



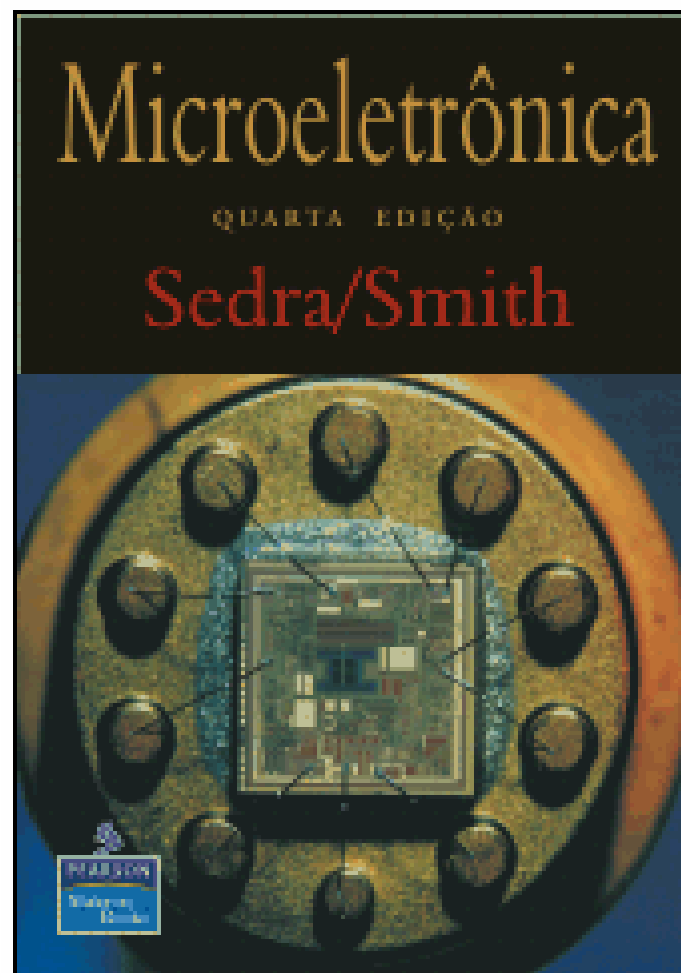
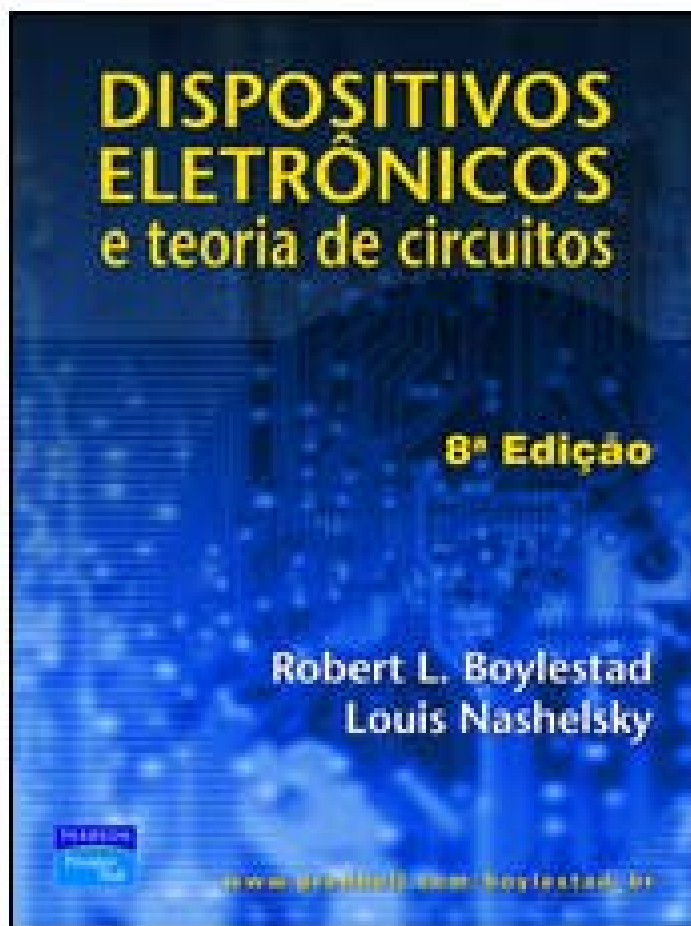
Universidade Federal de Santa Catarina
Departamento de Engenharia Elétrica
Materiais Elétricos - Laboratório

Resistores e Propriedades dos Semicondutores

Clóvis Antônio Petry, professor.

