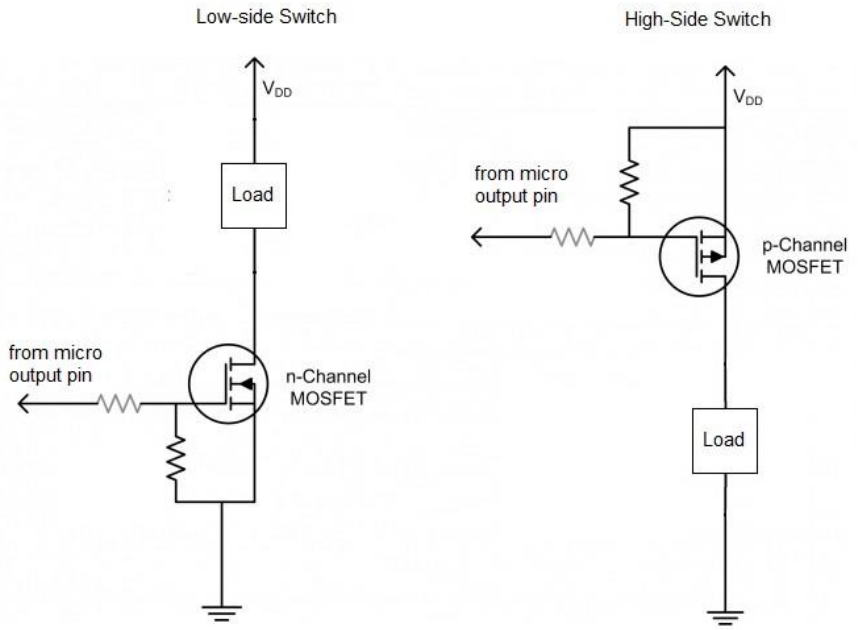
High side/Low side switching

High side switching:

Refers to the configuration of connecting a MOSFET between the supply voltage and the load or the higher voltage terminal hence the name “high side switch”

Low side switching:

In contrast, a low side switch refers to the configuration in which the load is connected the lower voltage terminal “ground” via a MOSFET



The main difference between the two configurations is the gate voltage required to turn on the device:

High side: load resistance is much higher than MOSFET internal resistance and so the voltage drop across the load will be approximately equal to the supply voltage meaning the voltage at the source V_S will be approximately equal to the supply voltage

to turn on the MOSFET V_{GS} has to be higher than the threshold voltage V_T so $V_G - V_S > V_T$ resulting in a very high voltage requirement at the gate.

Low side: in low side switching voltage drop across load is far higher and source voltage will equal to ground voltage (0) so gate voltage is only required to be higher than threshold voltage V_T

Applications for high side/ low side switching:

Low side switching:

Low side switches require a far lower gate voltage to turn on, and have a much simpler gate drive often used in low voltage, low power applications where it is not necessary to disconnect the load from the supply

High side switching:

Generally, you want to keep the ground connected in a circuit and switch the power. One reason is that even when the transistor is fully turned on, there is still a small voltage drop across it. That voltage drop means the ground is not 0 volts for that device. It does not matter which you switch for something simple like an LED. However, an active device like a Microcontroller needs its ground to be ground So when you have a load that requires ground, you need to use a high-side switch.