Abstracts

Distortion in Off-State Arsenide MESFET Switches

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This paper presents the results of an investigation into the origin and level of distortion generated by the off-state gallium arsenide MESFET when used as a microwave semiconductor control element. The results show that the drain-gate and gate-source capacitance nonlinearities generate distortion in the device in its off-state. These nonlinearities, which reflect the capacitance-voltage characteristic of the capacitances, can be reduced in as-fabricated devices by increasing the gate reverse bias voltage. The level of distortion monotonically increases with frequency throughout the usable range of the MESFET when used in a series reflective switch. In an SPDT switch application, where both on and off-state devices are used, the distortion level is relatively constant at frequencies in the vicinity of the gate bias cut-off frequency. The nonlinear off-state model is compared with both a SPICE-based analysis, and with experimental data on a GaAs MESFET SPDT switch. The main conclusions to be drawn from the study are that the dominate distortion generated by a GaAs MESFET used in a switch application occurs in the on-state, and that off-state distortion can be only slightly improved in as-fabricated devices.

❑ Return to main document.