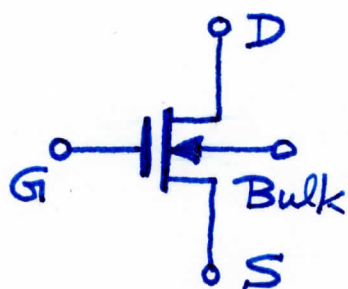
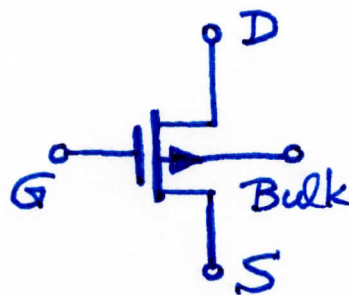


FET circuit symbols

4-terminal FET



N-channel
FET



P-channel
FET

- * Bulk terminal connects to bulk of semiconductor
- * Bulk terminal allows one to tune V_{th}
- * Bulk terminal frequently connected to S
 \Rightarrow 3-terminal device

3-terminal FET

N-channel FET Electrons (e^-) flow

from S to D . \Rightarrow Current flows from D to S .

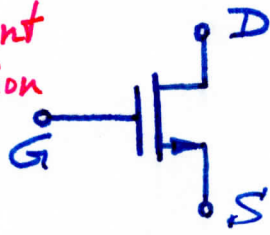
We differentiate: Enhancement Mode FET

(Normally OFF) and Depletion Mode FET
(Normally ON).

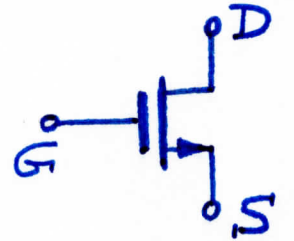
(2)



Enhancement
mode
Normally OFF
 $V_{th} > 0$



Depletion
mode
Normally ON
 $V_{th} < 0$

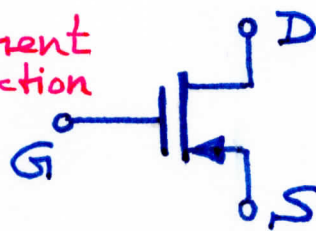


Accepted
symbol
for
both

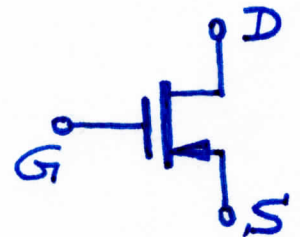
P - channel FET



Enhancement
mode
Normally OFF
 $V_{th} < 0$



Depletion
mode
Normally ON
 $V_{th} > 0$



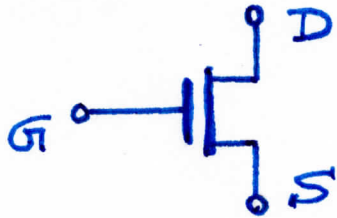
Accepted
symbol
for
both

Holes (h^+) flow from S to D. \Rightarrow Current flows from S to D.

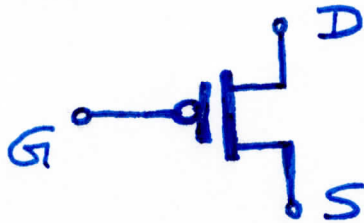
FET circuit symbol in digital circuits ③

In digital circuits the following FETs are used

* N-channel enhancement type. $\Rightarrow V_{th} > 0$



* P-channel enhancement type. $\Rightarrow V_{th} < 0$



FETs have complementary properties

\Rightarrow CMOS technology

\Rightarrow Virtually all ICs (integrated circuits) are CMOS ICs