

4.7 Dual Gate MOSFET

The circuit symbol from the dual gate MOSFET expands the basic single gate MOSFET and adds a second gate into the input.

Enhancement and depletion mode as well as N channel and P channel devices can be described, although P channel devices tend not to be used much for RF applications because hole mobility is much less than electron mobility.

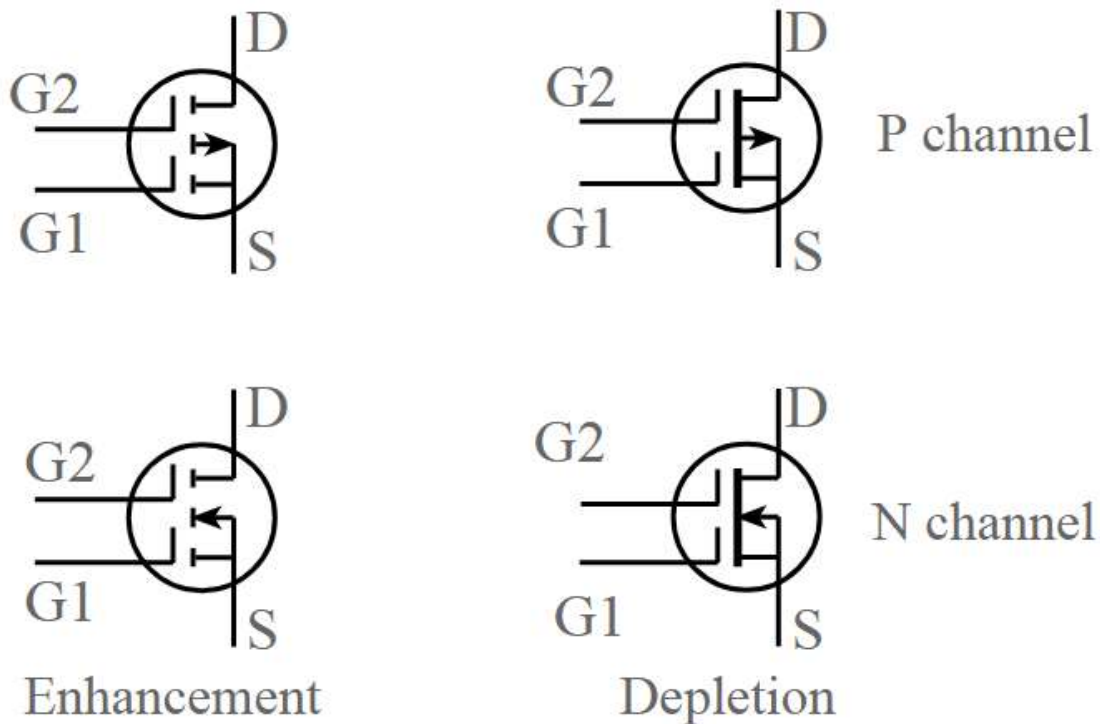


Fig:4.7.1 Symbol of Dual Gate DE, E - MOSFET

The dual gate MOSFET can be used in a number of applications including RF mixers /multipliers, RF amplifiers, amplifiers with gain control and the like.

Dual gate MOSFET structure

The dual gate MOSFET has what may be referred to as a tetrode construction where the two grids control the current through the channel.

The different gates control different sections of the channel which are in series with each other.

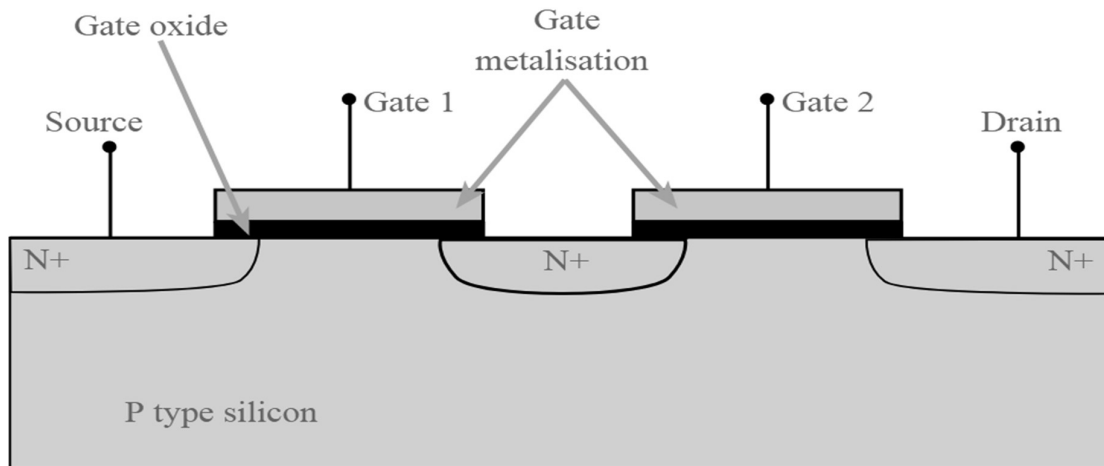


Fig:4.7.2 Dual gate MOSFET structure

Dual gate MOSFET applications

RF amplifier: The dual gate MOSFET enables a cascode two stage amplifier to be constructed using a single device. The cascode amplifier helps overcome the Miller effect where capacitance is present between the input and output stages. Although the Miller effect can relate to any impedance between the input and output, normally the most critical is capacitance. This capacitance can lead to an increase in the level of input capacitance experienced and in high frequency (e.g. VHF & UHF) amplifiers it can also lead to instability.

RF mixer / multiplier: ★ The dual gate MOSFET is able to provide a basis for an RF mixer. The dual gate MOSFET operation enables both the local oscillator and RF signal inputs to be accommodated. The RF signal is normally applied to gate 1 and the local oscillator to gate 2.

The operation of this dual gate MOSFET circuit is relatively easy to understand. The RF signal appears at gate 1 and controls the channel current in the normal way. However the much higher level local oscillator signal is applied to gate 2 and superimposes its effect on the channel current.

Level / gain control: The output from the dual gate MOSFET is proportional to the input at both of the gates. With a constant level at gate 1, for example, varying the voltage on gate 2 will alter the output level. Accordingly the dual gate MOSFET can be used to provide linear gain control.