BJT Topologies – Basic Bias

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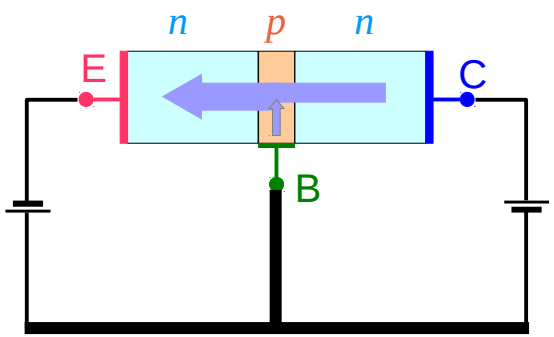
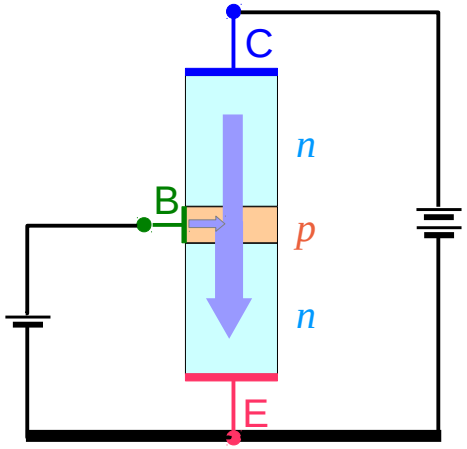
Young Won Lim
07/08/2017

BJT Amplifier Topologies



Common Base



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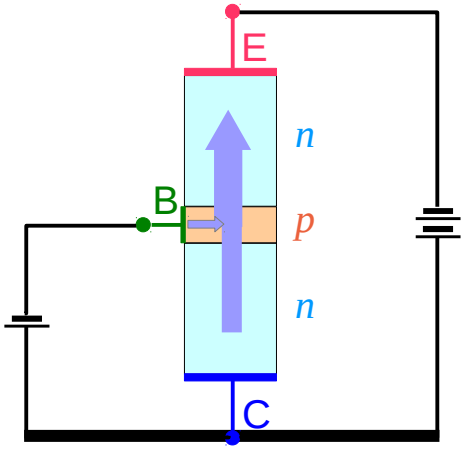

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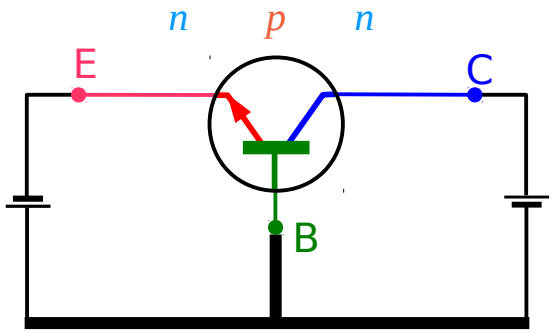
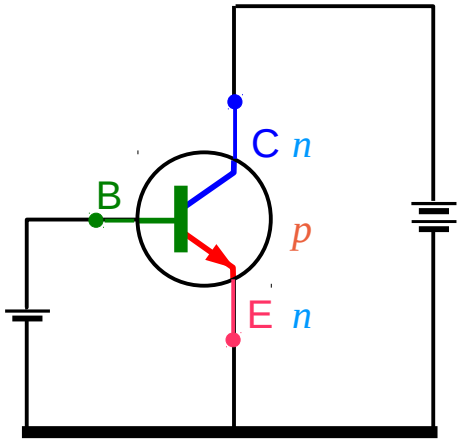
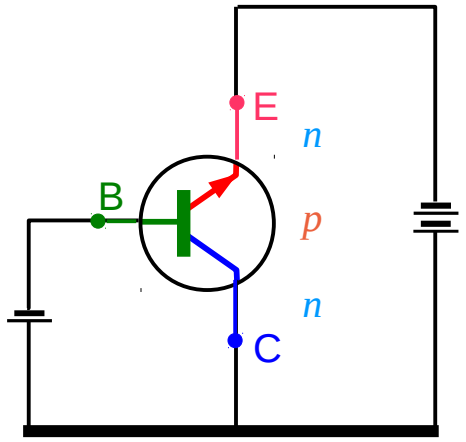


