The Current gain

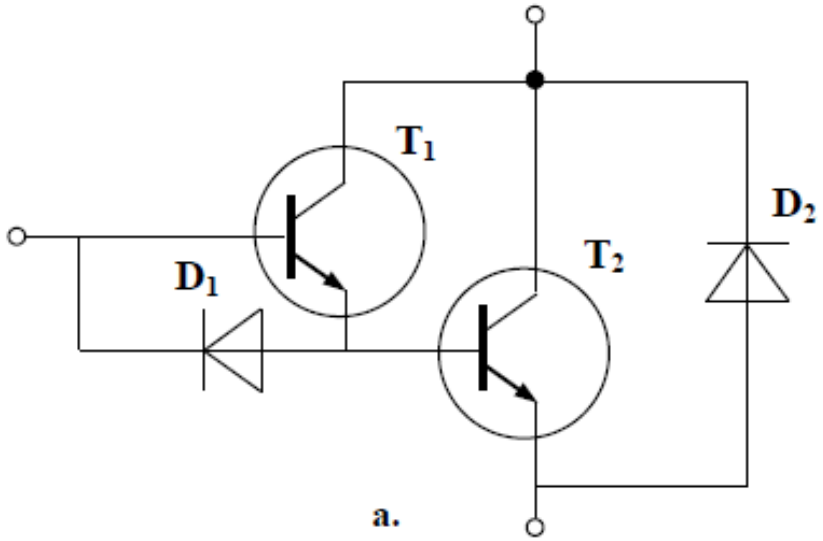
The *dc alpha* of a transistor indicates how close in value the collector current and the emitter current are; it is defined as

$$\alpha = I_C / I_E.$$

نسبة تيار المجمع أو الباعث على تيار القاعدة بكسب الترانزستور (**transistor gain**)

