Indian Institute of Information Technology Vadodara

CS/IT 429

Electronics, VLSI and Embedded Design

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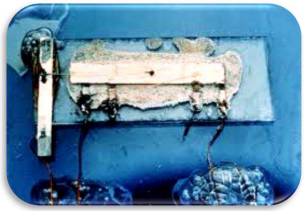
Solid State Devices

Solid state devices and phenomenon became popular with the invention of transistors in 1947.

Vacuum tube, 1906

Transistor, 1947

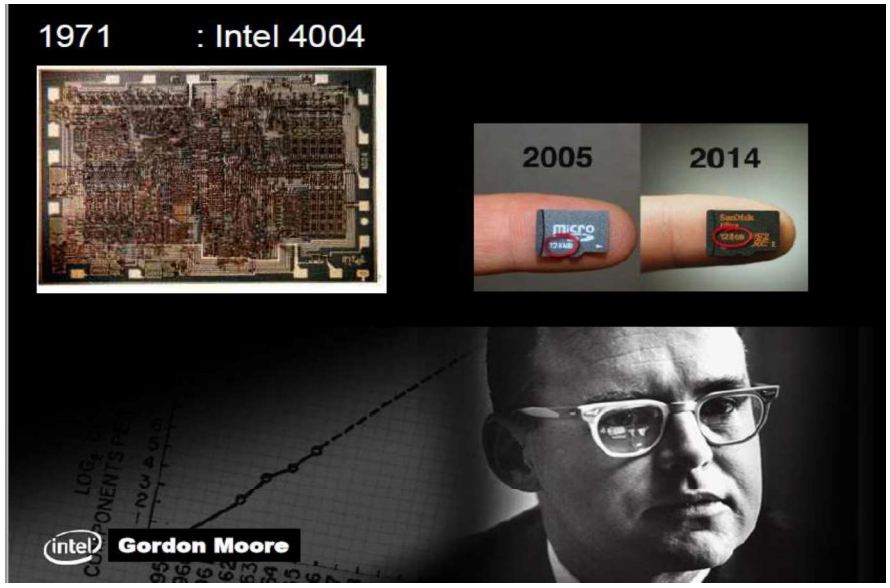


Integrated circuit, 1958

Contd….

Gordon Moore founder of Intel Corporation
-Number of Active transistors on a silicon integrated circuit would double ever 12 months.
- Prediction of 65,000 components on a single die would be possible by 1975.
- Later in 1975, Moore revised his prediction stating that no. of transistor would double every 18 to 24 months.

Contd….



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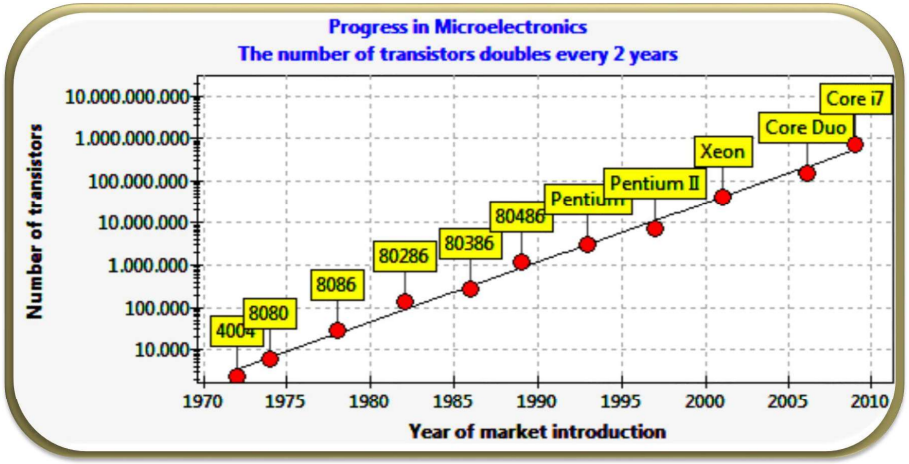
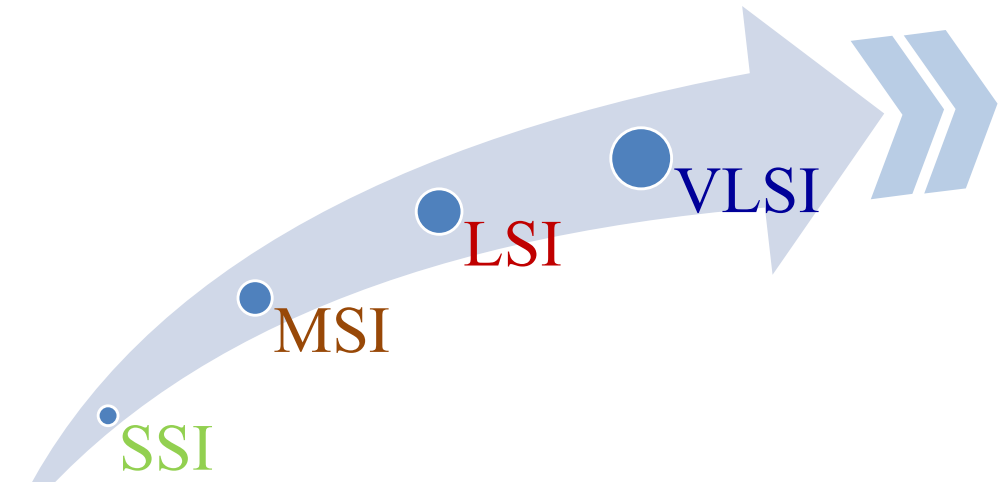