Common Base



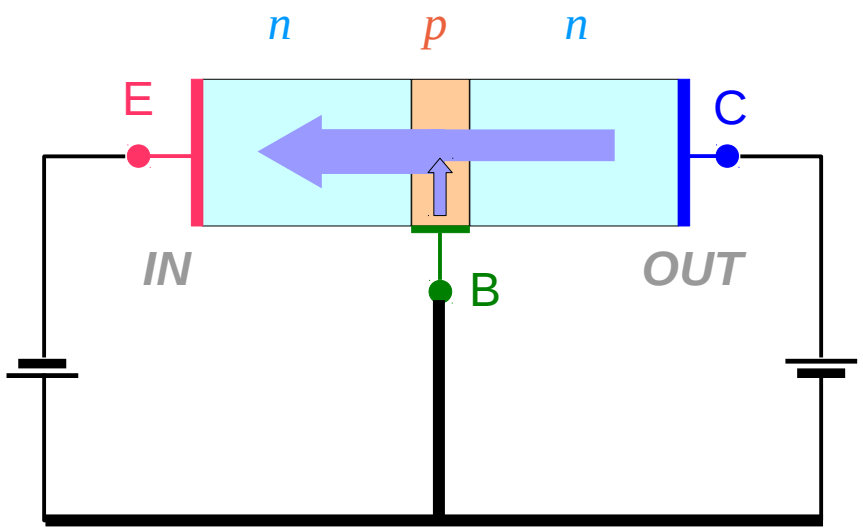
Common Emitter



Common Collector

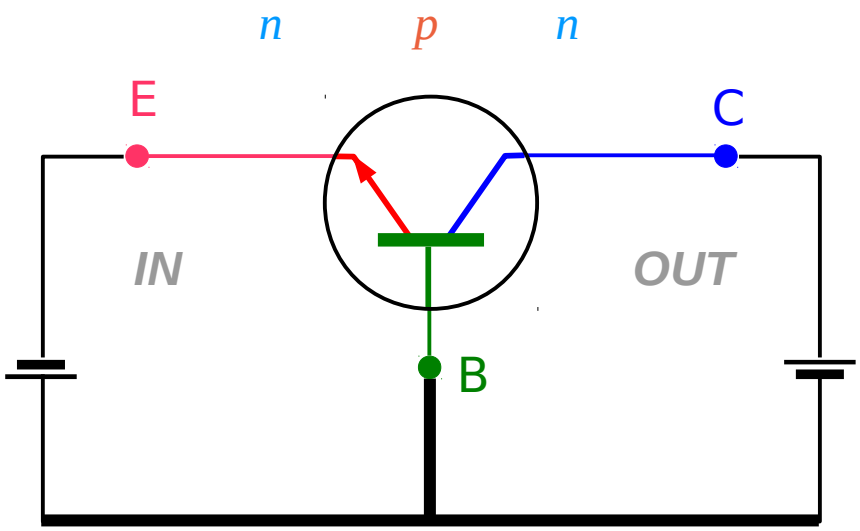
Common Base Topology

Current Flow



Common Base

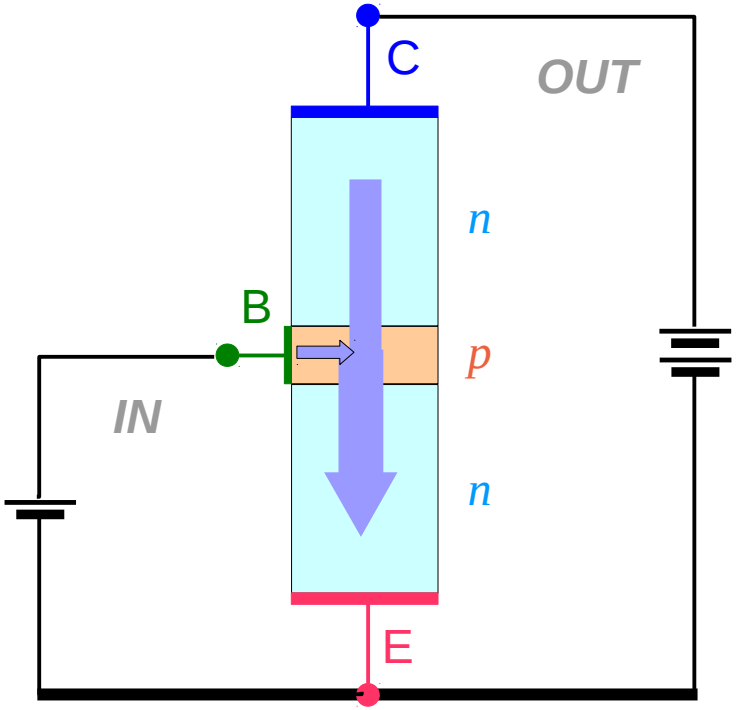
Current Flow



Common Base

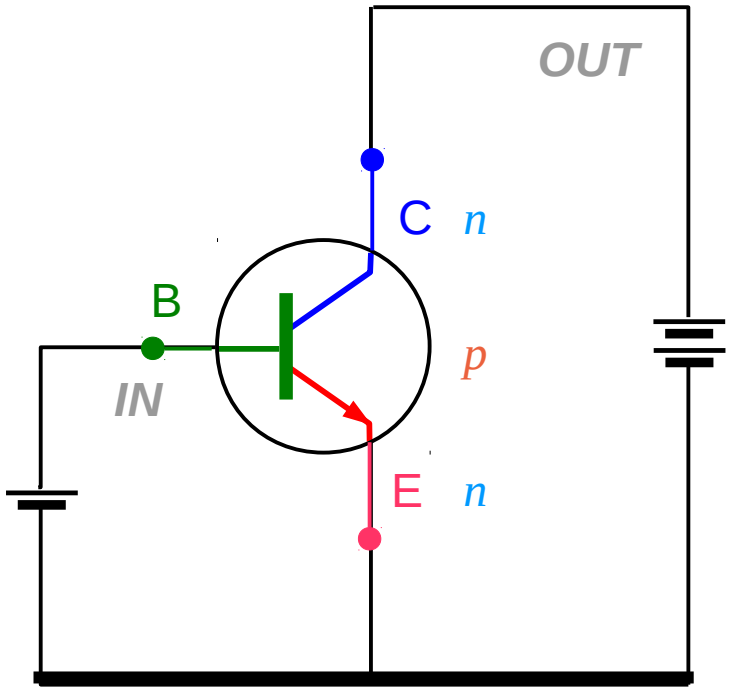
Common Emitter Topology

Current Flow



Common Emitter

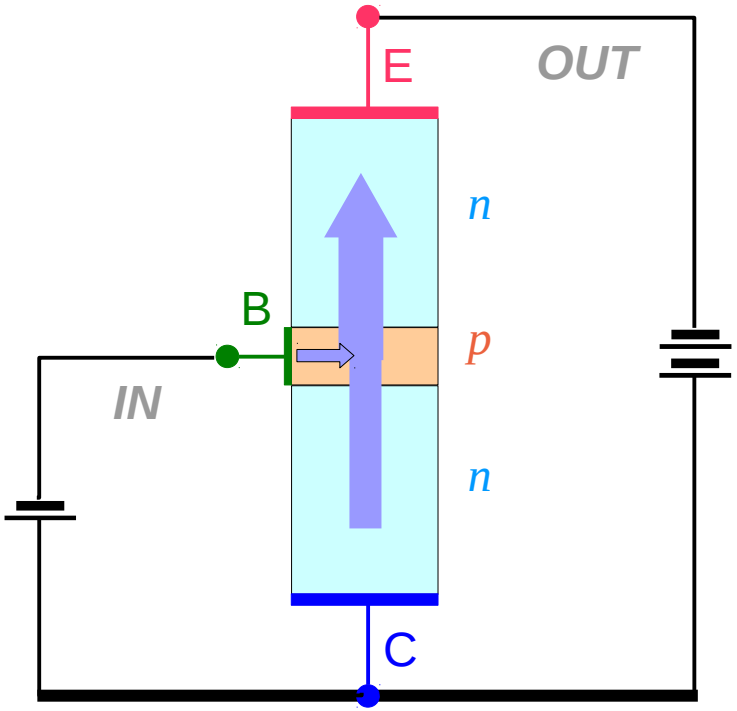
Current Flow



Common Emitter

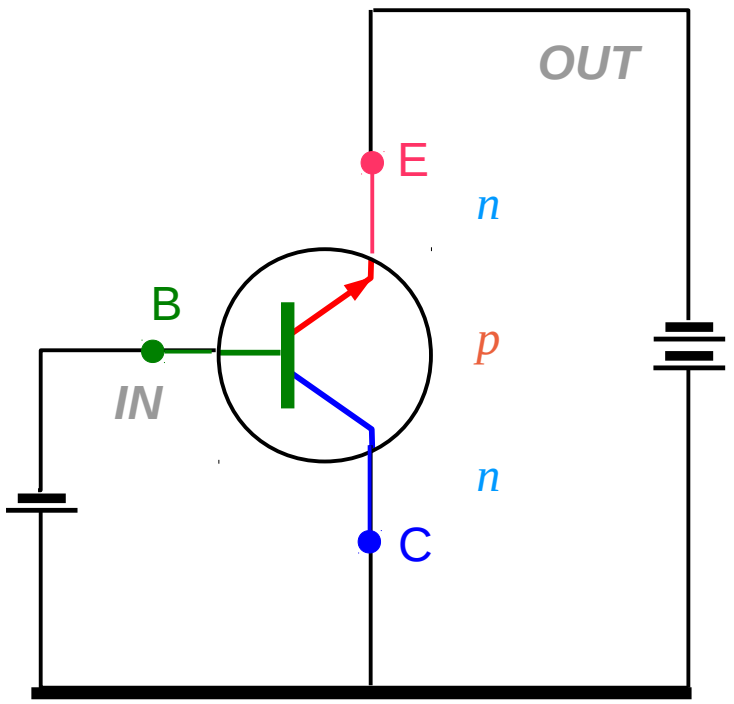
Common Collector Topology

Current Flow



Common Collector

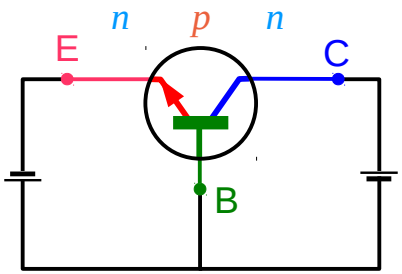
Current Flow

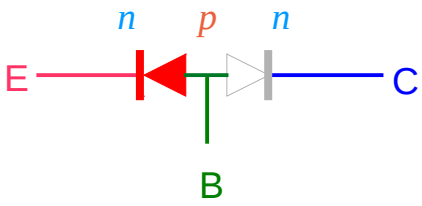


Common Collector

Forward bias (BE) & Reverse bias (CB)