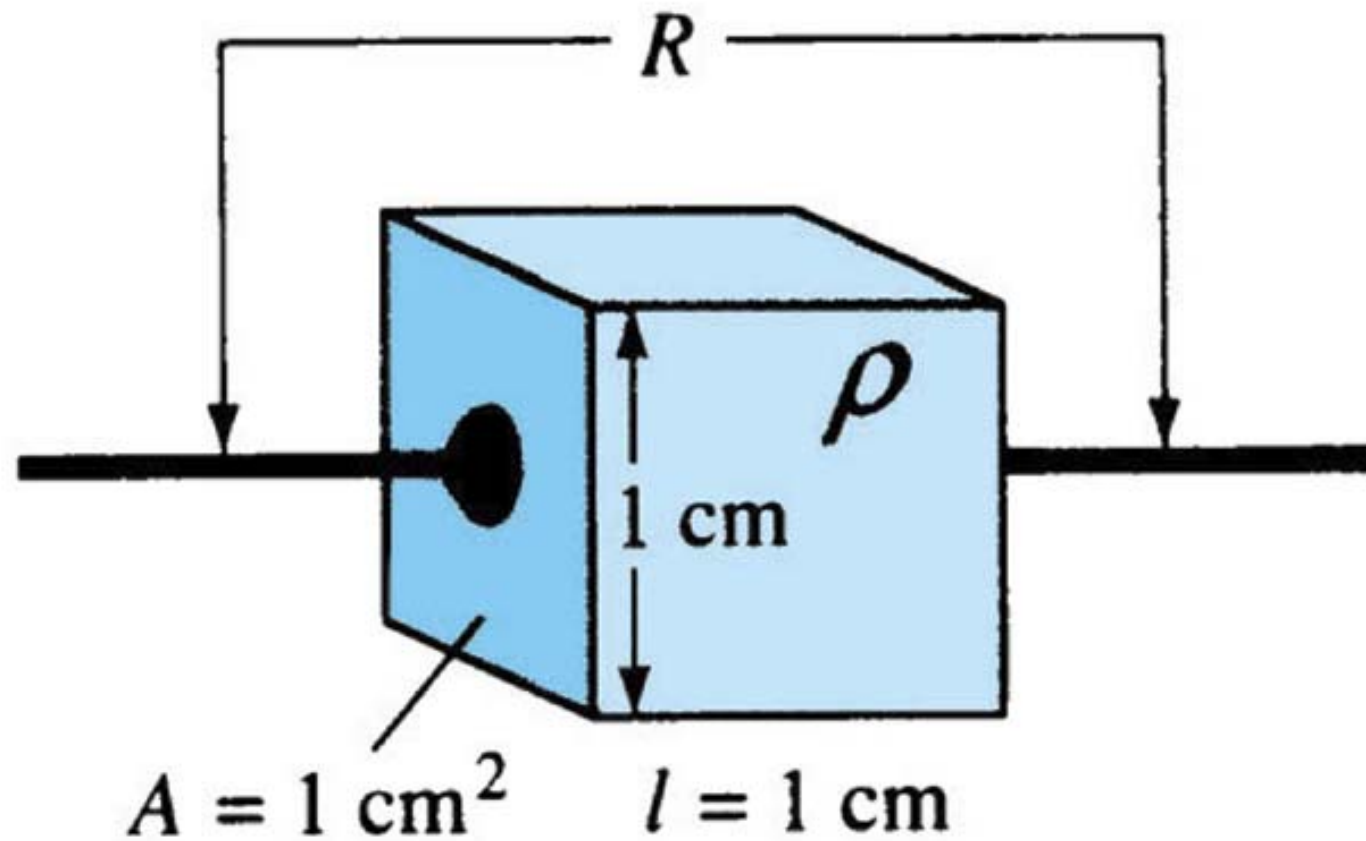
Florianópolis, agosto de 2006.

