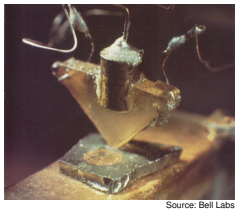
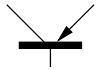
1947 Point Contact transistor

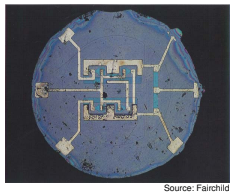


Source: Bell Labs

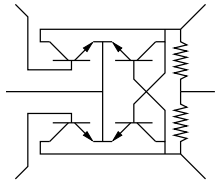


1961 Fairchild Bipolar RTL RS Flip–Flop

(4 Transistors)

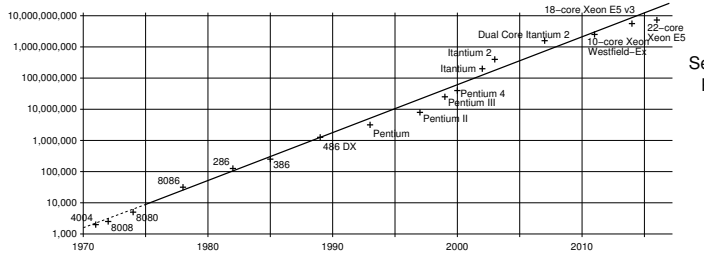


Source: Fairchild



Moore's Law (1965) Number of transistor has doubled every year and will continue to do so until 1975

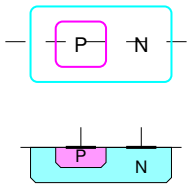
Moore's Law (1975) Number of transistors will double every two years