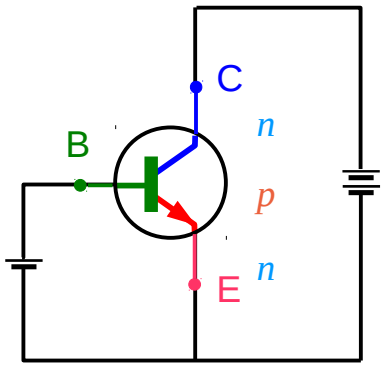
Common Base

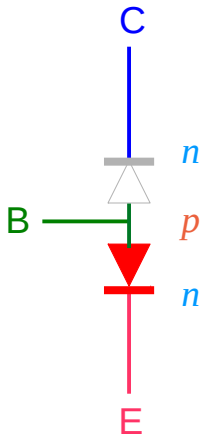




V_{BE} *forward bias*
V_{CB} *reverse bias*

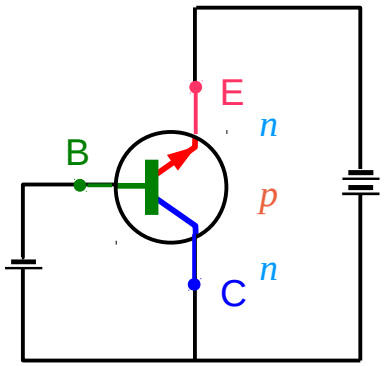
Common Emitter

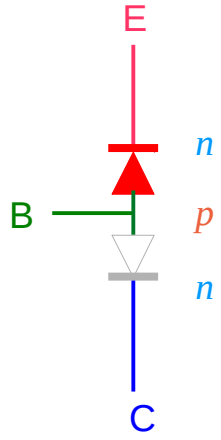




V_{BE} *forward bias*
V_{CB} *reverse bias*

Common Collector



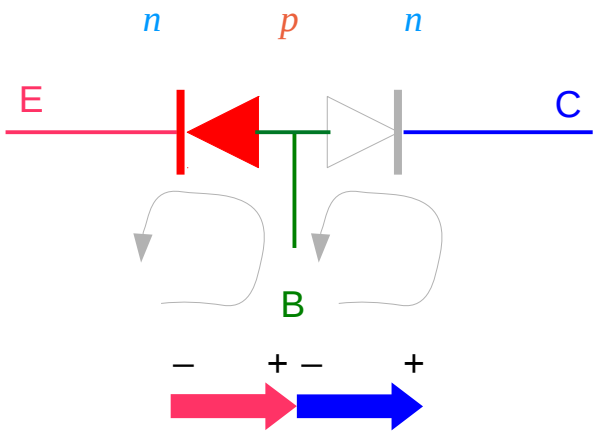


V_{BE} *forward bias*
V_{CB} *reverse bias*

Bias for Active Region

Biasing Back-to-back Diodes – Active Region

Common Base

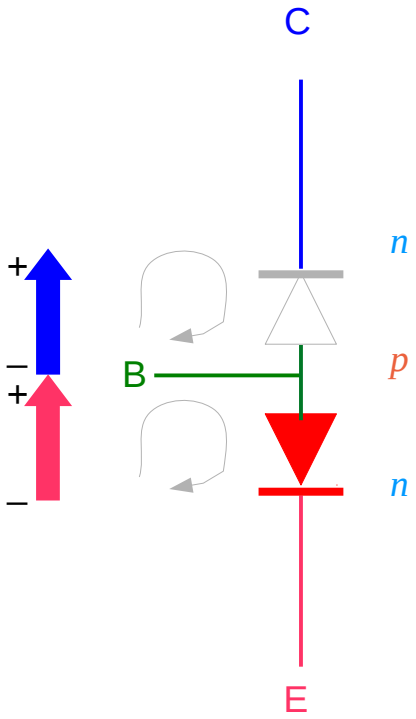


V_{BE}	*forward bias*
V_{CB}	*reverse bias*

active

=

Common Emitter

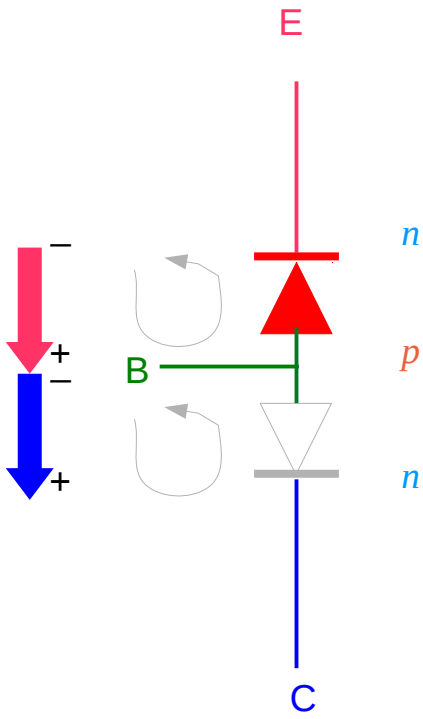


V_{BE}	*forward bias*
V_{CB}	*reverse bias*

active

=

Common Collector

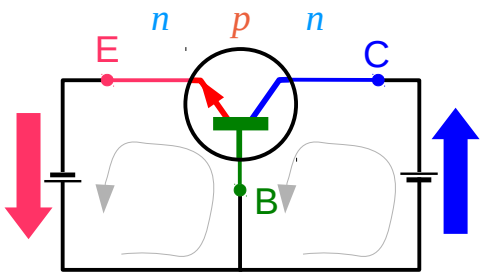


V_{BE}	*forward bias*
V_{CB}	*reverse bias*

active

Two voltage supplies – Active Region

Common Base



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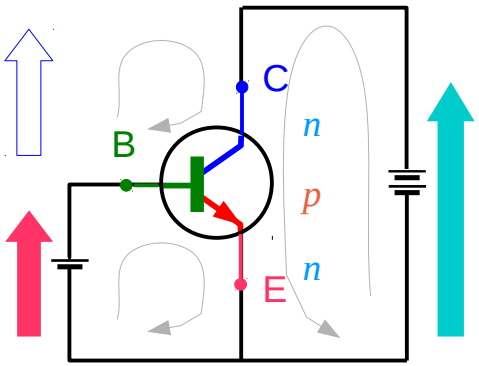
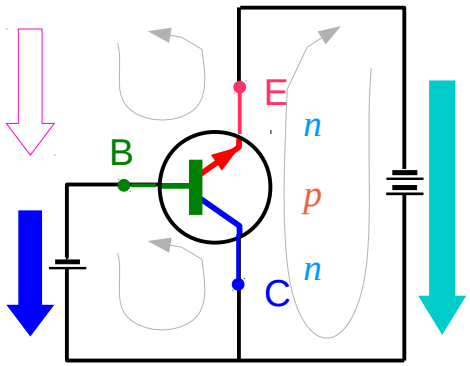
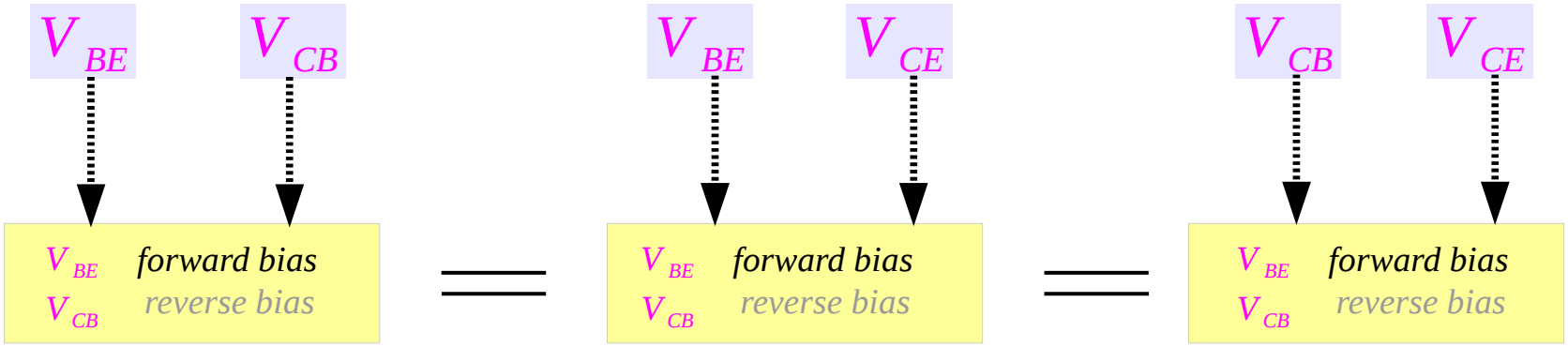


