

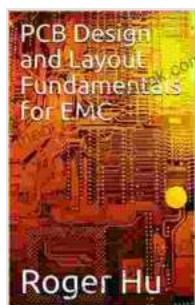
# PCB Design and Layout Fundamentals for EMC

Electromagnetic compatibility (EMC) is the ability of a device or system to function properly in its intended electromagnetic environment without causing harmful interference to other devices or systems. Poor PCB design and layout can lead to EMC problems, such as electromagnetic interference (EMI) and susceptibility to EMI.

This article provides an overview of the fundamentals of PCB design and layout for EMC. We will discuss the following topics:

- Sources of EMI
- Types of EMI
- EMC design guidelines
- PCB layout techniques for EMC

EMI can be generated by a variety of sources, including:



## PCB Design and Layout Fundamentals for EMC

by Roger Hu

★★★★☆ 4.4 out of 5

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- Digital circuits
- Power supplies
- Motors
- Transformers
- Antennas

EMI can be conducted through wires and cables, or it can be radiated through the air.

There are two main types of EMI:

- **Conducted EMI** is EMI that is conducted through wires and cables.
- **Radiated EMI** is EMI that is radiated through the air.

Conducted EMI can be caused by a variety of factors, such as:

- Ground loops
- Poorly shielded cables
- Improper termination of cables

Radiated EMI can be caused by a variety of factors, such as:

- Unintentional antennas
- Improper shielding

- Poor grounding

There are a number of EMC design guidelines that can be followed to help reduce EMI. These guidelines include:

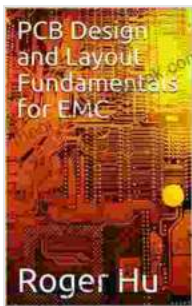
- Use proper grounding techniques. Grounding is essential for controlling EMI. All metal parts of the PCB should be grounded, and all ground connections should be made with low-impedance paths.
- Use shielded enclosures. Shielded enclosures can help to reduce the amount of EMI that is radiated from a PCB.
- Use proper cable management techniques. Cables can act as antennas, so it is important to manage them properly to minimize EMI.
- Use EMI filters. EMI filters can be used to reduce the amount of EMI that is conducted through wires and cables.
- Test for EMI. It is important to test for EMI to ensure that a PCB meets EMC requirements.

There are a number of PCB layout techniques that can be used to minimize EMI. These techniques include:

- **Use a symmetrical layout.** A symmetrical layout can help to reduce EMI by canceling out the electromagnetic fields generated by different components.
- **Place sensitive components away from sources of EMI.** Sensitive components, such as analog circuitry, should be placed away from sources of EMI, such as digital circuitry and power supplies.

- **Use proper component placement.** Components should be placed in a way that minimizes the amount of EMI that is generated. For example, components that generate high levels of EMI should be placed in shielded enclosures.
- **Use proper routing techniques.** Routing traces should be kept as short as possible and should be routed away from sensitive components.
- **Use a ground plane.** A ground plane can help to reduce EMI by providing a low-impedance path for ground currents.

PCB design and layout play an important role in EMC. By following the EMC design guidelines and PCB layout techniques discussed in this article, you can help to reduce EMI and improve the overall performance of your PCB.



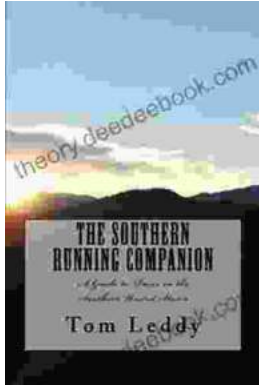
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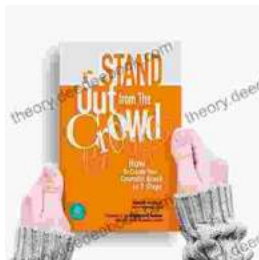
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