



Late 1970s

Commercialization of Microcomputer peripheral LSIs **such as CRTC (Hitachi)**

~ Integrated Circuit ~

Computer displays have changed from one used for dedicated tube such as Nixie tube to the other used cathode ray tube (CRT). It has evolved, from a random scan type that directly scans an electron beam to draw characters and graphics, into a raster scan type operating from corner to corner like a TV. In the late 1960s, Hitachi was mainly developing a display device for use in computational process control systems at its research laboratories. This device displays characters and graphics using a raster scan type CRT ¹⁾. In the 1970s, higher performance and more functions were so required, that the company was trying to develop a standalone LSI for it with dedicated hardware implementation design. But the solution about too long development time and heavy product cost became the issues.

In the 1970s, microcomputer technology, which began with Intel's 4004, was evolving from 4-bit to 8-bit, and its market was expanding significantly. In parallel with the advent of highly sophisticated CPUs, various LSIs for peripheral control were required in the microcomputer system, and semiconductor companies proceeded with the development of those LSIs. Considering such market movement, Hitachi modified direction of display LSI development and started the development of a microcomputer peripheral LSI intended for CRT control use, which is the CRT controller LSI (CRTC: HD46505, HD6845) ^{2,3)}. During the same period Hitachi also developed Peripheral LSIs such as magnetic cassette tape controller, floppy disk controller, DMA controller, and others ⁴⁾.

At that time, the CRT display focused on displaying characters. and CRTC had the function to display characters and semi-graphics composed of simple preset figures. The initial lot was shipped in 1977, and the degree of completion was so higher, that sample shipment started immediately (Figures 1 and 2). In the early stage, major customers were game machine manufacturers, which rapidly spread not only large arcade machines but also personal game machines.

It was the time of appearance and growth stage of PCs, and it became common to use CRTs as their output unit. CRTC was characterized by programmable functions being not affected by CRT specifications such as the number of displayed characters and CPU independent general-purpose interface. CRTC was adopted to the IBM-PC which was released in 1981 and became the industry standard PC with its open architecture strategy. CRTC was the basic component of display control adapter (later VGA: Video Graphics Array) of IBM-PC, which became the de facto standard. CRTC built a track record as a successful microcomputer peripheral LSI, and established the basis for subsequent developments of Hitachi's display control LSI categories.

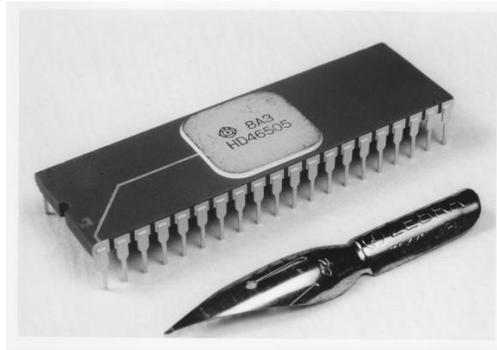


Figure 1 HD46505 CRTC

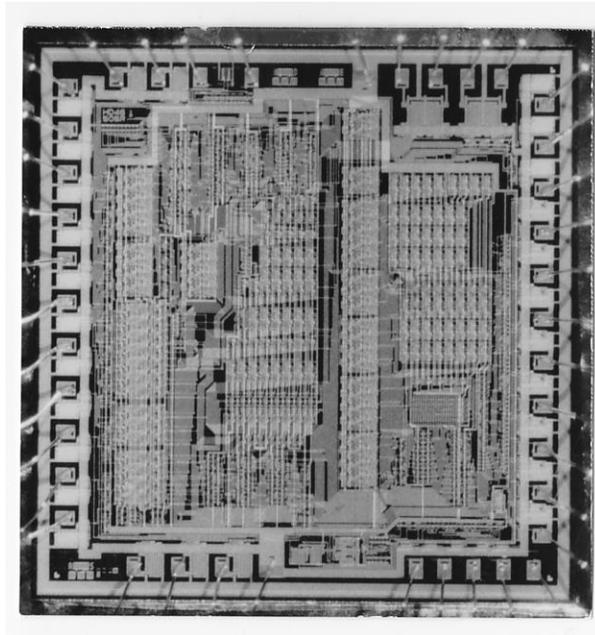


Figure 2 Chip photograph of HD46505 CRTC

References:

- (1) N. Hamada, I. Yasuda, and Y. Hayashi: HITACHI Process Display System, Hitachi Hyoron, Vol.52, No.8, pp.675~678 (1970-8) (Japanese)
- (2) S. Kuboki, N. Hamada, M.Iwamura, S. Yamada, Y. Kawamoto, Y.Hatsukano: Single-Chip Controller for Raster-Scan CRT Displays, Proc. of S.I.D. Vol 19, No. 2, pp75~80 (2ndQ. 1978)
- (3) N. Hamada, M. Iwamura, S. Kuboki, and S. Yamada: An Architecture of LSI for CRT Display Controller, Trans.IPS.Japan, Vol.20, No.3, pp199~204 (1979-5) (Japanese)
- (4) Y. Kita, Y. Kawamoto, E. Adachi, and Y. Hatsukano: Memory and Interface LSI Family of Microcomputer HMCS6800, Hitachi Hyoron, Vol.59, No.5, pp.47~52 (Japanese)