

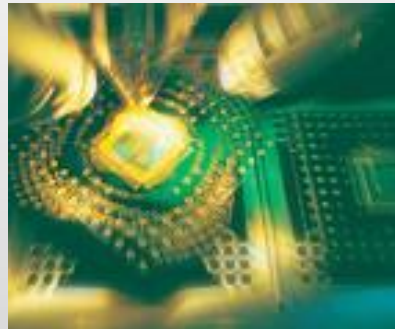
TECNICAS DE INTEGRACION

Ing. Iván Jaramillo J.

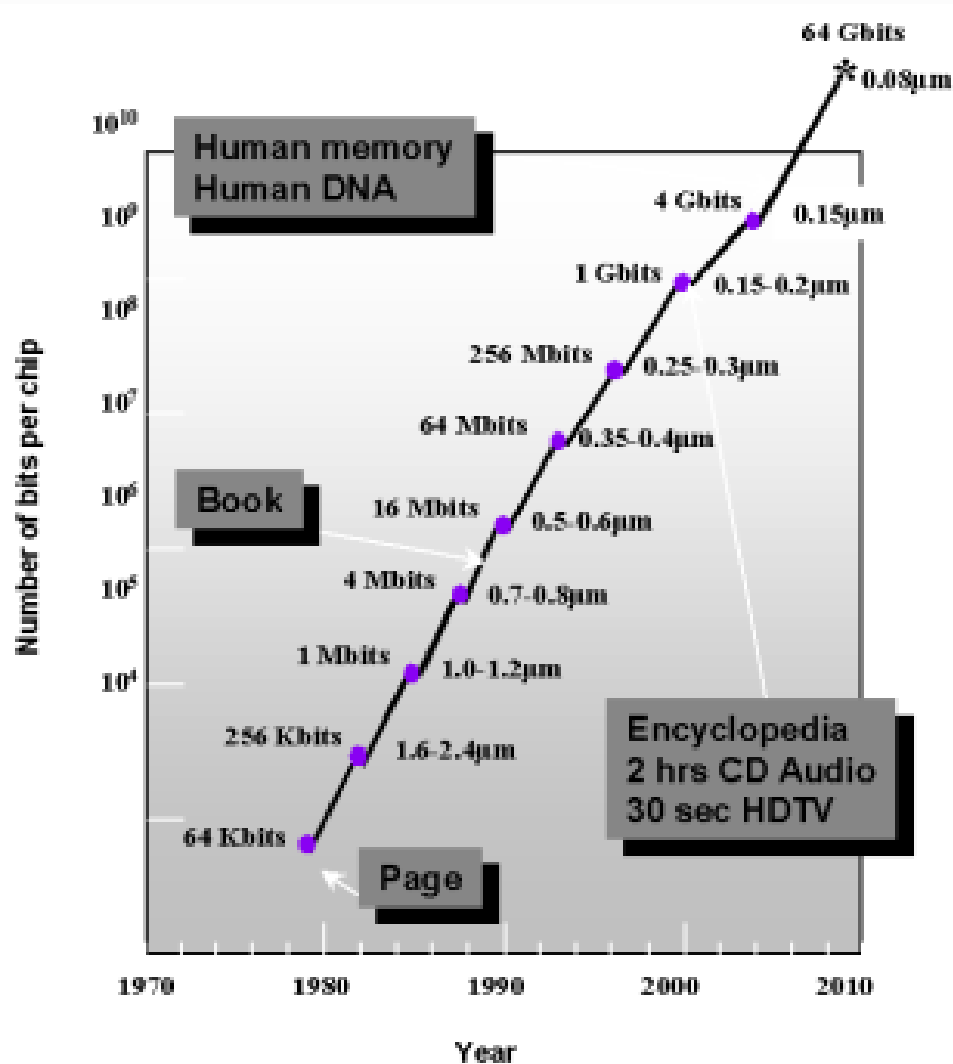
ijaramilloj@unal.edu.co

www.gmun.unal.edu.co/ijaramilloj

