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1960 Invention of the MOSFET (BTL)

~ Discrete Semiconductor/Others ~

A gate insulating film (MIS: Metal-Insulator-Semiconductor) type field effect transistor (FET) was proposed by Lilienfeld, Heil, Shockley et al. since around 1926, but the adverse effect of a large amount of surface state could not be overcome, and its operation was not successfully realized. In 1954, C. Frosch of BTL (Bell Telephone Laboratory) discovered that very high-quality oxide film grew on a Si surface by high temperature heat treatment of Si single crystal in water vapor. In 1959, BTL's J. Attala and D. Kahng devised an FET structure that used this steam oxidized silicon dioxide film as a gate oxide film, and they succeeded in stable operation of the device for the first time in the world, and it was announced in 1960. At the same time, it was registered in US Patent 3056888 and 3102230. At this time, the name of MOSFET had not been used yet, and the name of the patented invention was "Semiconductor Triode". The terms of a source, a gate and a drain were not used either, and they were a cathode, a grid, and an anode.

MOSFETs were commercialized by GE and Fairchild in 1964, and by Hitachi in 1965 in Japan.

Aug. 27, 1963 DAWON KAHNG 3,102,230
ELECTRIC FIELD CONTROLLED SEMICONDUCTOR DEVICE
Filed May 31, 1960

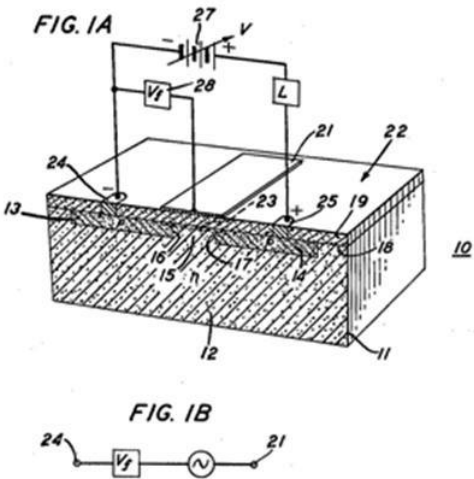


Fig. 1: Example drawing in the specification of US Pat. No. 3,102,230 (1)

The semiconductor substrate 12 is a p-type silicon with a slightly high resistance, and portions of the anode 14 and the cathode 13 are n-type with low resistance, and metal electrodes 24 and 25 are provided here. The surface of the semiconductor (Si) is oxidized to form a silicon dioxide (SiO₂) film 22. A metal electrode to be the grid 21 is attached on the SiO₂ insulating film. The electrodes of the anode and the cathode are in direct contact with the semiconductor by forming holes in the SiO₂ film.

Reference:
(1) US Patent 3102230