

An Overview of The Microprocessor and Its Impact on the Society

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The Microprocessor and Its Impact on the Society

The information revolution would not have occurred if it were not for microprocessor. In today's society, it is hard to find somebody who has not heard the word microprocessor, chip or integrated circuit (IC). Yet not a lot of people know what exactly an integrated circuit or chip really is. This paper briefly discusses the chip and its impact on our everyday life.

Invention of chip was a logical step in development of electronics. Many important developments, in the field of electronics such as semiconductors and transistor, took place by 1960. These developments along with other rapid advances in material sciences brought about miniaturization of the electronic circuitries. Tiny transistors replaced the bulky vacuum tubes. This led to the development of small and portable electronic equipment such as transistor radio.

The transistors, which replaced the bulky vacuum tubes, were very small. However, there was a limit on how small the transistor and hence the circuits could be made. Since transistors were the essential component of a circuit, the circuit could not be made small without having small transistors. So, two inventors, Jack Kilby and Robert Noyce, independently developed methods of miniaturizing circuits on a monolithic piece of silicon that became known as integrated circuit (IC) or chip. They both tried to solve essentially the problem of making more of less.

Before, chip was invented, separate electronic components such as transistor, resistor and capacitor were placed on a circuit board. The connections between these components were made using separate wires. The chip, however, is different. All the components are created on a single piece of silicon. What makes chips important is that large electronic circuits can be built in a very tiny space. Without the chip, these circuits would occupy large spaces, and would be costly, inefficient, and not handy. Texas Instrument manufactured the first chip. They first used the chips in Air Force computers and Minuteman Missiles. Later, they used chips for pocket calculators and computers. Today's typical chips contain several million transistors on a piece of silicon the size of a fingertip. A chip or microchip, as sometime called, is a very precise equipment. The precision is measured in micron and nowadays in fractions of microns. A micron is one-millionth of a meter, or about one one-hundredth of the diameter of a human hair.

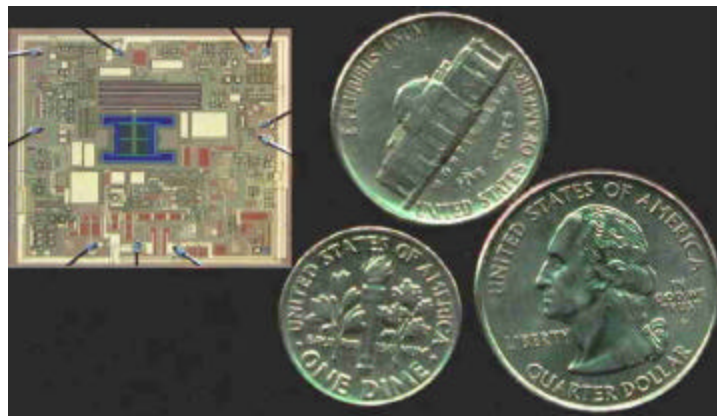


Figure 1. Actual size of microchip and coins.

Small wires on the chip are connection wires thinner than human hair.

Undoubtedly, the chip not only revolutionized the electronic industry but also drastically impacted our daily life style. Unlike other inventions, the chip is involved in our daily life rather in a hidden way. The chip is embedded in machines that we encounter on daily basis. Some of these machines are, copier, cellular phone, vending machines, exercise equipment, computer keyboard, hard disk drive, printer, interactive toys, calculators, wristwatch, traffic control lights and much more. The list is so long that cannot be mentioned here. A simple rule of thumb is if a device uses electricity and the user can tell it what to do by programming it or customizing it, then there is a chip inside that device.

One important use of chip is in the field of medical science and equipment. The chip is part of many life saving medical equipment. One such device is the implantable pacemaker. The heart is a muscle that is capable of continuous pumping throughout our lifetime. However, there are many diseases that cause it to fail. One such disease is called arrhythmias or abnormal rhythms in heartbeats. There are two types of abnormality of heartbeats. One is the fast heartbeat and the second is the slow heartbeat. The fast heartbeat can be controlled by medicine. However, the slow heartbeat cannot be controlled by medicine and needs mechanical device to create normal contractions of the heart so that it can pump adequate blood supply to body. The mechanical device, pacemaker, for the this problem had existed before the invention of chip. However, they were big and unportable and not at all implantable in human body. The patient would be bound to the big pacemaker machine and much like a paralyzed person could not continue with normal daily activities. Fortunately, the advent of chip brought a new life to these patients. The chip technology made it possible to create small pacemakers that could be implanted inside the body of patients. These pacemakers have complex circuitries that provide assistance to the heart on demand. When the heartbeat slows down, the pacemaker senses that and automatically activates and helps the heart by sending the required amount of electrical impulses. The pacemaker has saved millions of lives and enabled the patients to resume almost all of their daily activities. More than hundred thousand patients receive it each year in the U. S. Recently, the current vice president Dick Cheney also received a pacemaker, which will help his heart but it will not prevent him from doing his daily duties. Without the chip, his vice presidency would in effect be over because he would be bound to a machine perhaps in a hospital or his house.

