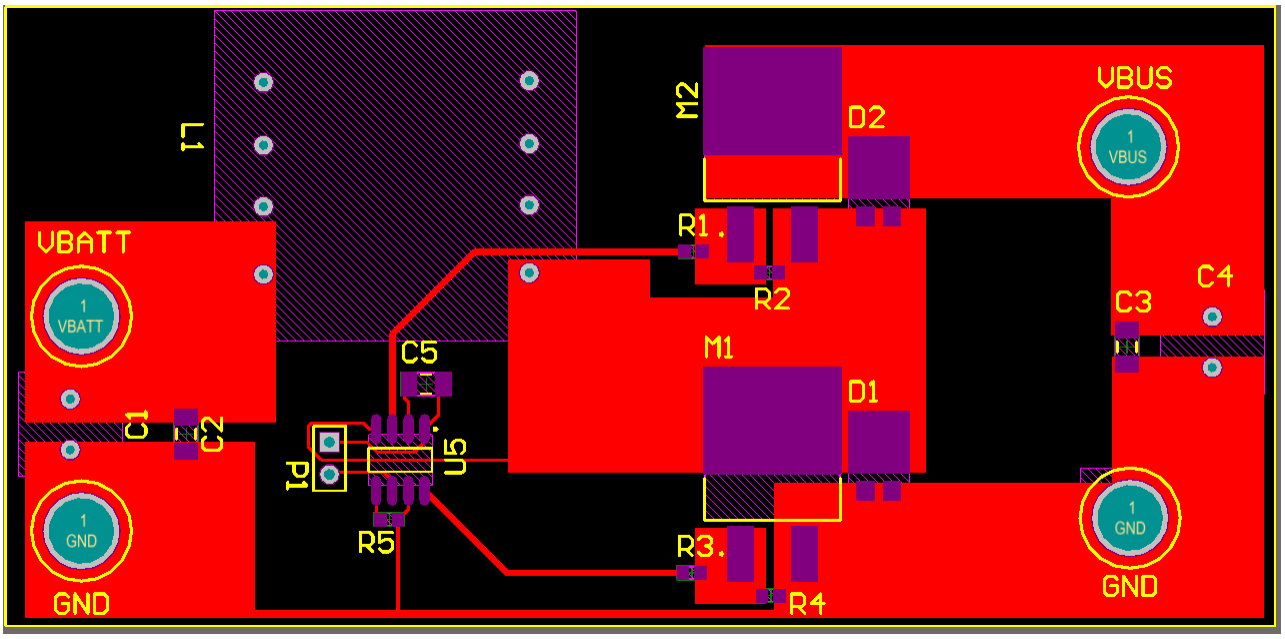

Figure 2: Boost converter PCB layout

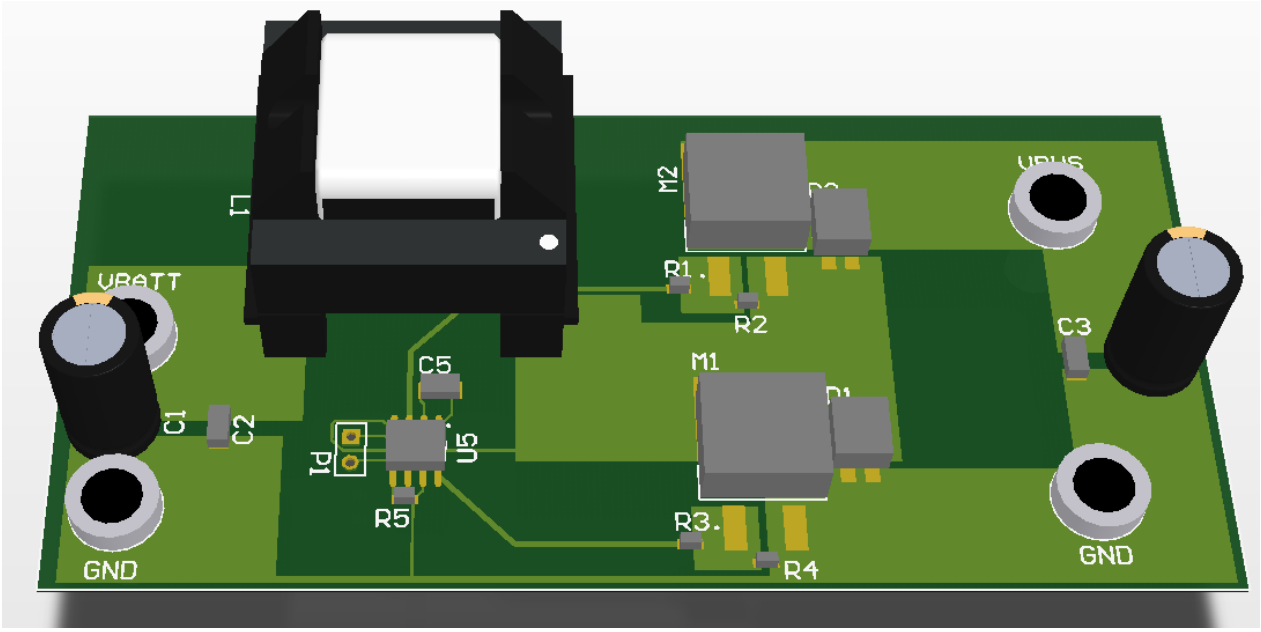

Figure 3: 3D representation of boost converter layout from Fig. 2

A. **[10 pts]** Describe, in one or two sentences at most, the purpose of including the following components in circuit

- R_1 and R_3

- R_2 and R_4

- R_5

- C_5

B. **[5 pts]** Two different types of capacitors are used between V_{bus} and ground. Explain the purpose of each, and what advantage this has over using two of the same type of capacitor.

C. [10 pts] Describe what you think are the *two* ***most important*** errors which must be addressed in the layout of Fig. 2 in order to ensure that the boost converter is able to work correctly and effectively. Explain what error is in the current layout, how it will harm circuit operation, and what should be altered to eliminate or reduce the harm.

The diagram of Fig. 2 is reproduced below and may be used to supplement your descriptions.