

To search page

1975

Release of a commercial large-output GaAs MESFET (Fujitsu)

~ Discrete Semiconductor/Others ~

Development of microwave band high power GaAs MESFET began around 1973.

Fukuta et al. of Fujitsu developed the design method of FET pattern to determine the optimum value of the gate width by treating the comb-shaped source/gate electrodes as the transmission line, the low resistance source/drain ohmic electrode forming method by Au-Ge alloy, and the FET assembly (package) capable of source grounding without intervening parasitic effect elements called sheet ground method. Based on these newly developed technologies, they developed a high-power GaAs MESFET that could obtain output of 1 W or more at a frequency of 10 GHz, and Fujitsu commercialized it for the first time in the world.

For the microwave high output transistor, there was a hot controversy in the academic society at this time, whether it should be a Si bipolar transistor or a GaAs MESFET, and GaAs MESFET came one step ahead.

With the development of this high power MESFET, the world's first all solid state microwave relay equipment was realized, replacing the traveling wave tube (TWT) which was conventionally used for the C, X band microwave repeater.

<http://www.fujitsu.com/jp/about/plus/museum/products/communication/radio/10series.html>

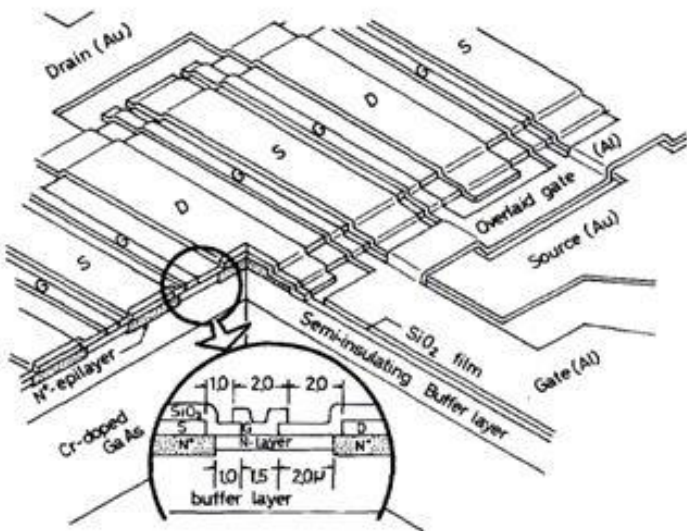


FIGURE 1—Cross sectional diagram of the power FET.

Schematic cross-sectional view of high-power GaAs MESFET

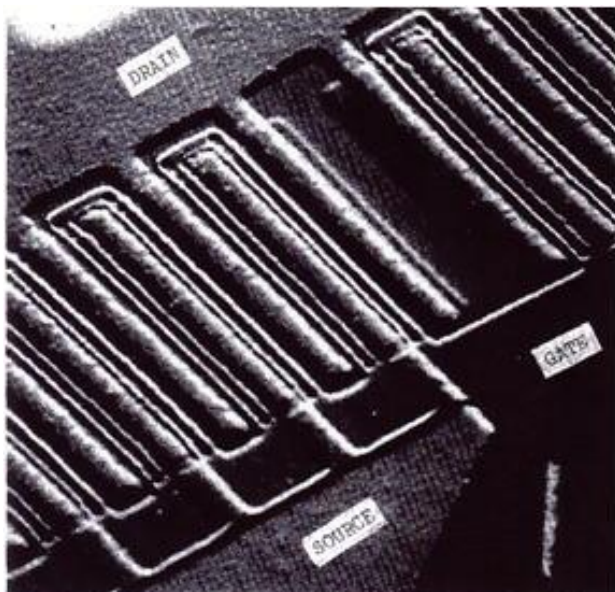


FIGURE 2—Scanning electron microphotograph of the FET center section.

Photograph of electrode pattern of high-power GaAs MESFET (3)

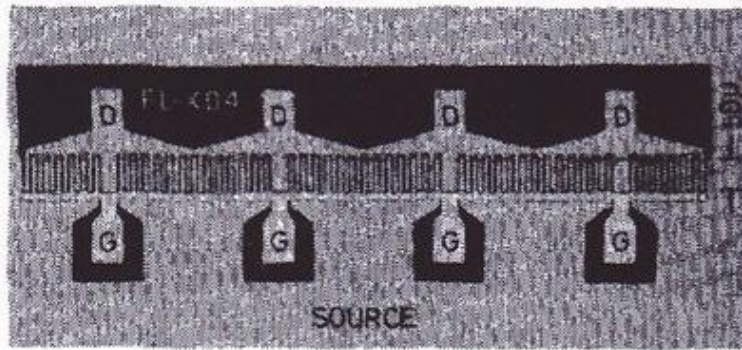


Fig. 2. FET pattern designed for 1-W X-band. Active device area is $0.05 \times 1.00 \text{ mm}^2$ and chip size is $0.5 \times 1.5 \text{ mm}^2$.

Electrode pattern of high-power GaAs MESFET photo ⁽³⁾

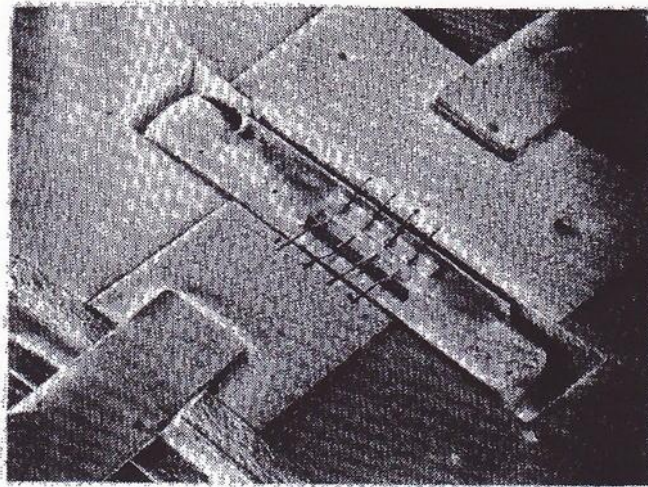


Fig. 6. Scanning electron micrograph of the assembled FET.

SEM micrograph of assembled FET ⁽³⁾

A source grounding method called sheet grounding is used.

References:

- (1) L.S. Napoli et al., "High-power GaAs FET amplifier- A multi-gate structure" IEEE ISSCC Digest of Tech. Papers, pp.82-83, (1973)
- (2) M. Fukuta et al., "Mesh source type microwave power FET" IEEE ISSCC Digest of Tech. Papers, pp.84-85, (1973)
- (3) M. Fukuta, K. Suyama, H. Suzuki, & H. Ishikawa, "GaAs Microwave Power FET" IEEE Trans. Electron Devices, vol. ED-23, pp. 388-394 (1976)
- (4) N. Yokoyama, S. Ohkawa, & H. Ishikawa, "Effects of the heating rate in alloying of Au-Ge to n-type GaAs on the ohmic properties" Japan. J. Appl. Phys. vol. 14, pp. 1071-1072 (1975)