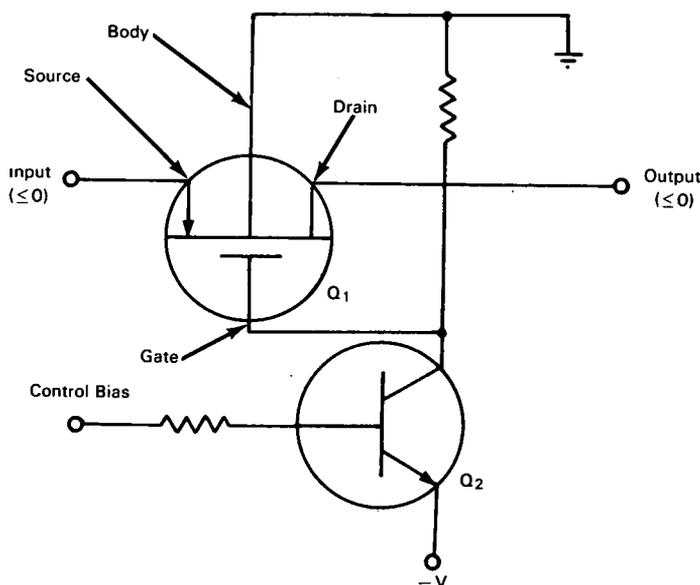


NASA TECH BRIEF



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Field-Effect Transistor Replaces Bulky Transformer in Analog-Gate Circuit



The problem: To design an analog-gate circuit using microelectronic integrated-circuit techniques in order to reduce size and weight. Conventional gate circuits use a heavy, bulky transformer in the drive circuit to isolate the gate from the system fixed voltages.

The solution: A metal-oxide semiconductor field-effect transistor (MOSFET) analog-gate circuit. The MOSFET adapts well to integrated circuits and provides better system isolation than a transformer. System size and weight are appreciably reduced.

How it's done: This analog-gate circuit consists essentially of the MOSFET Q_1 , and an NPN control transistor Q_2 . With Q_2 in saturation, a conducting

channel is formed from the source of Q_1 to its drain and the analog gate conducts. With Q_2 off, potential on the gate of Q_1 becomes greater than its source or drain potential and the analog gate is open-circuited.

The MOSFET provides complete isolation of the gate elements, resulting in zero offset voltages. Because the input and output signals are less than or equal to zero, the body of Q_1 is grounded and the source and drain junction leakage is kept in the nanoampere range. Body junctions can withstand up to 25 volts without excessive leakage or breakdown, thus permitting a wide range of input voltages. Crosstalk in the MOSFET is minimized by a source-to-drain capacitance of less than 1 picofarad.

(continued overleaf)

Notes:

1. This invention should be of interest to the electronics industry, particularly in the area of telemetry.
2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland, 20771
Reference: B65-10284

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Radiation, Incorporated
under contract to
Goddard Space Flight Center
(GSFC-351)