BJT Symbols and Conventions

From KCL only we find:

\[ i_E = i_B + i_C \]

From KVL only we find:

\[ V_{CE} = V_{CB} + V_{BE} \quad (npn) \]

\[ V_{EC} = V_{EB} + V_{BC} \quad (pnp) \]
Note that:

* The circuit **symbols** are very **similar** to MOSFETs, with *nPN* like N-MOS and *pNP* like P-MOS.

* Positive **current** is defined in **opposite** directions for *nPN* and for *pNP* (just like N-MOS and PMOS!).

* The **voltages** are of **opposite** polarity for *nPN* and *pNP*. Specifically, for *nPN* we use $v_{BE}$, $v_{CE}$ and $v_{CB}$, whereas for *pNP* we use $v_{EB}$, $v_{EC}$ and $v_{BC}$. This convention typically results in **positive** voltage values for **both** *nPN* and *pNP* (unlike the MOSFET convention!).

* The **base current** $i_B$ is **not** equal to zero, therefore $i_E \neq i_C$ (unlike MOSFETS)!