Semicondutores – referências bibliográficas

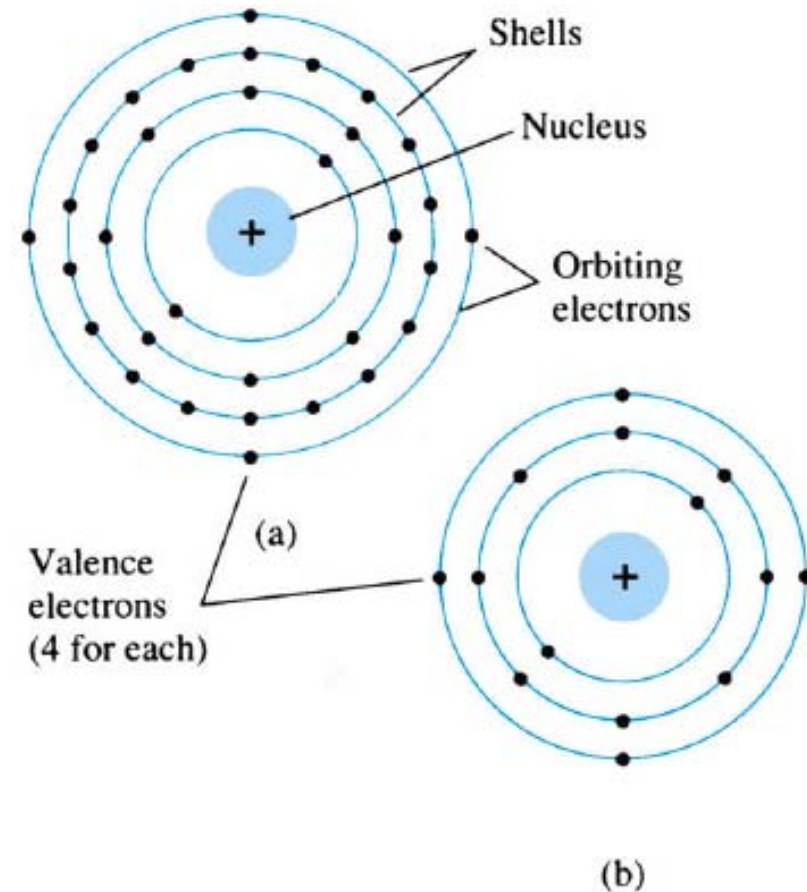
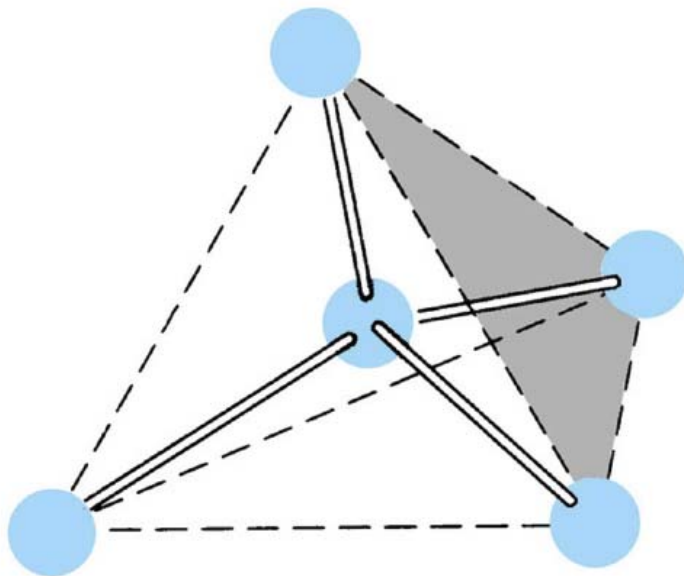


http://www.prenhall.com/boylestad_br/

Semicondutores

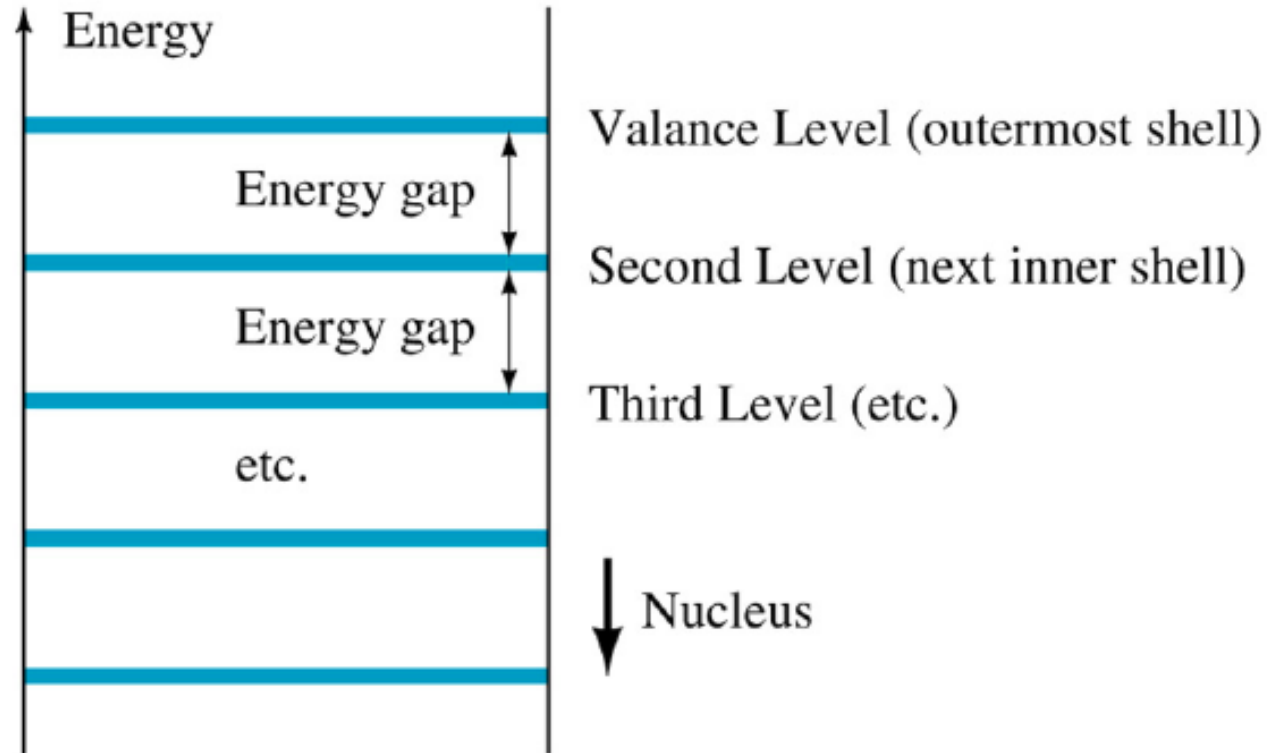


Semicondutores



Atomic structure: (a) germanium; (b) silicon.