[Intel Corporation]

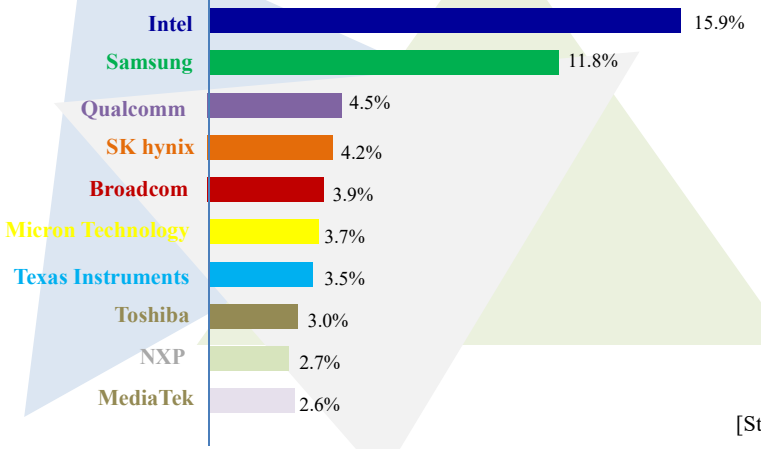
WHAT IS VLSI…?
&
WHY VLSI…?

Progression of Technology....



Semiconductor and VLSI Market Share

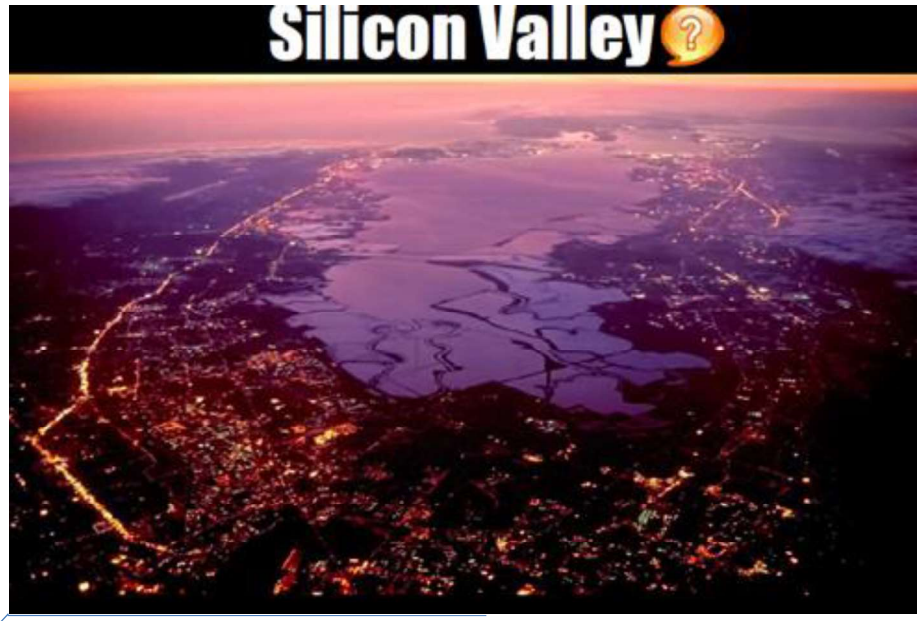
Global Market Share of the largest Semiconductor Vendors…