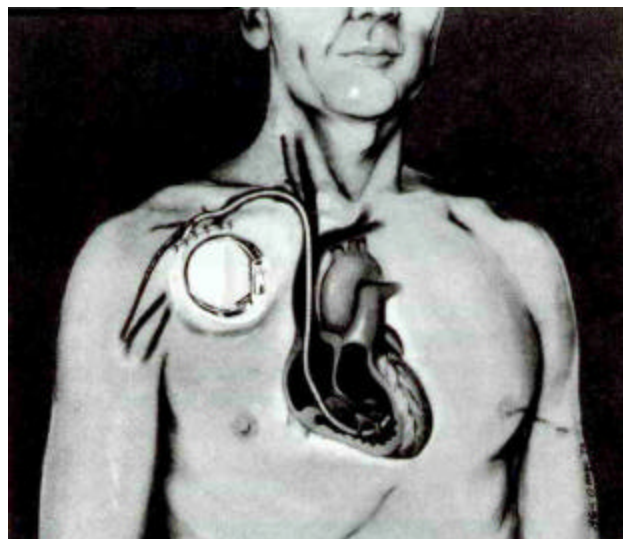


Figure 2. A pacemaker implanted inside the body.

The field of communication is another area that has been revolutionized by the advent of the chip. Modern communication devices such as cell phone, beeper, internet and wireless internet, satellites and much more owe their existence to chip. One of the latest equipment, in the field of personal communication, is disposable cell phone. This new device that will soon reach the market, could not be a reality without chips. It is invented by Randi Altschul, a New Jersey toy designer. The size of this disposable cell phone is 2 by 3 inches and it is made by printing most of cell phone circuitries onto a paper substrate, which is then sealed and laminated. The construction of the disposable cell phone is largely based on the construction of the chip.

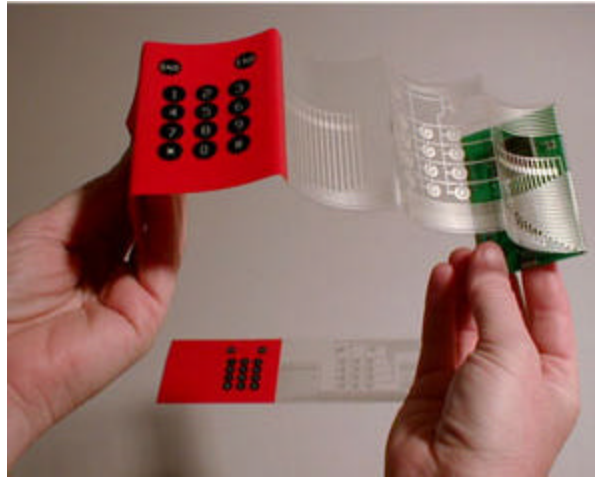


Figure 3. Disposable cell-phone.

It has a simple construction.

The chip or integrated circuit has certainly ignited an unprecedented revolution in today's society. Its use in our life as well as its computing power is increasing fast. It has been noted that if progress in the automotive industry had been as rapid as in chip technology since 1960, today's automobile would have an engine that is less than 0.1 inch in length, would get 120 000 miles per gallon of gas, would have a top speed of 240 000 miles per hour, and would still cost only \$4.00. Today's Intel 4 Pentium chip contains over one billion transistors and by 2010 the chip will become so miniaturized that it will contain four times as many transistors as today. The implications of such powerful chip will be enormous and their effect would be felt in many more ways than we see today.

Glossary

Transistor: An electronic component made of semiconductors. It acts as a switch.

Resistor: It is circuit component the controls the flow of current.

Capacitor: It is a device that store electric charges.

Minuteman Missiles: U.S. Intercontinental Ballistic Missiles.

Semiconductor: Semiconductors are materials that exhibit both the properties of conductors and insulators.

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