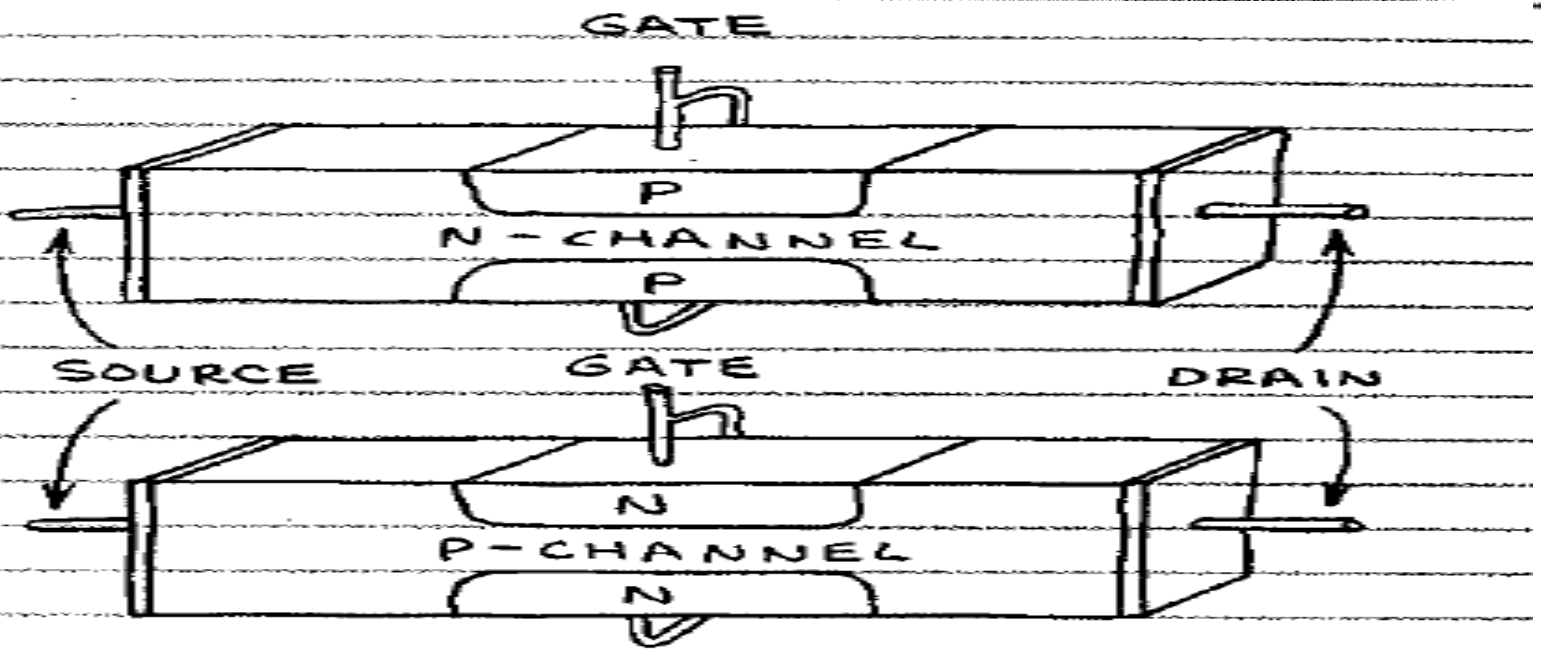
Darlington transistor

The emitter of the first transistor is connected to the base of the second one. A connected pair of bipolar transistors could raise the current gain of a power device. Commonly, this connection is designed monolithic because manufacturers put two transistors inside a single housing. This three-terminal device is known as a *Darlington transistor*. The summary current gain of such connection of

