Ground(GND)

Introduction:

Grounding refers to the connection of a circuit or system to the earth or a common reference point. There are several types of grounding used in electronics and electrical systems:

1. **Signal Ground(SGND)**

   Provides a reference point for voltage measurements and ensures proper circuit operation.

2. **Power Ground (PGND)**

   In a power circuit, current flows from the power source through the load and back to the source. The Power Ground serves as the return path for this current.

3. **Analog Ground (AGND)**

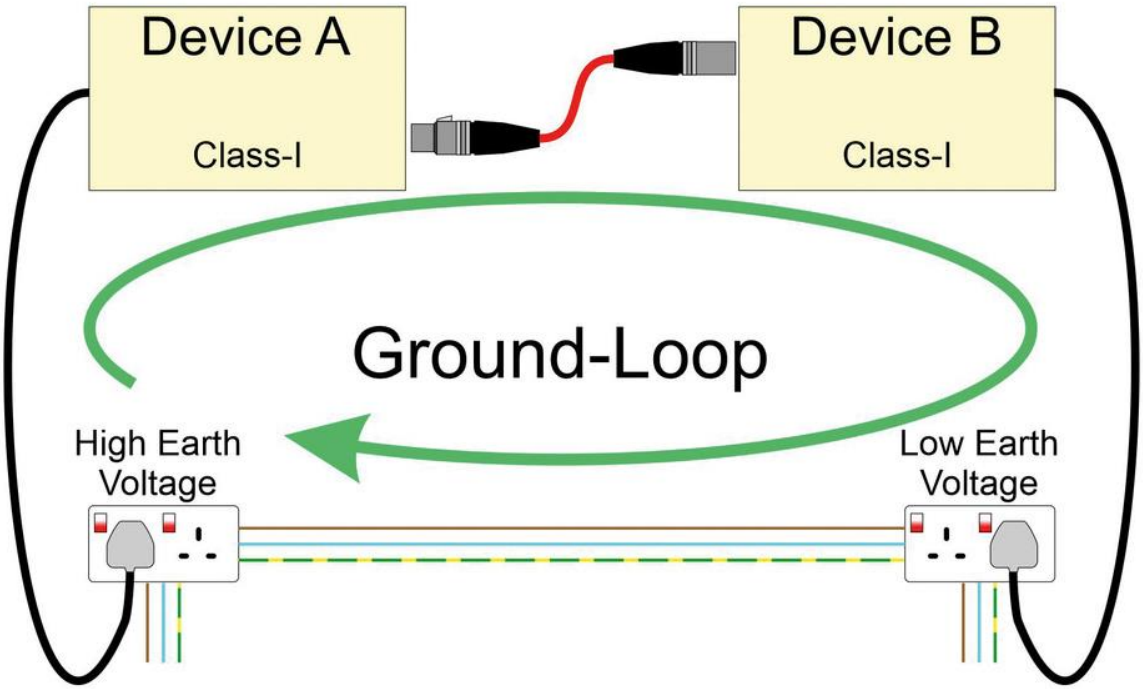
   provide a stable reference point and return path for analog signals in a circuit. It is specifically designated for low-noise, high-precision analog circuits, such as those found in analog-to-digital converters (ADCs), digital-to-analog converters (DACs), sensors, and amplifiers.

4. **Digital Ground (DGND)**

   provide a return path and reference point specifically for digital circuits and signals within an electronic system. It plays a crucial role in ensuring the proper functioning of digital components, such as microcontrollers, processors, logic gates, and digital communication interfaces.

Ground Loop

A ground loop in PCB design refers to an unintended current path formed between different ground points on a circuit board. This can occur when there are multiple ground connections at different potentials or when the ground plane is not properly designed.



How to Prevent it

Unfortunately, only simpler designs with low component interconnectivity will allow the placement of a ground plane that spans below every signal trace. Spanning a ground plane below signal traces is generally a good idea in lower-frequency devices. Keeping the area enclosed by your signal traces and the ground plane small also reduces susceptibility to external EMI.

Spanning the large ground plane under every component may not even be desirable in high-frequency applications. For example, in

high-frequency mixed-signal circuits driven by crystal oscillators, placing a ground plane directly below the signal clock creates a center-fed patch antenna. This will exacerbate EMI issues, and signal integrity is likely to be degraded without significant shielding.

If you elect to use multiple ground planes, a PCB ground loop can be prevented between ground planes by using the proper topology. Rather than connecting ground planes in a ring-like or daisy-chain topology, ground planes can be connected to the power supply ground in a star topology. Daisy chaining your ground planes can cause PCB ground loops between ground planes. A star topology connects each plane directly to the power supply and eliminates loops between ground planes.