

PCB Layout Guidelines for MPC5674x Switch Mode Power Supply (SMPS)

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1 Overview

Switched regulators have become popular for their improved efficiency and frequency response compared to equivalent linear regulators. A system based on switched supplies can provide significantly lower power consumption, and consequently allow reduced printed circuit board area and a reduction in cost of external components.

The MPC5674F device provides an internal SMPS regulator that may be used to provide the V_{DD} voltage, eliminating the external V_{DD} supply. To ensure that the switched regulator operates as designed, it is important that the designer select appropriate components and design the PCB following some simple rules. A good PCB layout is of particular importance when using the switchmode regulator.

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2 Layout Guidelines

These simple component and layout guidelines ensure an effective layout:

- The input power supply capacitor C1, output capacitor C2, and inductor shown in [Figure 1](#) should be located very close to the power MOS-Schottky diode.
- The common power ground for nodes with high switching currents should be separated from nodes with low switching currents.
- Minimize the inductance between the switching supply node and the decoupling/filtering capacitor, so that decoupling is effective and minimum energy is radiated.
- Star-connect all grounds to the ground plane below the MOS-Schottky device.
- Keep gate control signal VRCTRL far from switching signals.
- Keep smaller EMI capacitors underneath the microcontroller.
- Use the 5 V power track exclusively as power to the drain of the power MOS by means of star connection to the global 5 V power supply.

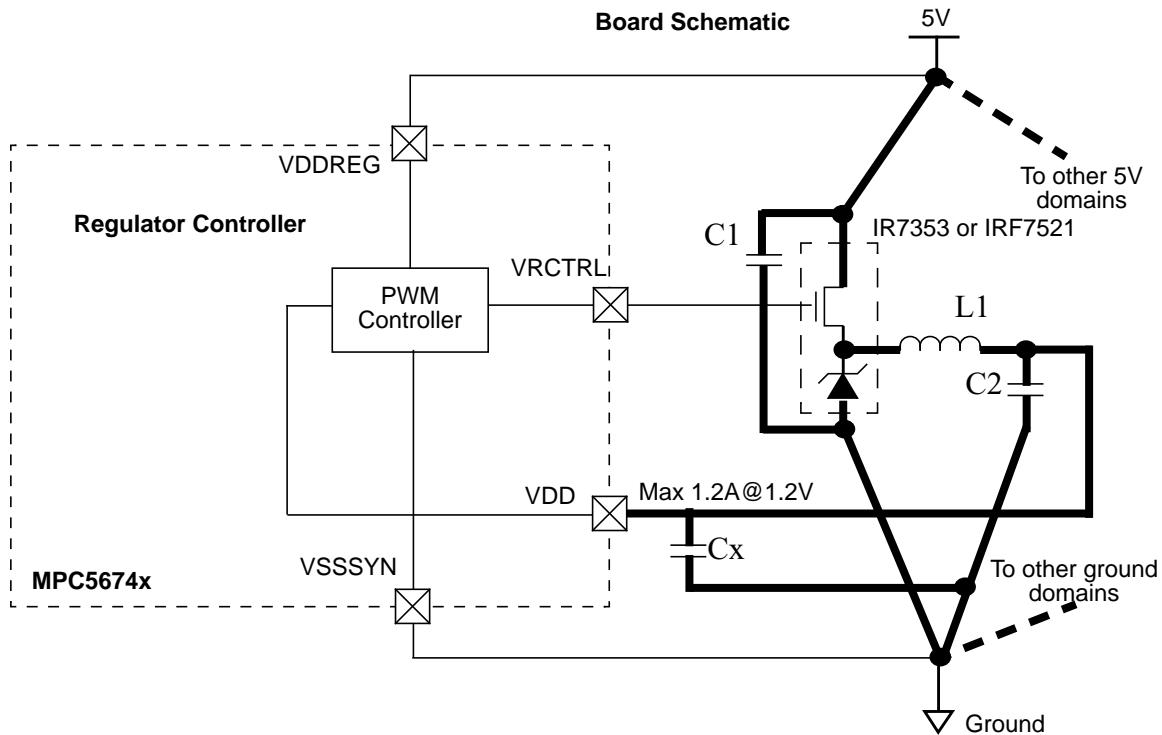


Figure 1. PCB Board Schematic with High Switching Current Paths Emphasized

3 External Components

- N-MOS + Schottky diode. Current rating >1.6 A over temperature, low V_t (max 1.5 V), low V_f (max 0.5 V) and low Q_g (max 12 nC @ 4.5 V).
- 2.2 μH nominal coil with current rating of 1.6 A or more across temperature range (Coilcraft DO3316T-222MLB, TDK RLF7030T-2R2M5R4, or equivalent).
- 6 \times 2.2 μF capacitors with ESR < 20 m Ω across temperature range. Should be able to withstand high voltages (>20 V) and fast transients (TDK RLF7030T-2R2M5R4, AVX-08053C225KAT2A, or equivalent).