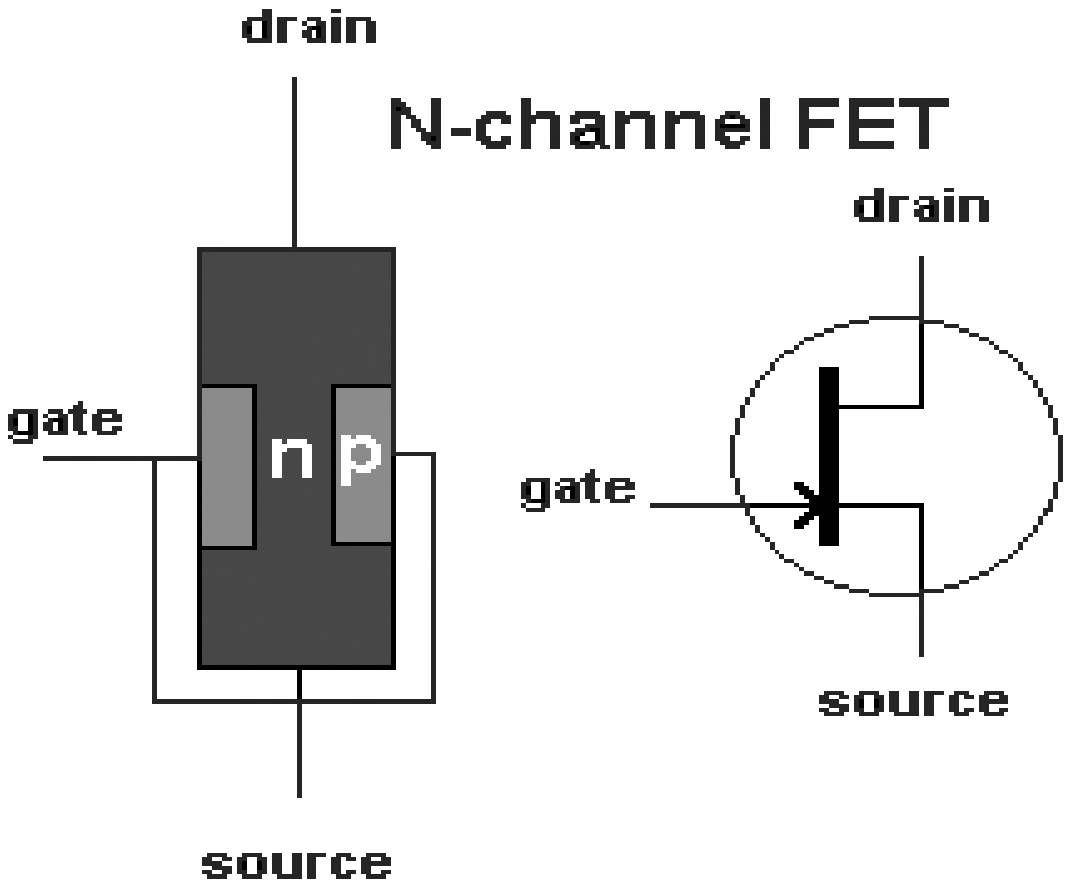


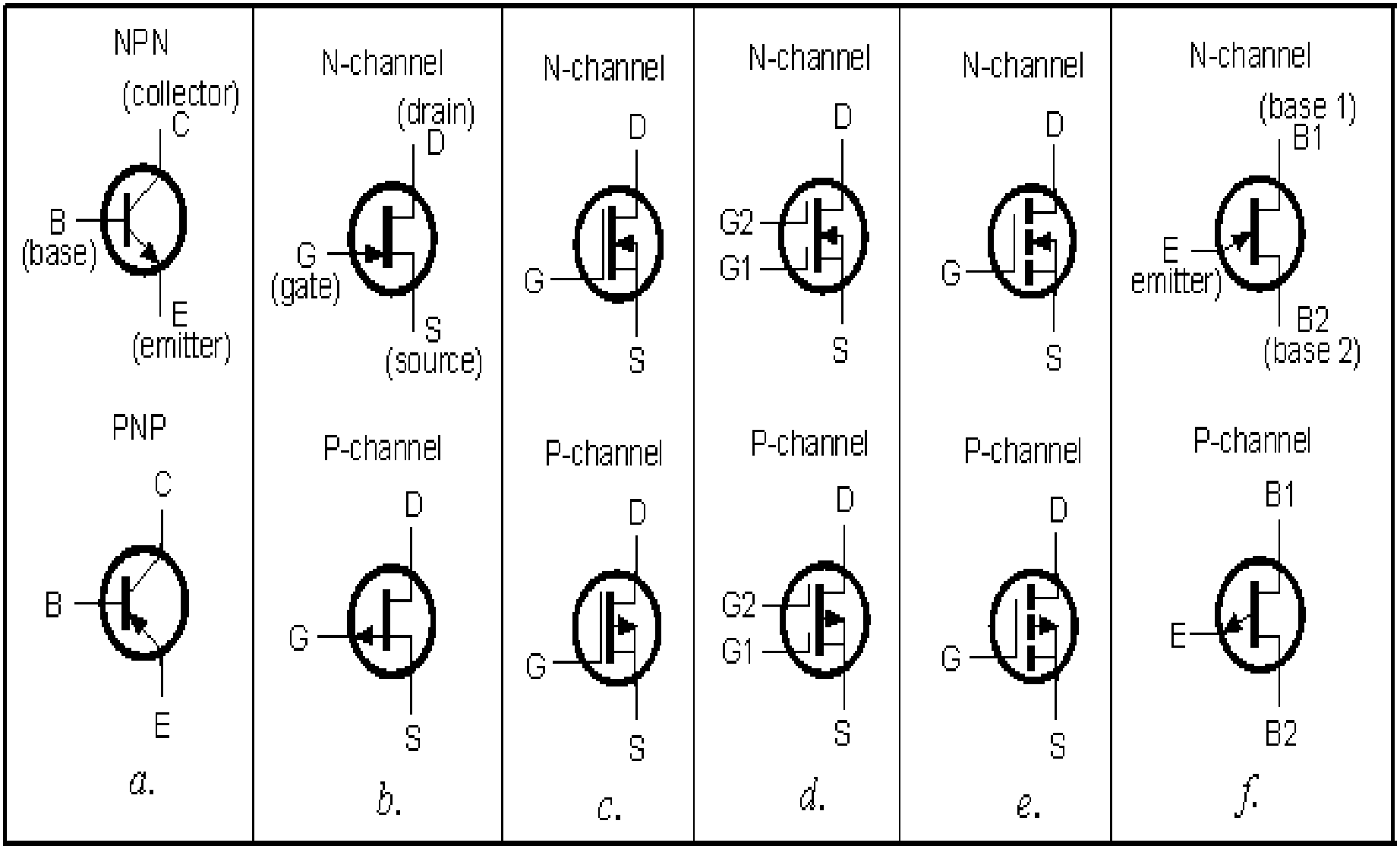
FIELD-EFFECT TRANSISTORS

FIELD-EFFECT TRANSISTORS (OR FETs) HAVE BECOME MORE IMPORTANT THAN BIPOLAR TRANSISTORS. THEY ARE EASY TO MAKE AND REQUIRE LESS SILICON. THERE ARE TWO MAJOR FET FAMILIES, JUNCTION AND METAL-OXIDE-SEMICONDUCTOR. IN BOTH KINDS AN OUTPUT CURRENT IS CONTROLLED BY A SMALL INPUT VOLTAGE AND PRACTICALLY NO INPUT CURRENT!



