

Mid-1960s

Mass-production of ICs for calculators begins

~ Integrated Circuit ~

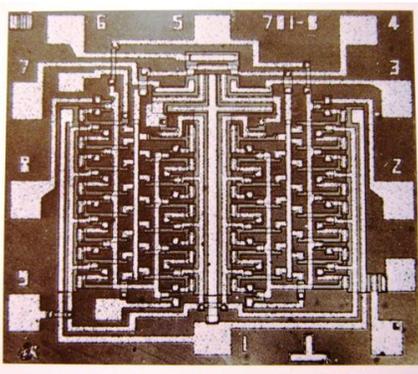
Since the world's first all-transistor calculator was released from Sharp in 1964, each company aggressively adopted new semiconductor devices for weight saving, price reduction, and low power consumption. In October 1966, IC calculator (CS-31A) using bipolar IC in part was released from Sharp, and the weight and the number of parts were halved compared to the first product released in 1964. The selling price was greatly reduced to 350,000 yen (535,000 yen for the first product). 28 pieces of Mitsubishi Electric's bipolar ICs were used for this model.

At that time, in the industry, discussion on "Bipolar ? or MOS ?" was thriving. Although MOS was still somewhat shaky in terms of reliability, it had advantages in terms of degree of integration and power consumption, consistent with the direction of calculator makers, and it gradually gained momentum. As mass production advanced, the MOS reliability problem was also solved.

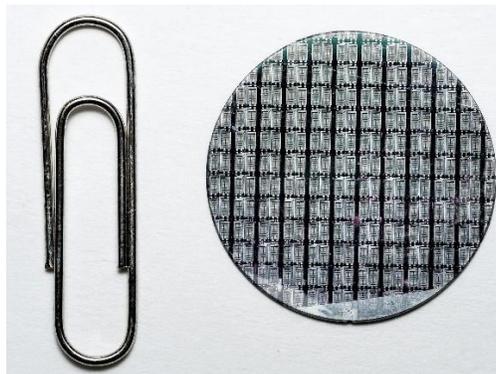
Sharp released "All IC Calculator (CS-16A)" using MOS ICs in December 1967. Compared with the first machine, the number of parts was reduced to 1/15, the volume to one third, the weight to one sixth, and the price of 230,000 yen was realized which was less than half price. Hitachi's 56 MOS ICs were used for this model. Calculator market became a powerful driver to lead the mass production of MOS devices in Japan.

The figures below are a chip photograph and a package photograph of Hitachi's MOS IC (HD 701). The HD 701 was a 16-bit shift register, 1 bit consisting of 3 MOS ICs, and the number of elements was 55 in total. The gate length was 15 μ m. A 10 pin TO - 5 type package was used.

Following this, the degree of integration of MOS rose year by year and new devices appeared like MSI in 1968, LSI in 1969, and one chip LSI 1972. They drove the price performance ratio of calculators dramatically.



MOS IC for calculator chip photo



HD701 : 1" wafer photo
(By courtesy of Hitachi)



MOS IC for calculator
10-pin TO-5 package