

BJT Topologies – Basic Bias

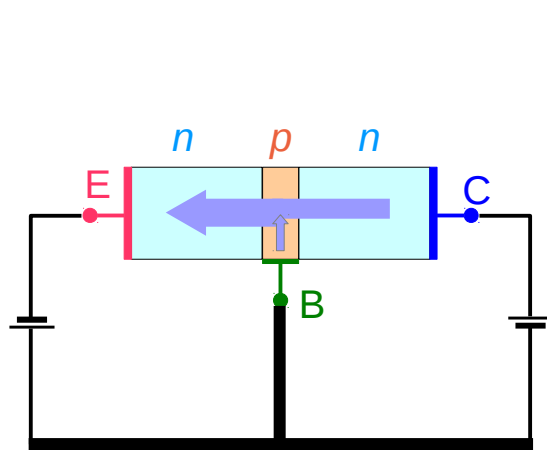
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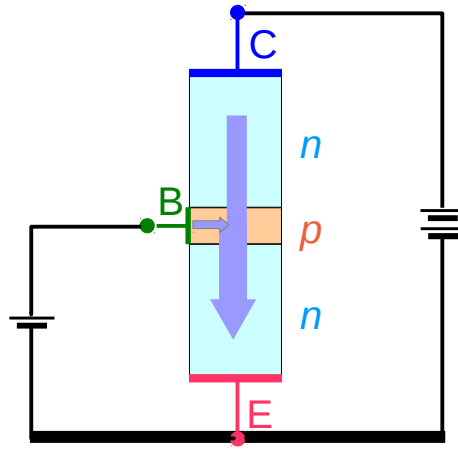
Please send corrections (or suggestions) to youngwlim@hotmail.com.

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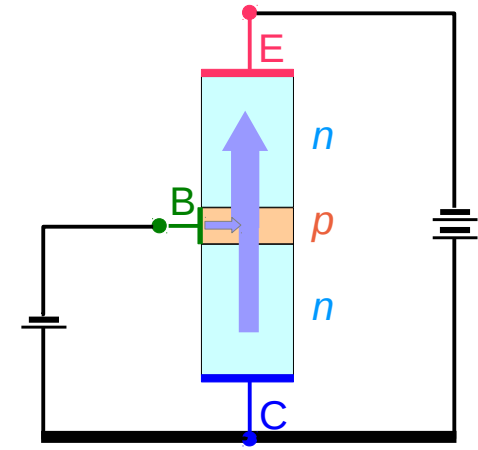
BJT Amplifier Topologies