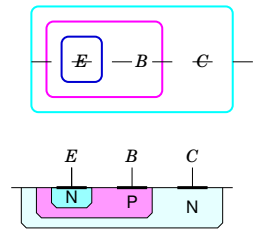
Self–fulfilling Prophecy

1000

Diode

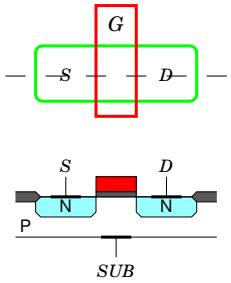


NPN Transistor

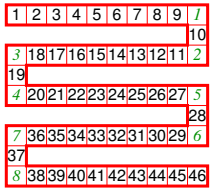


NMOS Enhancement transistor

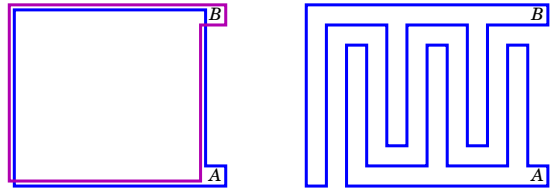
NMOS Process



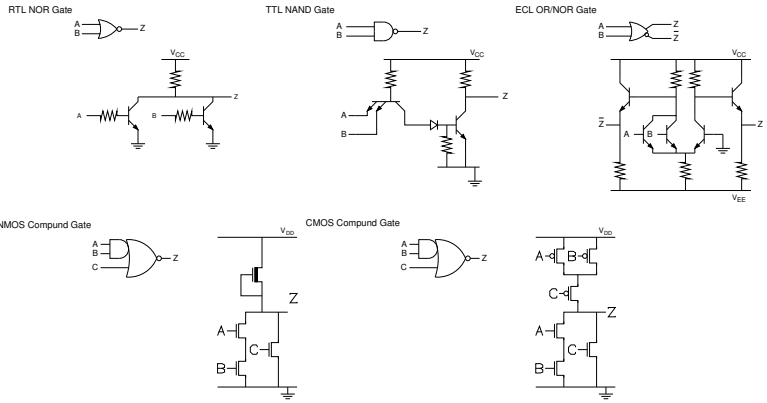
Resistor



Capacitors



3000



- Bipolar Transitors with Resistors - MSI/LSI

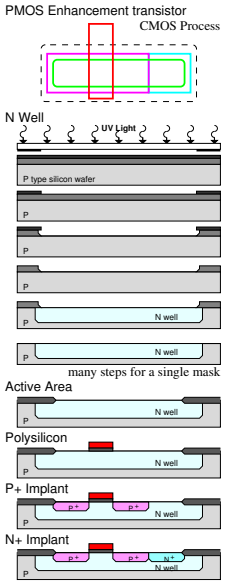
  RTL - NOR TTL - NAND ECL - OR/NOR

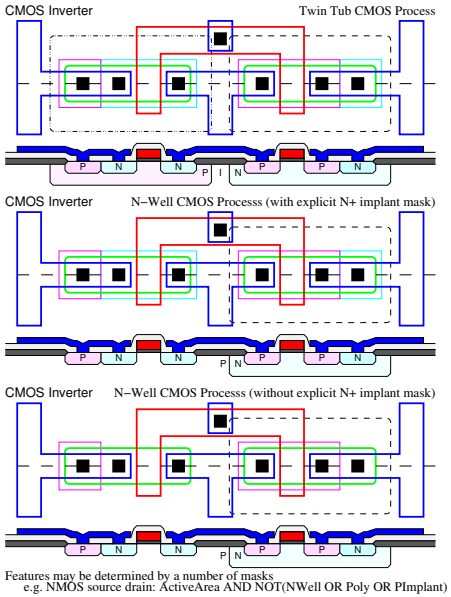
- MOS Transistors (no resistors) - VLSI

  NMOS CMOS - No static power!

Both allow construction of NOR, NAND & Compound gate (always inverting)

