

Dual-Gate FET Mixer

A dual-gate FET is an n-channel depletion type FET (commonly a GaAs MESFET) with two independently insulated gate terminals. MESFETs operate essentially like a MOSFET, but can be used at very high frequencies, in the order of several GHz. These FETs have a series arrangement of two separate channels, with each channels having independent gate control. The circuit symbol for the n-channel depletion type dual-gate MESFET is shown in Figure 1a, with the simplified symbol in Figure 1b. Dual-gate MESFETs are used at very high frequencies and are commonly used in mixer, modulator, and Automatic Gain Control (AGC) circuits. When Gate 2 is at AC ground, the dual-gate FET may be represented as a common-source, common-gate (CS-CG) pair, referred to as the cascode circuit, shown in Figure 2.

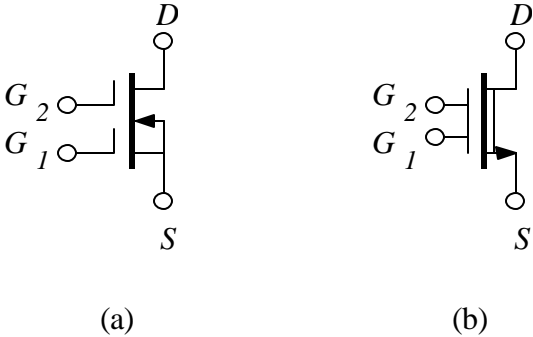


Figure 1. (a) Dual-Gate n-Channel Depletion MESFET Symbol
(b) Simplified Dual-Gate MESFET Circuit Symbol

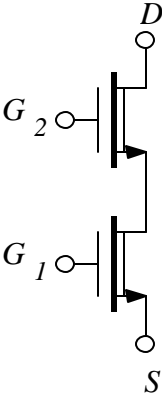


Figure 2. Dual-Gate n-Channel Depletion MESFET Equivalent Representation

In mixer/modulator applications, the LO is applied to Gate 1, and the output taken from the drain (common-source configuration). The baseband signal is applied to Gate 2 to modulate the LO signal.

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A dual-gate n-channel depletion MESFET mixer makes use of the isolated gates for good isolation between the LO and the baseband. The IF output is transformer coupled for impedance matching and isolation.

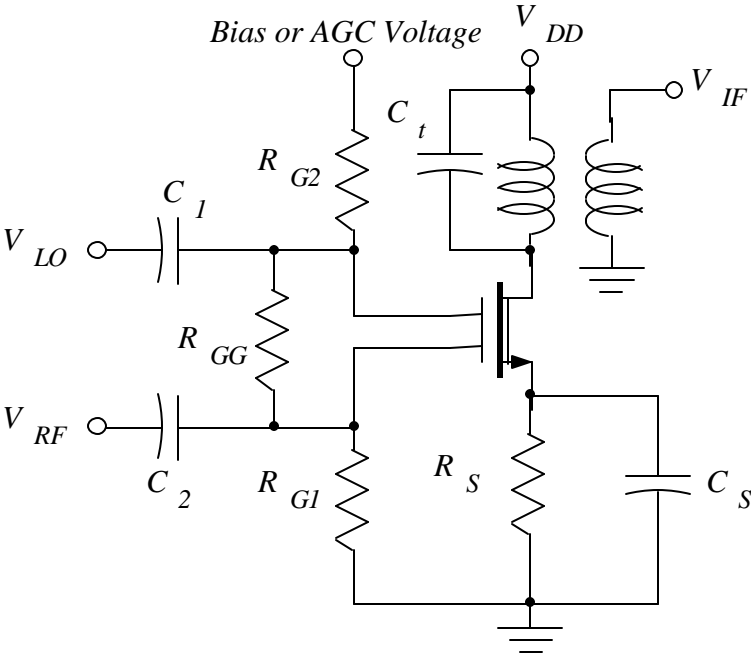


Figure 3. Dual-Gate n-channel Depletion Type MESFET Mixer