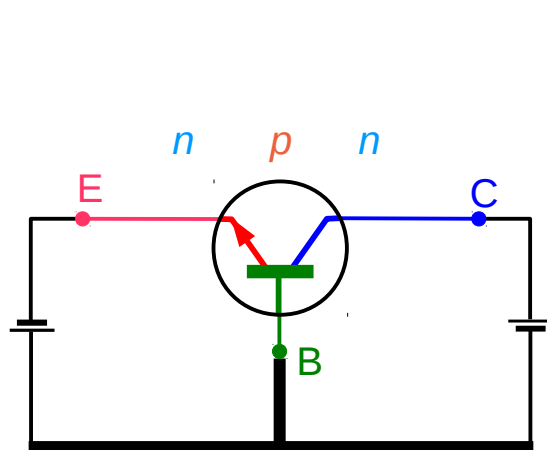
Common Base



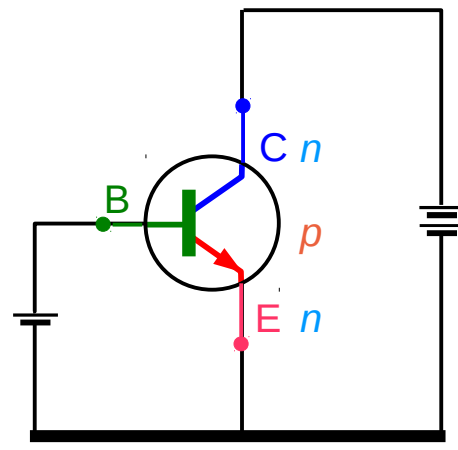
Common Emitter



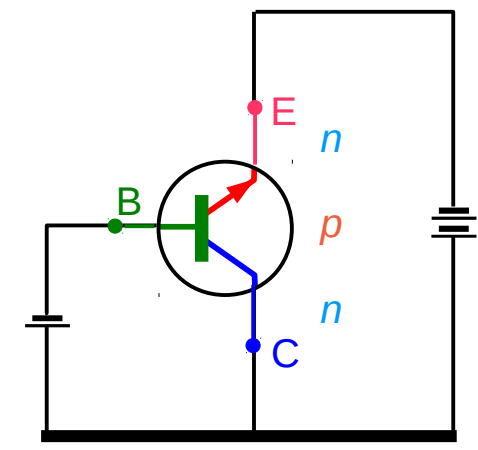
Common Collector



Common Base

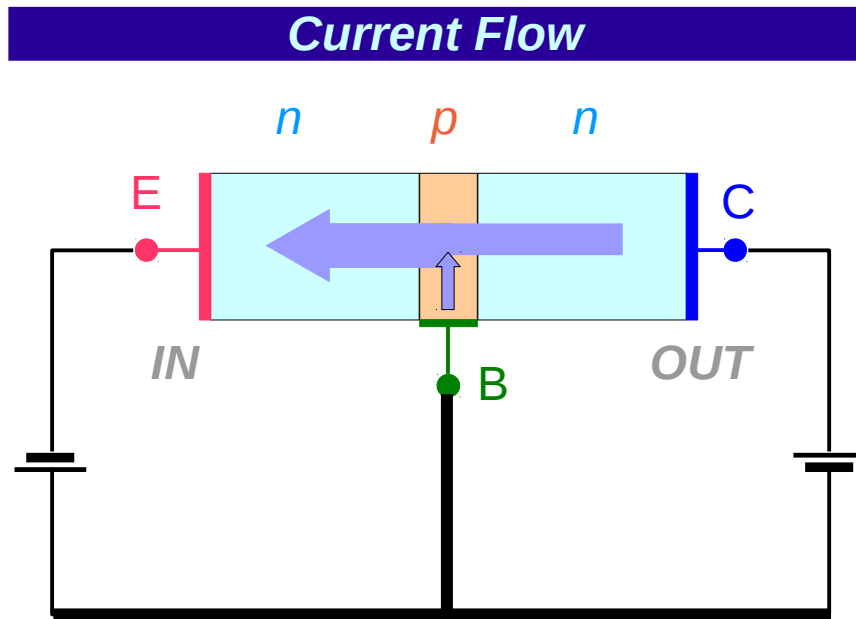


Common Emitter

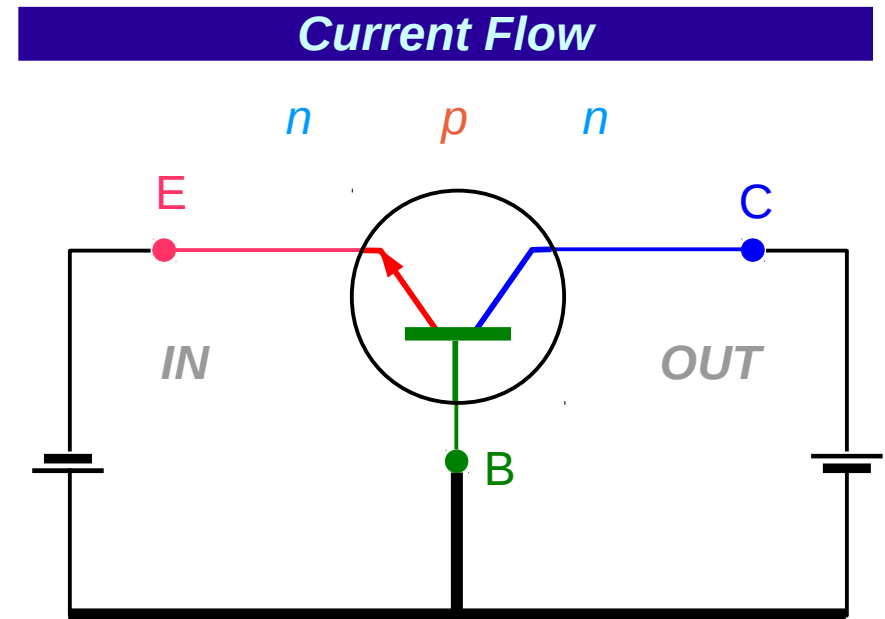


Common Collector

Common Base Topology



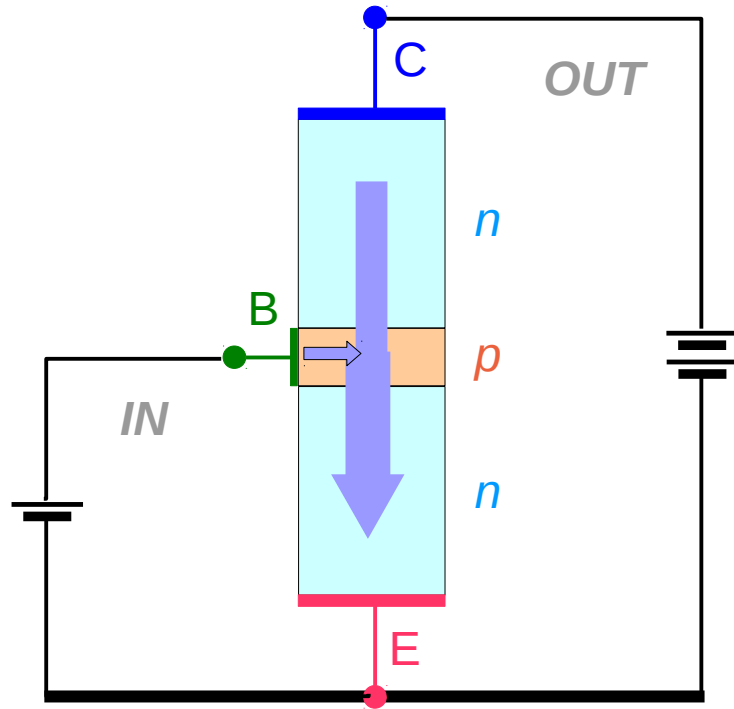
Common Base



Common Base

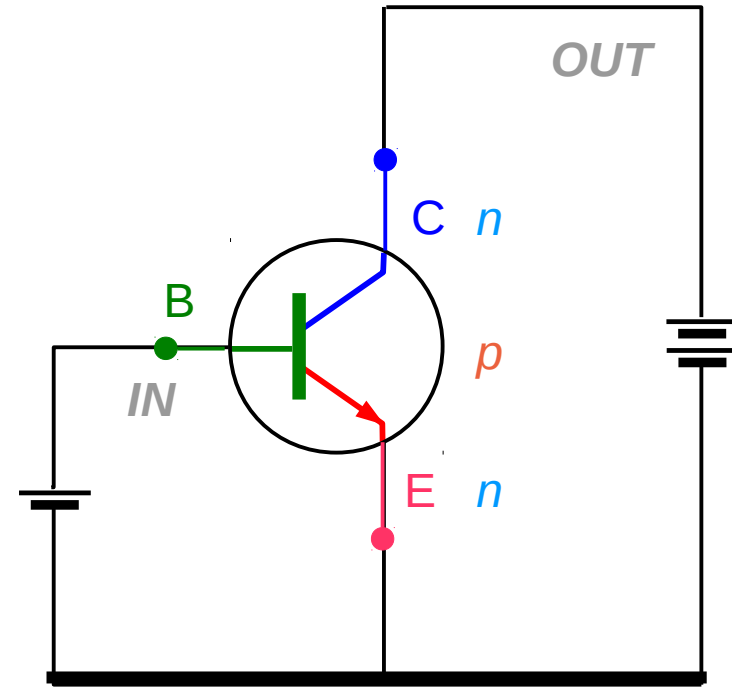
Common Emitter Topology

Current Flow



Common Emitter

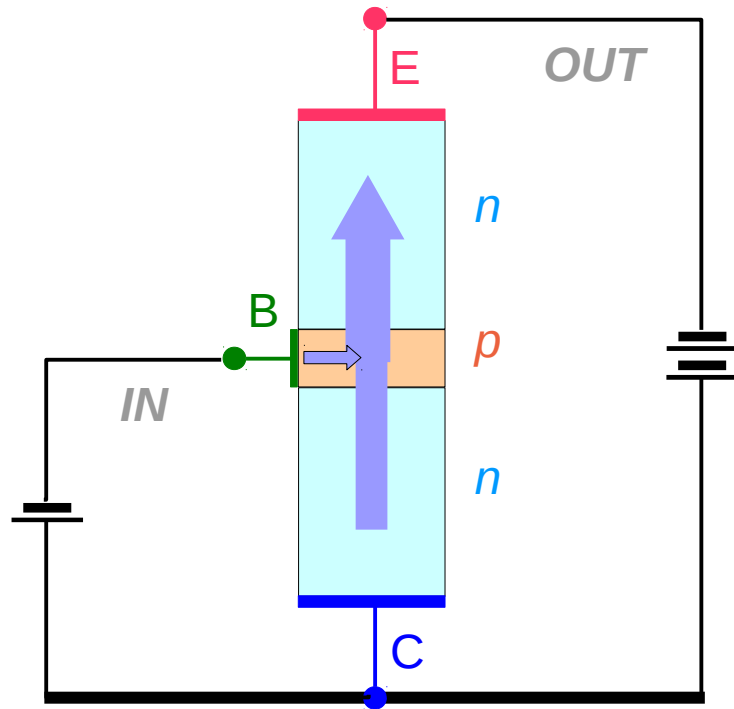
Current Flow



Common Emitter

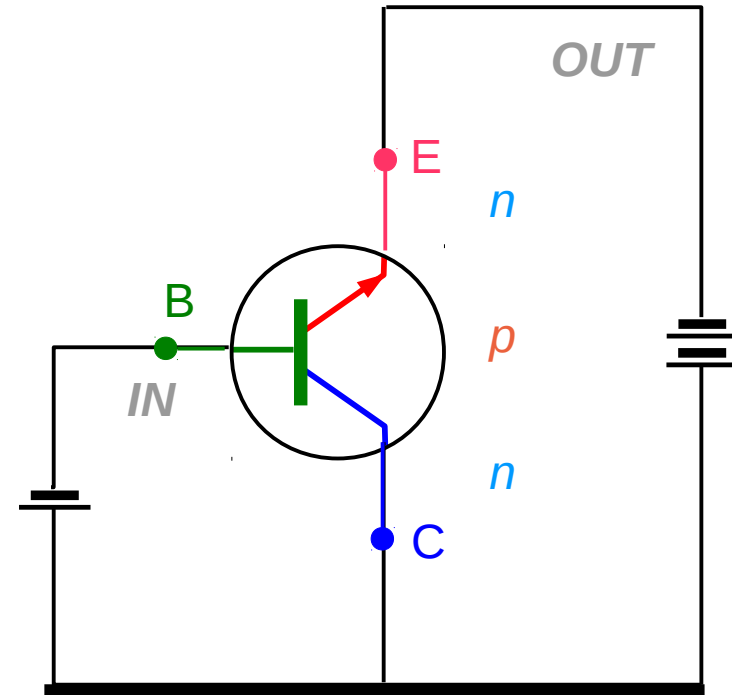
Common Collector Topology

Current Flow



Common Collector

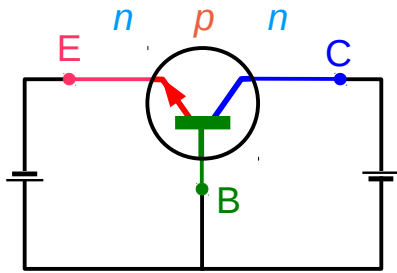
Current Flow



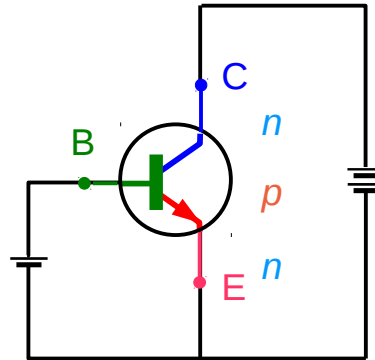
Common Collector

Forward bias (BE) & Reverse bias (CB)

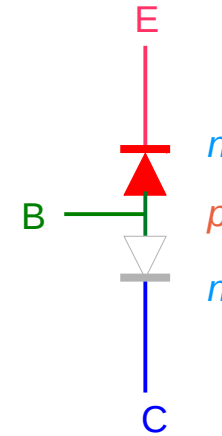
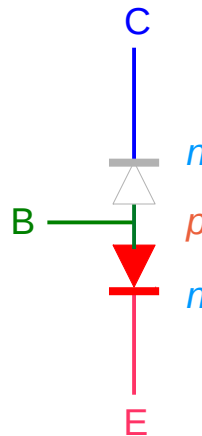
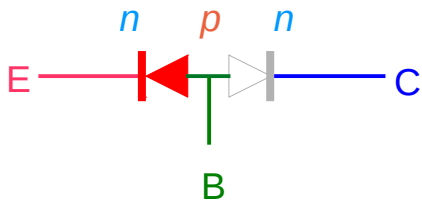
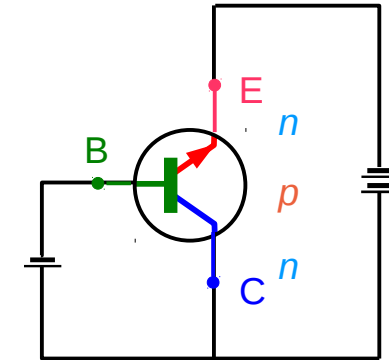
Common Base



Common Emitter



Common Collector



V_{BE} forward bias
 V_{CB} reverse bias

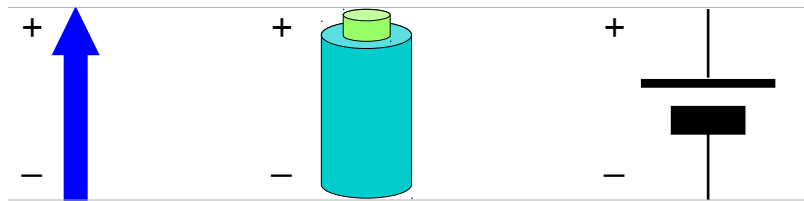
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V_{BE} forward bias
 V_{CB} reverse bias

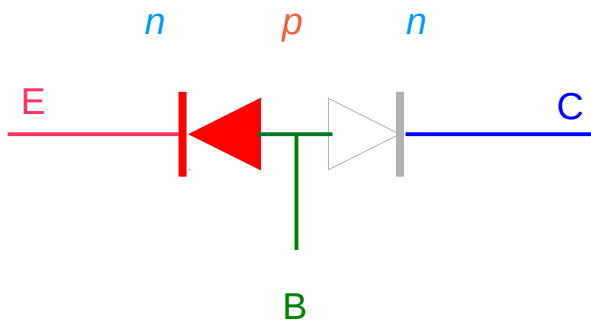
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V_{BE} forward bias
 V_{CB} reverse bias

Bias for Active Region



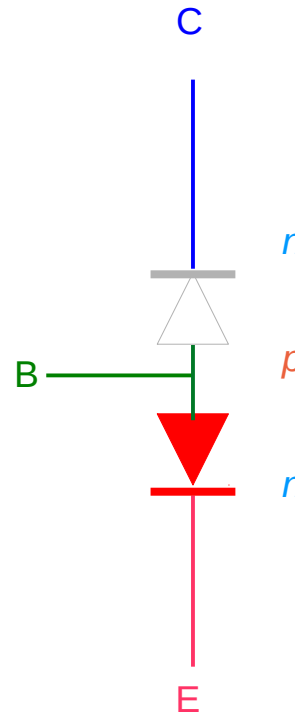
Common Base



V_{BE} forward bias
 V_{CB} reverse bias

Active region

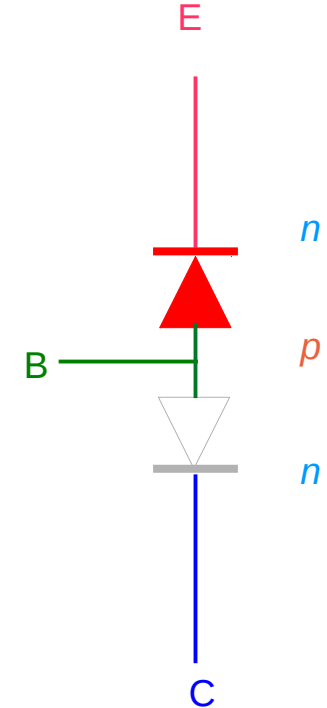
Common Emitter



V_{BE} forward bias
 V_{CB} reverse bias

Active region

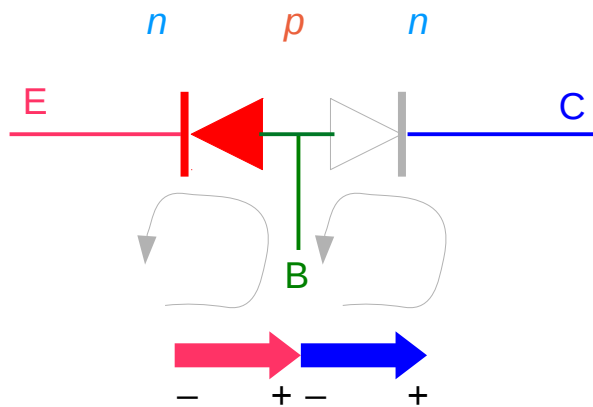
Common Collector



V_{BE} forward bias
 V_{CB} reverse bias

Active region

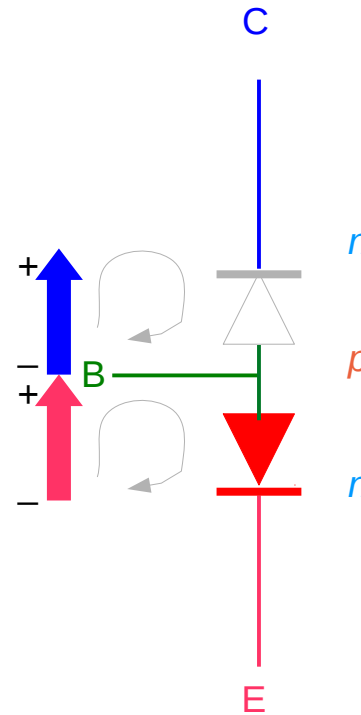
Common Base



V_{BE} forward bias
 V_{CB} reverse bias

Active region

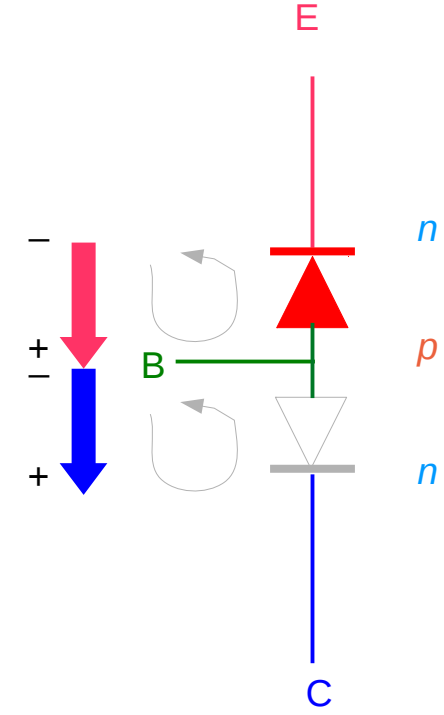
Common Emitter



V_{BE} forward bias
 V_{CB} reverse bias

Active region

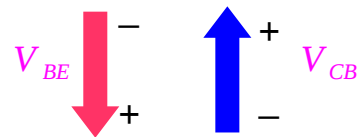
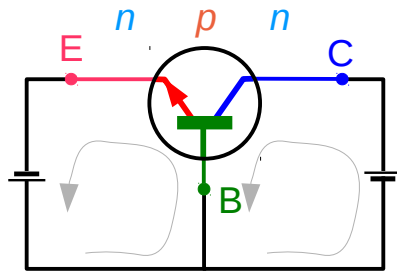
Common Collector



