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1974

Development of an aluminum-gate power MOSFET for the UHF band (Fujitsu)

~ Discrete Semiconductor/Others ~

Unlike a bipolar transistor, a MOSFET is a majority carrier device, so it has a very advantageous property for a high output transistor in which current-temperature coefficient becomes negative and current crowding hardly occurs. As the fabrication technology such as lithography technology advanced and the MOSFET's gate length shortened (so-called short channel), the operating frequency of the MOSFET also increased, and the MOSFET with output of 30W at 10MHz was developed by Philips, and development momentum of MOSFET operating in the UHF band or microwave band increased.

Fujitsu's Morita et al. developed an Al gate MOSFET with a cross section structure as shown in the Figure, which had 16.4W output at a frequency of 700MHz, and 4.4W output at a frequency of 1GHz. The gate length was 5μm, and the gate oxide film thickness was 120nm. An n-type drift region was provided in the drain region to secure a breakdown voltage of 55v. Various techniques were implemented such as using a p-on-p+ epitaxial substrate and connecting the source region and the substrate backside (source electrode) with the p+ pipe diffusion layer to reduce the grounding resistance of the source.

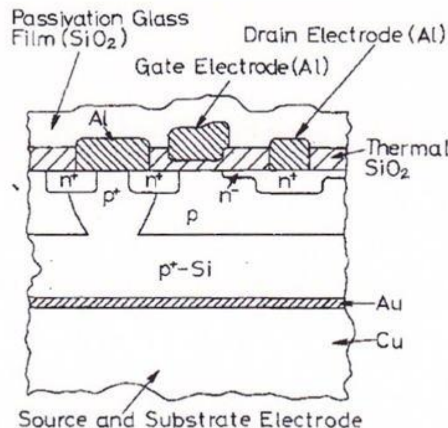

Fig. 1. Schematic cross section of MOSFET.

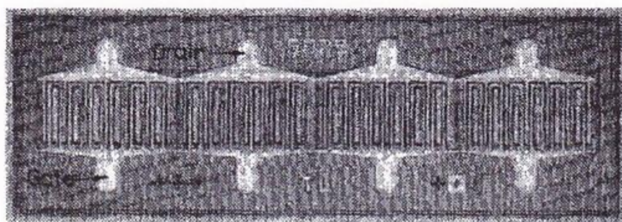

Fig. 2. Photomicrograph of MOSFET (unit section).

Figure: Cross sectional structure (part) of MOS FET and chip photo

Reference:

[1] Y. Morita, H. Takahashi, H. Matayoshi, & M. Fukuta, "Si UHF MOS high power FET", IEEE Trans. Electron Devices. Vol.ED-21, pp. 733-734, (Nov. 1974)

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