Semicondutores



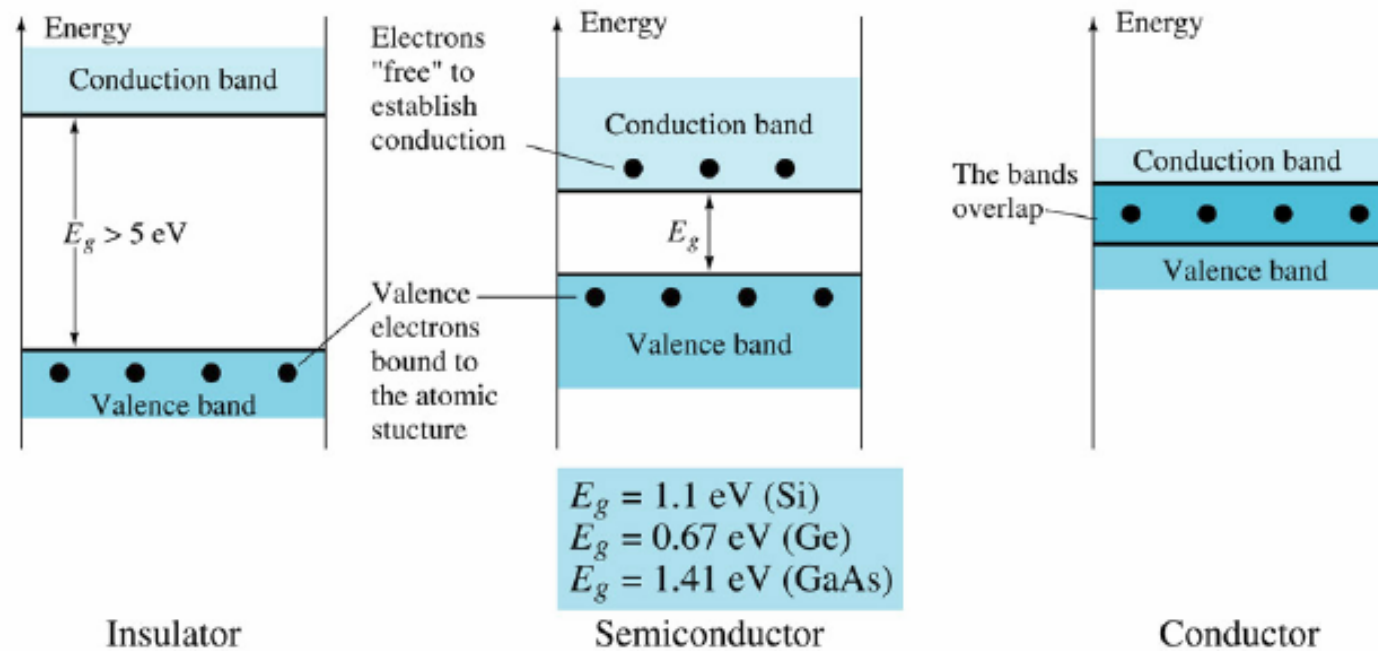
Condutor: $\rho = 10^{-6} \Omega\text{cm}$ [cobre]

Semicondutor: $\rho = 50 \Omega\text{cm}$ [germânio]

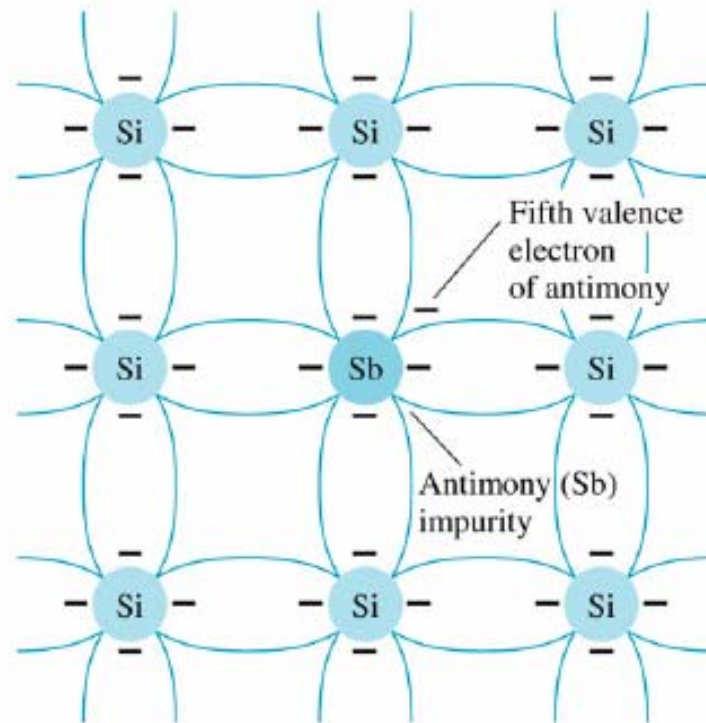
Semicondutor: $\rho = 50 \text{ k}\Omega\text{cm}$ [silício]

