

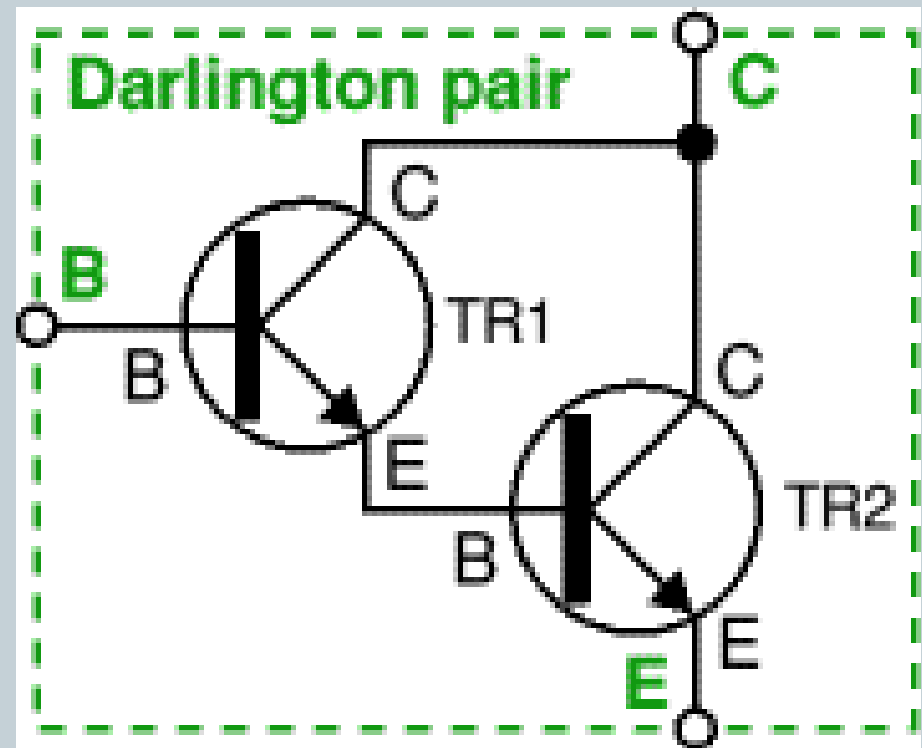
BJT transistors



Darlington Transistors



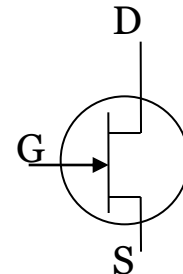
- Allow for much greater gain in a circuit
- $\beta = \beta_1 * \beta_2$



FET Transistors

- Analogous to BJT Transistors
- FET Transistors switch by voltage rather than by current

BJT	FET
Collector	Drain
Base	Gate
Emitter	Source
N/A	Body



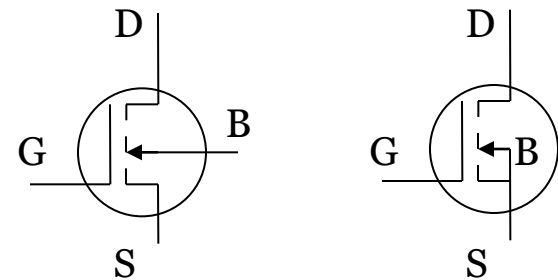
FET Transistors

- **FET (Field Effect Transistors)**
 - MOSFET (Metal-Oxide-Semiconductor Field-Effect Transistor)
 - JFET (Junction Field-Effect Transistor)
 - MESFET
 - HEMT
 - MODFET
- **Most common are the n-type MOSFET or JFET**

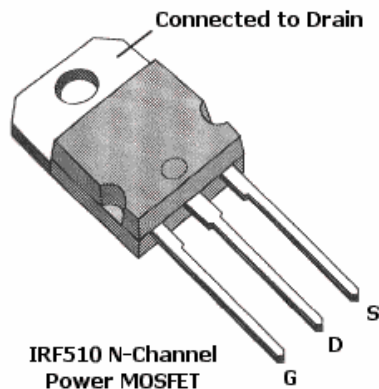
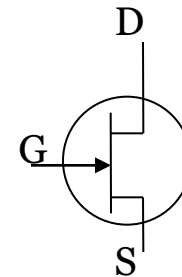
FET Transistors Circuit Symbols