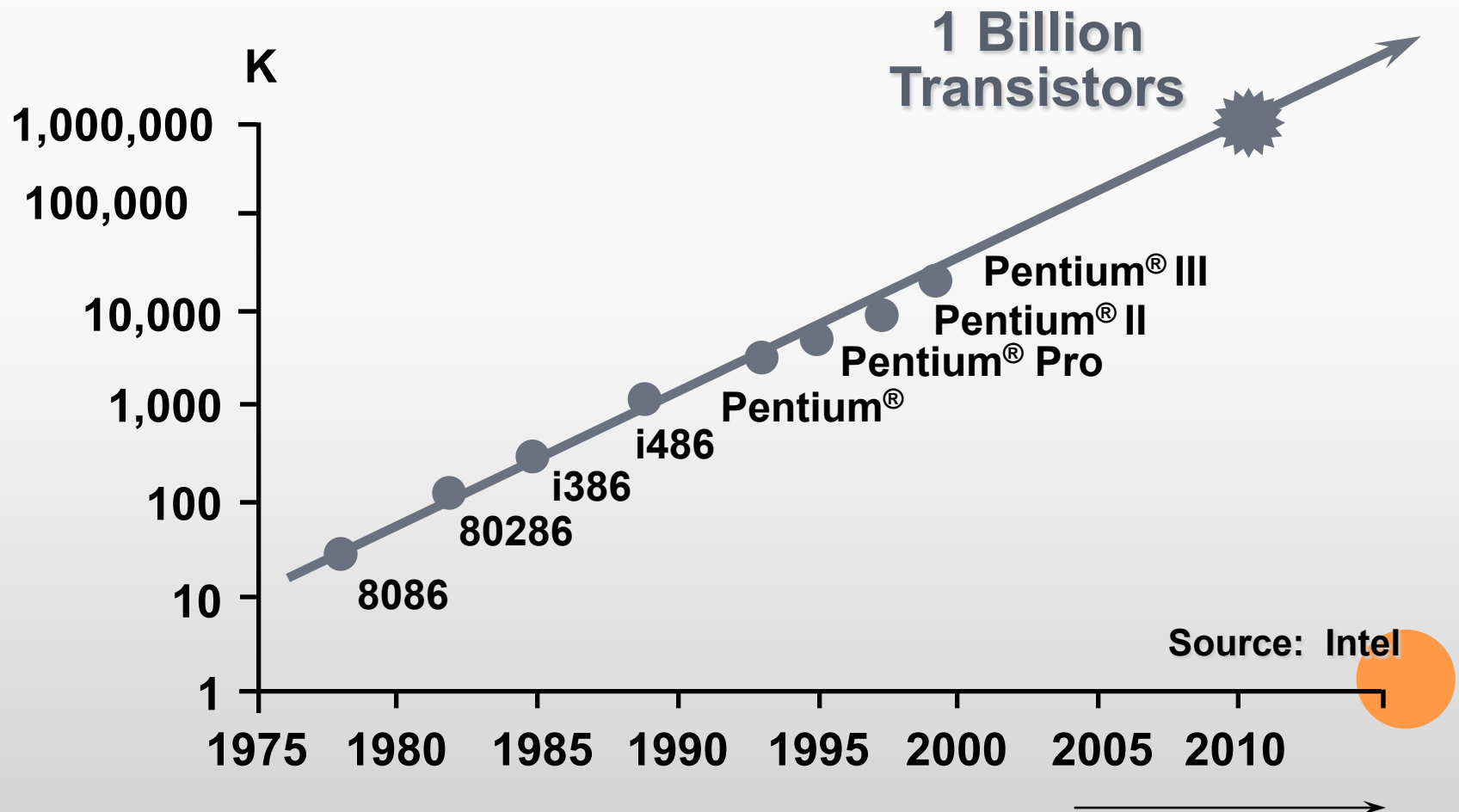
II-2013



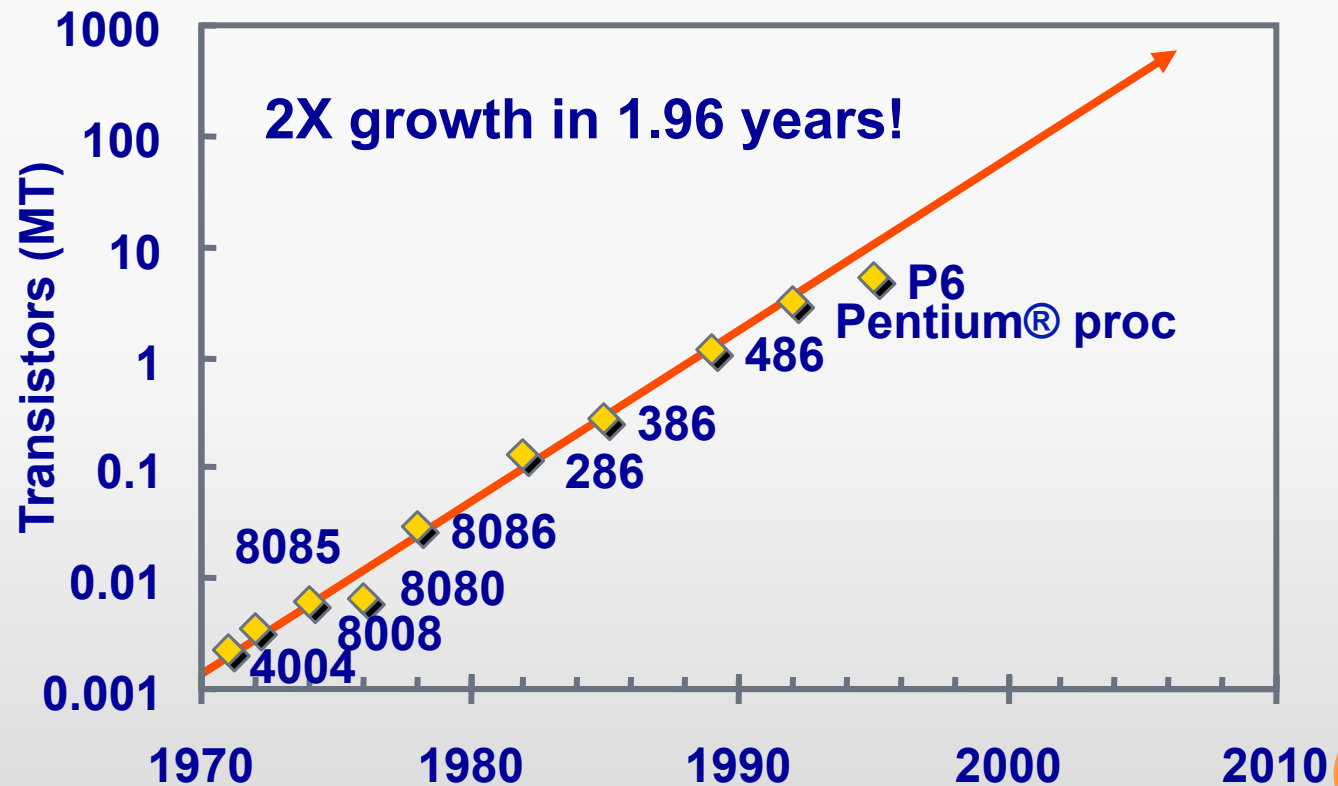
EVOLUCION EN COMPLEJIDAD



TENDENCIAS DE INTEGRACIÓN

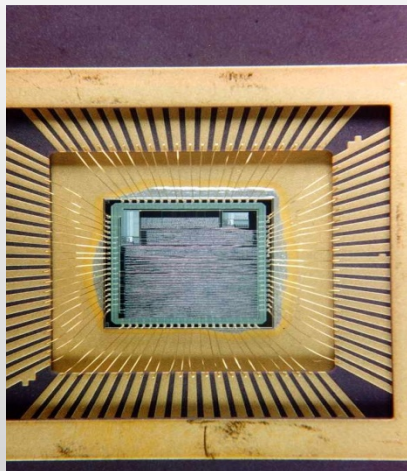
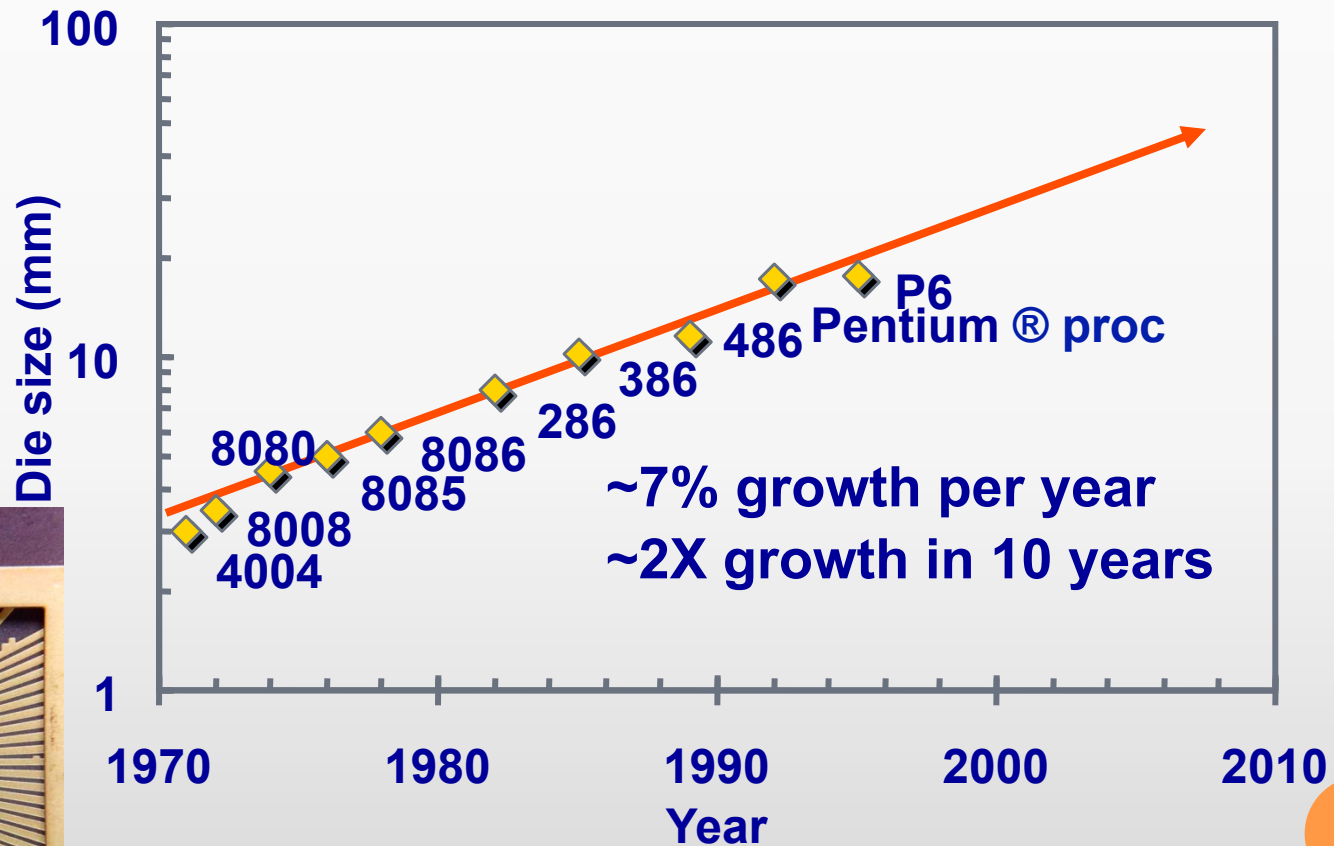