Isolante: $\rho = 10^{12} \Omega\text{cm}$ [mica]

Semicondutores

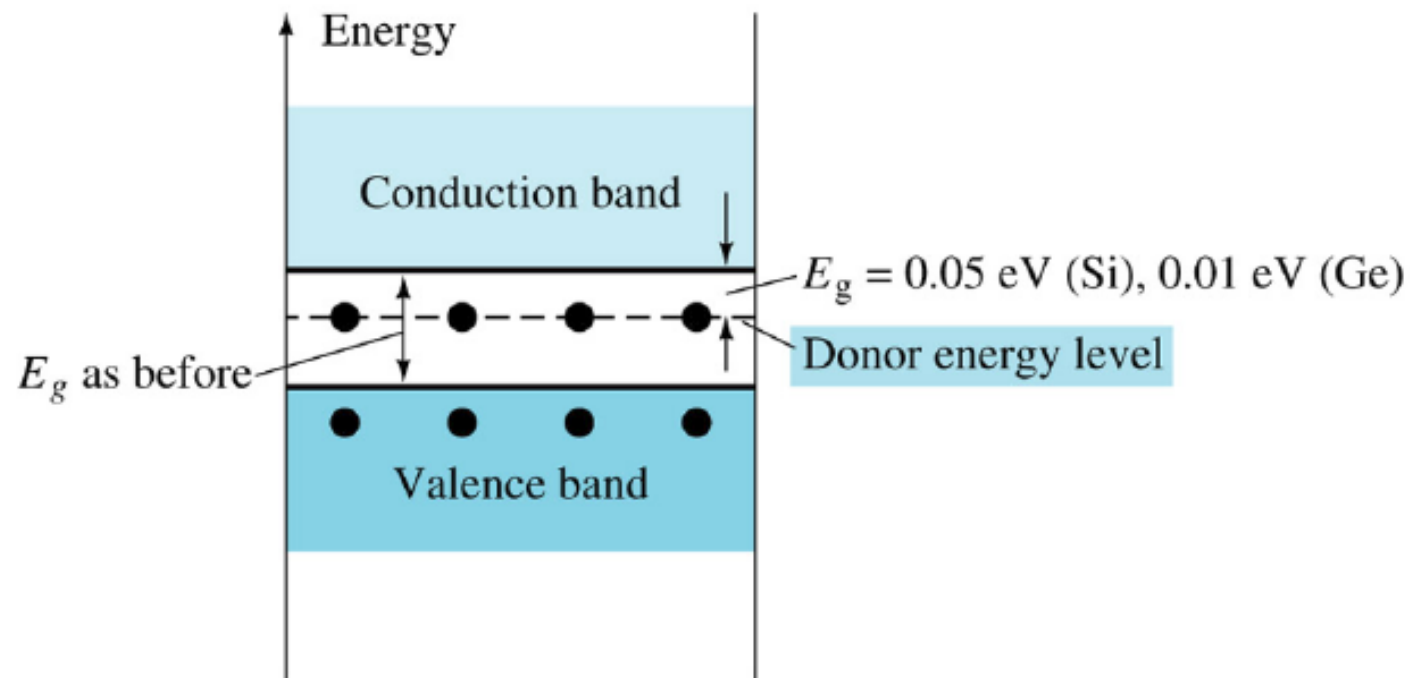


Semicondutores



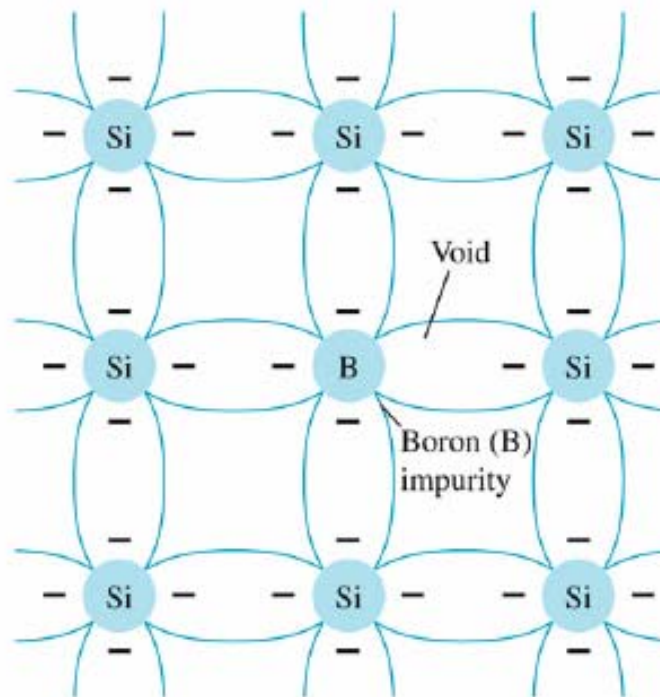
Antimony impurity in n-type material.

