What is VLSI?

Very Large Scale Integration (noun)
Very Large Scale Integrated (adjective)

example: VLSI Circuit

definition - 100s of thousands of transistors on a single integrated circuit (IC) or “chip”

History of VLSI:

late 40s Transistor invented at Bell Labs
late 50s First IC (JK-FF by Jack Kilby at TI)
early 60s Small Scale Integration (SSI)
   10s of transistors on a chip
late 60s Medium Scale Integration (MSI)
   100s of transistors on a chip
early 70s Large Scale Integration (LSI)
   1000s of transistor on a chip
early 80s VLSI 10,000s of transistors on a chip (later 100,000s & now 1,000,000s)

Ultra LSI is sometimes used for 1,000,000s
VLSI Implementation Media

Media requiring fabrication:
Full Custom - design and physical layout at transistor level
Standard Cell (aka Semi-Custom) - design and physical layout at gate/flip-flop level
Gate Array - design and physical layout at gate level (like standard cell but with some prefabrication of wafer)

Prefabricated media:
Field Programmable Gate Arrays (FPGAs) - design at gate/flip-flop or register transfer level
Complex Programmable Logic Devices (CPLDs) - design at gate/flip-flop or register transfer level
Programmable Logic Devices (PLDs) - design at gate/flip-flop level

System-on-Chip (SoC) may incorporate several of these implementation media on a single chip
Advantages of VLSI
(when compared to of-the-shelf SSI/MSI/LSI)

smaller size
lower cost
lower power
higher reliability
more functionality

Disadvantages of VLSI
(when compared to pre-fabricated media like FPGAs)

long design and fabrication time
higher risk to project