LEY DE MOORE PARA MICROPROCESADORES



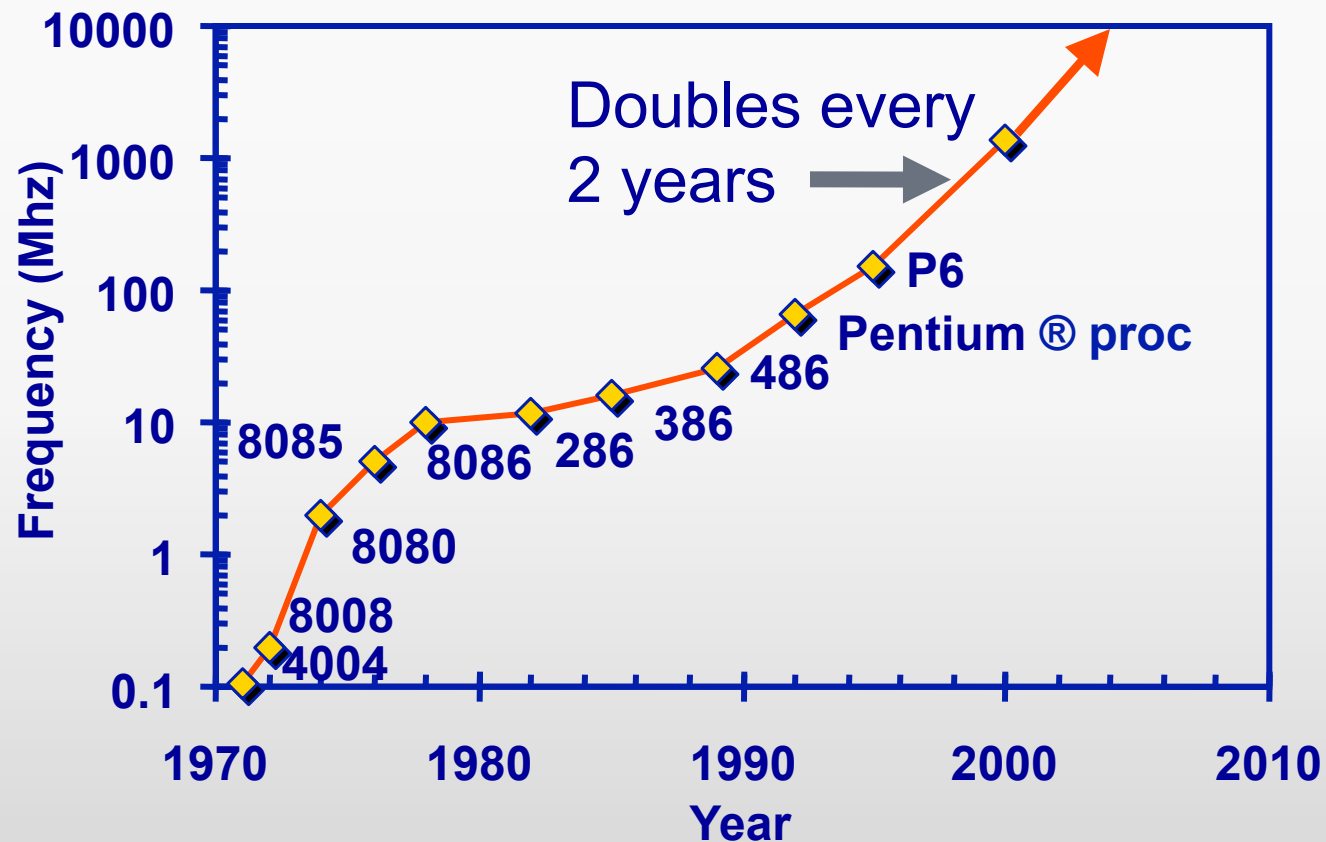
Transistors on Lead Microprocessors double every 2 years

TAMAÑO DEL DADO



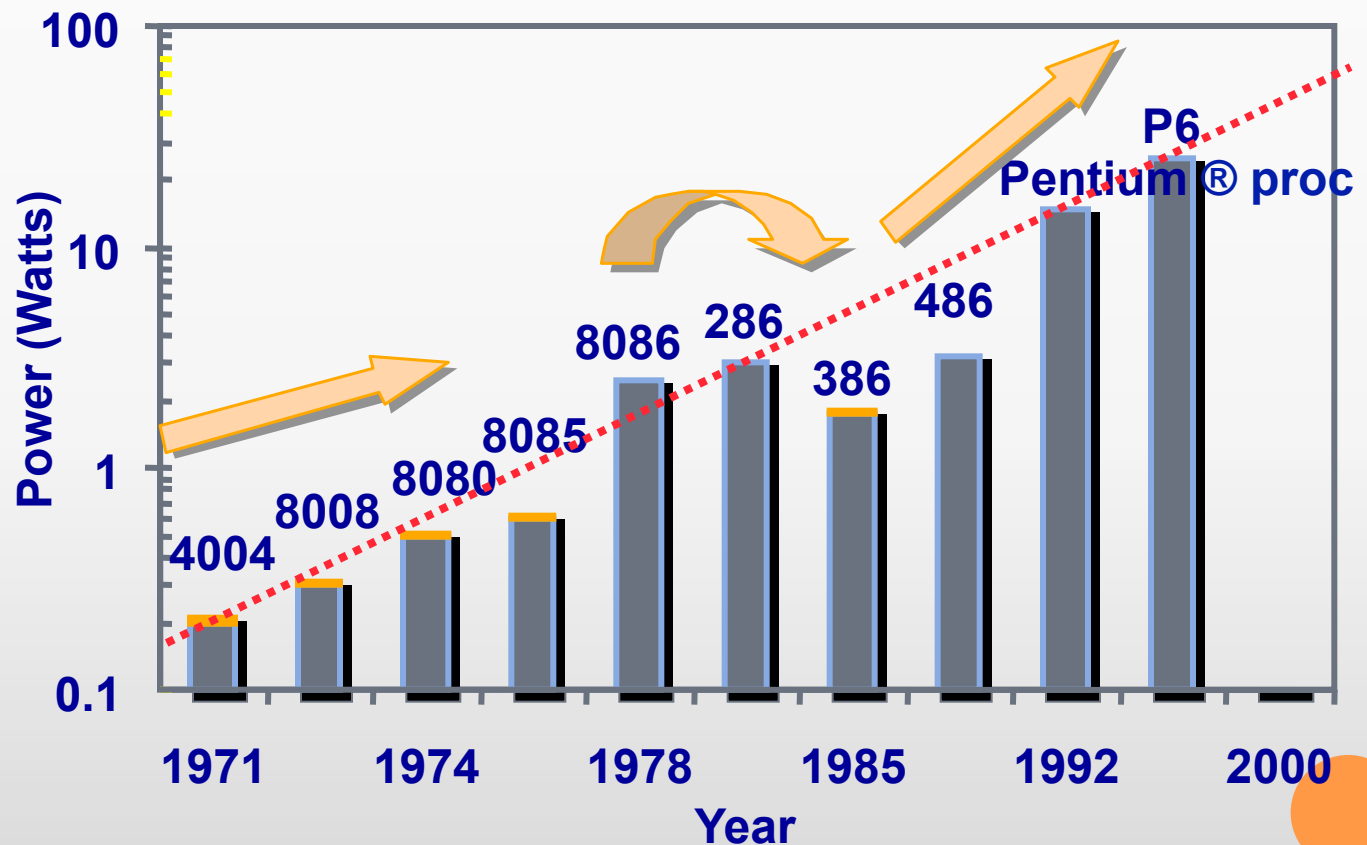
Die size grows by 14% to satisfy Moore's Law