MOSFET

- In practice the body and source leads are almost always connected
- Most packages have these leads already connected

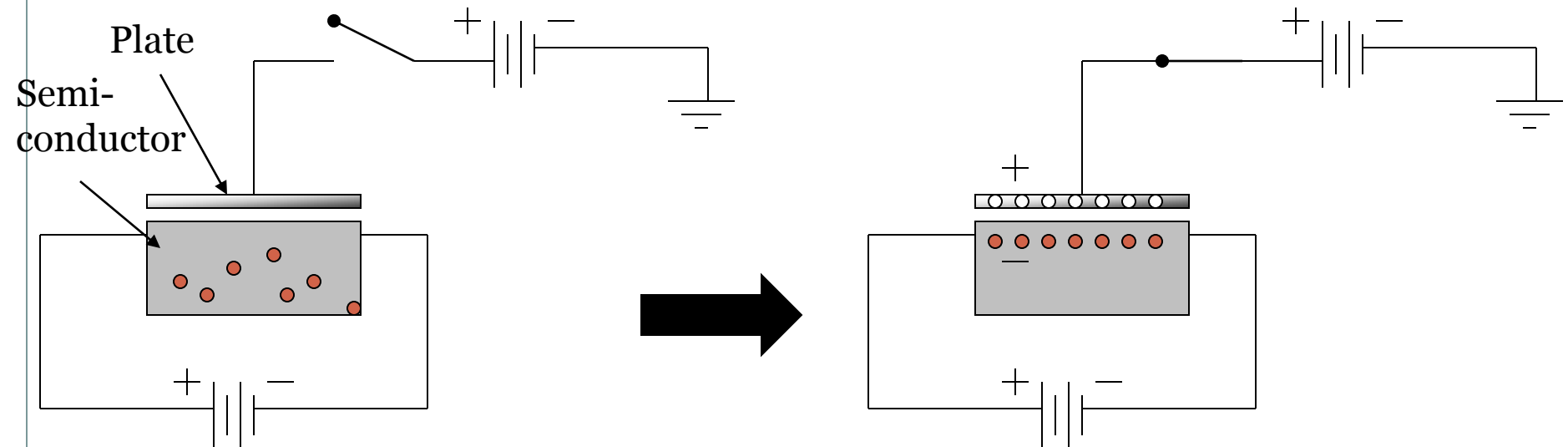


JFET



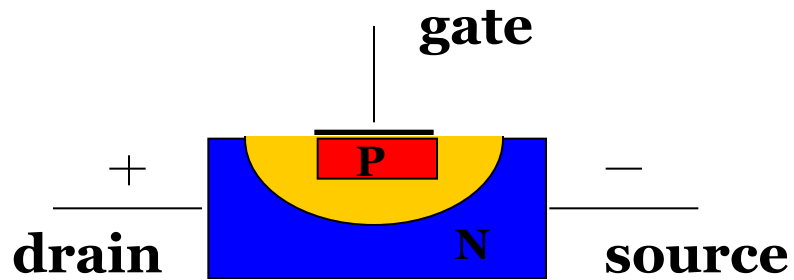
FET Transistors – How it works

- The “Field Effect”
- The resulting field at the plate causes electrons to gather
- As an electron bridge forms current is allowed to flow