Semicondutores



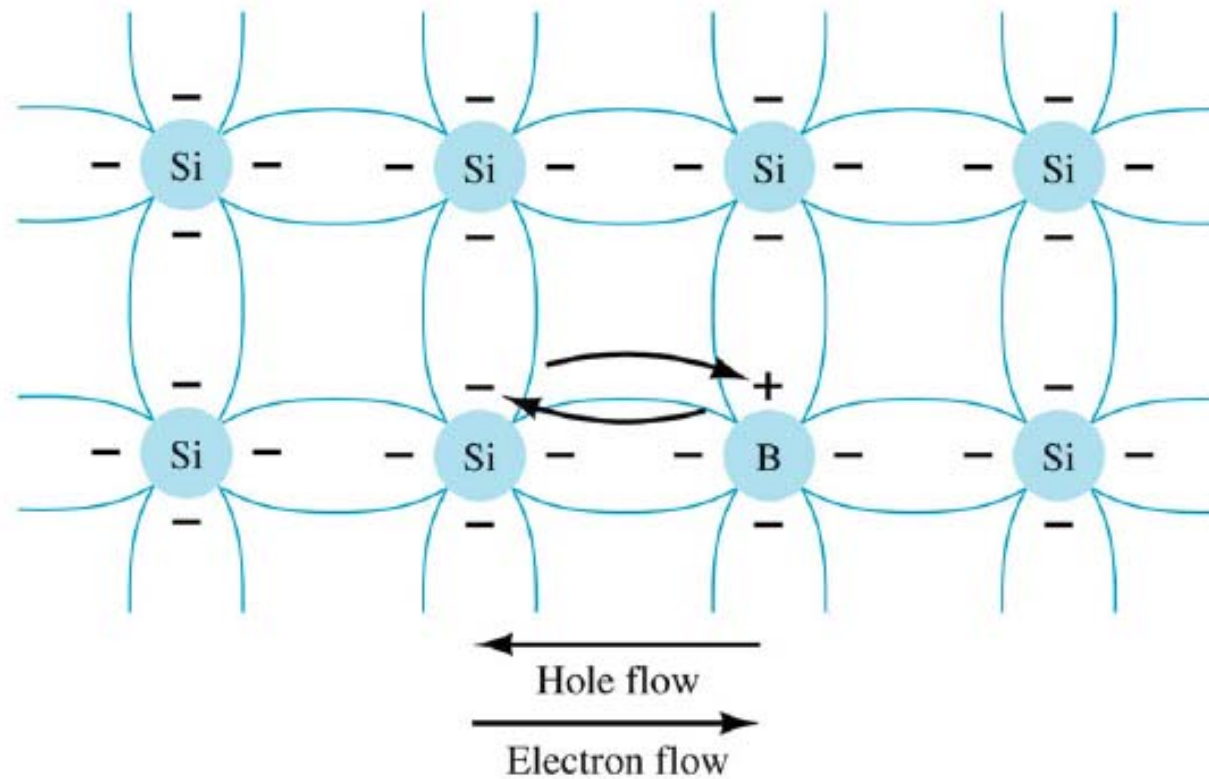
Effect of donor impurities on the energy band structure.