FRECUENCIA



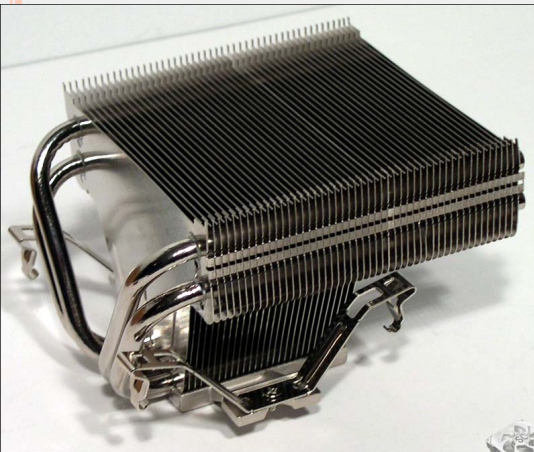
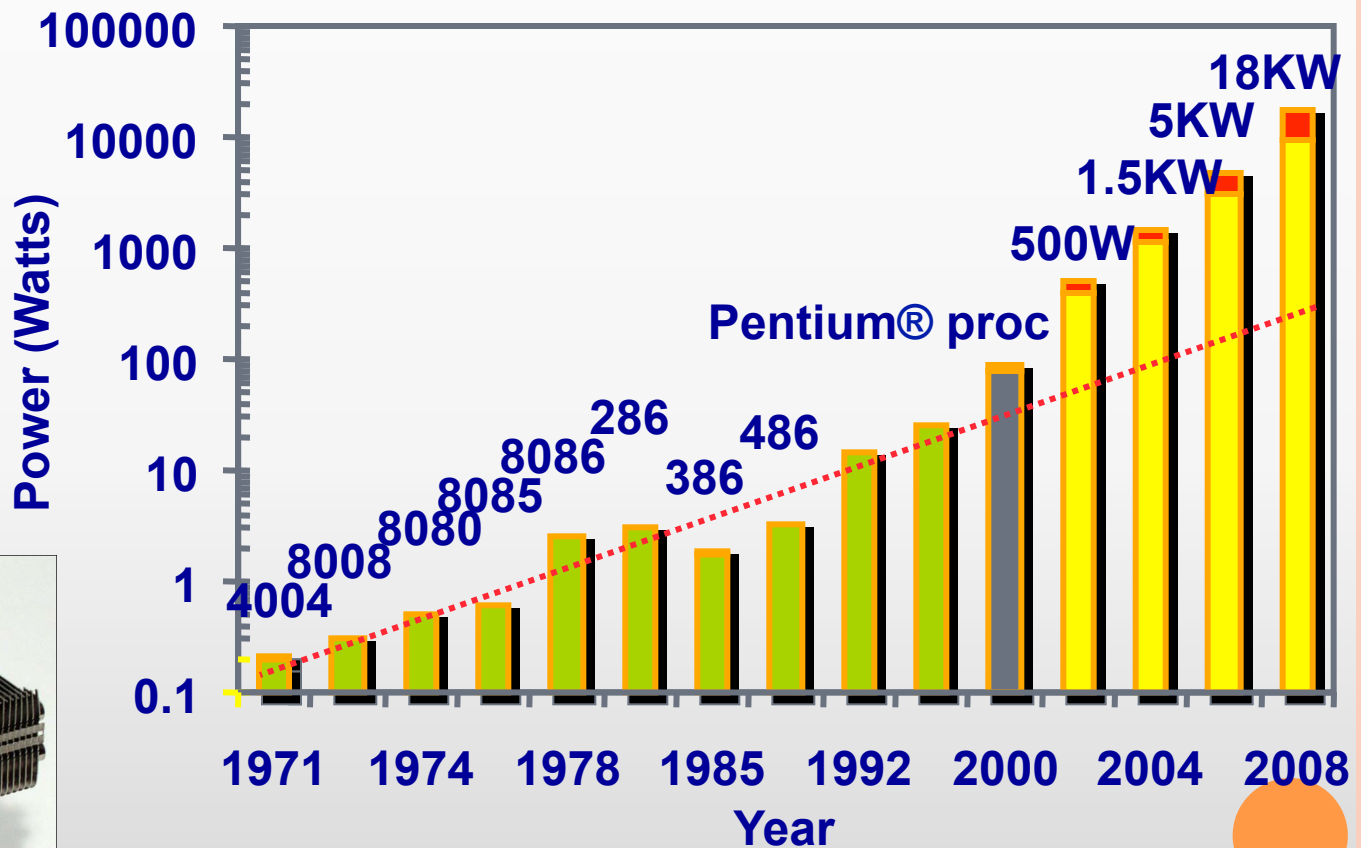
Lead Microprocessors frequency doubles every 2 years

DISIPACIÓN DE POTENCIA



Lead Microprocessors power continues to increase

LA POTENCIA: EL MAYOR PROBLEMA



Power delivery and dissipation will be prohibitive

TELEFONÍA CELULAR

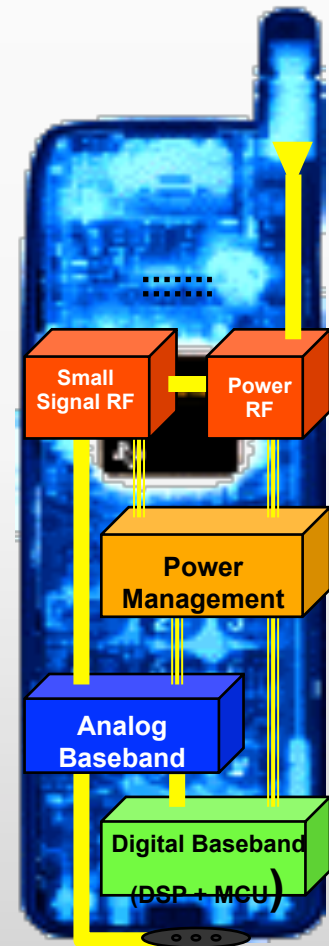
Cell
Phone

Digital Cellular
(Phones)

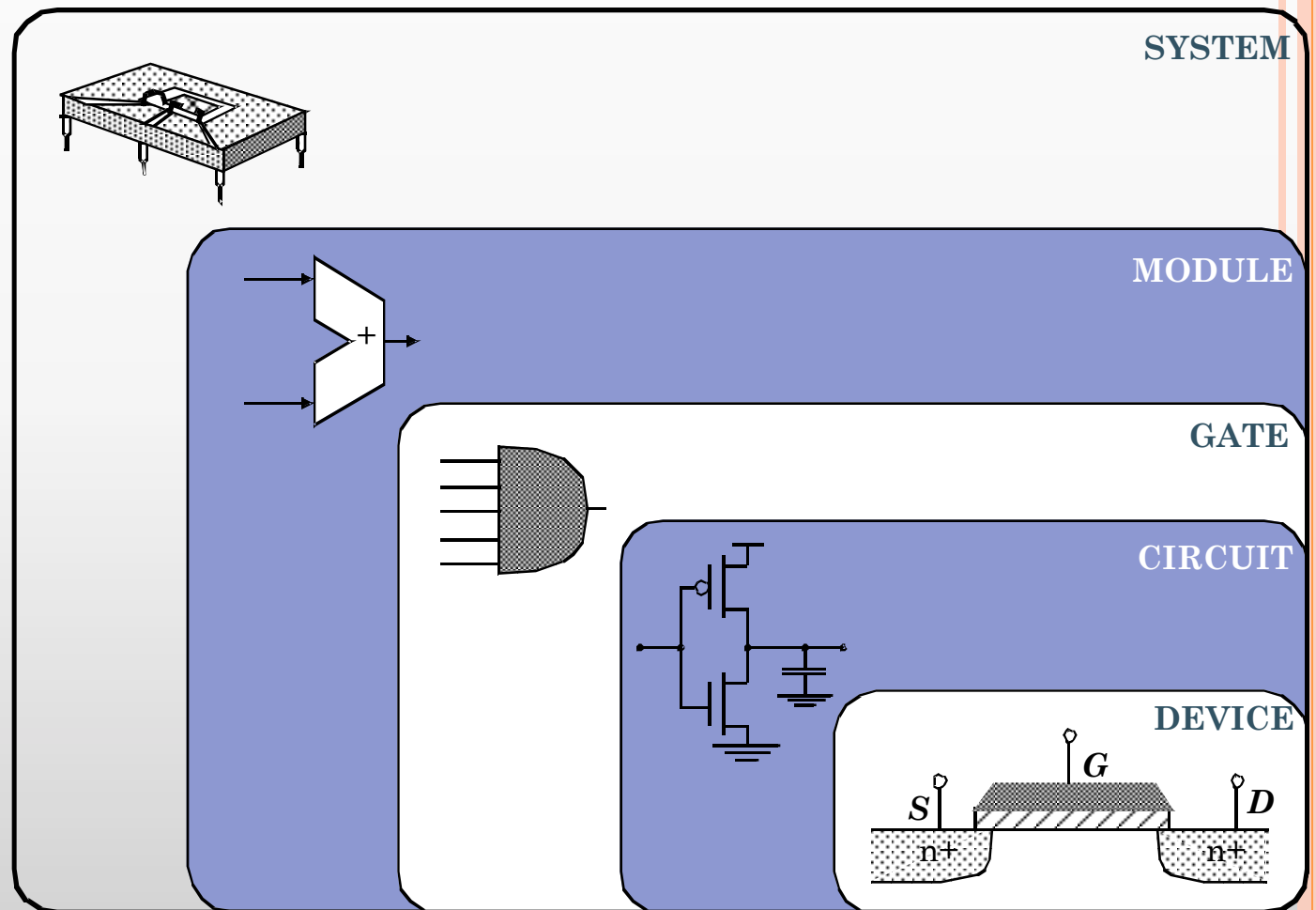


	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<u>2010</u>
Units	48M	86M	162M	260M	435M	900M

