High Side vs Low Side Switching

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In high side switching, the switch is placed between the power supply and the load. In low side switching, the switch is placed between the load and the ground.

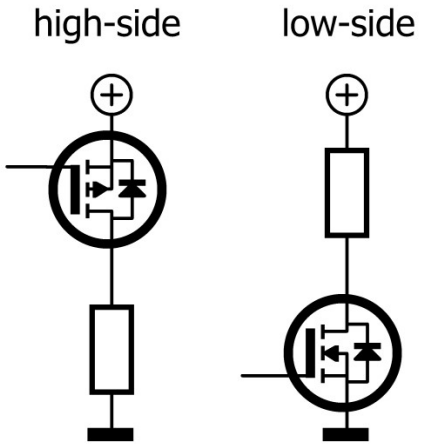

Figure 1: High Side vs Low Side with a MOSFET

When short circuits to the ground are a significant threat (for example, in cars or machines whose whole structure is grounded), high side switching is much safer. This is because it is safer to disconnect the load from the power supply than the ground.

In an application where controlling a machine using PWM with high load currents (i.e power switching) is required, low side switching is almost mandatory. N type switches can carry more current than p type, which is required for high load current. N type switches can be controlled with just a microcontroller if using low side switching (since the source is connected to the ground if we take a MOSFET as an example switch). In high side switching, a charge pump is required to make the gate voltage greater than source voltage (which is the power supply voltage in this case). This is problematic because the design is more complicated, more expensive and since charge pumps are vulnerable to noise and interference, PWM control becomes very inaccurate. It is, however, preferred to use high side switching if the application requires a normal on / off switch with no high frequency control, due to the safety concerns discussed above.

Another advantage of low side switching is that the load and controller are both connected to the same ground, which avoids ground potential differences and is therefore more robust to ground noise when compared to high side switching.

References

- https://www.elektormagazine.com/articles/high-side-low-side-switchings