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# PARAMETER DETERMINATION OF THE PHYSICAL EQUIVALENT CIRCUIT FOR THE DUAL-GATE MESFET

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**A new technique is suggested to determine the parameters of the physical equivalent circuit describing the metal-Schottky dual-gate field effect transistor. The method is based on measurement of the maximal stable gain factor of the transistor in different connection circuits.**

The substantiation of a method for parameter determination of the equivalent circuit of the crystal active area in a single-gate Schottky FET (MESFET1) has been described in [1]. The method is based on the results of measurement of the maximal gain factor $K_{ms}$ under stable amplification conditions for different connection circuits, and permits to diminish the impact of some elements of the casing in the passive area of the crystal. Analysis of the structure of dual-gate Schottky FET (MESFET2) shows [2] that such a transistor may be regarded as two single-gate MESFET1, where the drain of the first transistor is connected to the source of the second one. This makes it possible to employ the technique of parameter determination of single-gate MESFET to find some parameters of the physical equivalent network of dual-gate MESFET.

Resolution of this problem is possible in the case when we have determined the maximal stable gain factors $K_{ims}$ of both single-gate MESFET1 comprising MESFET2. Let us show that under certain conditions the $K_{msi}$ value can be determined by the results of $K_{ms}$ measurement of the dual-gate MESFET2 connected as a two-port. Consider four variants of MESFET2 connection as a two-port representing a cascade connection of the constituent single-gate MESFET1 (Fig. 1).

Determine the maximal gain factor $K_{msN}$ at the stable power amplification of the two-port formed by the cascade connection of $N$ two-ports. The resulting chainwise matrix $\|ABCD\|_N$ of such connection is equal to the product of the matrices $\|ABCD\|_i$ of the constituent two-ports [3]:

$$\|ABCD\|_N = \prod_{i=1}^{N} \|ABCD\|_i\,, \quad i = 1, 2, 3 \ldots N.$$

After transforming this matrix into the transfer matrix, we find that $\|T\|_N = \prod_{i=1}^{N} \|T\|_i$, where $\|T\|_i$ is the transfer matrix of the $i$th stage. Taking into account that $k_{msi} = 1/\Delta T_i$ [4], where $\Delta T_i$ is the determinant of the matrix $\|T\|_i$, we obtain $k_{msN} = \prod_{i=1}^{N} k_{msi}$. Now we can find the maximum attainable gain factors at the stability boundary for different circuits of MESFET2 connection:

$$K_{ms}^{\mathrm{S1D2}} = \frac{K_{ms}^{\mathrm{S1}}}{K_{ms}^{\mathrm{D2}}}\,, \quad K_{ms}^{\mathrm{G1D2}} = \frac{K_{ms}^{\mathrm{G1}}}{K_{ms}^{\mathrm{D2}}}\,, \quad K_{ms}^{\mathrm{S1G2}} = K_{ms}^{\mathrm{S1}} K_{ms}^{\mathrm{G2}}\,, \quad K_{ms}^{\mathrm{G1G2}} = K_{ms}^{\mathrm{G1}} K_{ms}^{\mathrm{G2}}\,, \qquad (1)$$

where the superscripts point to the MESFET2 electrodes connected to the common bus.

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