Semicondutores



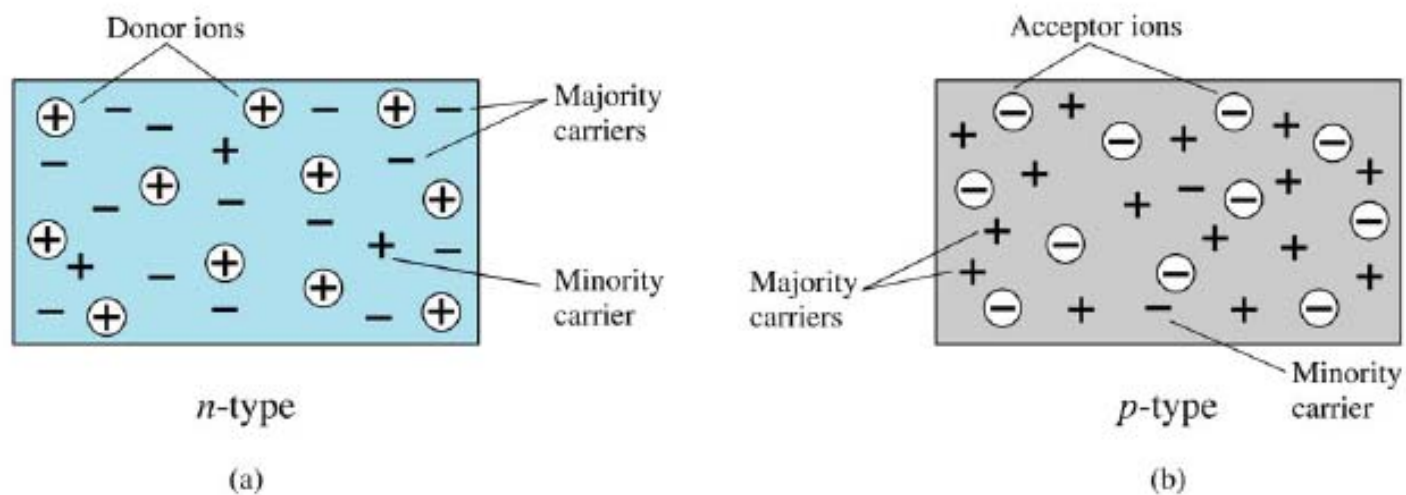
Boron impurity in *p*-type material.

Semicondutores



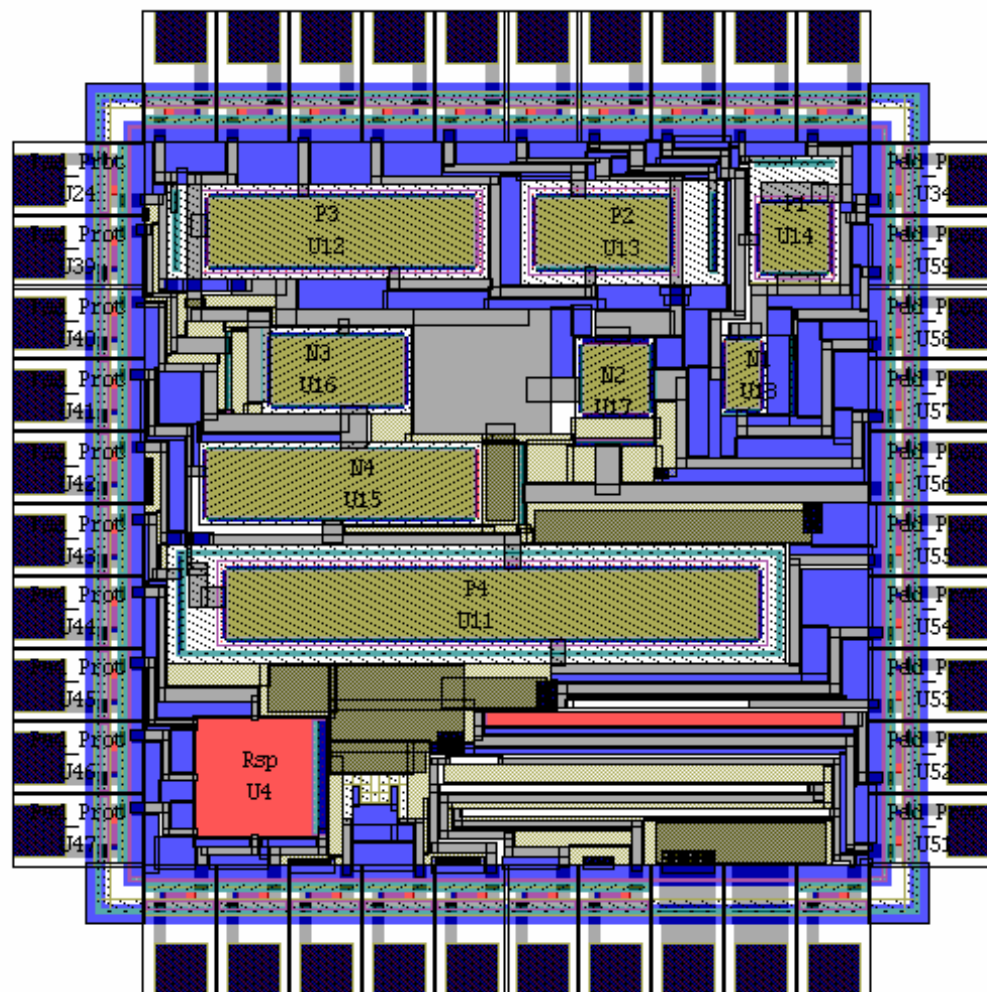
Electron versus hole flow.

Semicondutores



(a) *n*-type material; (b) *p*-type material.

Circuito integrado projetado no LCI



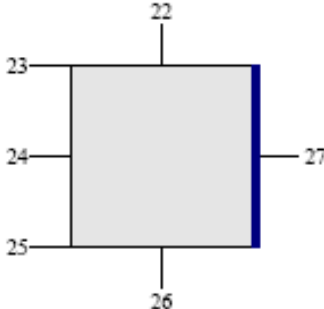
Pinagem e descrição dos terminais

Pinagem e descrição dos terminais do CI.