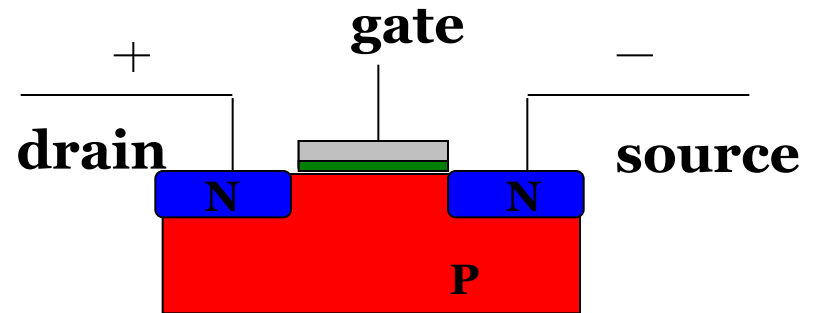


FET Transistors

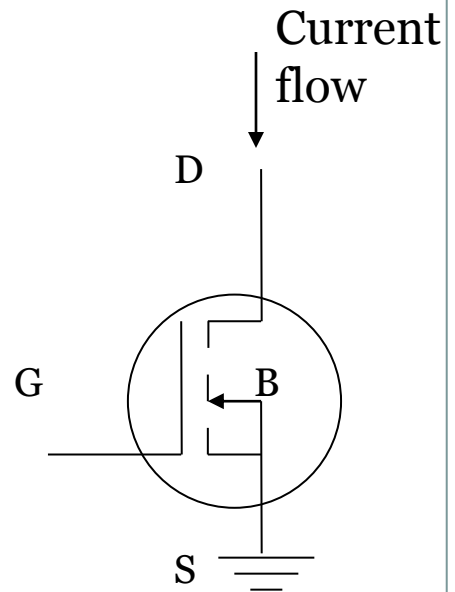
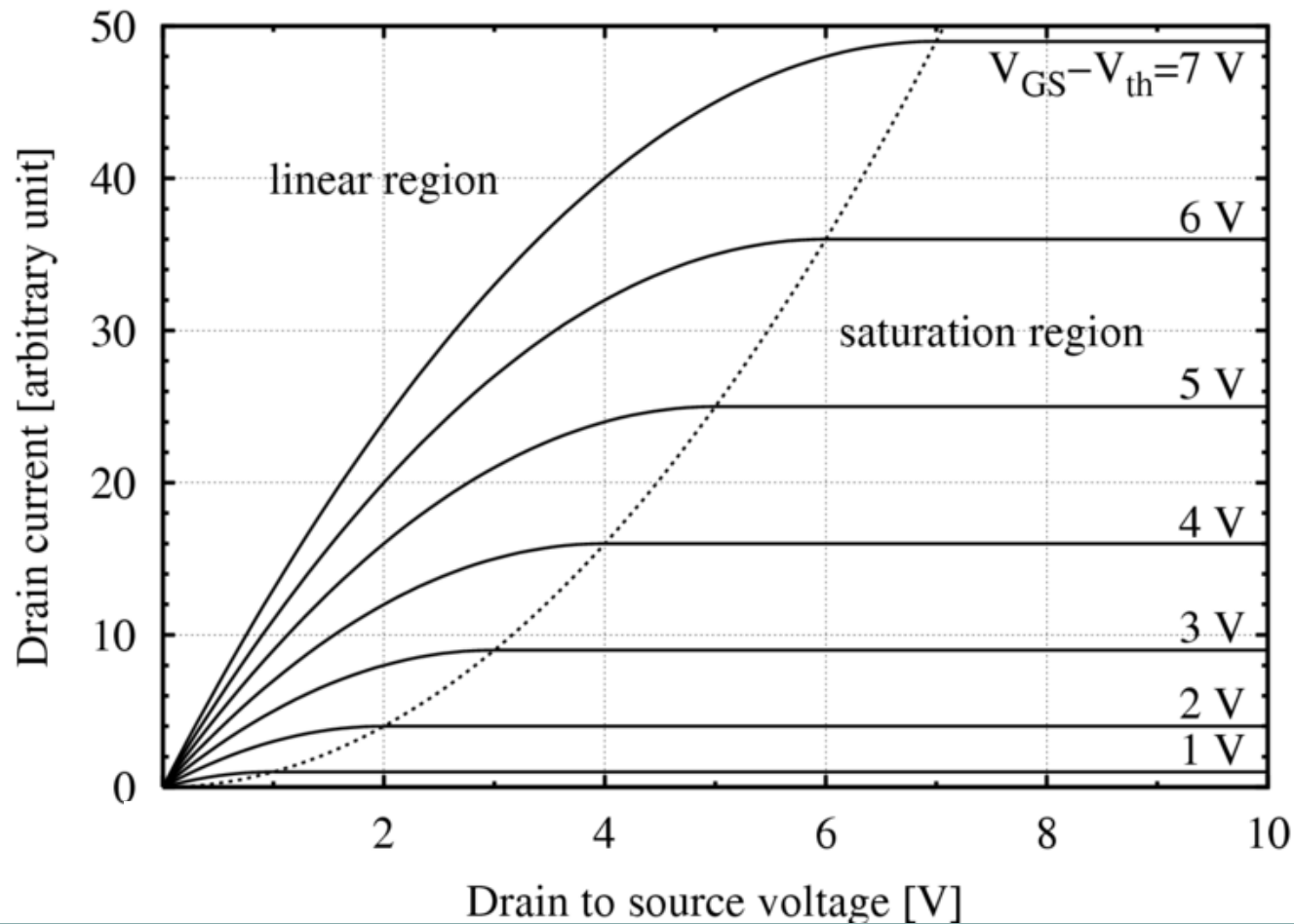
JFET