Common Collector

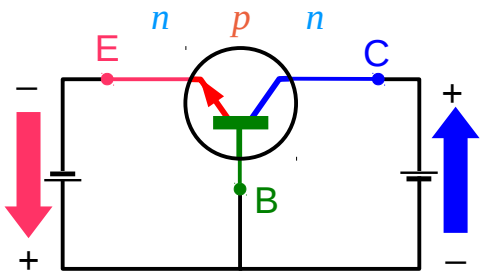




active ***active*** ***active***

Two voltage supplies controls V_{BE} & V_{CB}

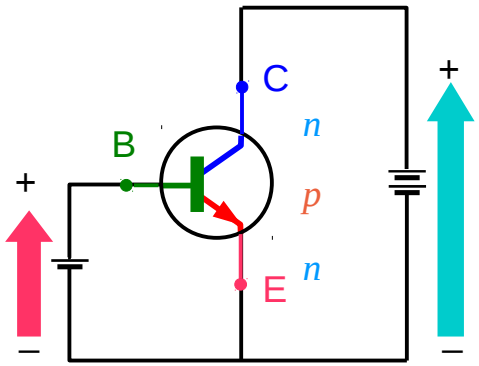
Common Base



V_{BE} *Voltage of* ***B*** *from E*

V_{CB} *Voltage of C from* ***B***

Common Emitter

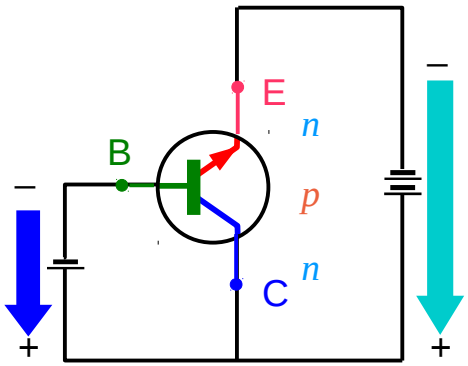


V_{BE} *Voltage of B from* ***E***

V_{CE} *Voltage of C from* ***E***

$$V_{CE} = V_{CB} + V_{BE}$$

Common Collector



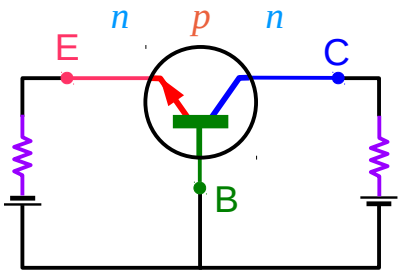
V_{CB} *Voltage of* ***C*** *from B*

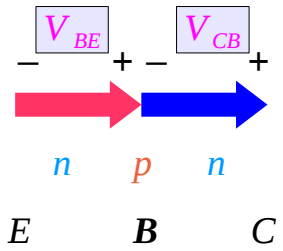
V_{CE} *Voltage of* ***C*** *from E*

$$V_{CE} = V_{CB} + V_{BE}$$

Two voltage supplies with resistors – Active Region

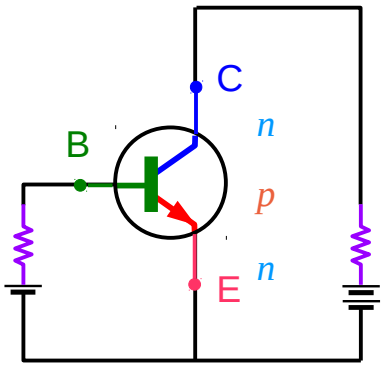
Common Base

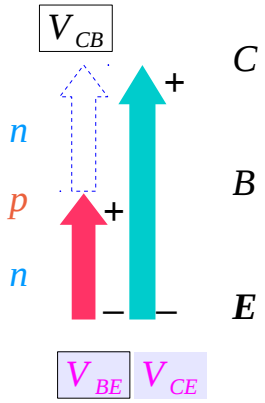




active

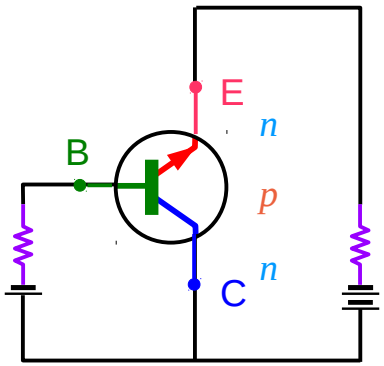
Common Emitter

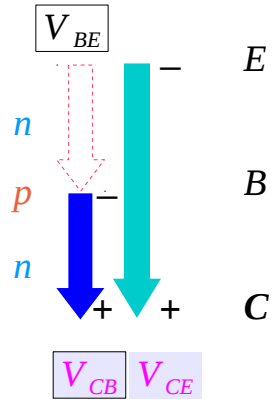




active

Common Collector



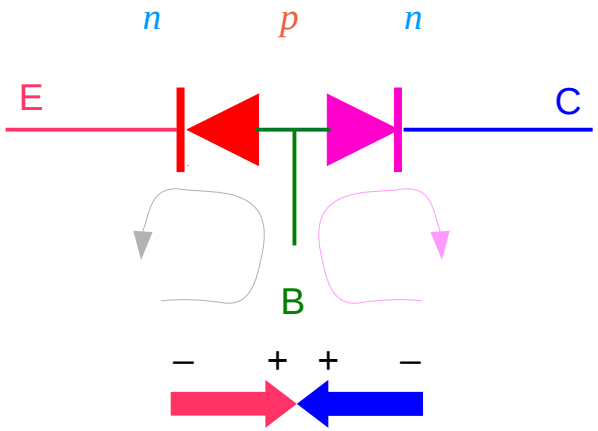


active

Bias for Saturation Region

Biasing Back-to-back Diodes – Saturation Region

Common Base



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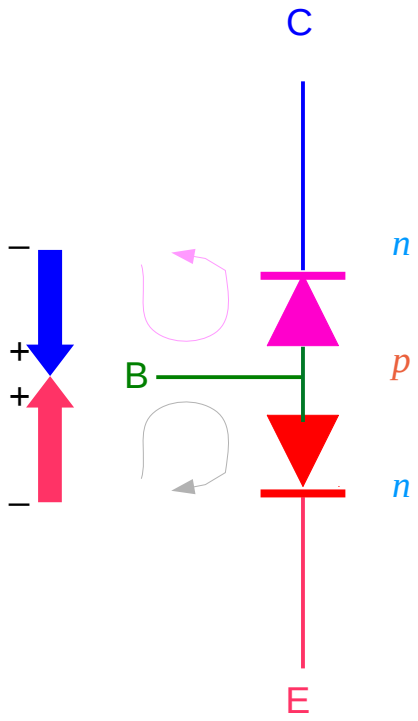
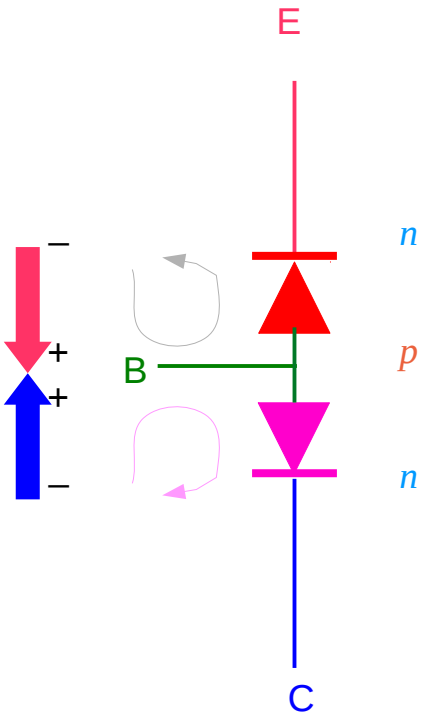


Common Collector

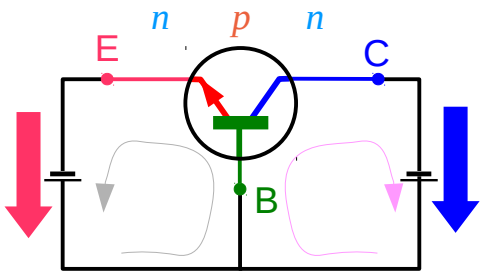


V_{BE}	*forward bias*	=	V_{BE}	*forward bias*	=
V_{BC}	*forward bias*		V_{BC}	*forward bias*	

saturation ***saturation*** ***saturation***

Two voltage supplies – Saturation Region

Common Base

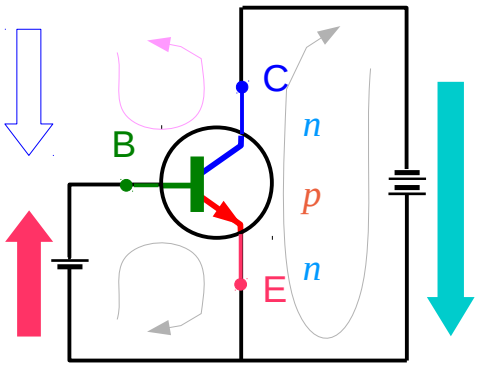


V_{BE} V_{BC}

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

saturation

Common Emitter

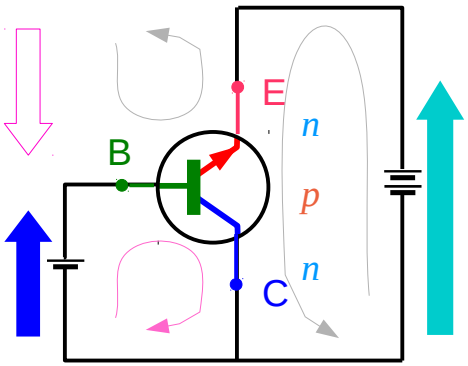


V_{BE} V_{EC}

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

saturation

Common Collector



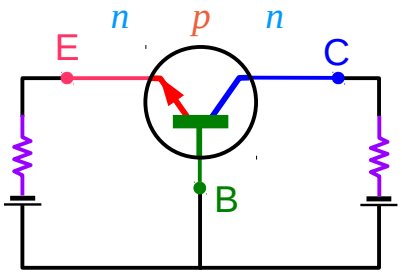
V_{BC} V_{EC}

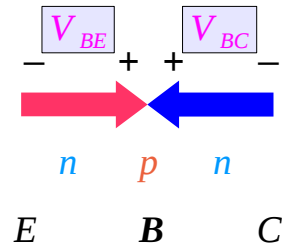
V_{BE} *forward bias*
V_{BC} *forward bias*

saturation

Two voltage supplies with resistors – Sat Region

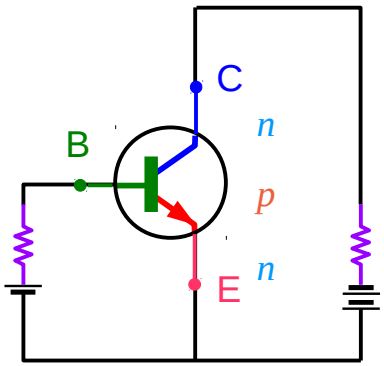
Common Base

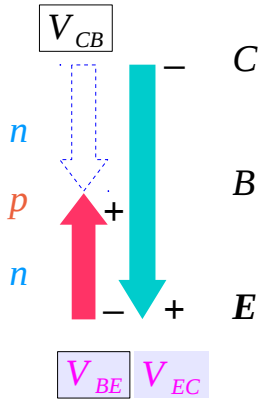




saturation

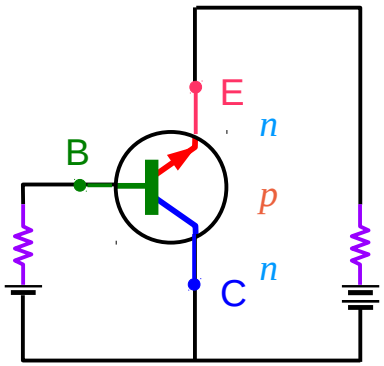
Common Emitter

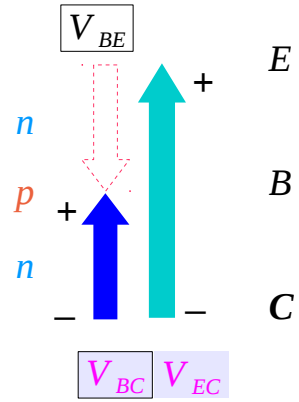




saturation

Common Collector

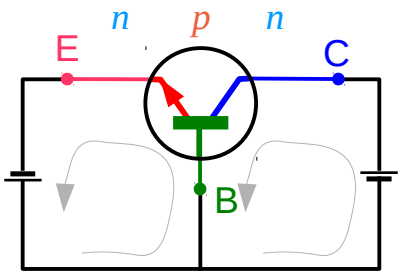




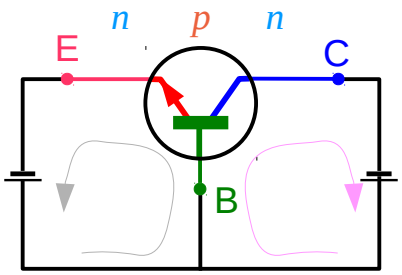
saturation

Active and Saturation Regions (1)

