single-quadrant switches

- passive switch (a passive switch does not have a control terminal)

\[
\begin{align*}
\text{Diode is off when } V < 0 \Rightarrow i = 0 \\
\text{Diode is off when } V = 0 \Rightarrow i > 0
\end{align*}
\]

V-I characteristics of the diode

\[\text{realistic } \quad \text{ideal } \]

Diode blocks negative voltage but not positive voltage.

\[\Rightarrow \text{Diode is a Forward Conducting Reverse Blocking Component.}\]

2) Active switch (the conducting state is determined by the control signal applied to the control terminal. The state does not depend on V_{CE} and i_{ct} applied to terminals C, B, & E of the switch.

BJT & MOSFET are examples.
BJT is a forward conducting, forward blocking switch. If it is controlled to be off $\Rightarrow i = 0 \Rightarrow$ block positive voltage $v > 0$.

If it is controlled to be on $\Rightarrow v = 0$ and the device is capable of conducting positive current $i > 0$.

MOSFET is a two-quadrant switch. MOSFET inherently contains a built-in diode, called body diode.