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1963

Invention of CMOS (Fairchild Semiconductor)

~ Discrete Semiconductor/Others ~

Fairchild's F.M. Wanlass announced the basic concepts of CMOS (inverters, NOR gates, SR-FF, etc.) in collaboration with C.T. Sah at 1963 IEEE ISSCC [1] and filed a patent (US Pat. No. 3356858) [2]. In the technology at the time, the enhancement type NMOSFET could not be fabricated, and the circuit operation was confirmed by individual FETs of the depletion type NMOSFET and the PMOSFET under bias, but they already showed the concept of monolithic integration and foresaw that it would be suitable for high density integration.

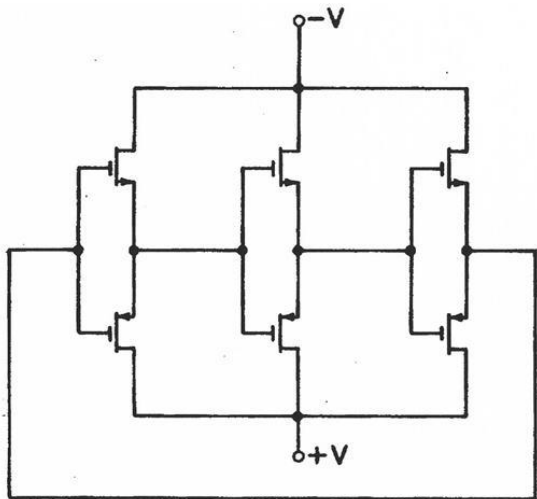


FIGURE 5—Ring-oscillator circuit for determining propagation delay of complementary inverter circuit.

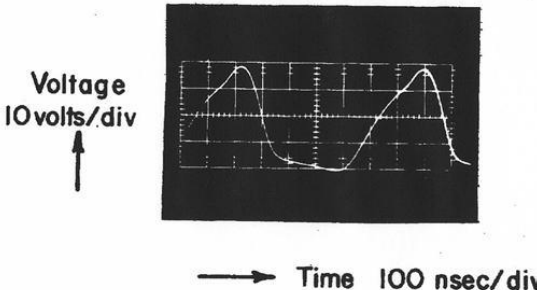


FIGURE 6—Plot of output voltage waveform from one stage of ring oscillator circuit.

Fig. 1: Circuit diagram and oscillation waveform of the World's first CMOS ring oscillator [1]

Dec. 5, 1967

F. M. WANLASS

3,356,858

LOW STAND-BY POWER COMPLEMENTARY FIELD EFFECT CIRCUITRY

Filed June 18, 1963

5 Sheets-Sheet 5

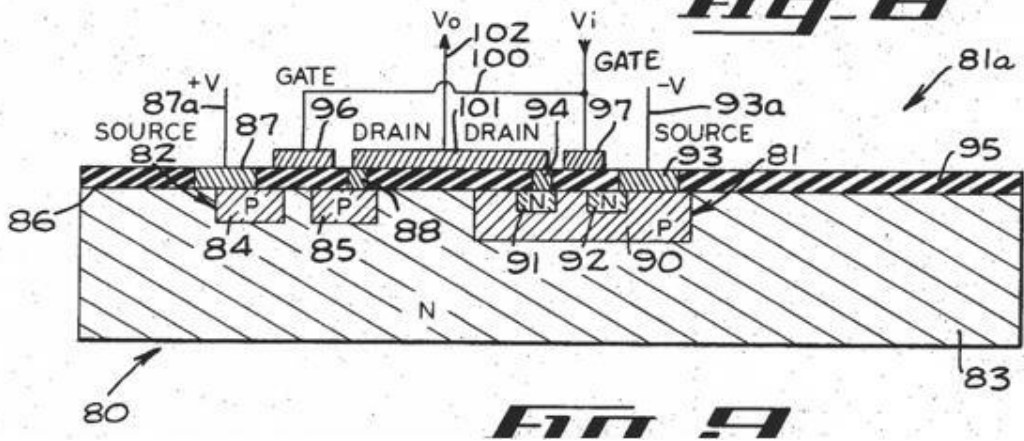


Fig. 2: Structure drawing of p-well CMOS described in US Pat. No. 3,356,858 [2] (Is the NMOS gate offset an error?)

References:

[1] F.M. Wanlass and C.T. Sah, "Nanowatt logic using field-effect metal-oxide semiconductor triodes", pp.32-33, IEEE ISSCC Digest of Tech. Papers, (Feb. 1963)

[2] US Patent 3356858: "Low standby power complementary field effect circuitry"