V_{BE} forward bias
 V_{CB} reverse bias

Active region

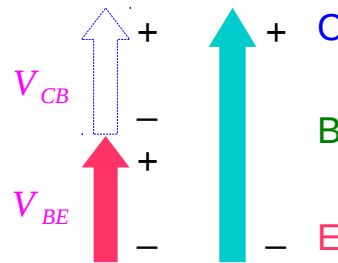
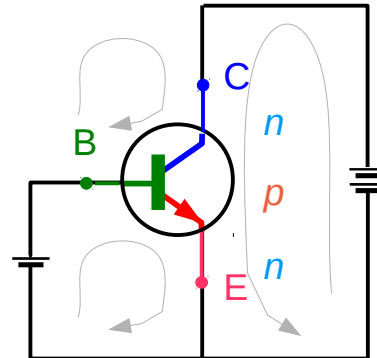
Common Base



V_{BE} forward bias
 V_{CB} reverse bias

Active region

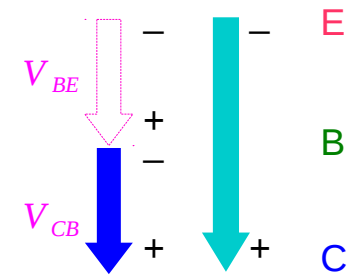
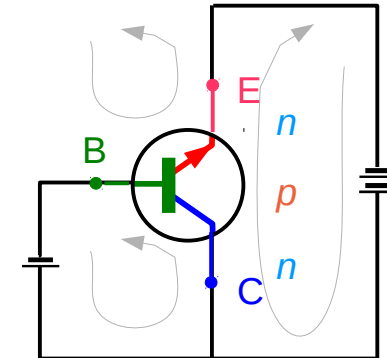
Common Emitter



V_{BE} forward bias
 V_{CB} reverse bias

Active region

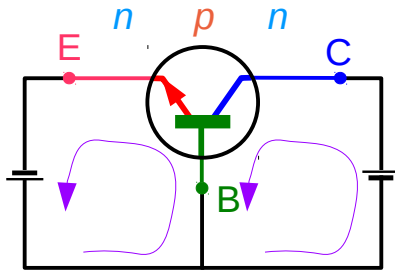
Common Collector



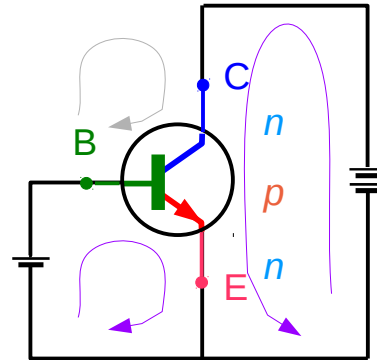
V_{BE} forward bias
 V_{CB} reverse bias

Active region

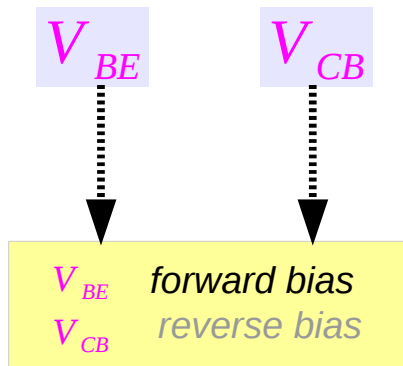
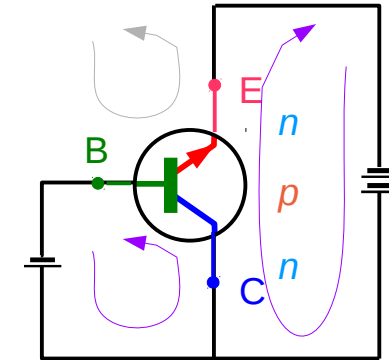
Common Base



Common Emitter

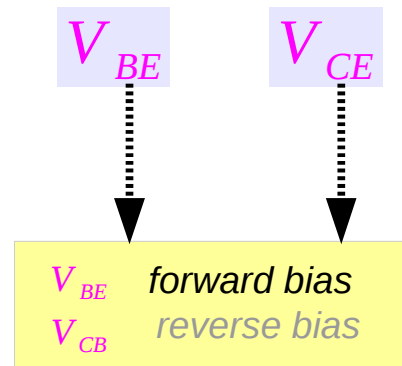


Common Collector



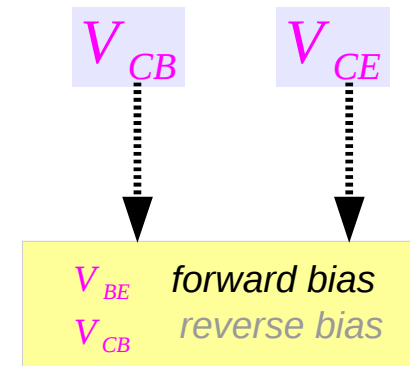
Active region

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Active region

=

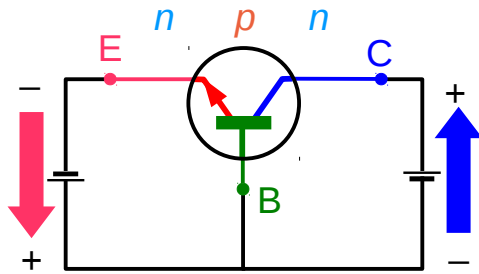


Active region

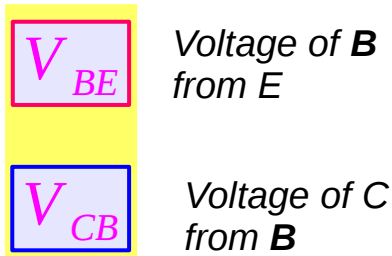
Controlling V_{BE} & V_{CB}

Active Region

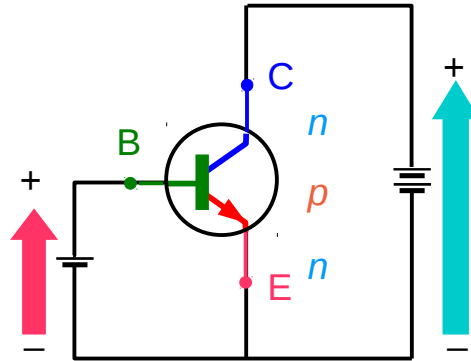
Common Base



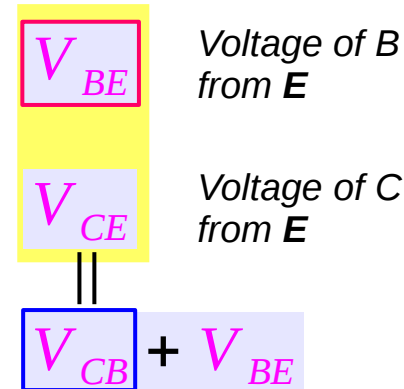
Direct Control



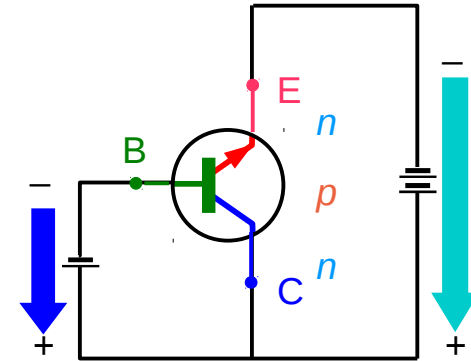
Common Emitter



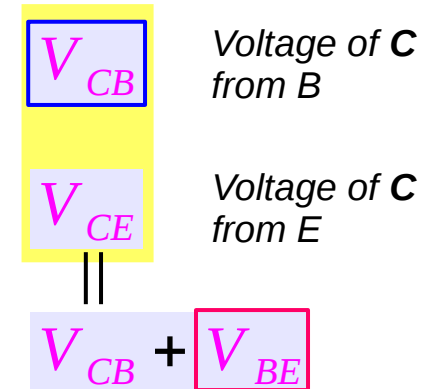
Indirect Control



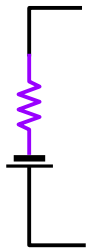
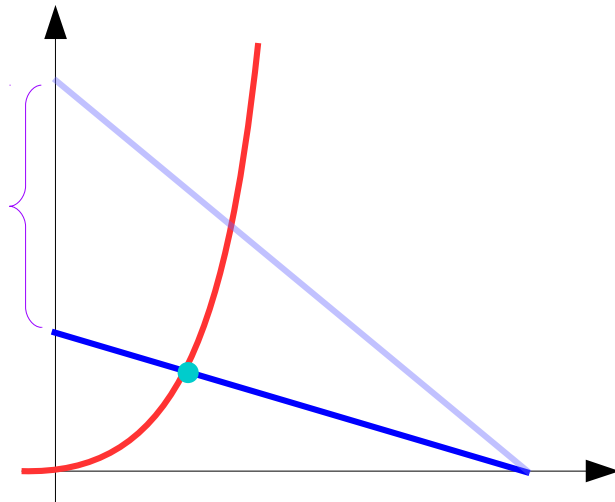
Common Collector



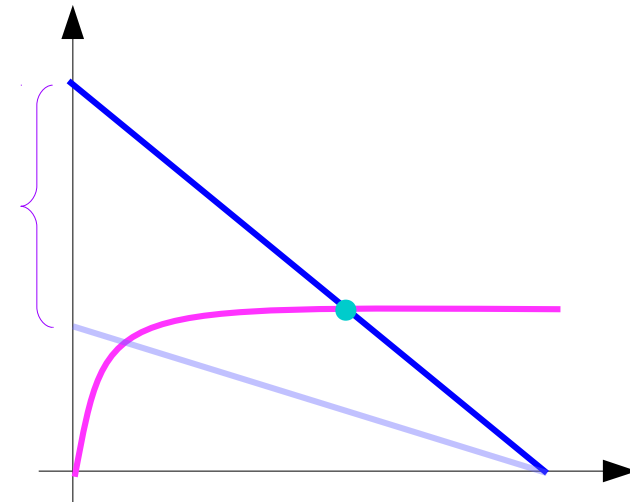
Indirect Control



Input Characteristics



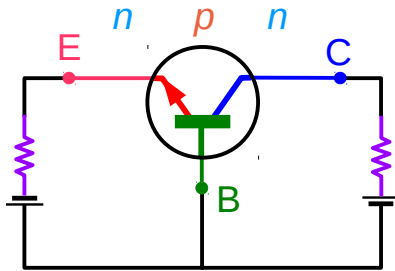
Output Characteristics



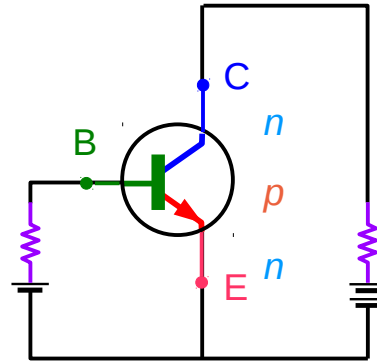
Two Voltage Sources

Active Region

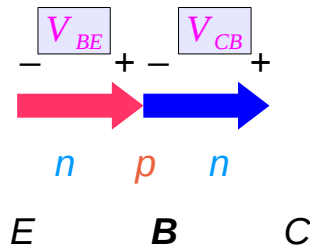
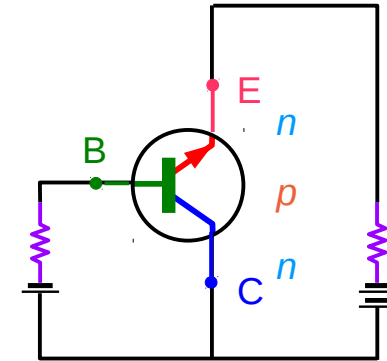
Common Base



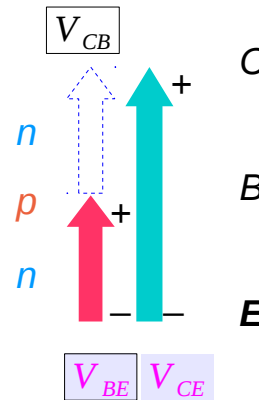
Common Emitter



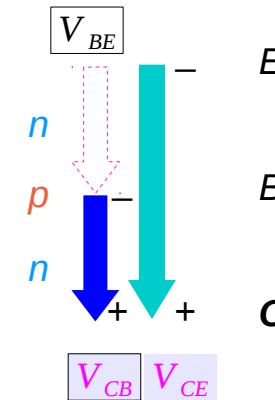
Common Collector



Active region

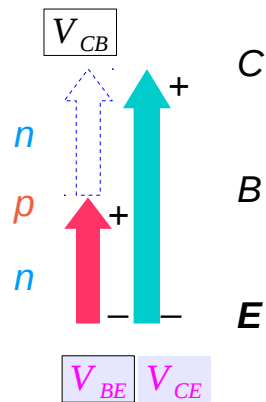
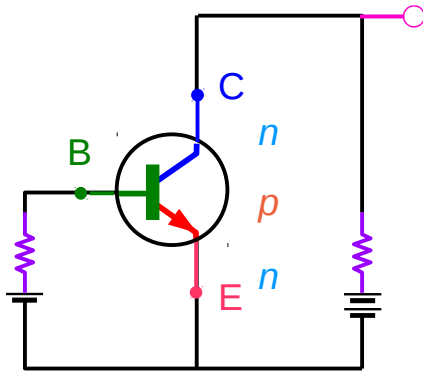