[Statista]

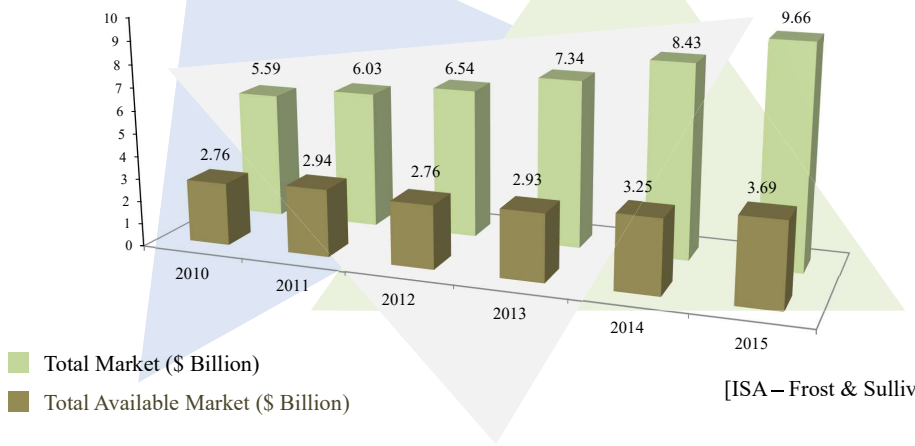
It constitutes to around whopping **$340** Billion Chip Industry….

Semiconductor and VLSI Market Share



Semiconductor and VLSI Market Share *in India*

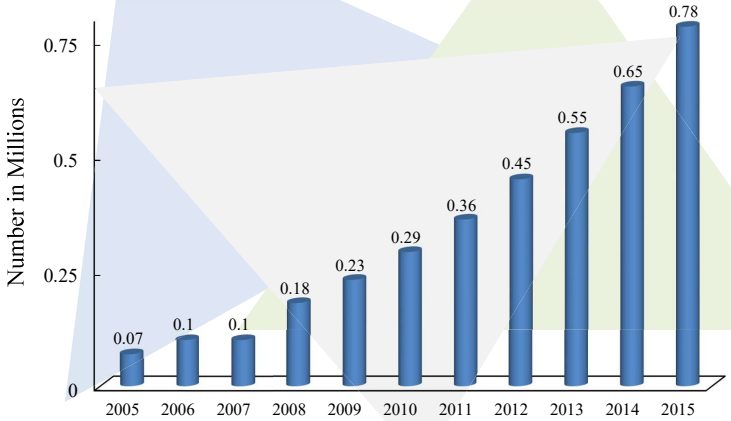
Indian Semiconductor Market Revenue



[ISA – Frost & Sullivan]

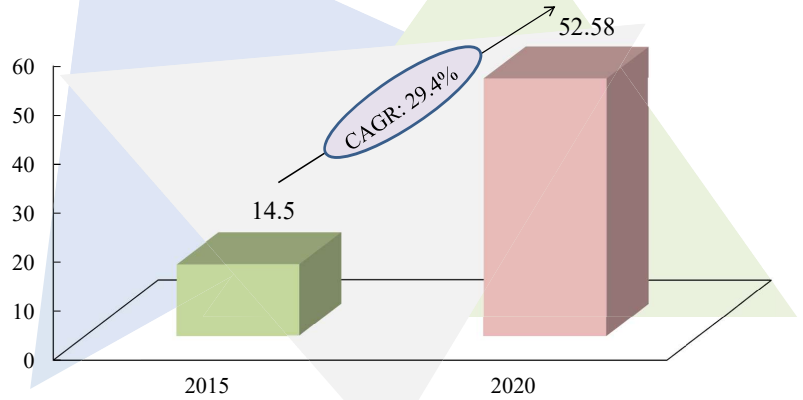
Semiconductor and VLSI Market Share *in India*