Common Base

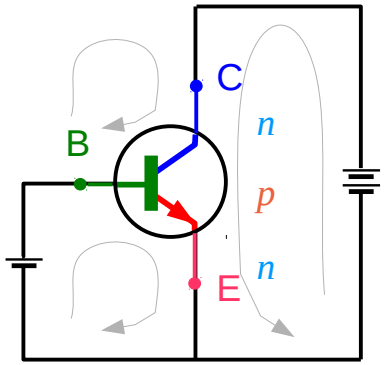


active

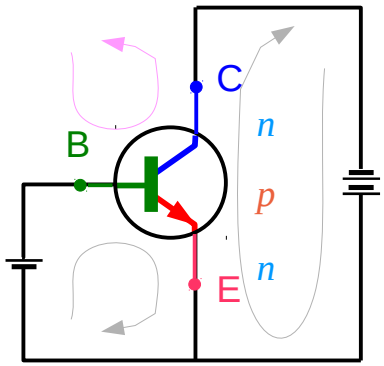


saturation

Common Emitter

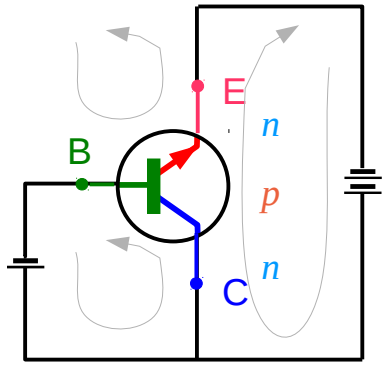


active

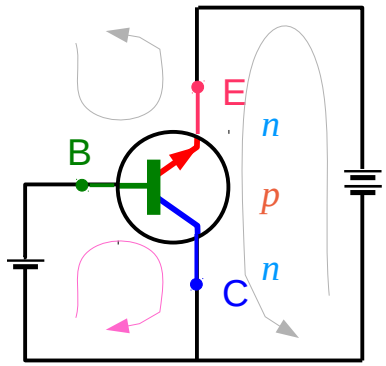


saturation

Common Collector



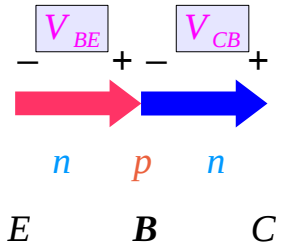
active



saturation

Active and Saturation Regions (2)

Common Base



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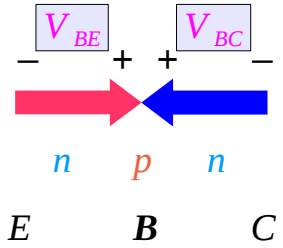
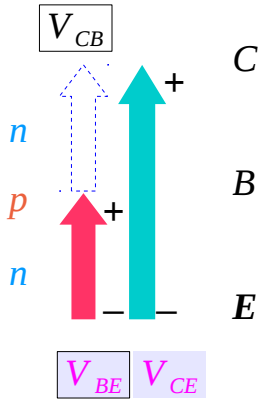


saturation

Common Emitter



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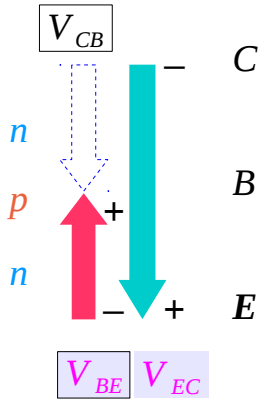
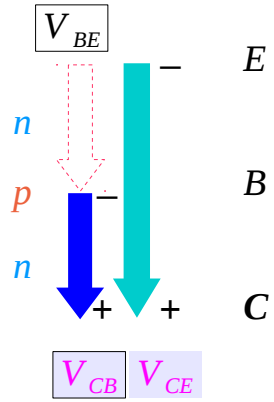


saturation

Common Collector



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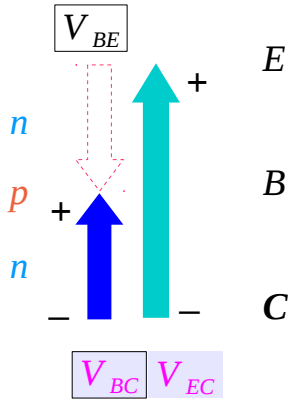
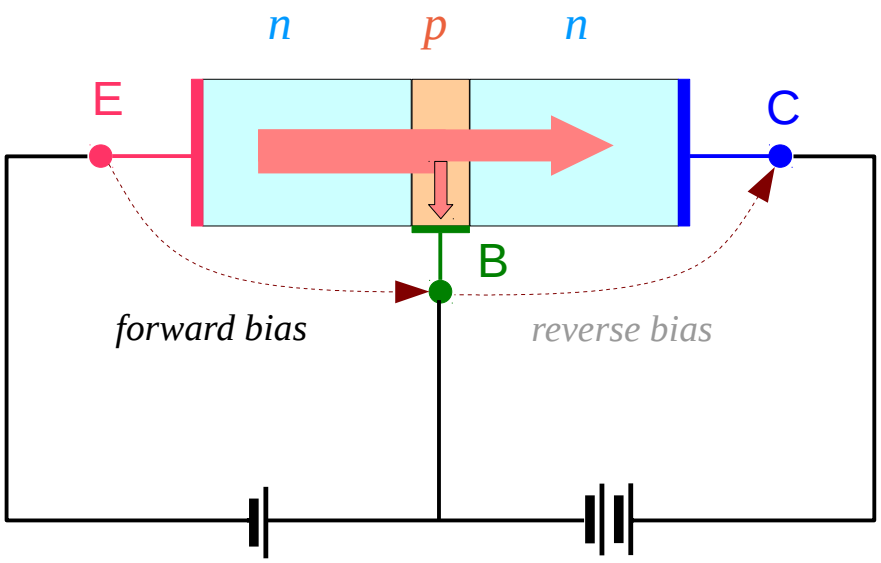


saturation

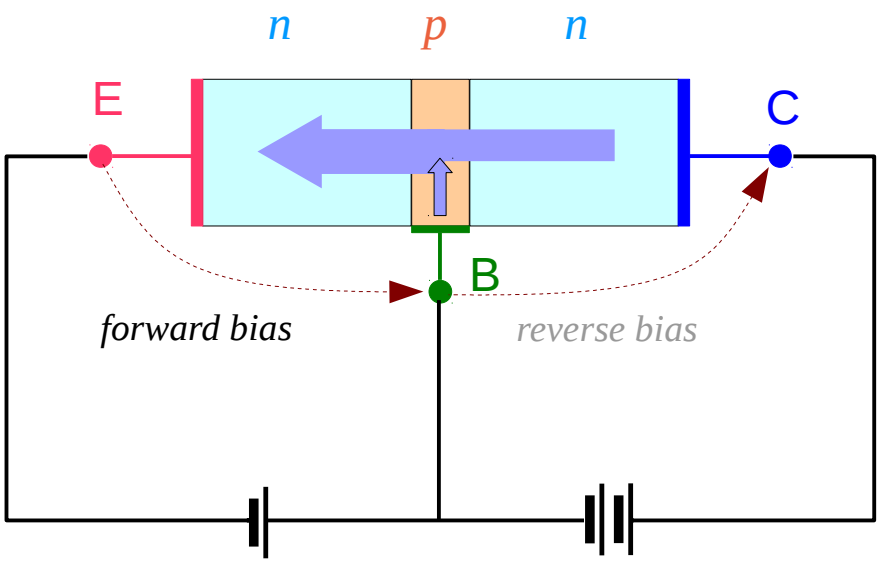
Common Base (1)

Electron Flow



Common Base

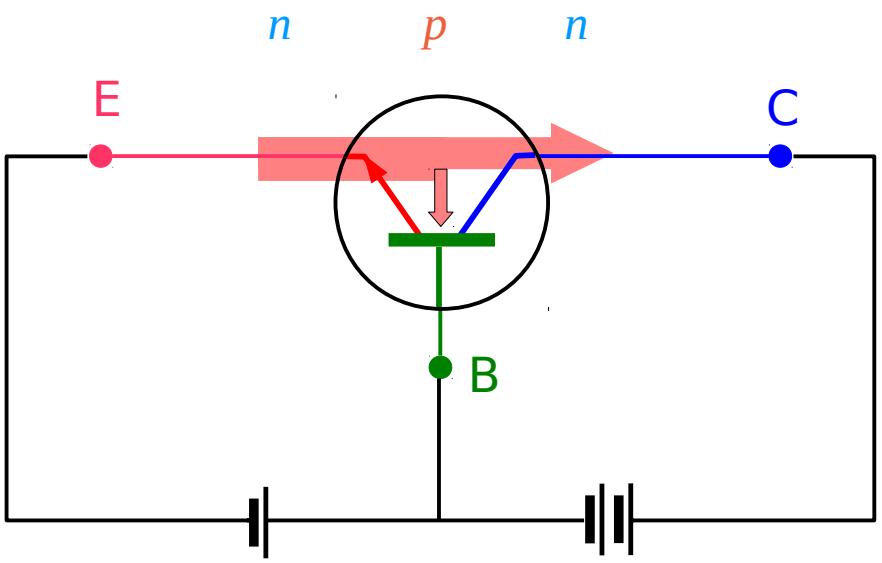
Current Flow



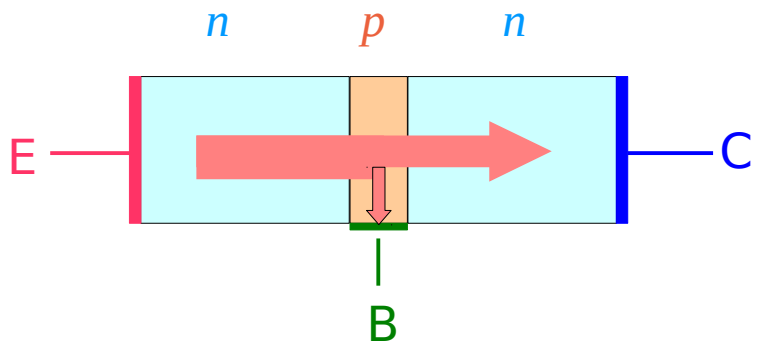
Common Base

Common Base (2)