Active region



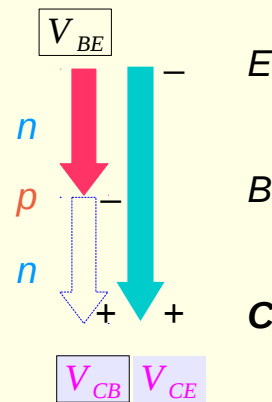
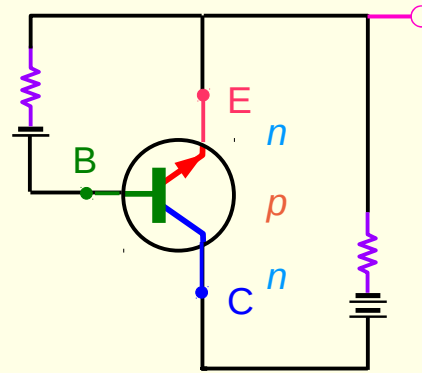
Active region

Common Emitter



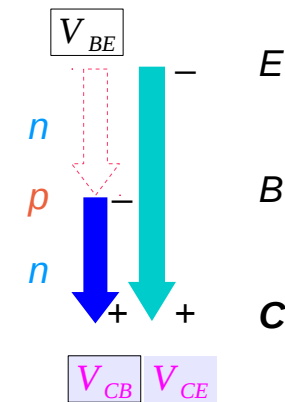
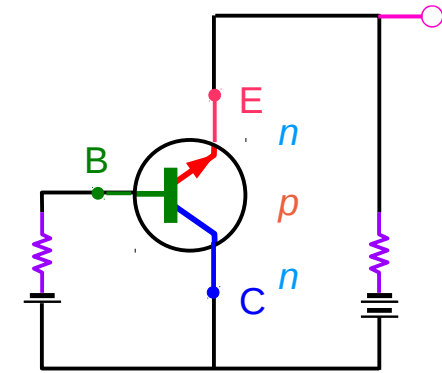
Active region

Common Collector 2



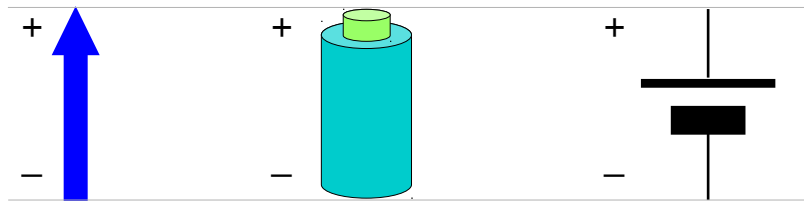
Active region

Common Collector

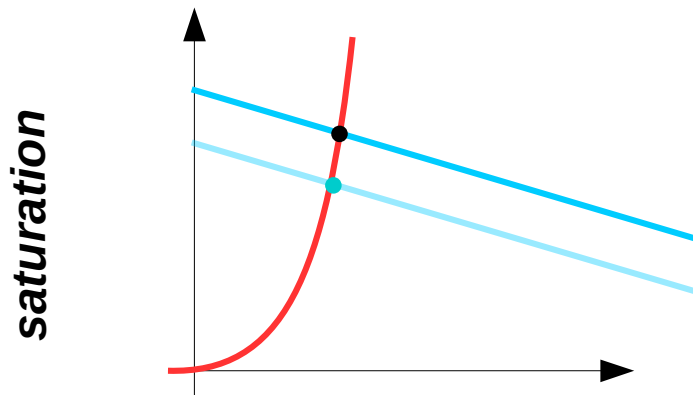
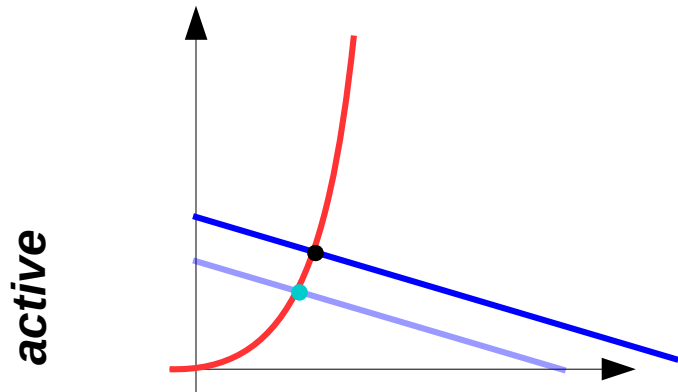


Active region

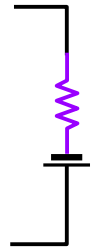
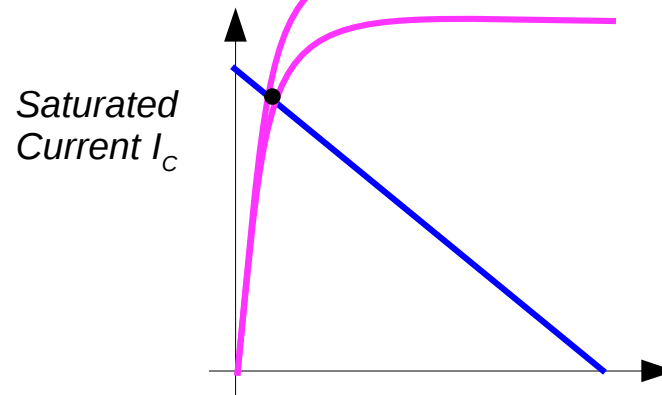
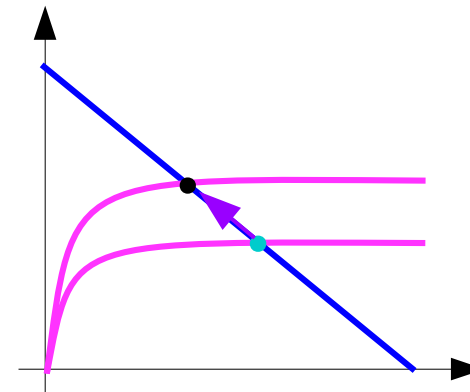
Bias for Saturation Region



Input Characteristics



Output Characteristics



Increasing Current I_C



Increasing Voltage Drop across R

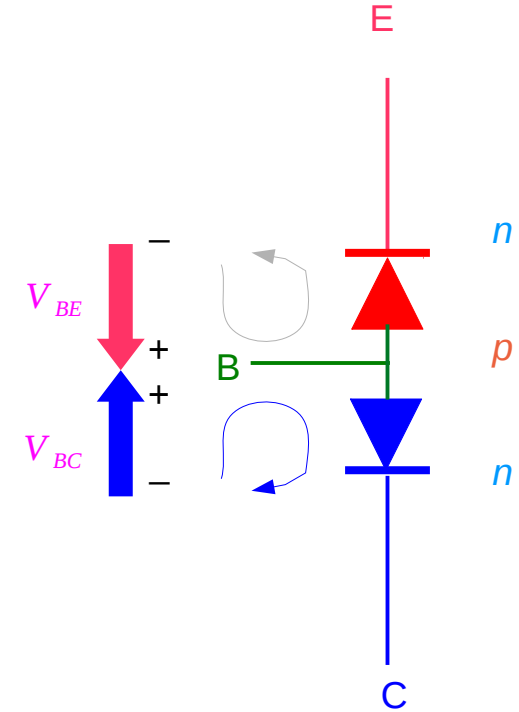
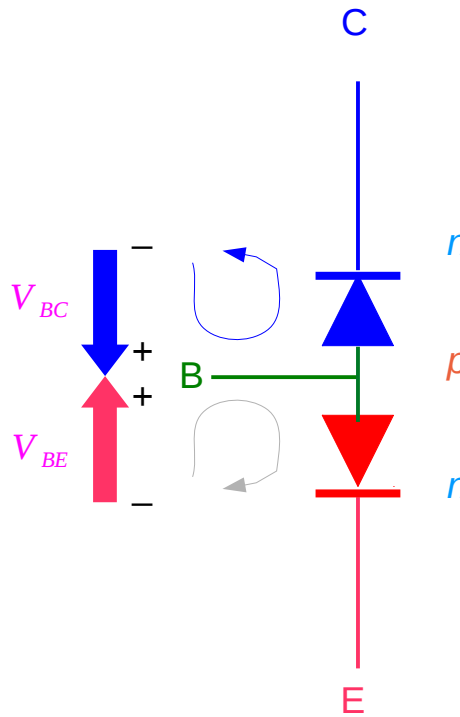
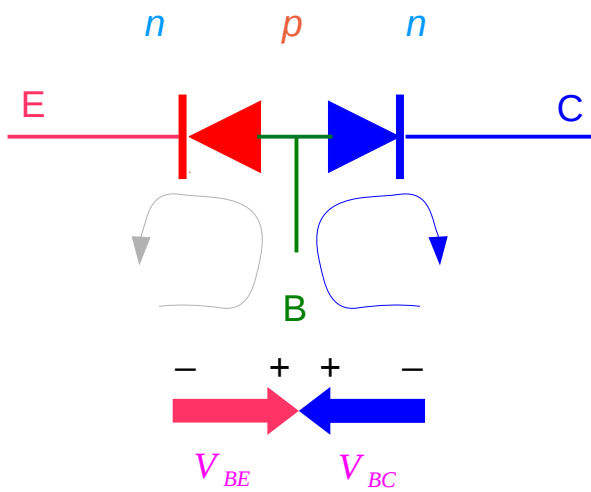


Decreasing V_{CE}

Common Base

Common Emitter

Common Collector



V_{BE} forward bias
 V_{BC} forward bias

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V_{BE} forward bias
 V_{BC} forward bias

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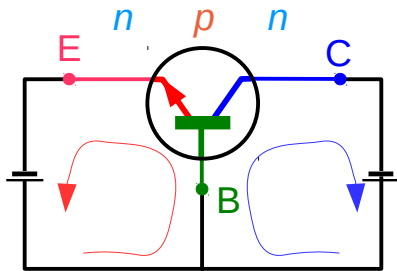
V_{BE} forward bias
 V_{BC} forward bias

saturation

saturation

saturation

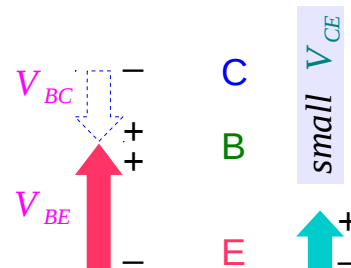
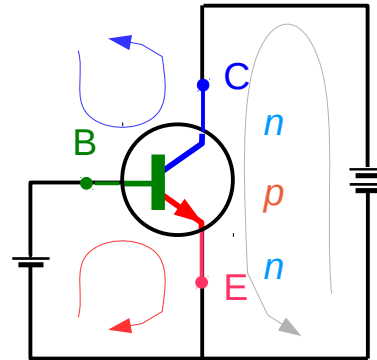
Common Base



V_{BE} forward bias
 V_{BC} forward bias

saturation

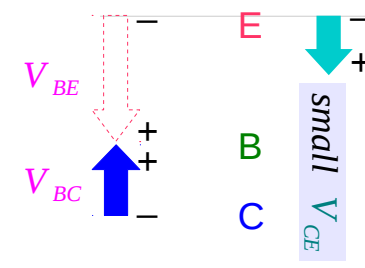
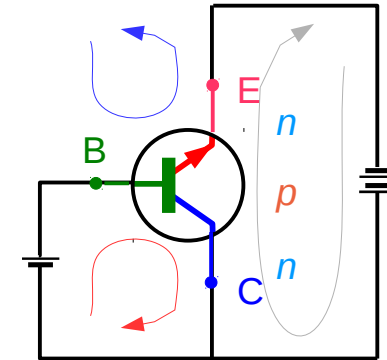
Common Emitter