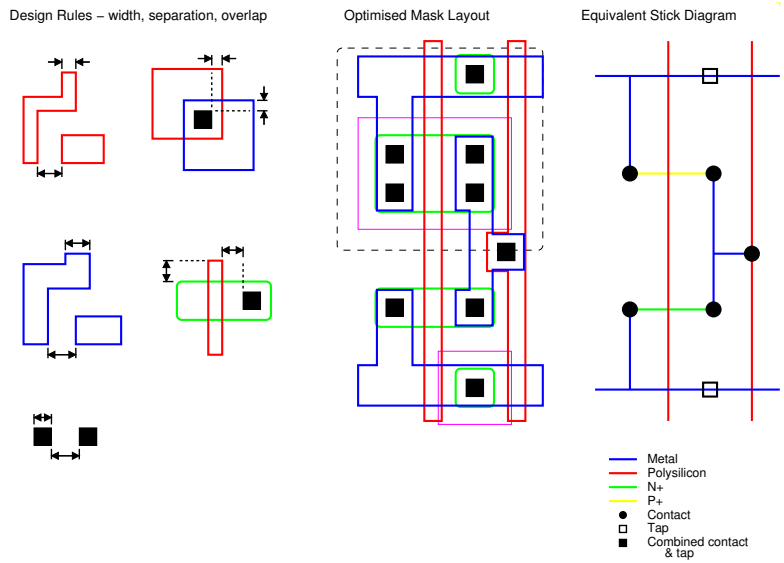
2000



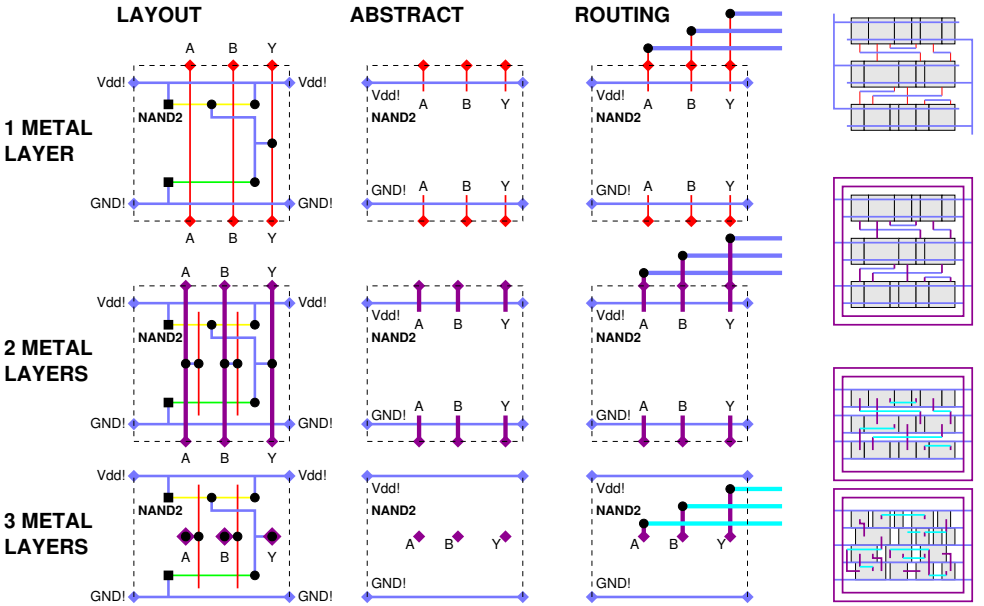


Features may be determined by a number of masks
e.g. NMOS source drain: ActiveArea AND NOT(NWell OR Poly OR PImplant)

4000

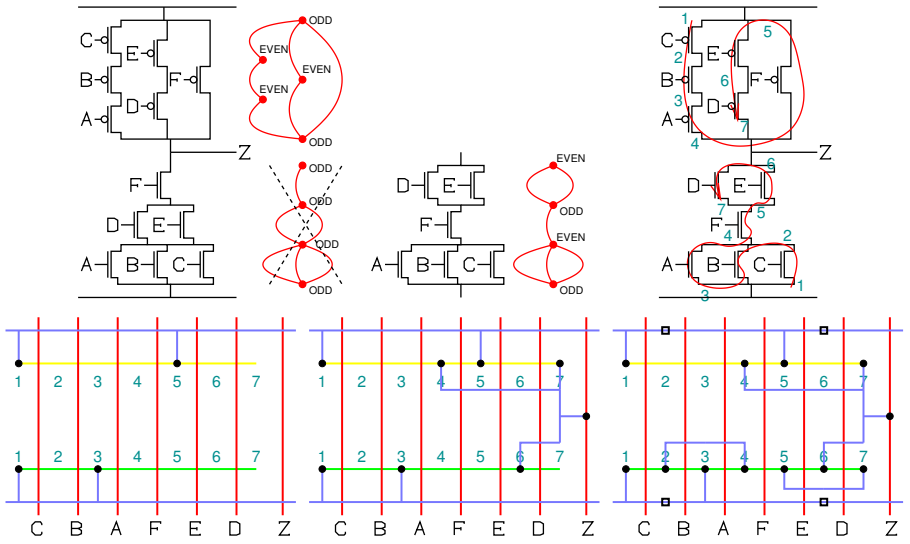


5000



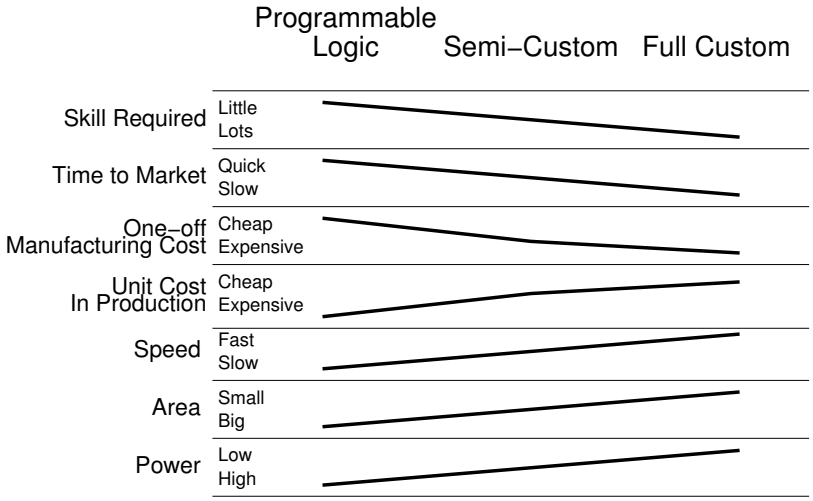
7000

Investigation of Euler paths leads to more efficient layout*



*not all gates will support a common Euler path for both PMOS and NMOS

6000



All design styles need full custom designers

A large ASIC (especially SoC) may mix Semi–Custom and Full Custom

8000