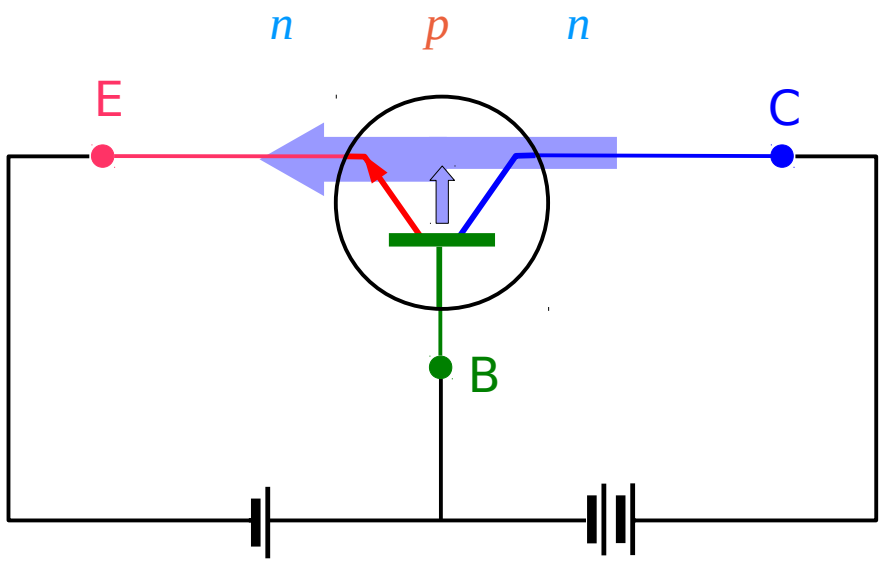
Electron Flow



Common Base



Current Flow



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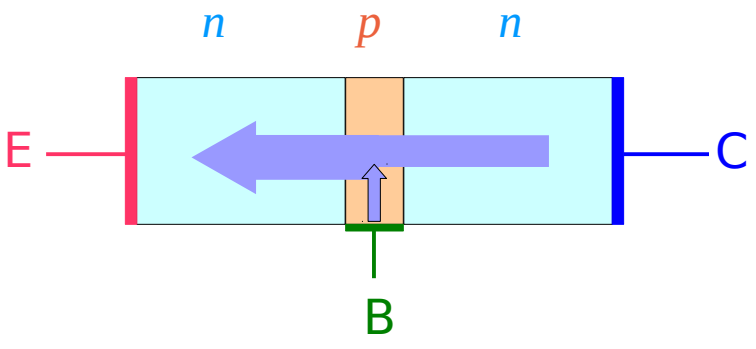
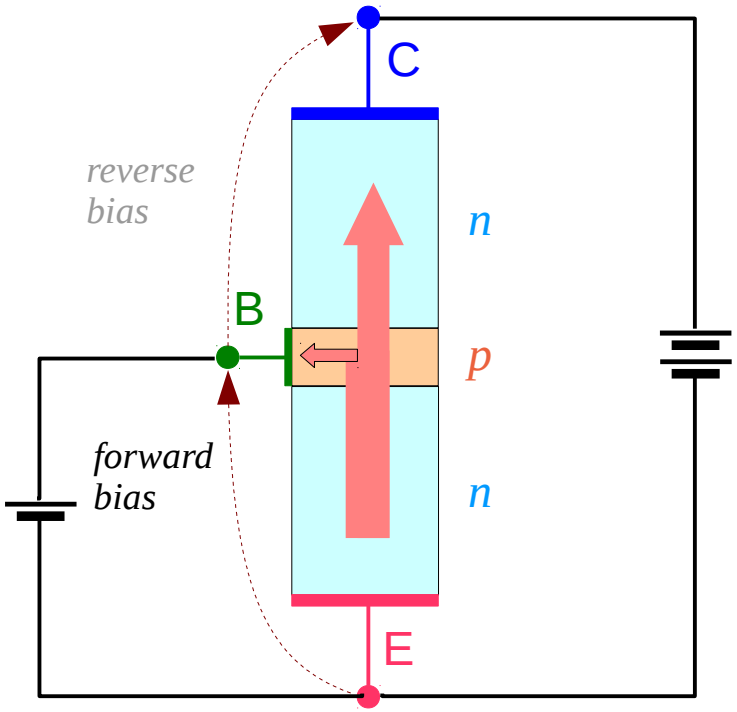


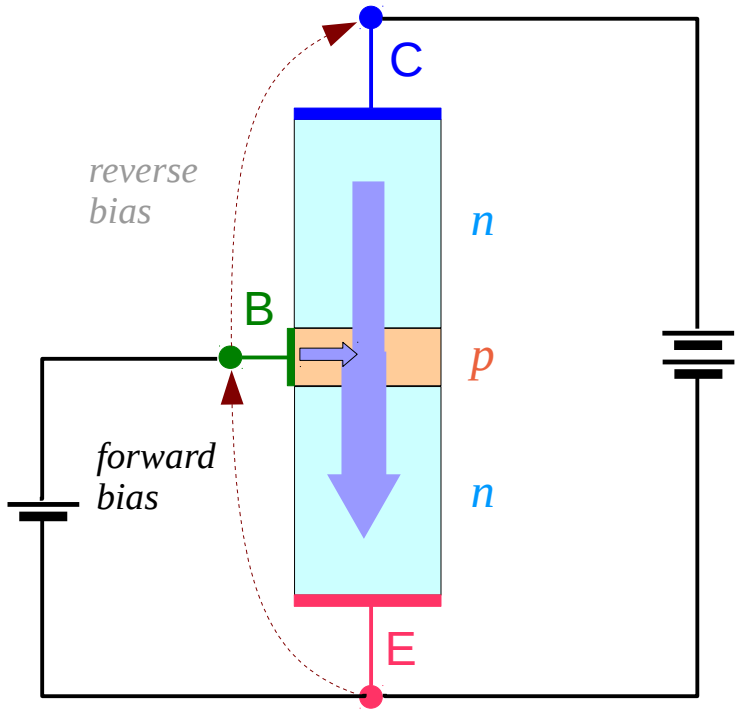
Common Emitter (1)