V_{BE} forward bias
 V_{BC} forward bias

saturation

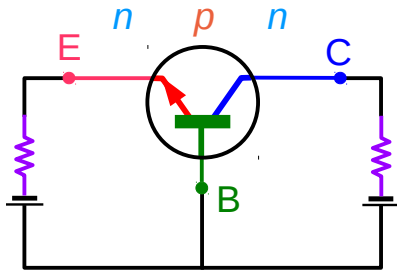
Common Collector



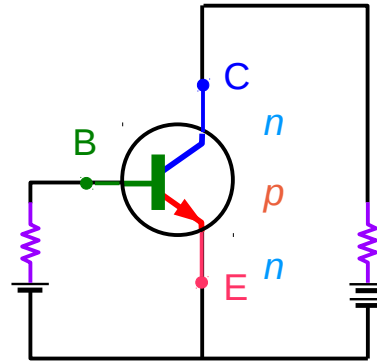
V_{BE} forward bias
 V_{BC} forward bias

saturation

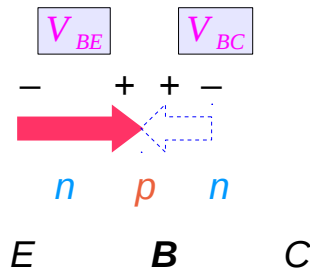
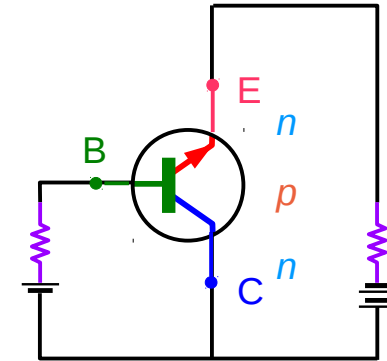
Common Base



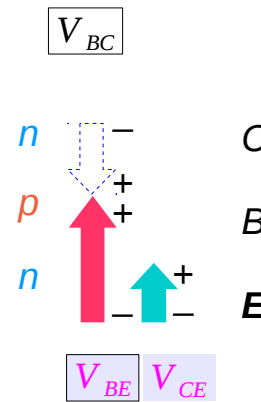
Common Emitter



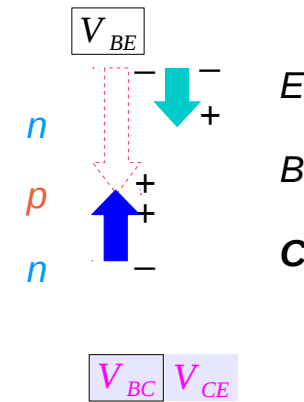
Common Collector



saturation

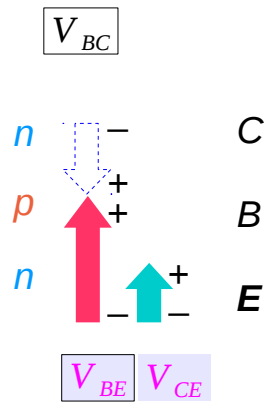
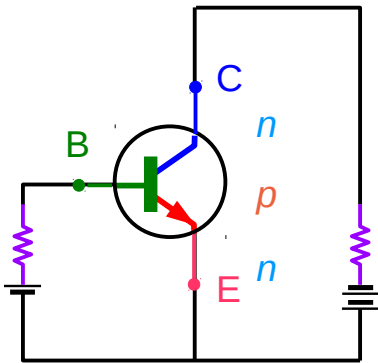


saturation



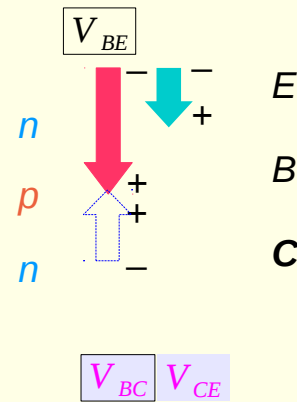
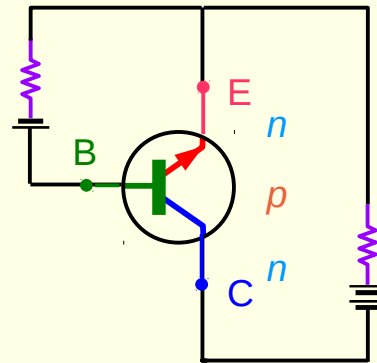
saturation

Common Emitter



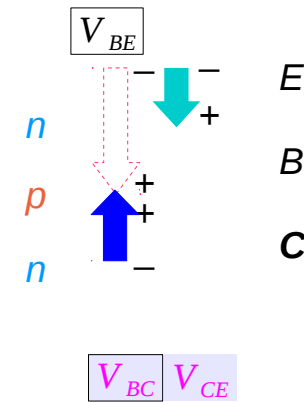
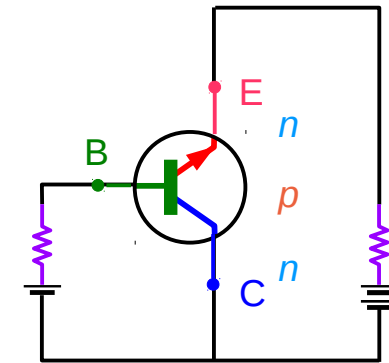
saturation

Common Collector 2



saturation

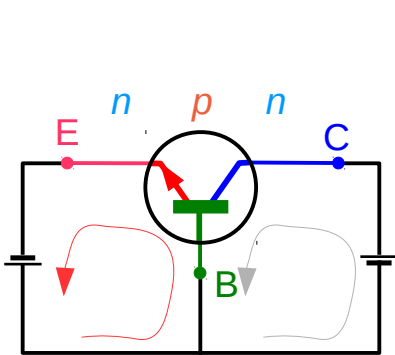
Common Collector



saturation

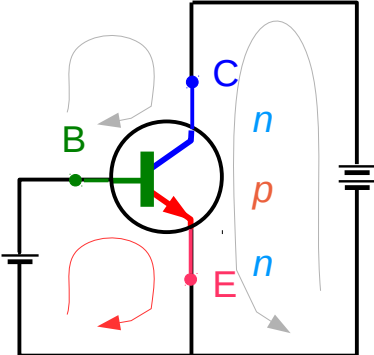
Active and Saturation Regions (1)

Common Base



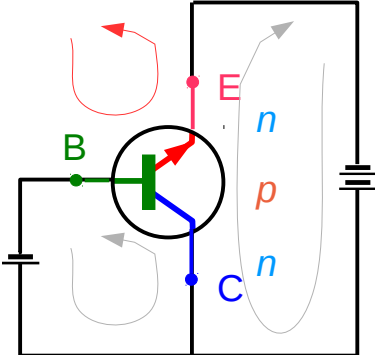
active

Common Emitter

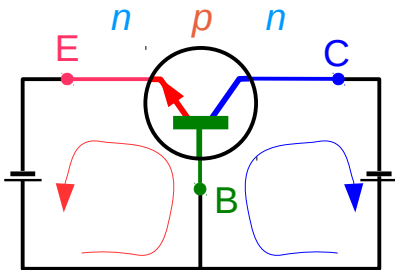


active

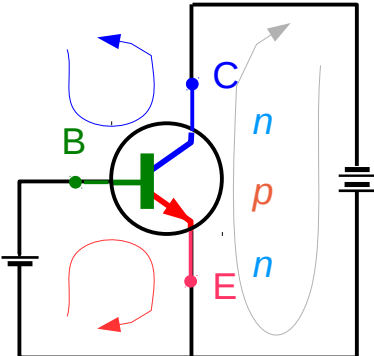
Common Collector



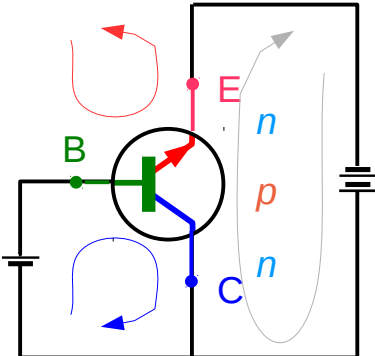
active



saturation



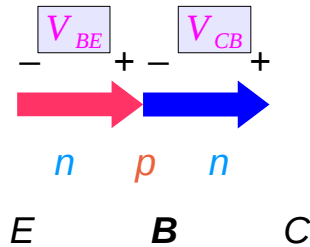
saturation



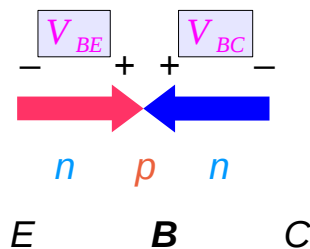
saturation

Active and Saturation Regions (2)

Common Base

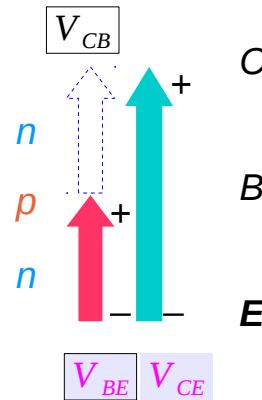


active

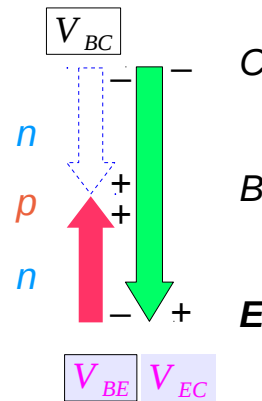


saturation

Common Emitter

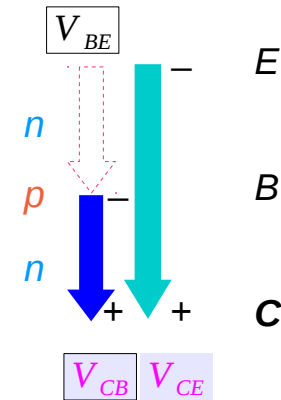


active

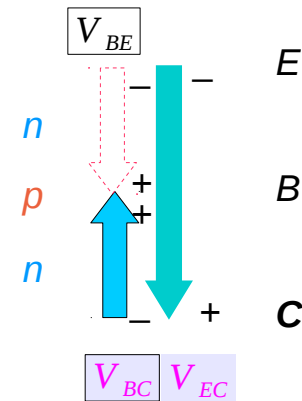


saturation

Common Collector



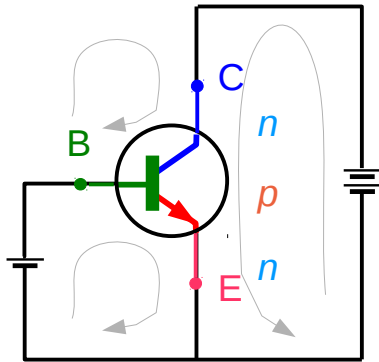
active



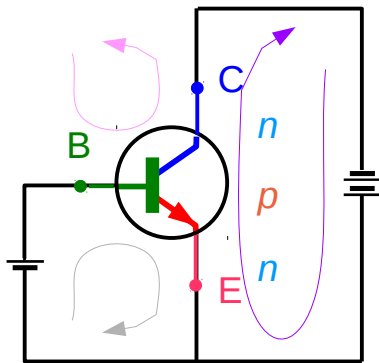
saturation

Active and Saturation Regions (3)