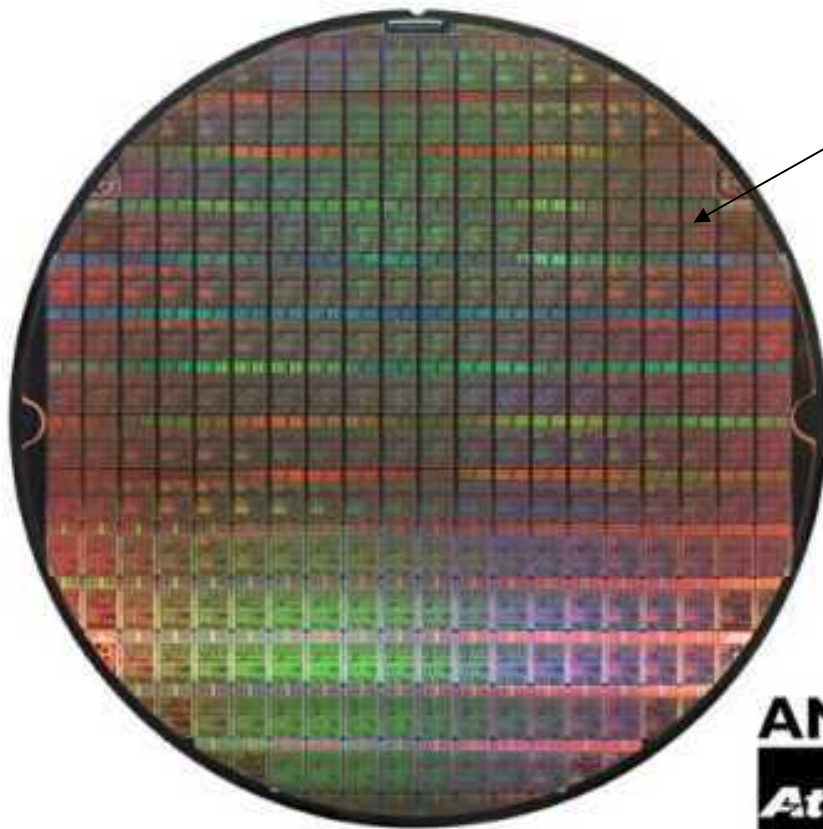
(data from Texas Instruments)



DISEÑO: NIVELES DE ABSTRACCIÓN



DESARROLLO DEL DADO



Dado Simple

Oblea



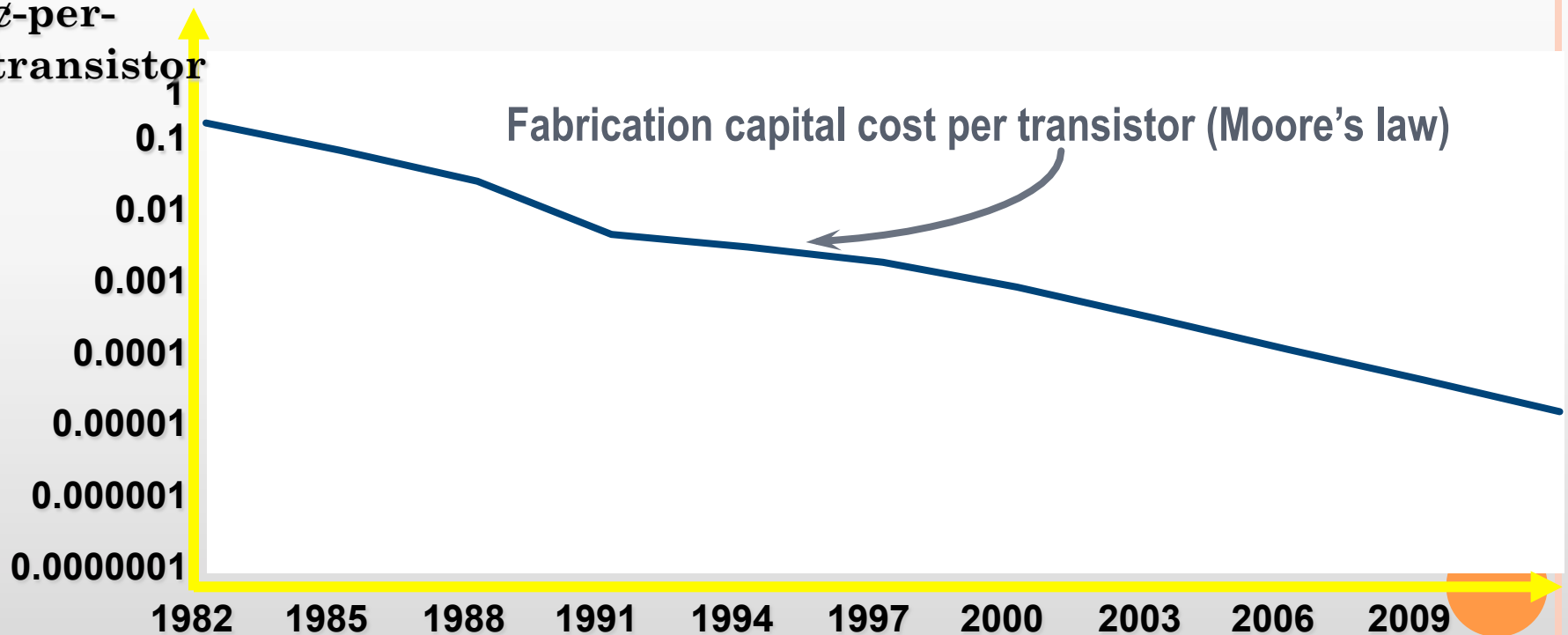
Llegando a 12" (30cm)



COSTO POR TRANSISTOR

cost:
¢-per-
transistor

Fabrication capital cost per transistor (Moore's law)



TIPOS DE MONTAJE

ANTECEDENTES ENCAPSULADOS MODERNOS

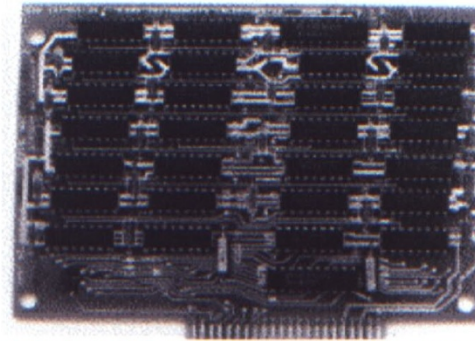


Figura 1. Parte de arriba de una tarjeta de memoria usando DIP's

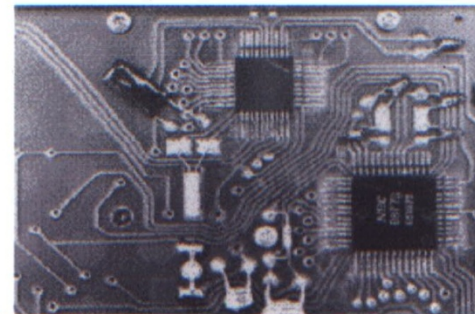
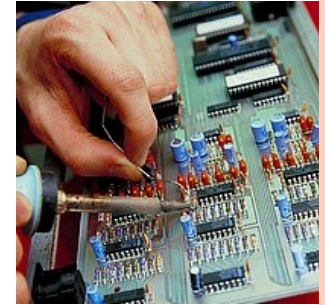


Figura 2. Calculadora PWB mostrando encapsulados de cuatro lados con componentes de inserción (Thru-hole).

