

Very large-scale integration (VLSI)



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What is VLSI?

Very-large-scale integration (VLSI) is the process of creating an integrated circuit (IC) by combining thousands of transistors into a single chip of semiconductors.

VLSI designed in the 1970s when the complex semiconductor and communication technologies were being developed.

The microprocessor is known as a VLSI device. Before the introduction of the VLSI technology most of the ICs had a limited set of functions they could perform.

An electronic circuit might consist of a CPU, ROM, RAM and other fundamental logic. VLSI lets IC designers add all of these into one chip.

The Very large-scale integration (VLSI) is the process of integrating or embedding hundreds of thousands of transistors on a single silicon semiconductor microchip.

The VLSI technology was conceived in the late 1970s when advanced level computer processor microchips were under development.

The VLSI is a successor to large-scale integration (LSI), medium-scale integration (MSI) and small-scale integration (SSI) technologies.

VLSI Technology

VLSI is one of the most widely used technologies for microchip processors, integrated circuits (IC) and component designing.

It was initially designed to support hundreds of thousands of transistor gates on a microchip which, as of 2012, exceeded several billion.

All of these transistors are remarkably integrated and embedded within a microchip that has shrunk over time but still has the capacity to hold enormous amounts of transistors.

The first 1 mega byte RAM was built on top of VLSI design principles and included more than one million transistors on its microchip die.

Integrated circuit classification

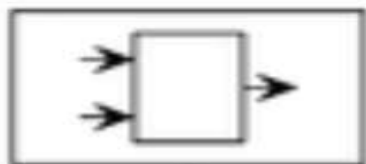
Name	Signification	Year	Number of Transistors	Number of Logic Gates
SSI	small-scale integration	1964	1 to 10	1 to 12
MSI	medium-scale integration	1968	10 to 500	13 to 99
LSI	large-scale integration	1971	500 to 20,000	100 to 9,999
VLSI	very large-scale integration	1980	20,000 to 1,000,000	10,000 to 99,999
ULSI	ultra-large-scale integration	1984	1,000,000 and more	100,000 and more

Why VLSI?

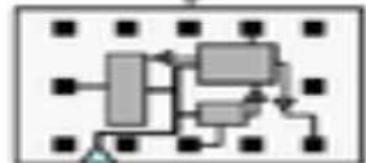
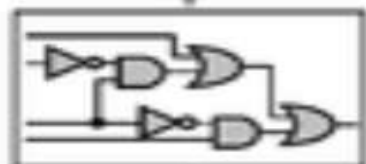
- Integration improves the design
- Lower parasitic = higher speed
- Lower power consumption
- Physically smaller

Integration reduces manufacturing cost -(almost) no manual assembly

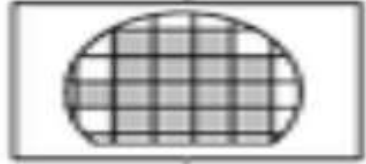
Manufacturing processes of VLSI is given below



ENTITY test
port a: in;
end ENTITY;



DRC
LVS
ERC



System
Specification

Architectural
Design

Functional Design
and Logic Design

Circuit Design

Physical Design

Physical Verification
and Signoff

Fabrication

Packaging
and Testing

Chip

VLSI advantages:

VLSI has many advantages-

1. Reduces the Size of Circuits.
2. Reduces the effective cost of the devices.
3. Increases the Operating speed of circuits
4. Requires less power than Discrete components.
5. Higher Reliability
6. Occupies a relatively smaller area.

VLSI Applications

VLSI is an implementation technology for electronic circuitry - analogue or digital

It is concerned with forming a pattern of interconnected switches and gates on the surface of a crystal of semiconductor

- Microprocessors
- personal computers
- microcontrollers
- Memory - DRAM / SRAM
- Special Purpose Processors - ASICS (CD players, DSP applications)
- Optical Switches

Has made highly sophisticated control systems mass-producible and therefore cheap

VLSI Applications

In today's world VLSI chips are widely used in various branches of Engineering like:

- 1.Voice and Data Communication networks
- 2.Digital Signal Processing
- 3.Computers
- 4.Commercial Electronics
- 5.Automobiles
- 6.Medicine and many more.

VLSI Chips