Common Emitter

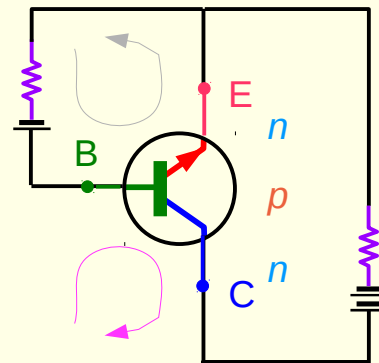
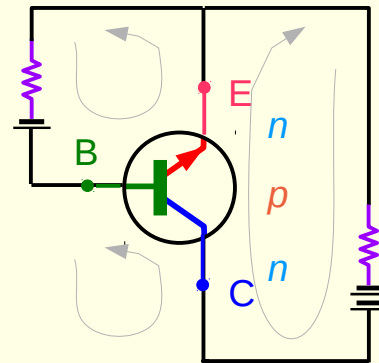


active



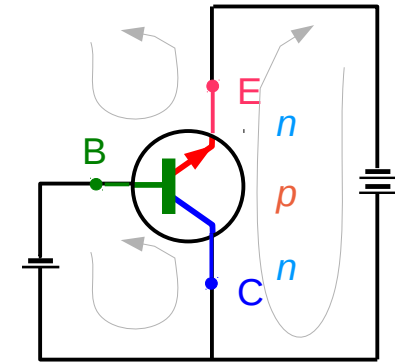
saturation

Common Collector 2

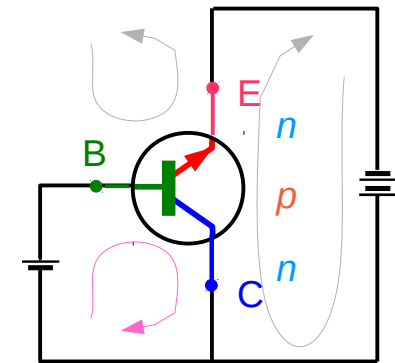


saturation

Common Collector



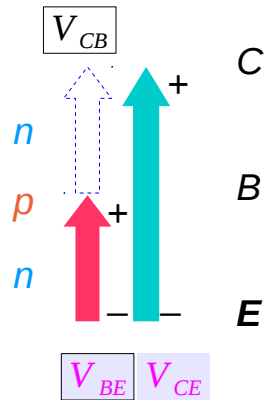
active



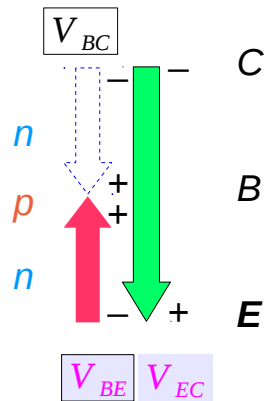
saturation

Active and Saturation Regions (4)

Common Emitter

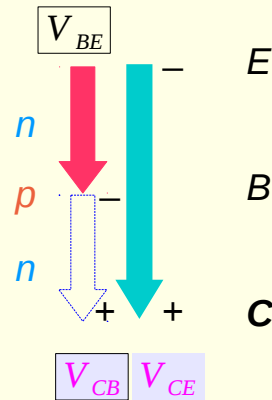


active

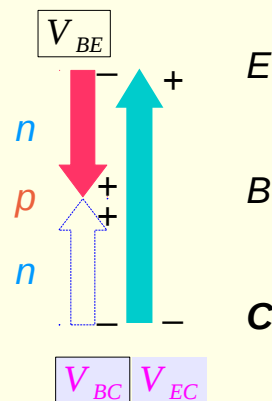


saturation

Common Collector 2

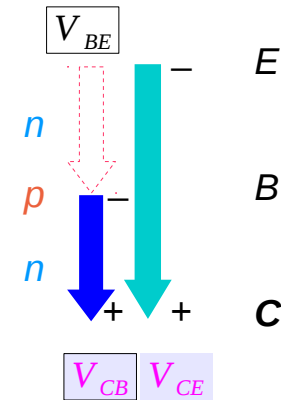


active

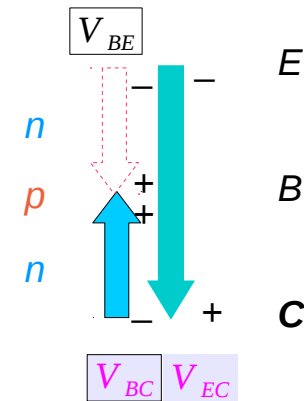


saturation

Common Collector



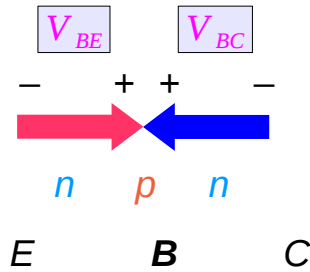
active



saturation

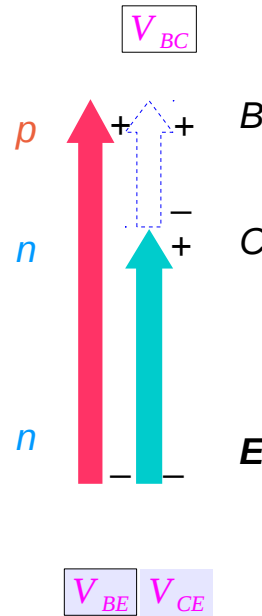
Active and Saturation Regions (2)

Common Base



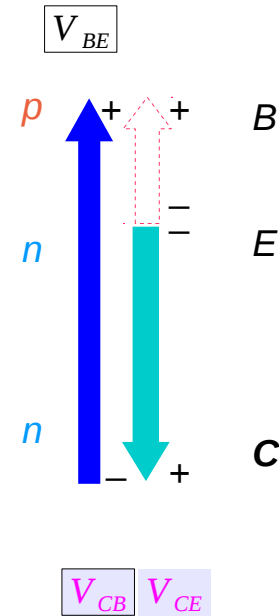
saturation

Common Emitter



saturation

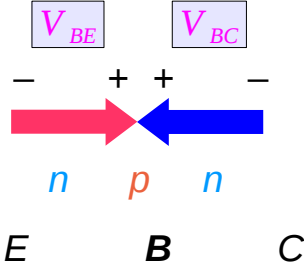
Common Collector



saturation

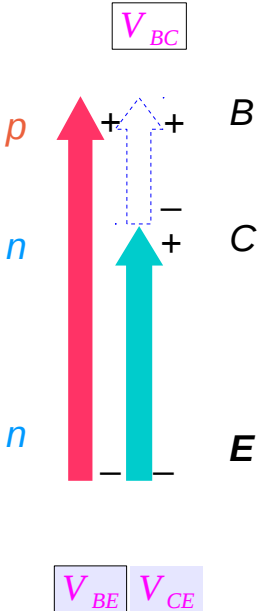
Active and Saturation Regions (2)

Common Base



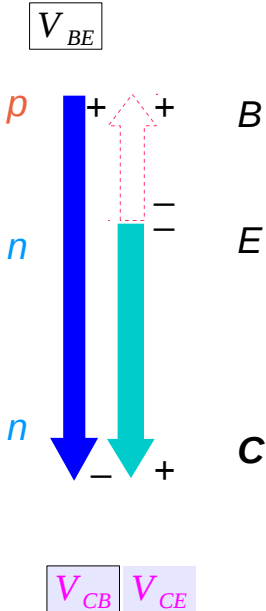
saturation

Common Emitter



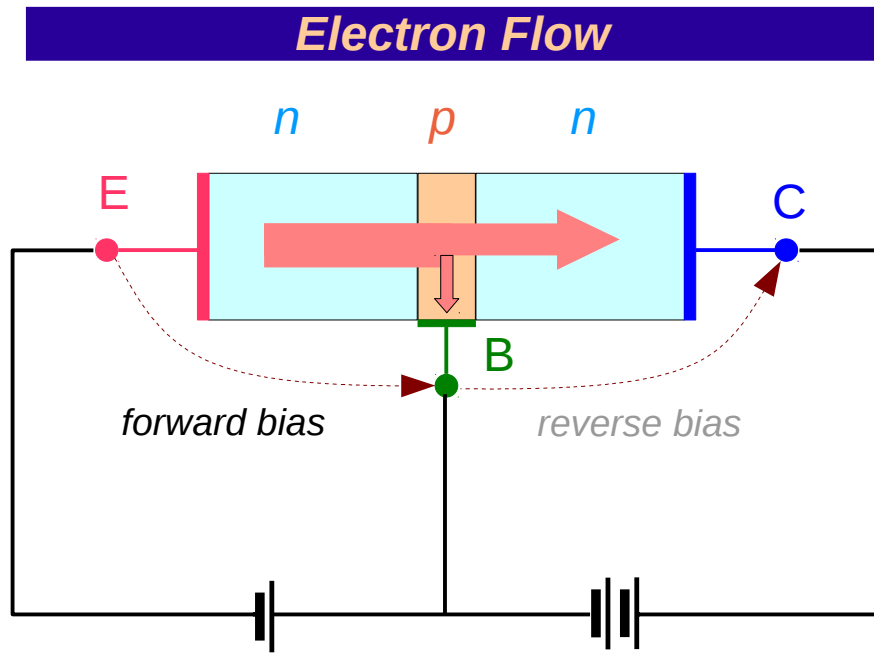
saturation

Common Collector

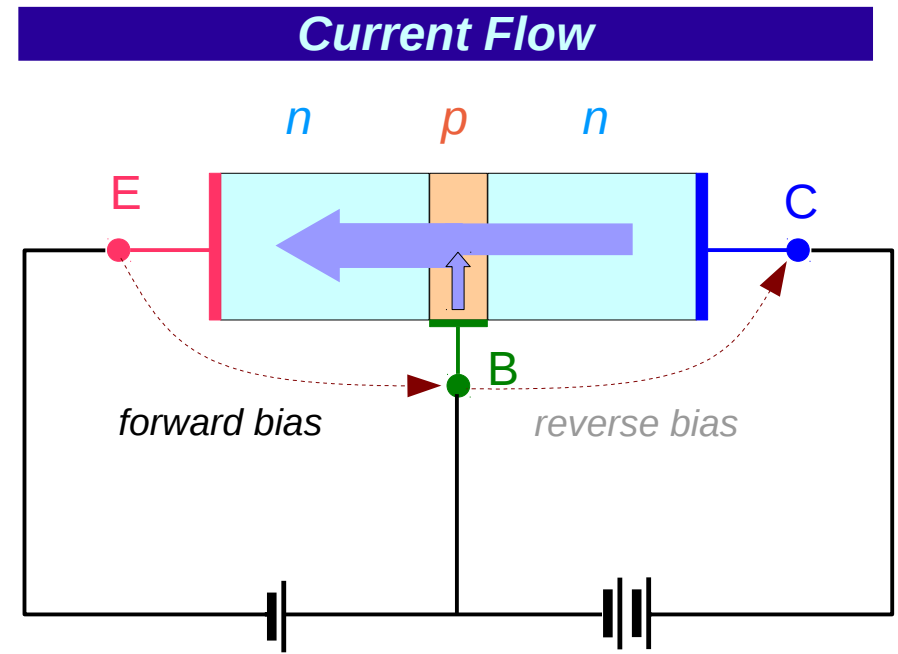


saturation

Common Base (1)



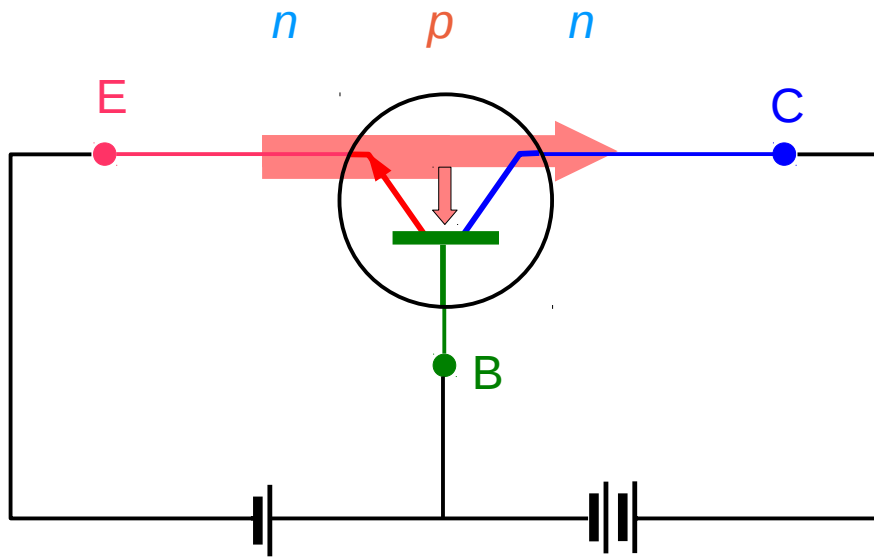
Common Base



Common Base

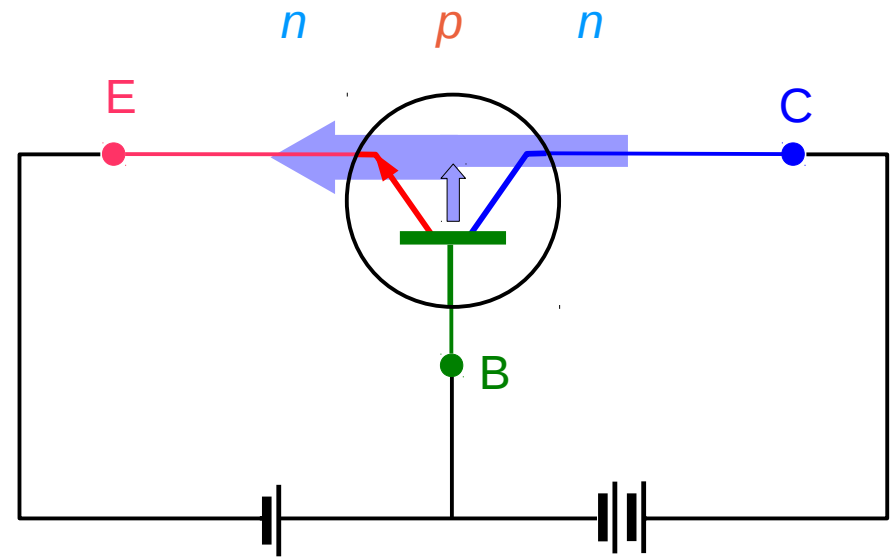
Common Base (2)