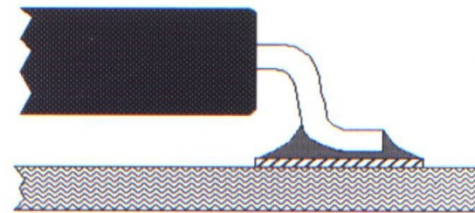
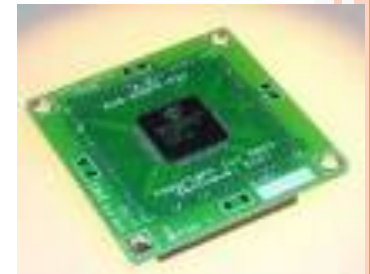
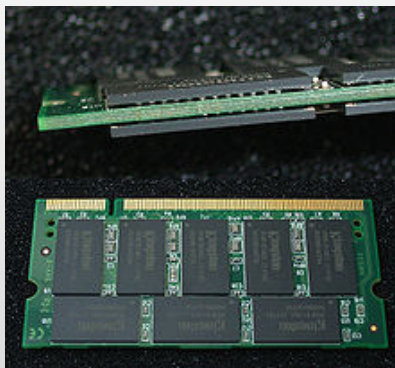
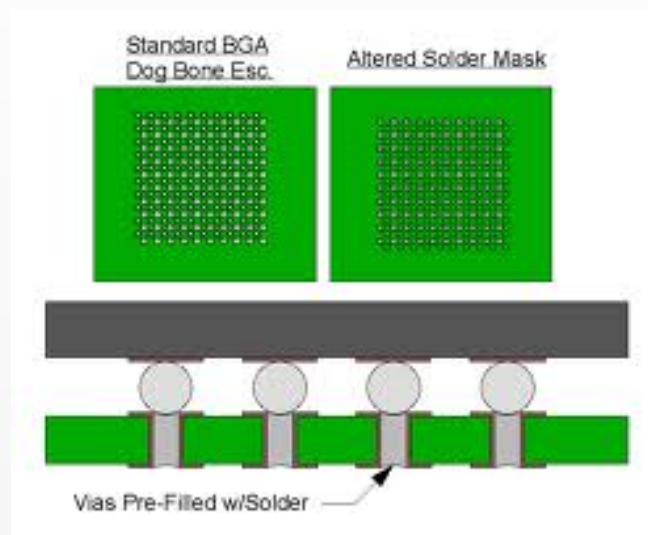


Figura 3. Terminal de un encapsulado "Ala de gaviota"

TECNOLOGÍA BGA



CLASIFICACIÓN DE LOS MATERIALES

Gap de Energía (eV)

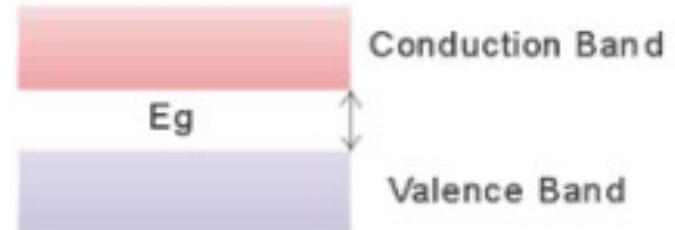
Aisladores	eV	Semiconductores	eV
Diamante	5,33	Silicio	1,14
Oxido de Zinc	3,2	Germanio	0,67
Cloruro de Plata	3,2	Telurio	0,33
Sulfuro de Cadmio	2,42	Antimoniuro de Indio	0,23

Tabla 1 Gap de energía de algunos aisladores y semiconductores.

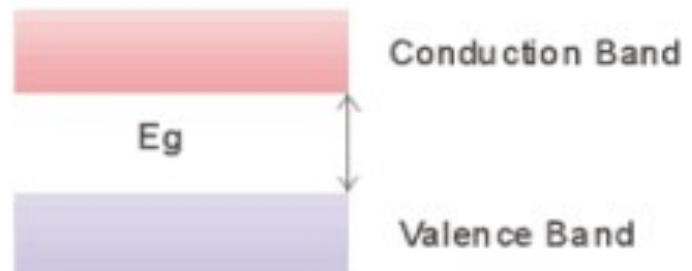
Metals



Semiconductors



Insulators

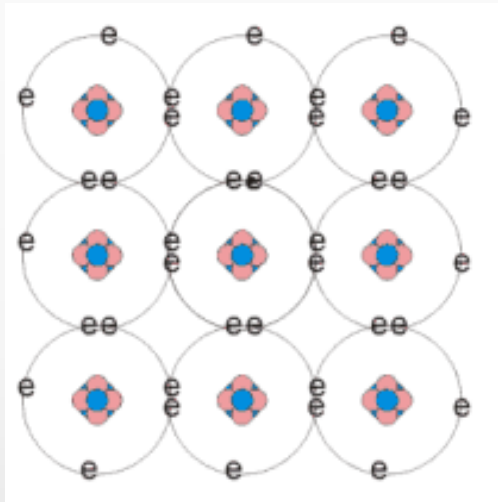


BANDAS DE ENERGÍA – VALORES TÍPICOS

<i>Símbolo</i>	<i>Nombre</i>	<i>Ancho BP (eV)</i>	<i>Mov. elec. (cm²/V.s)</i>	<i>Mov. huecos (cm²/V.s)</i>	<i>Dist. crist. (Å)</i>
<i>SPb</i>	<i>Galena</i>	<i>0,37</i>	<i>575</i>	<i>200</i>	<i>5,93</i>
<i>SZn</i>	<i>Blenda</i>	<i>3,60</i>	<i>110</i>	<i>–</i>	<i>5,41</i>
<i>Ge</i>	<i>Germanio</i>	<i>0,67</i>	<i>3900</i>	<i>1900</i>	<i>5,65</i>
<i>Si</i>	<i>Silicio</i>	<i>1,11</i>	<i>1350</i>	<i>480</i>	<i>5,43</i>
<i>AsGa</i>	<i>Arseniuro de Galio</i>	<i>1,43</i>	<i>8500</i>	<i>400</i>	<i>5,65</i>