Electron Flow



Common Emitter

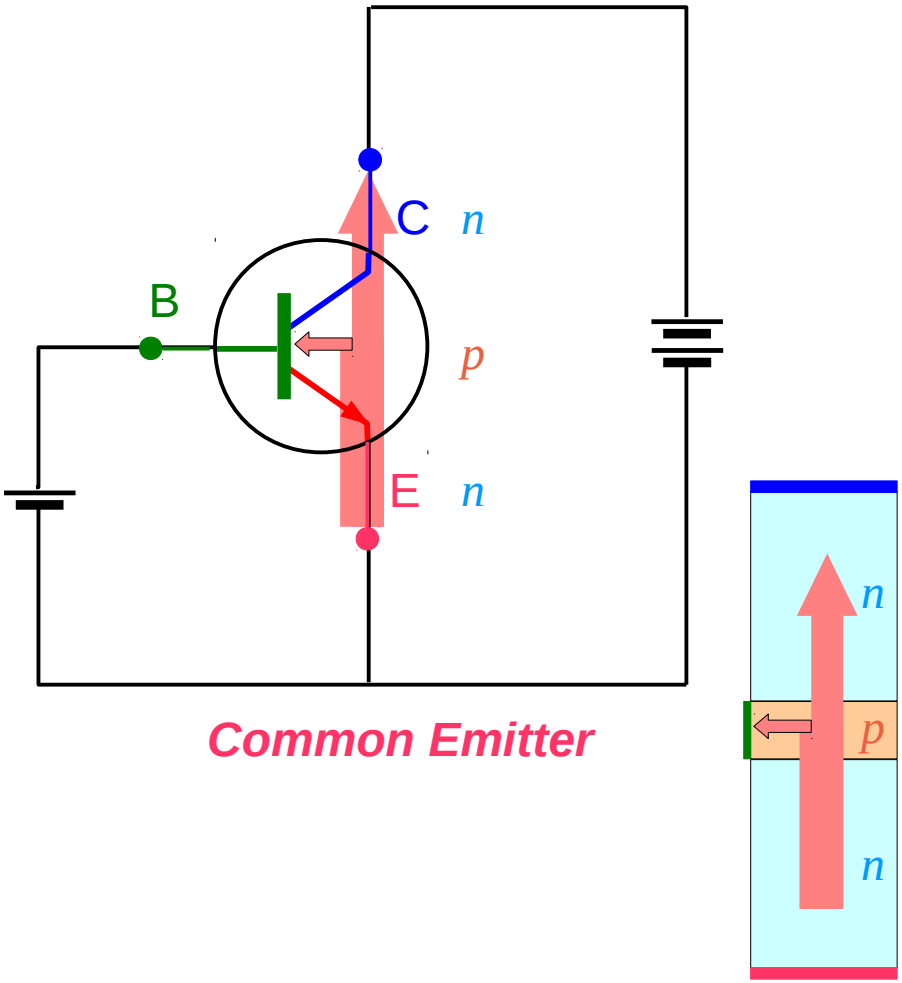
Current Flow



Common Emitter

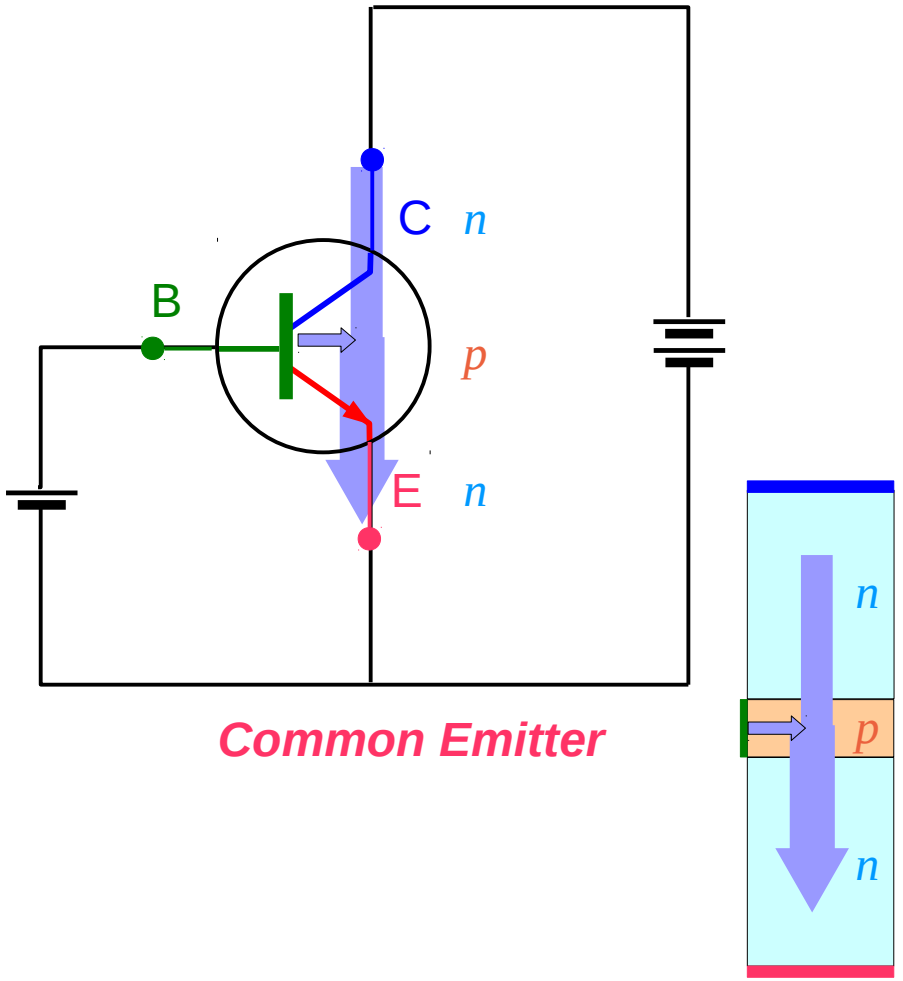
Common Emitter (2)

Electron Flow



Common Emitter

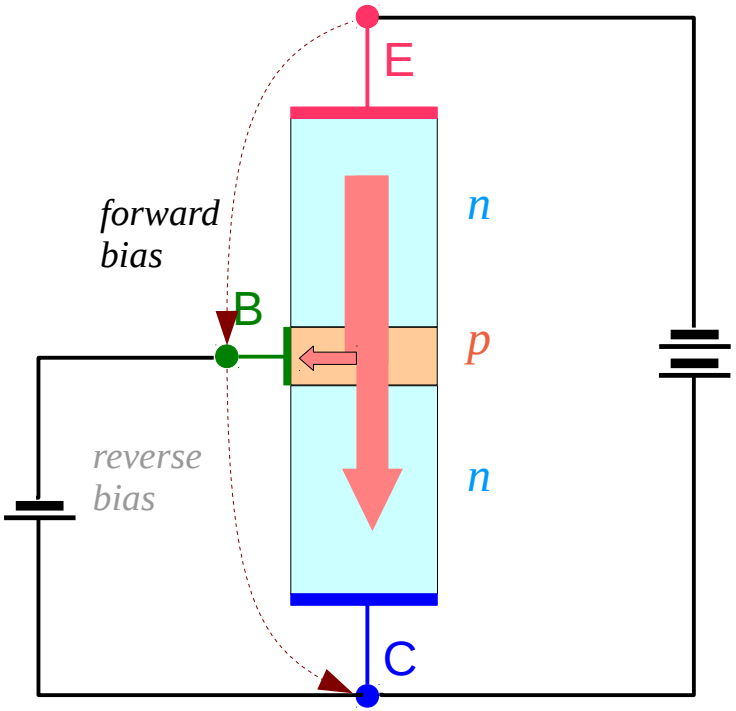
Current Flow



Common Emitter

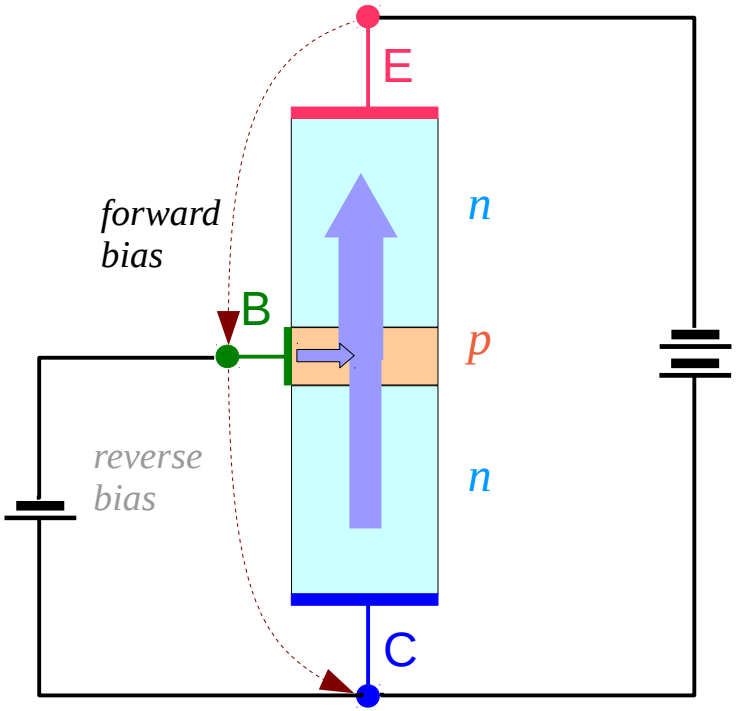
Common Collector (1)