Engineering Workforce Employed by Indian Semiconductor Design Market



Semiconductor and VLSI Market Share *in India*

Semiconductor Design Market in India (US$ billion)



[Dept. of E&IT, ISA]

Govt. Initiative in Semiconductor Industry

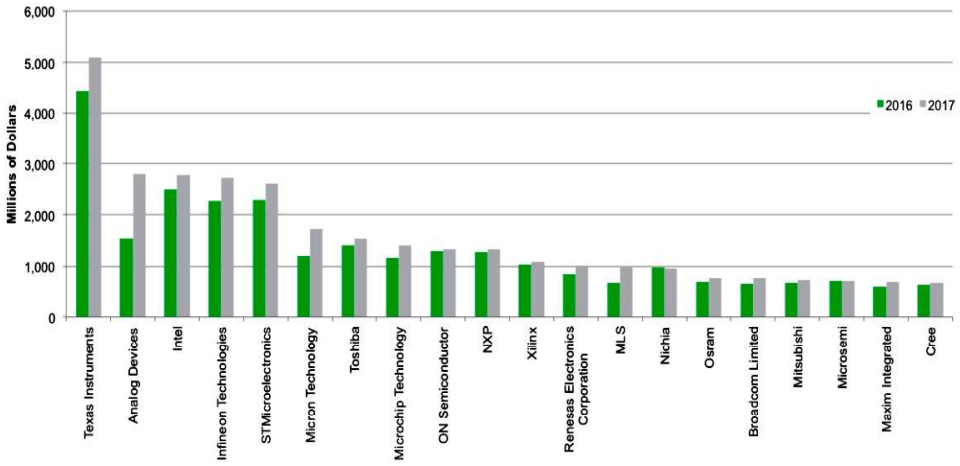
Semiconductor Design Market in India (US$ billion)

Govt approves Rs 76,000-cr plan for semiconductor, display manufacturing

The move would further India's ambitions to be self-reliant in electronics manufacturing

Chipmaker Micron to invest Rs 22k crore in Gujarat's Sanand

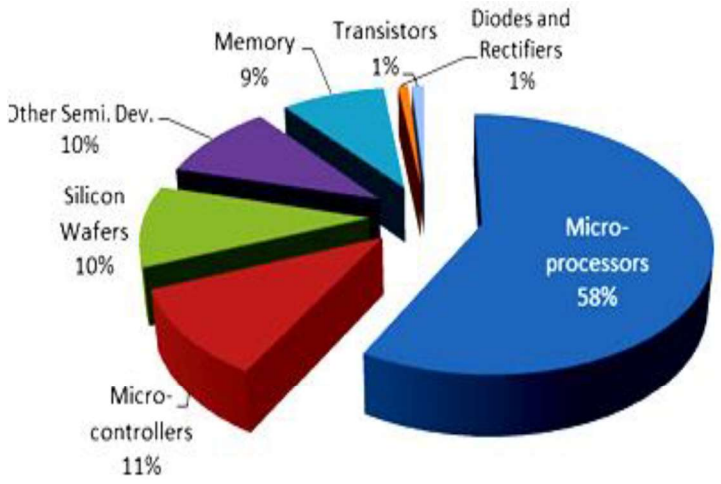
Top Semiconductor Suppliers for Industrial Markets *in India*



[IHS Markit]