Electron Flow

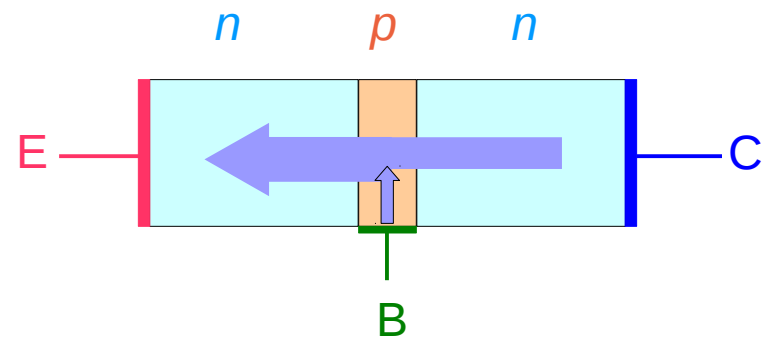
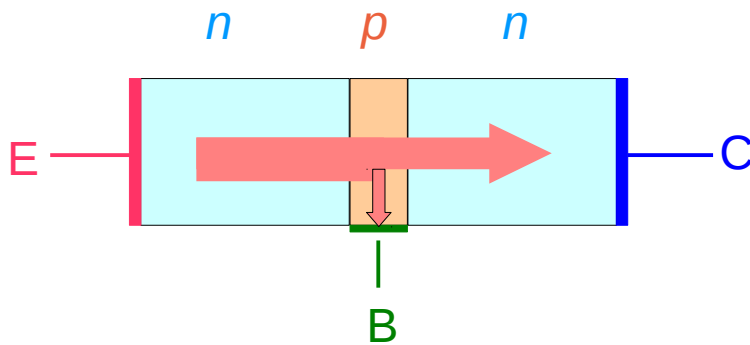


Common Base

Current Flow

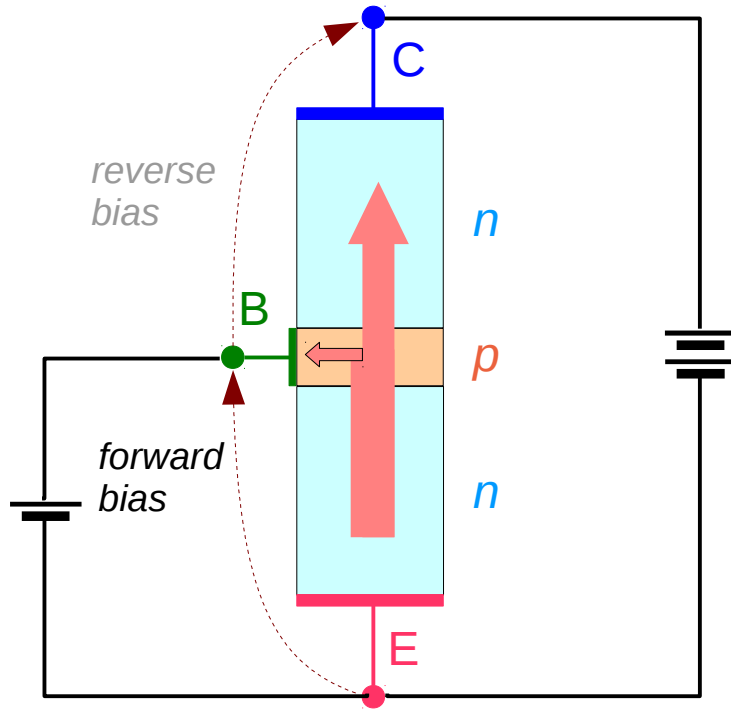


Common Base



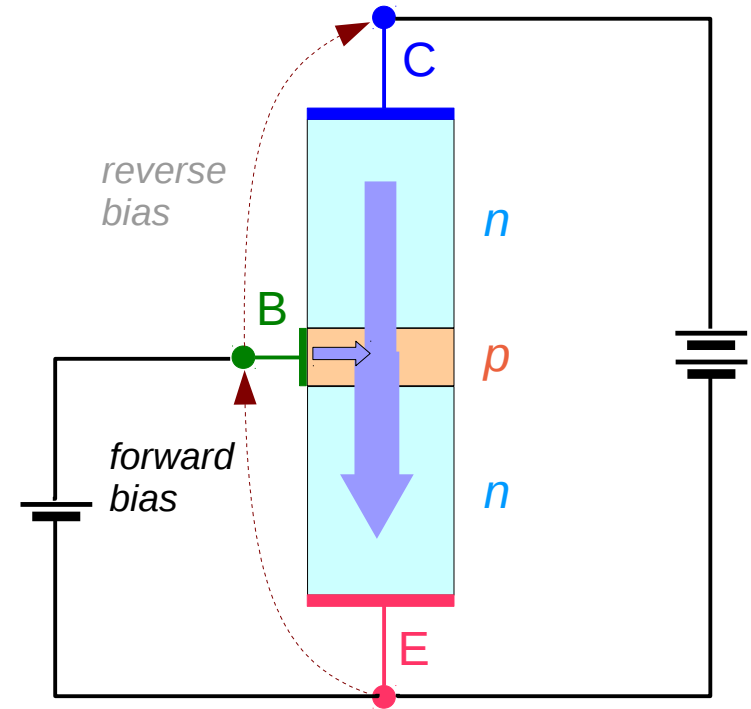
Common Emitter (1)

Electron Flow



Common Emitter

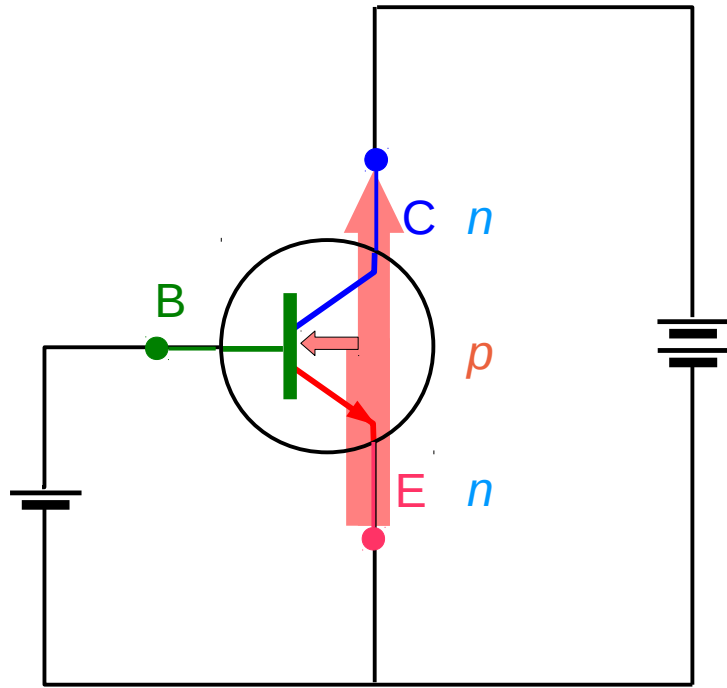
Current Flow



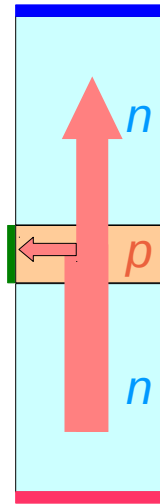
Common Emitter

Common Emitter (2)

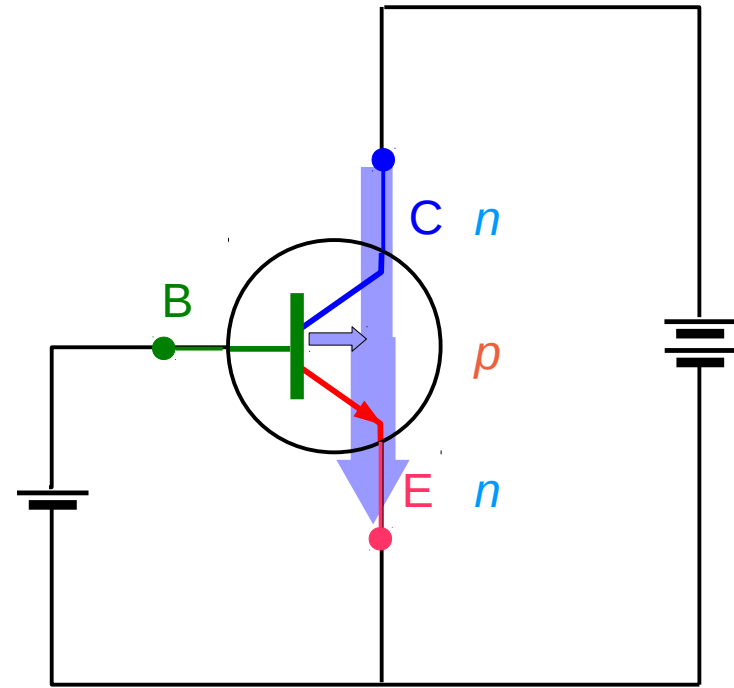
Electron Flow



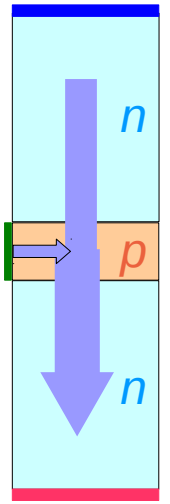
Common Emitter



Current Flow

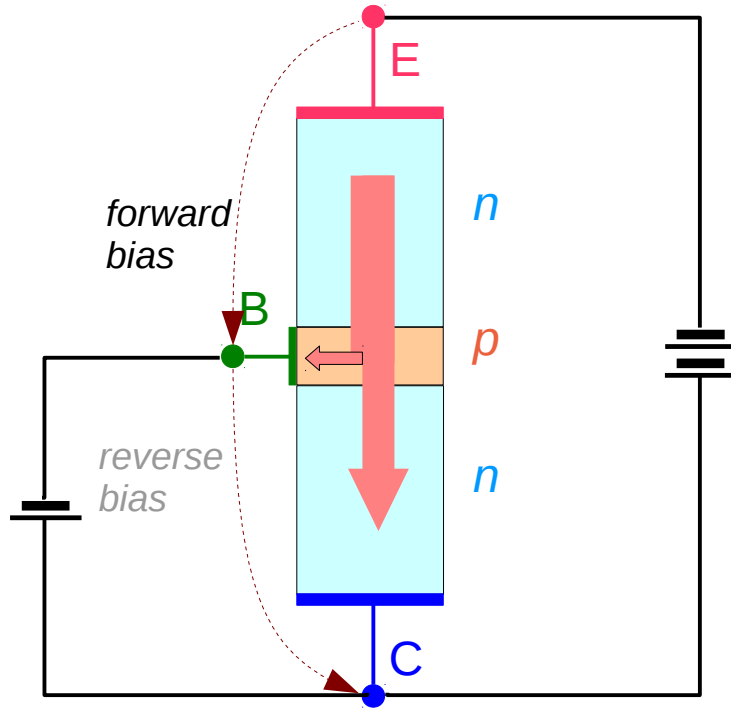


Common Emitter



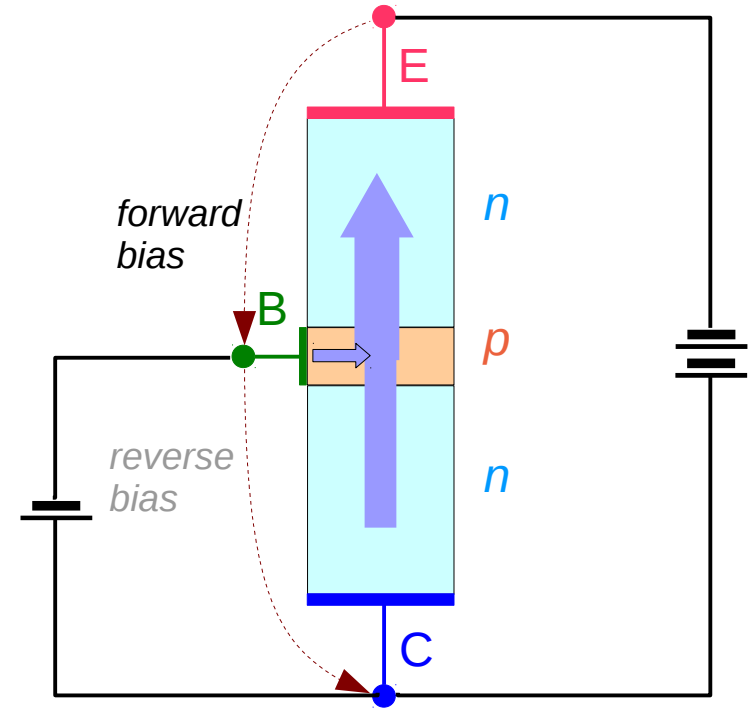
Common Collector (1)