Electron Flow



Common Collector

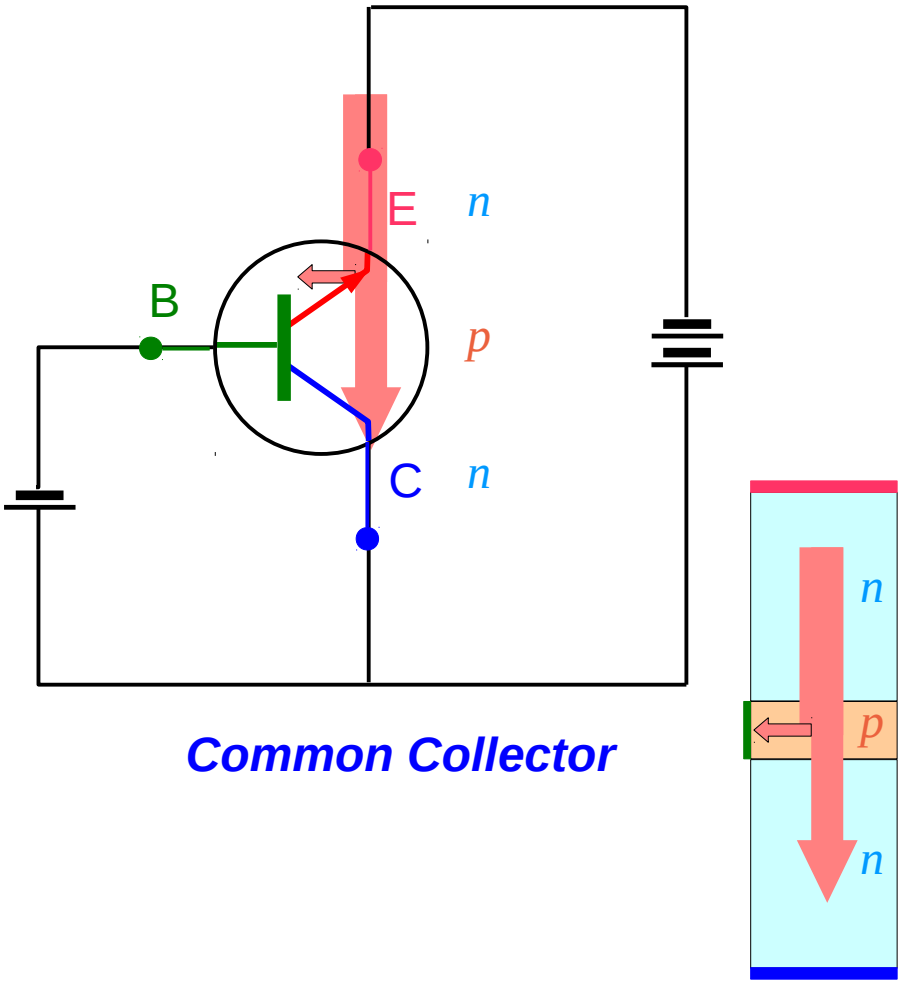
Current Flow



Common Collector

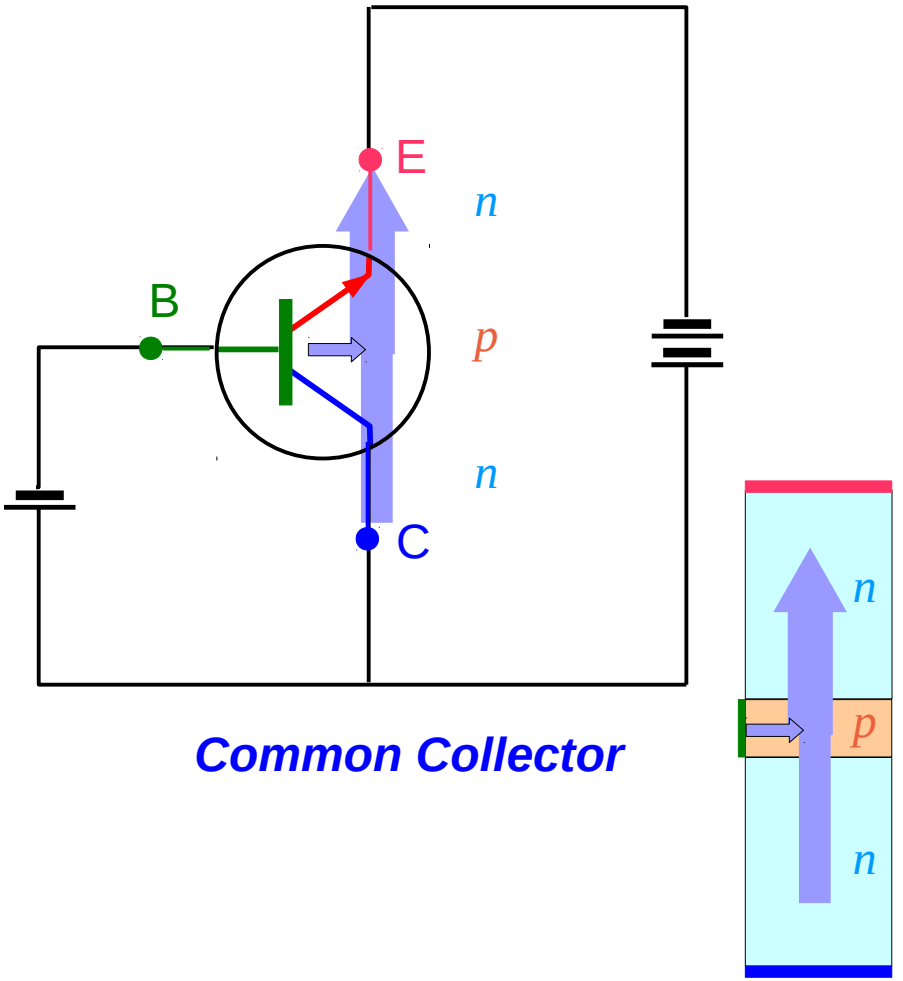
Common Collector (2)

Electron Flow



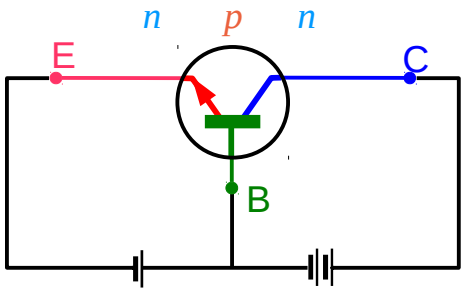
Common Collector

Current Flow

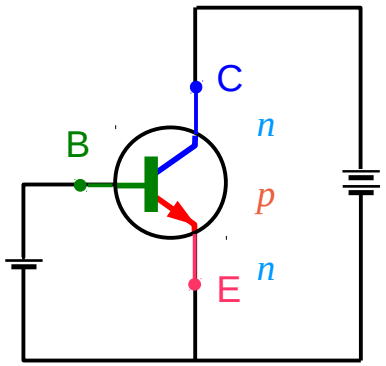


Common Collector

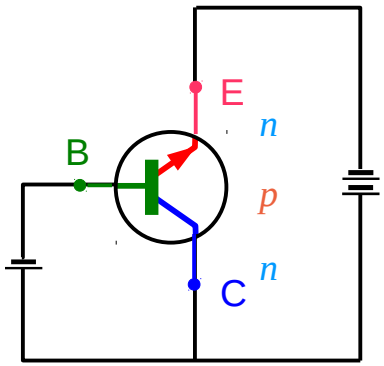
BJT Bias



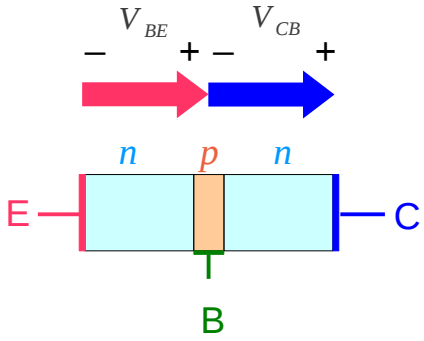
Common Base

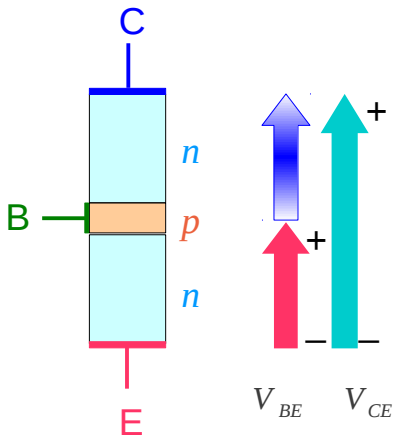


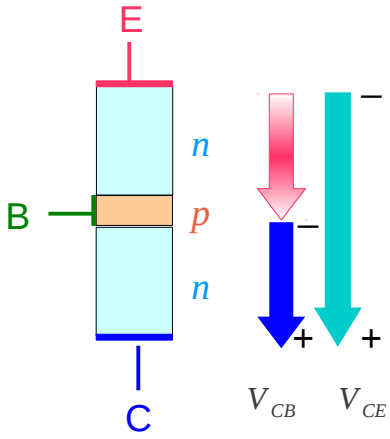
Common Emitter



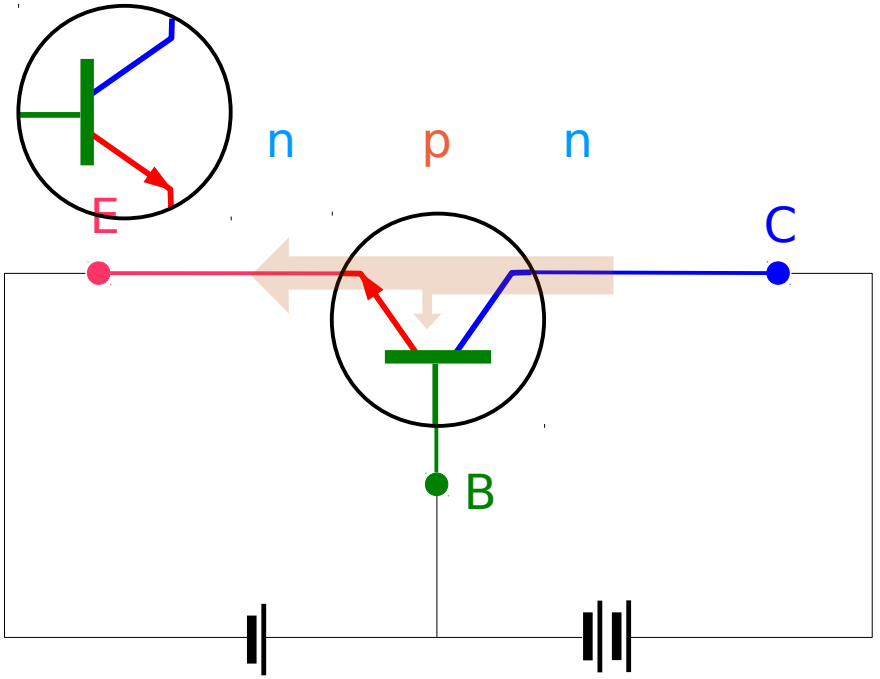
Common Collector



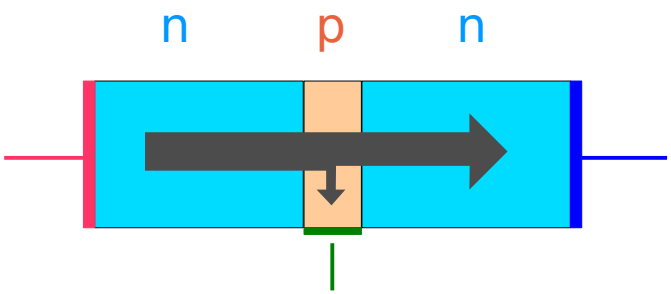




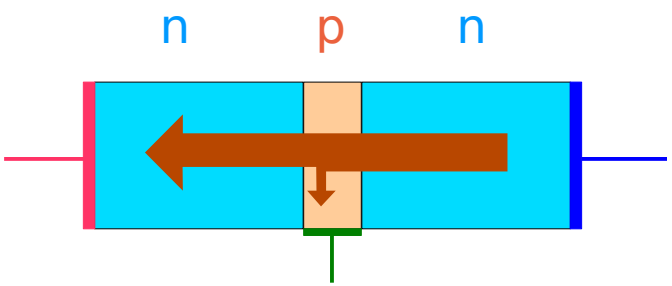
Common Emitter (2)



Electron Flow



Current Flow



References

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