Major VLSI Companies *in India*

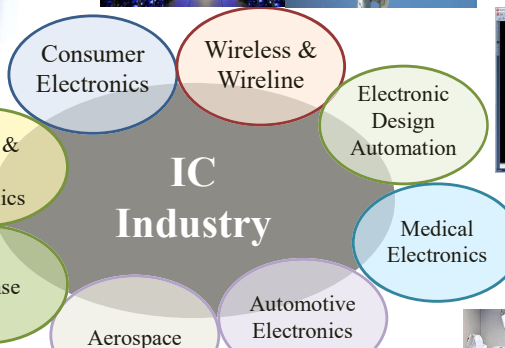
Major Semiconductor Products…

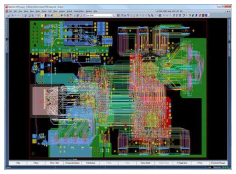


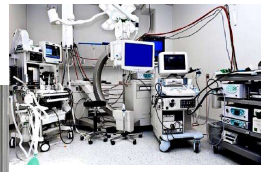
IC Products

- Processors
  - CPU, DSP, Controllers
- Memory chips
  - RAM, ROM, EEPROM
- Analog
  - Mobile communication, audio/video processing
- Programmable
  - PLA, FPGA
- Embedded systems
  - Used in cars, factories
  - Network cards
- System-on-chip (SoC)

Applications of VLSI



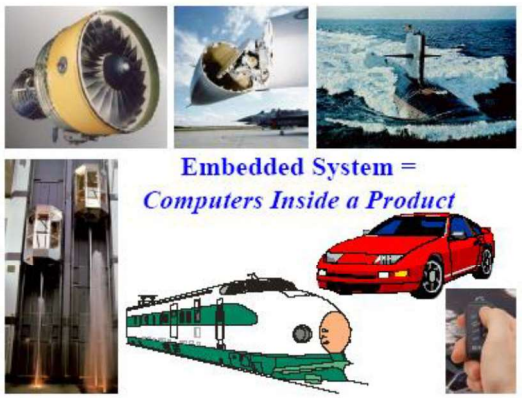




WHAT IS EMBEDDED SYSTEM (ES)…?
&
WHY ES…?

Embedded Systems

An embedded system is a combination of computer hardware and software designed for a specific function.



[P Koopman, CMU]

Embedded Systems

A few examples of Embedded systems

Anti-lock brakes
Auto-focus cameras
Automatic teller machines
Automatic toll systems
Automatic transmission
Avionic systems
Battery chargers
Camcorders
Cell phones
Cell-phone base stations
Cordless phones
Cruise control
Curbside check-in systems
Digital cameras
Disk drives
Electronic card readers
Electronic instruments
Electronic toys/games
Factory control
Fax machines
Fingerprint identifiers
Home security systems
Life-support systems
Medical testing systems
Modems
MPEG decoders
Network cards
Network switches/routers
On-board navigation
Pagers
Photocopiers
Point-of-sale systems
Portable video games
Printers
Satellite phones
Scanners
Smart ovens/dishwashers
Speech recognizers
Stereo systems
Teleconferencing systems
Televisions
Temperature controllers
Theft tracking systems
TV set-top boxes
VCR's, DVD players
Video game consoles
Video phones
Washers and dryers
And so on…..

[Setha Pan-ngum]