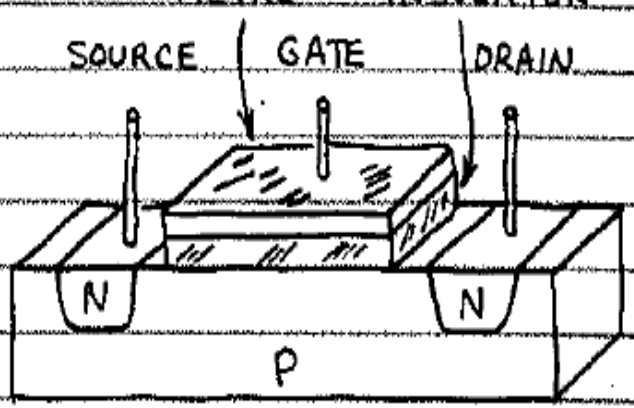
Field Effect Transistors (FET)



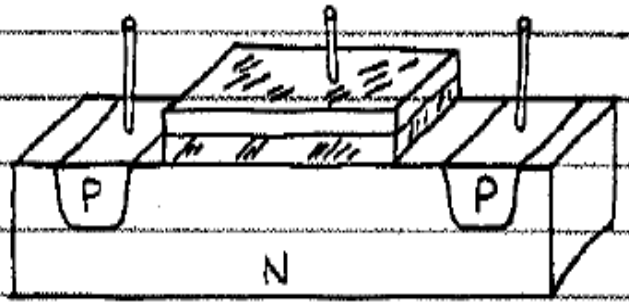

NPN
(collector)
C
B
(base)
E
(emitter)
N-channel
(drain)
D
G
(gate)
S
(source)
N-channel
D
G
S
N-channel
D
G2
G1
S
N-channel
D
G
S
N-channel
(base 1)
B1
E
emitter)
B2
(base 2)
PNP
C
B
E
a.
P-channel
D
G
S
b.
P-channel
D
G
S
c.
P-channel
D
G2
G1
S
d.
P-channel
D
G
S
e.
P-channel
B1
E
B2
f.

METAL-OXIDE-SEMICONDUCTOR FETs

THE METAL-OXIDE-SEMICONDUCTOR FET (OR MOSFET) HAS BECOME THE MOST IMPORTANT TRANSISTOR. MOST MICROCOMPUTER AND MEMORY INTEGRATED CIRCUITS ARE ARRAYS OF THOUSANDS OF MOSFETs ON A SMALL SLIVER OF SILICON. WHY? MOSFETs ARE EASY TO MAKE, THEY CAN BE VERY SMALL, AND SOME MOSFET CIRCUITS CONSUME NEGLIGIBLE POWER. NEW KINDS OF POWER MOSFETs ARE ALSO VERY USEFUL.



N-MOSFET



P-MOSFET

☐ MOSFET OPERATION — ALL MOSFETs ARE N-TYPE OR P-TYPE. UNLIKE THE JUNCTION FET, THE

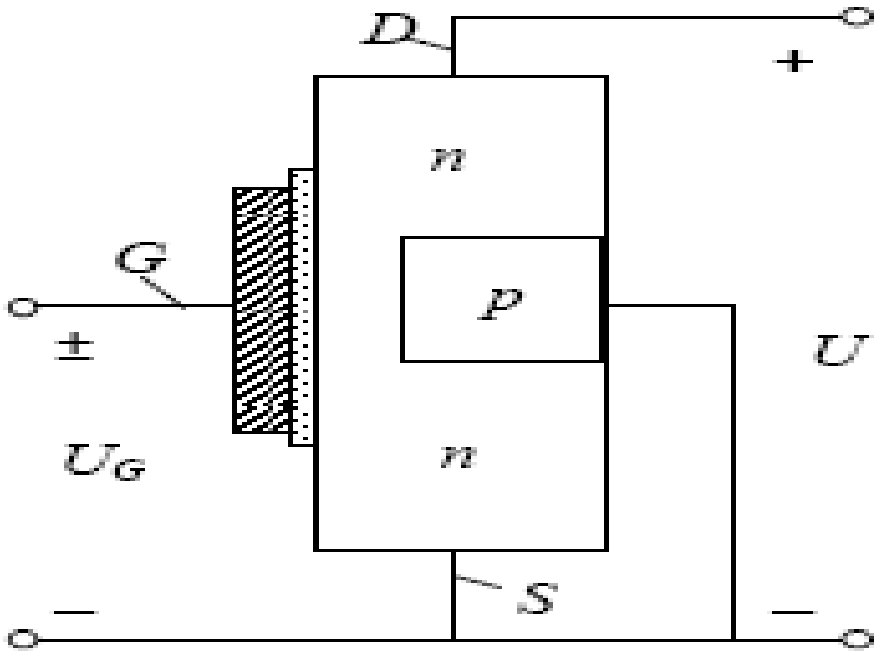


Fig. 1.35