MOSFET



FET Transistors Characteristics

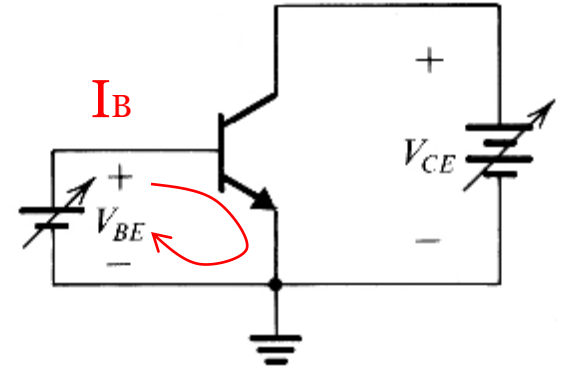
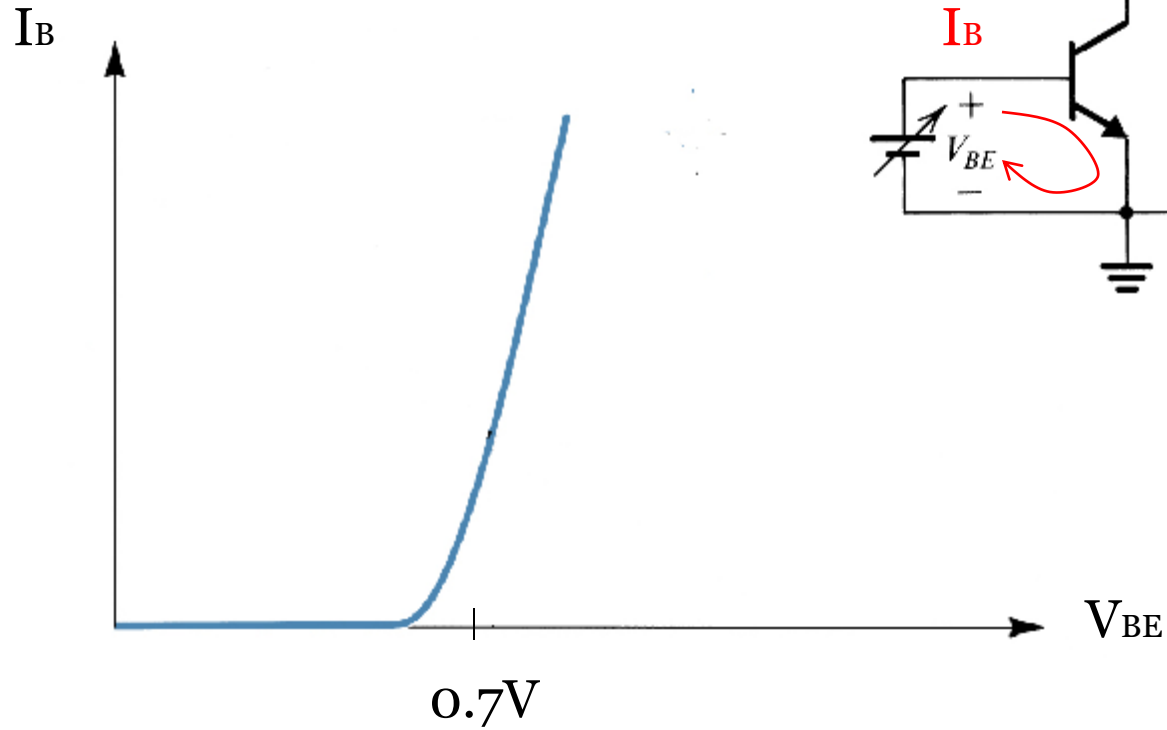