System Development

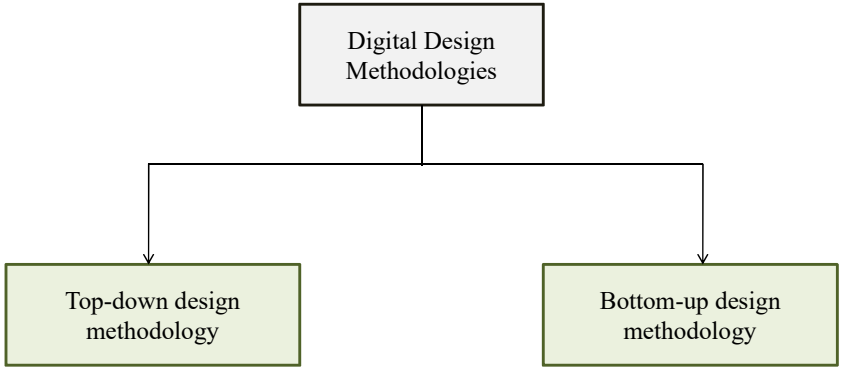
Systems

Types of Systems

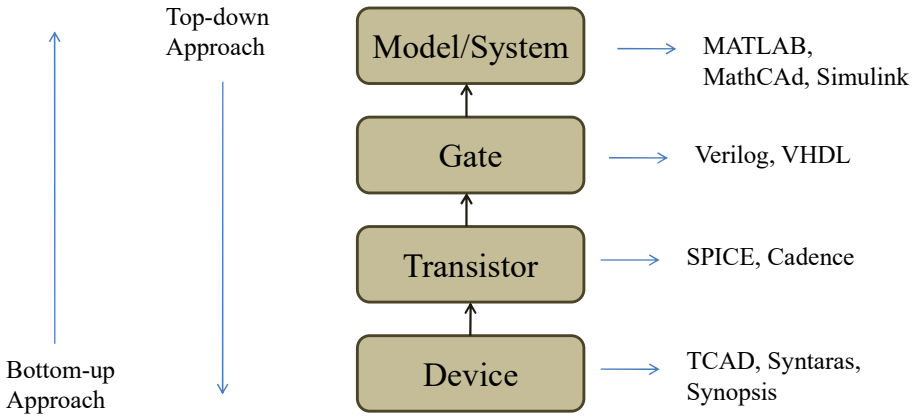
Contd…

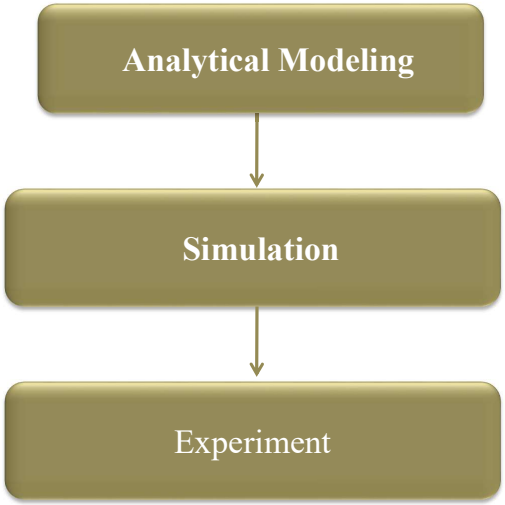
Basic Design Flow

Design, Methodologies, Hierarchy, Levels of Abstraction



Levels of abstraction and tools used…





Analytical Modeling Techniques

Closed form

Numerical form

Simulation Techniques/Platforms

Atomic Level

Device Level

Circuit Level

Gate Level

System Level

Introduction

Experimental Hardware Modeling

Bread board

Printed Circuit Board

Microprocessor and Microcontrollers (8051, ATMega, ARM…)

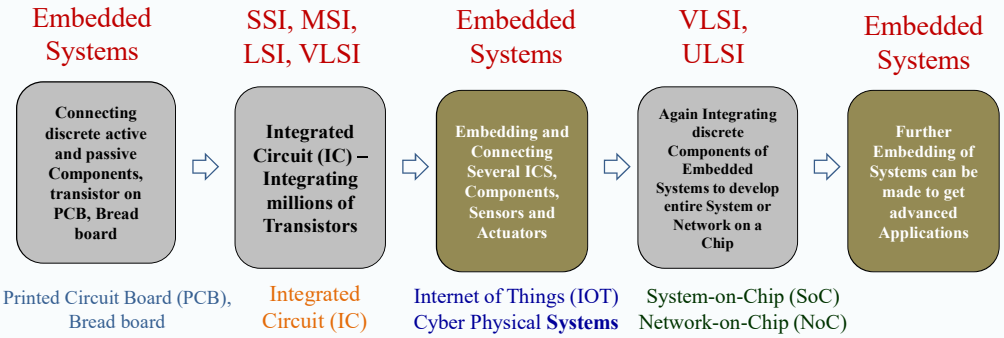
Development Boards -- Arduino, Rapberry Pi, etc.

Programmable Devices (PROM, PAL, PLA, CPLD, FPGA)

Application Specific Integrated Circuit

VLSI and Embedded Systems….

Technology Advancement and Need of advanced **Applications…**



For any Queries….

I am available/approachable at

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