4 PCB Layout Example

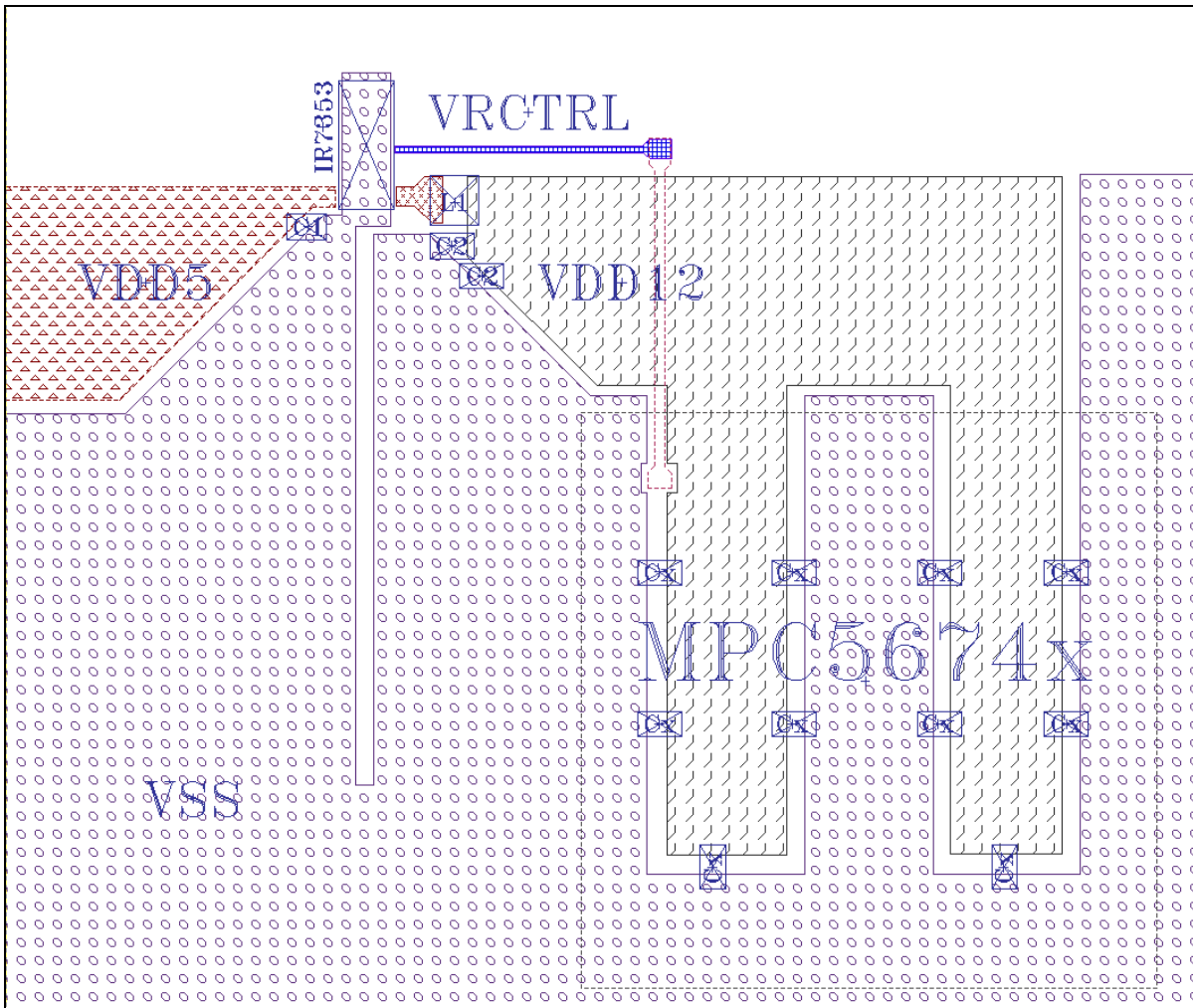


Figure 2. PCB Layout, Common Practice Example

NOTE

This example is not in scale and does not represent actual pinout of the device. It is provided to describe figuratively the concept explained in the guideline rules.

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