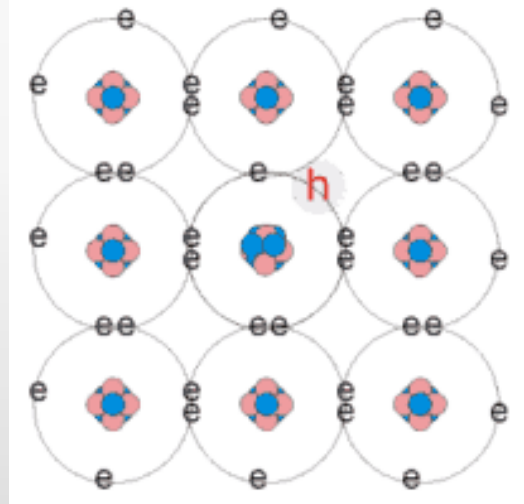
ADICIÓN DE IMPUREZAS



INTRINSECO

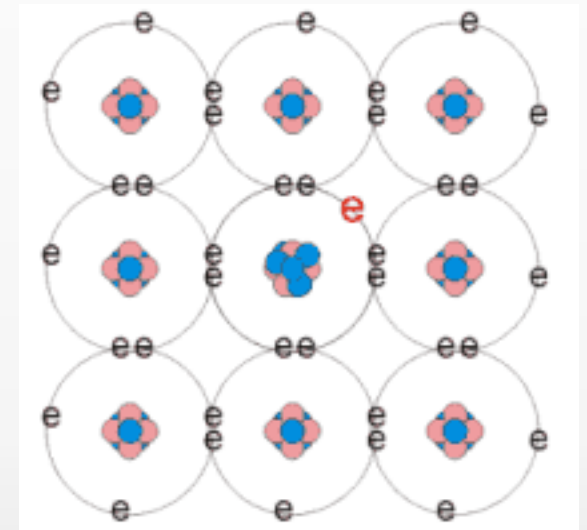
Aceptores:
Grupo III

Boro
Galio
Indio



TIPO-P

TIPO-N



Donadores:
Grupo V

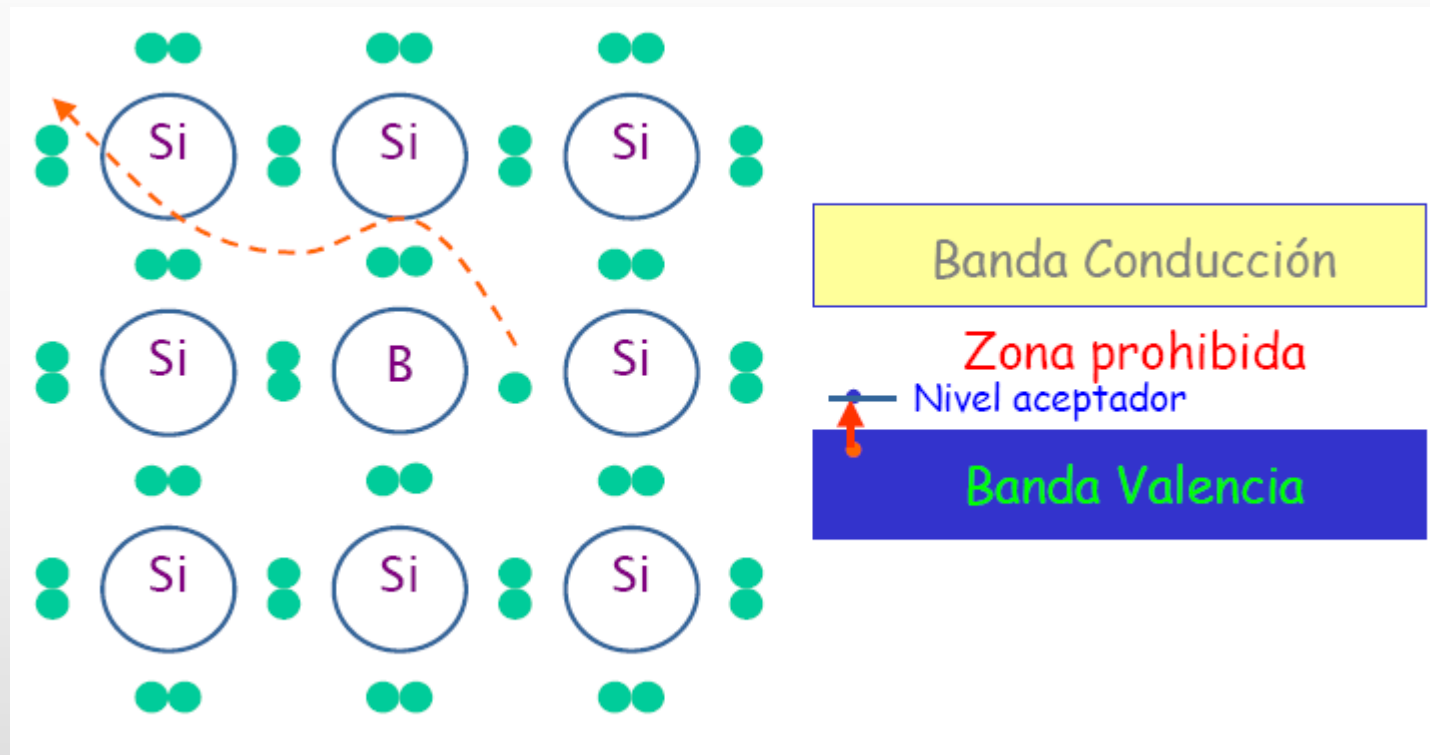
Antimonio

Arsénico

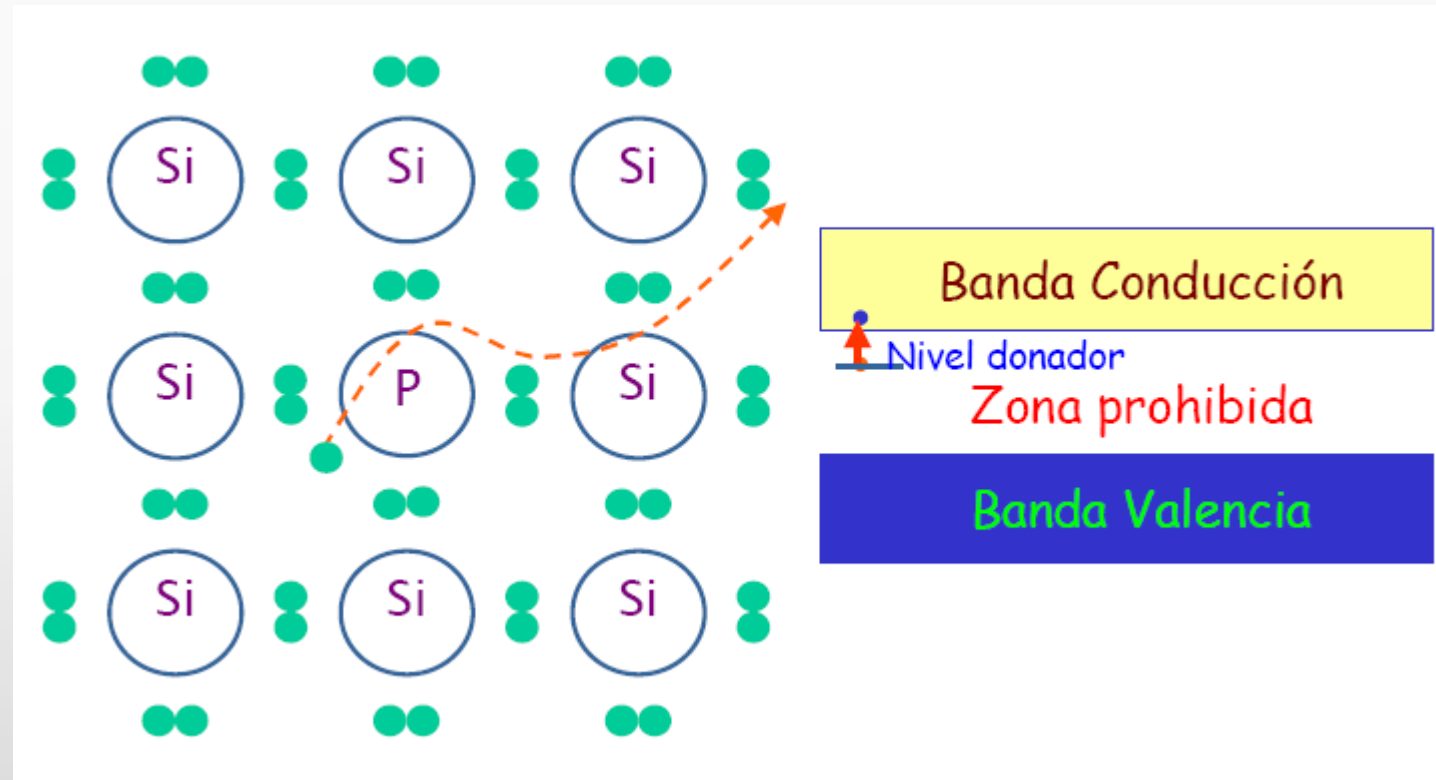
Fósforo



MATERIALES TIPO P



MATERIALES TIPO N



JUNTURA PN

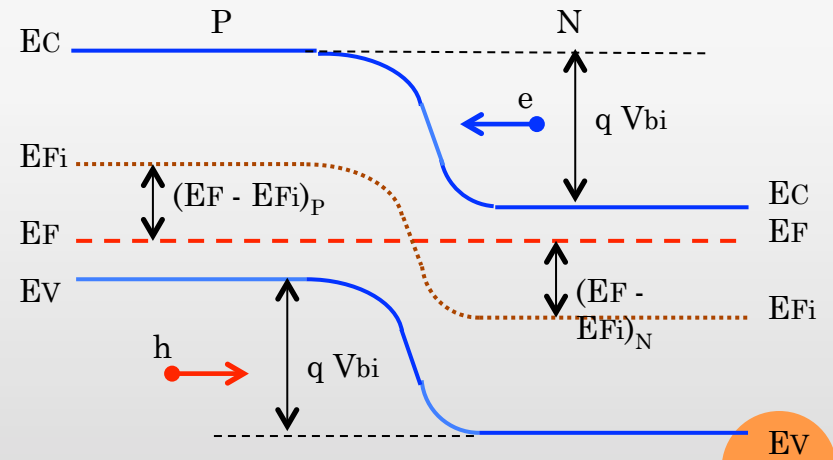
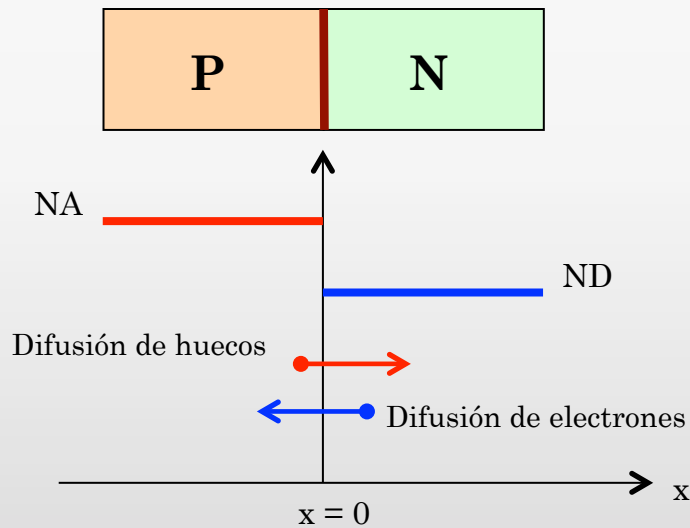
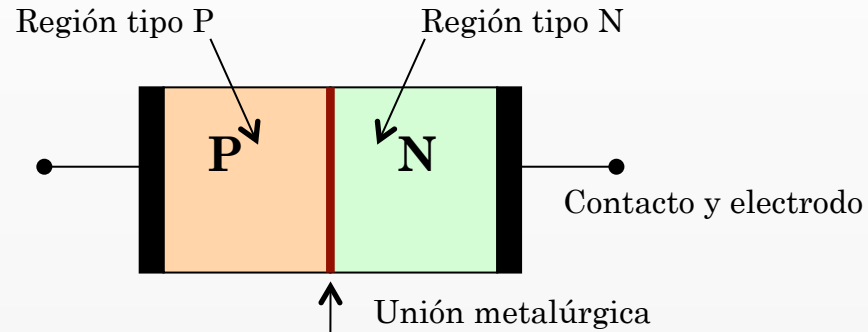
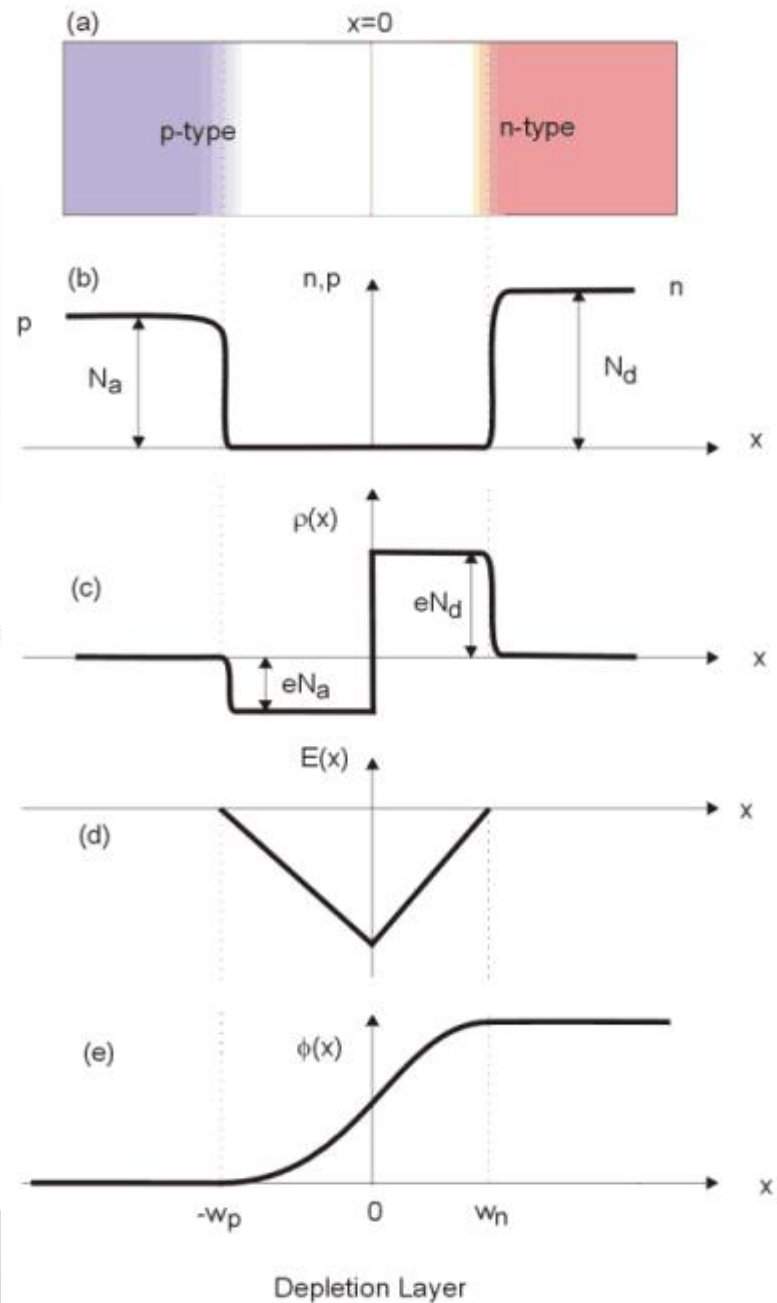
