1984

Microcontroller with on-chip EPROM (Hitachi)
~ Integrated Circuit ~

In the early 1980s, as semiconductor integration advanced, single chip microprocessor incorporating CPU, memory, and entire peripheral functions became widespread. However, the on-chip memory was MASK ROM which was superior in cost and reliability, but MASK ROM is to be programmed during the wafer processing at the wafer manufacturing fab. Therefore, it took time and expenses to modify the program code in the single chip microprocessor in mass production stage.

This problem could be resolved by switching the on-chip memory to field programmable EPROM memory, but there was a concern about cost and reliability of on-chip EPROM at the time, so it was not put into practical use in mass production stage. The EPROM embedded microprocessors were used only in development stage, and in the mass production stage it was an industry common sense to move to on-chip MASK ROM versions.

In 1984, Hitachi launched the first EPROM embedded microprocessor product 63701V into the market, which was intended for the use in mass production stage as well as in development stage. Hitachi named this EPROM embedded microprocessor as ZTAT microprocessor, which meant that the time required from completion of customized program code to mass production of the customized microprocessor (Turn Around Time) was reduced to ZERO. Cost reduction and reliability improvement were the challenges of this EPROM embedded microprocessor development. Various countermeasures taken made it possible to productize this EPROM embedded microprocessor. They were used initially in consumer applications where the cost performance was key, and then expanded their market to other area including automotive engines where high reliability was required. Successful track record of their applications both in consumer and automotive market is the proof that EPROM embedded microprocessors successfully realized both of competitive cost and reliability.

This product captured the universal and essential needs of shortening the time (TAT) from development to mass production, so the market impact was great. The EPROM built-in microprocessors rapidly spread to other single chip microcontroller manufacturers such as NEC as well as Hitachi. Later, the on-chip memory technology evolved from onetime programable EPROM to reprogrammable flash memory. Currently, single chip microprocessors are with embedded flash memory.
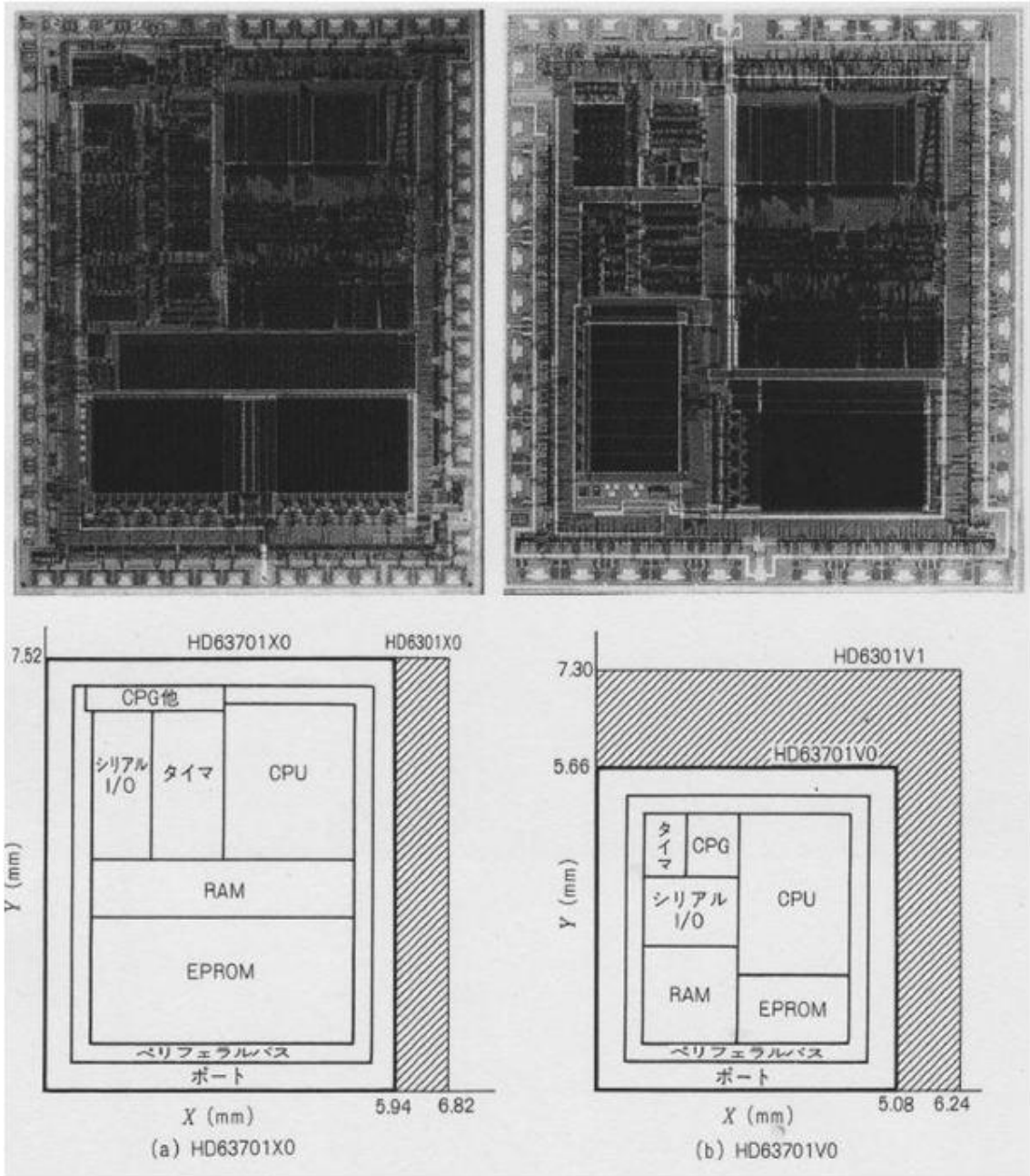
Fig. Die photos of EPROM on-chip Microcontroller HD63701X0 and HD701V0