Electron Flow



Common Collector

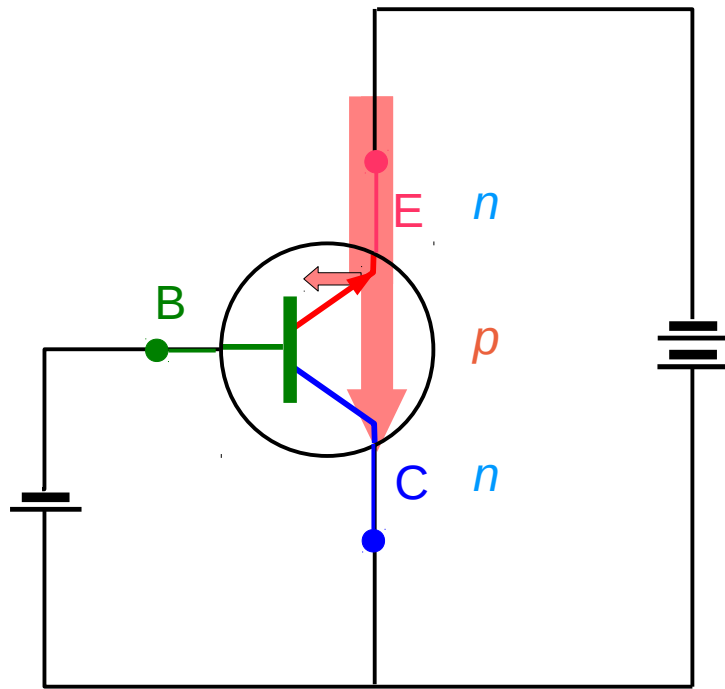
Current Flow



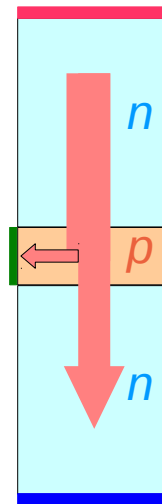
Common Collector

Common Collector (2)

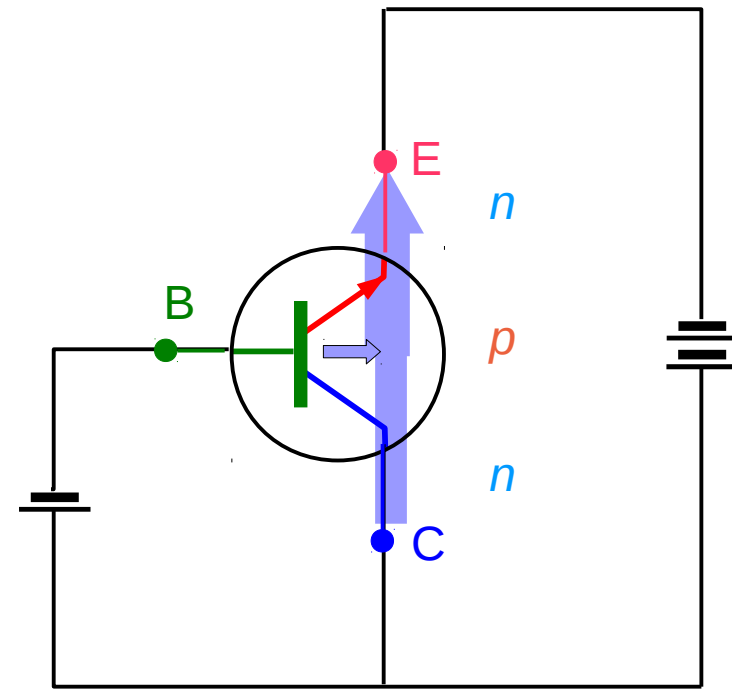
Electron Flow



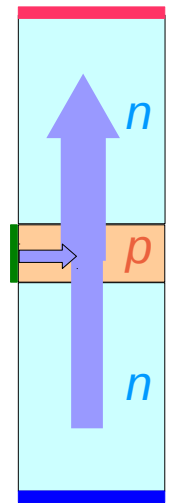
Common Collector



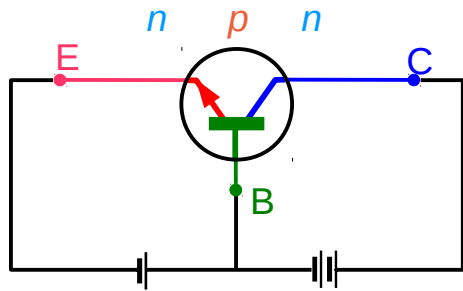
Current Flow



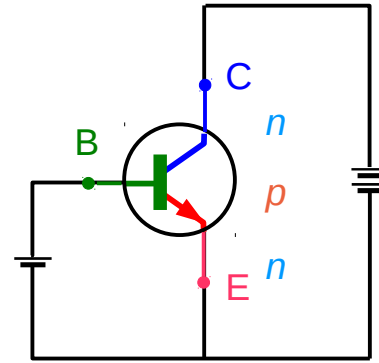
Common Collector



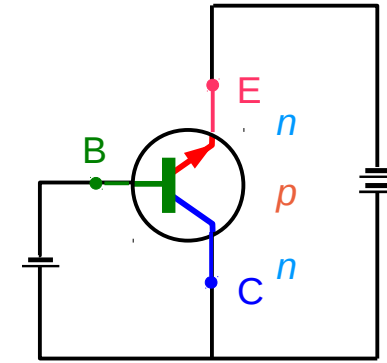
BJT Bias



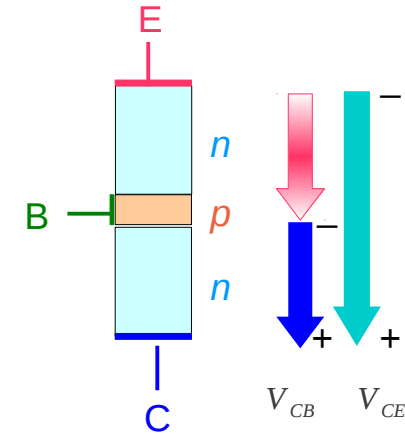
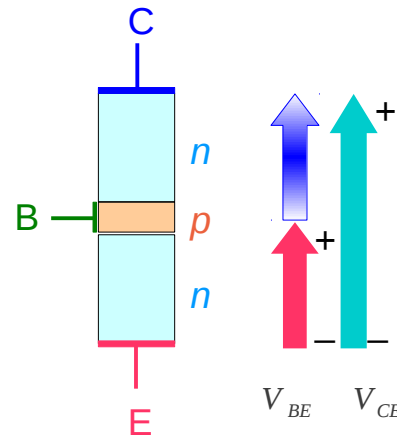
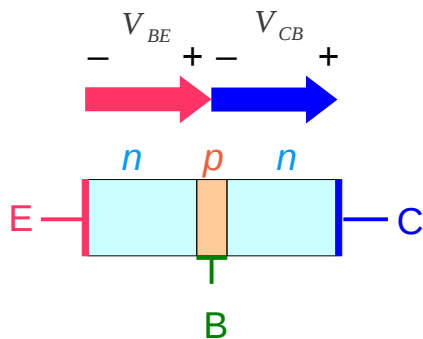
Common Base



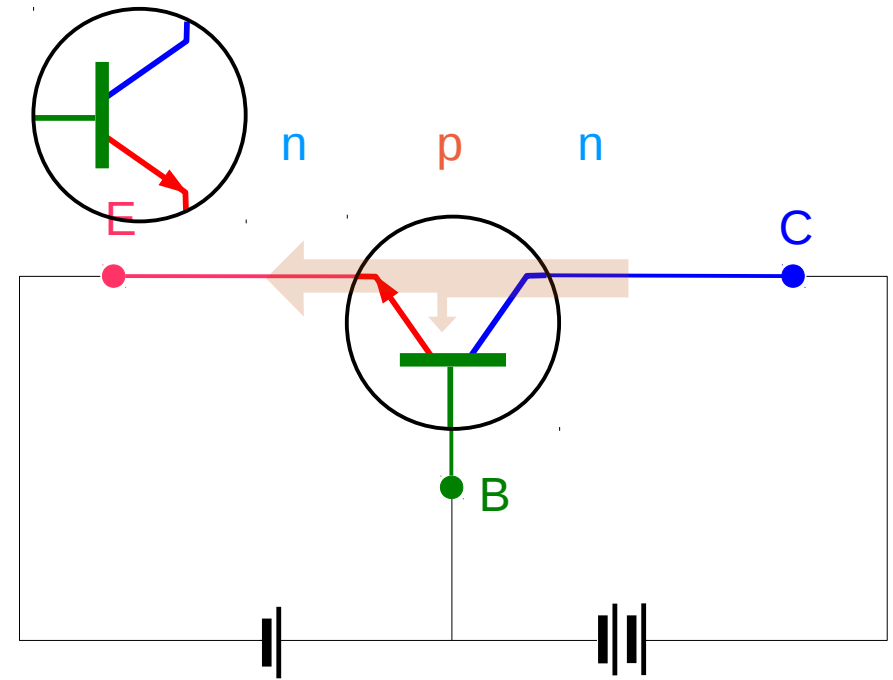
Common Emitter



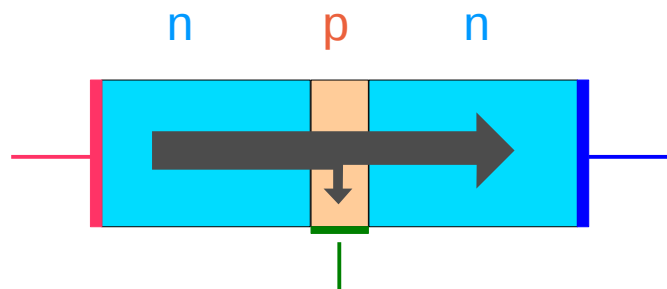
Common Collector



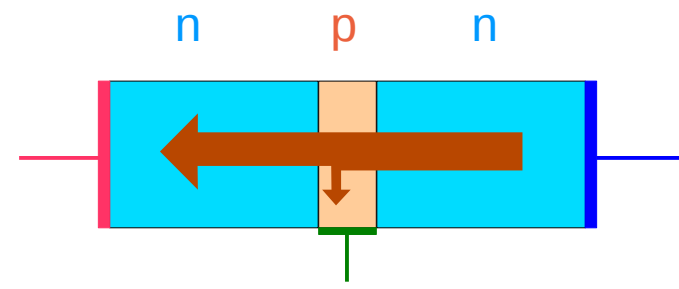
Common Emitter (2)



Electron Flow



Current Flow



References

- [1] <http://en.wikipedia.org/>
- [2] J.H. McClellan, et al., Signal Processing First, Pearson Prentice Hall, 2003