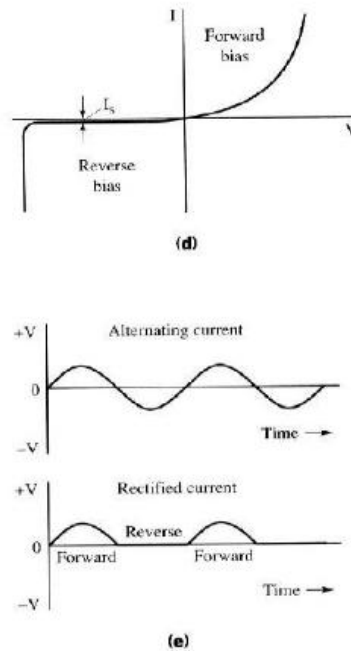
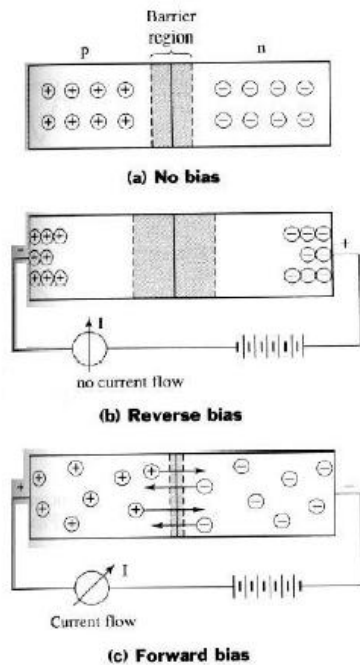
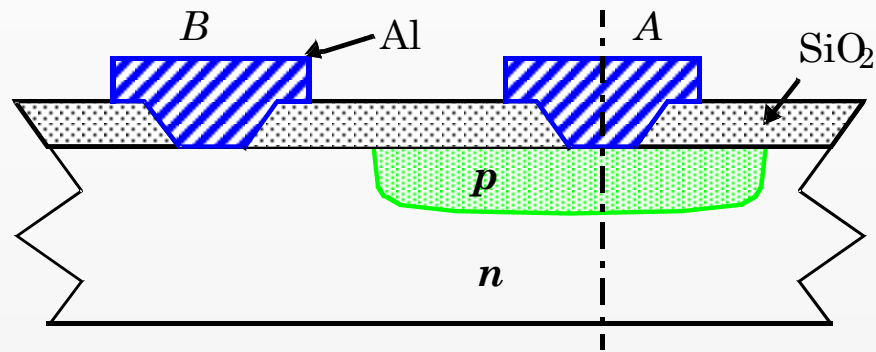


Figura 6

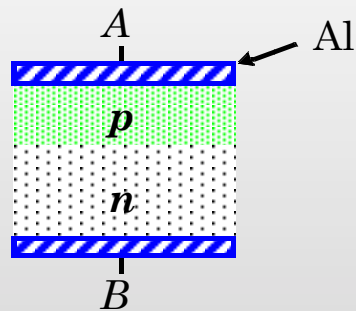
COMPORTAMIENTO JUNTURA PN



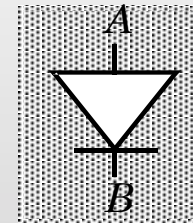
EL DIODO



Cross-section of n -junction in an IC process



One-dimensional
representation



diode symbol



TEMA DE TRABAJO

- Tipos de diodos que se utilizan para hacer osciladores
 - Características
 - Construcción
 - Principio de operación.