Transistor Uses

- Switching
- Amplification
- Variable Resistor

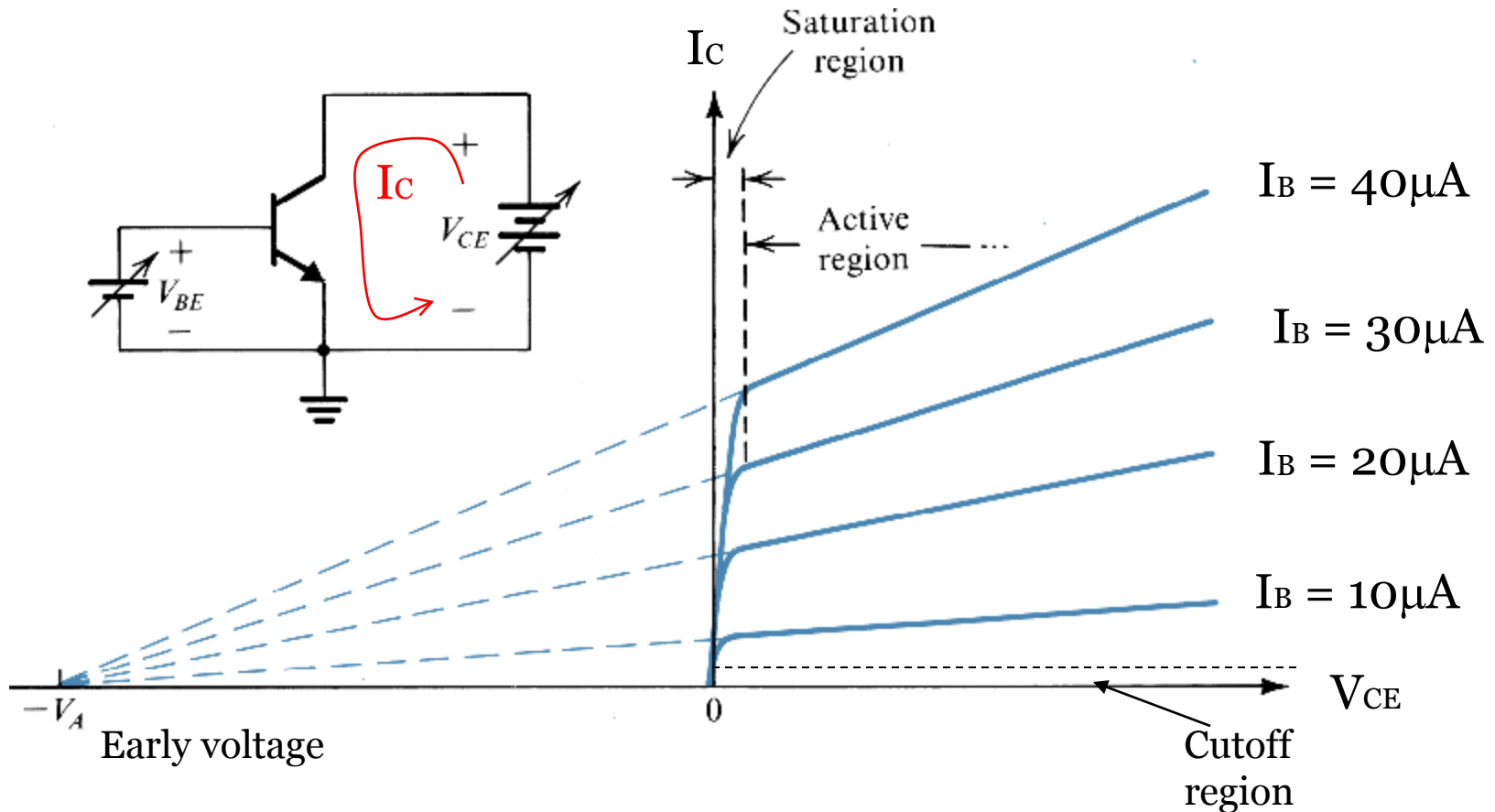
Input characteristics

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- Acts as a diode
- $V_{BE} \approx 0.7V$

Output characteristics



- At a fixed I_B , I_C is not dependent on V_{CE}
- Slope of output characteristics in linear region is near 0 (scale exaggeration)

Biasing a transistor

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- We must operate the transistor in the linear region.
- A transistor's operating point (Q-point) is defined by I_C , V_{CE} , and I_B .

