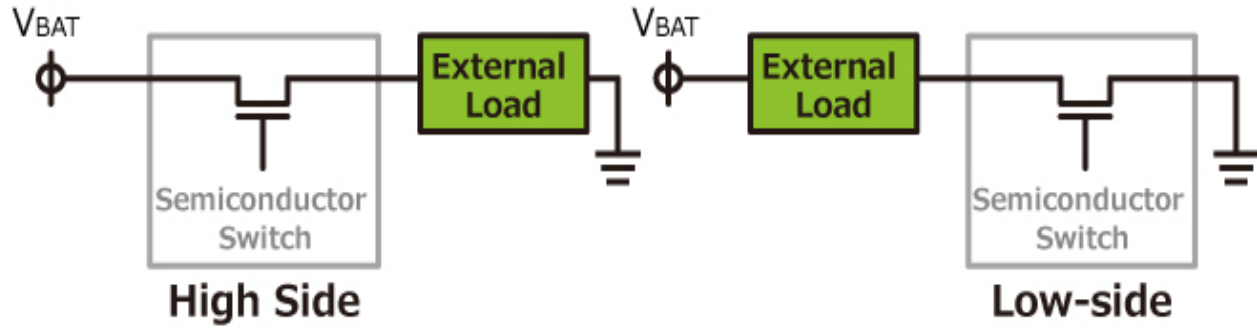


# High Side Vs Low Side Switches



## High Side:

High-side switches are used to turn electrical loads ON and OFF by switching the positive (high-) side of the load supply. Additionally, smart high-side switches are designed with the ability to protect themselves and diagnose possible unintended system behavior.

## Low Side:

Low-side power switches are used to turn electrical loads ON and OFF by switching the GND (low-) side of the load supply.

## How to Choose Between High-side and Low-side Switching?

The switch is inserted between the positive power line and the load in systems that use high side switching. In contrast, low side switching connects the load to ground. Although it's not difficult to understand how high-side and low-side switching work, when is one approach better than the other? inevitably, everything depends on the application.

- **Avoid dangerous situations:** When short circuits to ground are more likely to occur than short circuits to the positive power line, high-side switching is the recommended switching method. Consider automobiles or other devices where the majority of the body or structure is anchored to the earth. Disconnecting the load from the battery in such circumstances is safer than doing so from the ground. Additionally, because the load is not carrying any voltage when it is off, this usually leads to less connector corrosion in humid environments.
- **Power switching is better with N-type devices:** N-type transistors are preferred for switching heavy loads because they can typically handle higher current levels than P-types. When using N-type devices, low-side switching is simpler than high-side switching and can frequently be accomplished using microcontroller ports

without the use of additional drivers. High-side switching with an N-type transistor is feasible, but it needs a control voltage greater than the load voltage applied to the source and emitter. To raise the gate or base voltage above the source or emitter voltage, a charge pump of some kind is required. This adds complexity to the design, raising its cost and making it more susceptible to interference and noise. Because of the charge pump, controlling such a high-side switch with PWM can present challenges.

- **A Fuse Can Be the Decisive Factor:** As a result, low-side switching is typically less expensive than high-side switching. In contrast, high-side switching would only require one fuse to protect both the load and its controller when they are not placed directly next to one another. Although adding a fuse could completely negate the cost advantage of low side switching, it may seem pointless given the wiring and labor involved in making the fuses accessible in a fuse box.
- **A Solid Grounding System is Essential :** By using a single ground connection for both the load and its controller, low-side switching eliminates the possibility of ground potential differences, or "ground shifts," between the two during high current periods. For this reason, low-side switching can withstand ground noise better than high-side switching.

## **Conclusion:**

High-side switching is the recommended technique when a (heavy) load only needs to be turned on or off. It is advised to use low side switching when a load needs to be controlled via (relatively) high-speed PWM, such as in a lighting or heating system. There are also half H-bridges that need PWM in addition to a high-side and low-side switch. As such, always check that a technique is appropriate for your specific application before deciding on it.