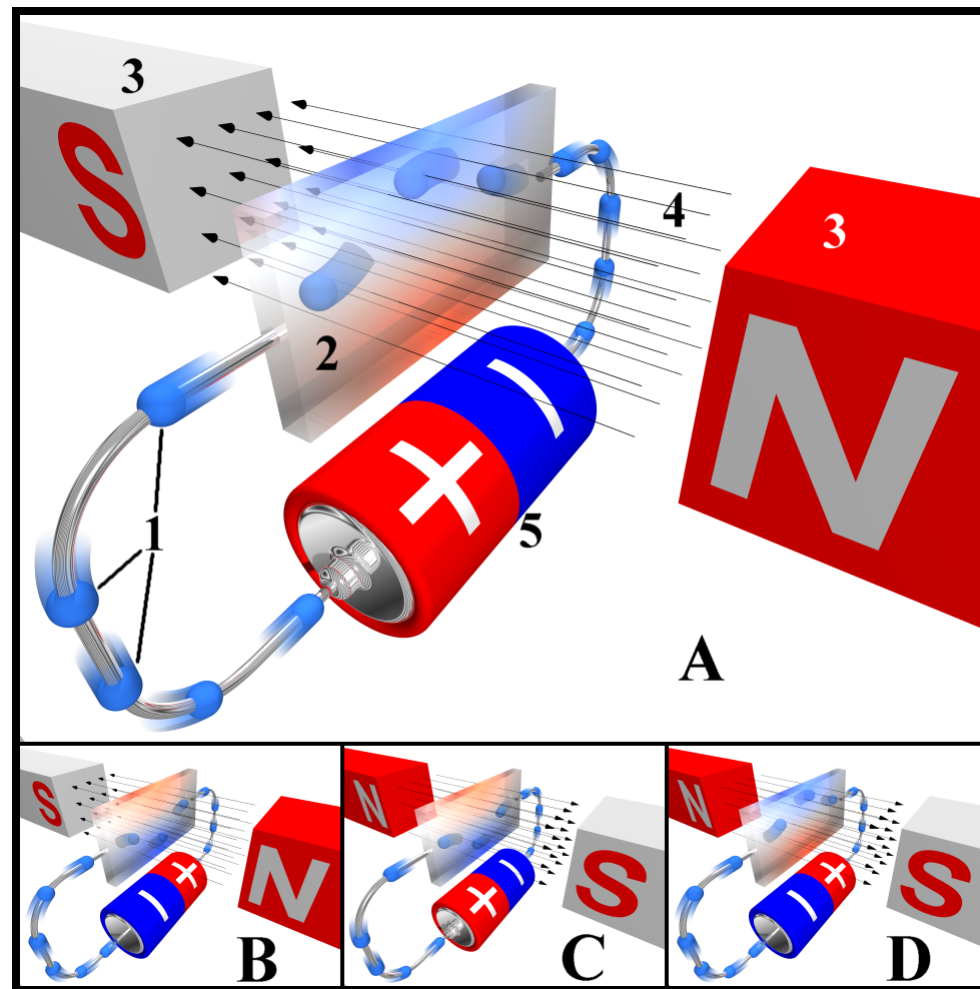
Pinos	Descrição
1	Bulk N_2 e N_4
2	Source\drain N_2
3	Source\drain N_1
4	Bulk N_1
5	Source\drain N_1 e P_1
6	Source\drain P_1
7	Bulk P_1
8	Gate P_1 e N_1
9	Bulk P_2
10	Gate P_2 e N_2
11	Source\drain P_2
12	Source\drain P_2 e P_3
13	Source\drain P_3
14	Gate P_3 e N_3
15	Bulk P_3
16	Source\drain N_3 e N_2
17	Bulk N_3
18	Source\drain N_3 e N_4
19	Gate N_4 e P_4
20	Source\drain N_4 e P_4

Pinos	Descrição
21	Bulk P_4
22	Centro superior R_{sp}
23	Canto superior R_{sp}
24	Centro Lateral esquerda R_{sp}
25	Canto inferior esquerdo R_{sp}
26	Centro inferior R_{sp}
27	Contato direito R_{sp}
28	R_6 resistor serpentina (resistor de poço) 10 K Ω
29	R_6 resistor serpentina (resistor de poço) 10 K Ω
30	R_3 e R_1 (R_3 resistor de poço 4,7 K Ω)
31	R_1 (resistor de poly) 1 K Ω
32	R_2 (resistor de poly) 1 K Ω
33	Ground
34	V_{dd}
35	R_3 e R_2
36	R_4 (resistor de poly) 500 Ω
37	R_4 (resistor de poly) 500 Ω
38	R_8 (resistor de poly) 500 Ω
39	R_8 (resistor de poly) 500 Ω
40	Source\drain P_4

Parte experimental – Medida de resistência

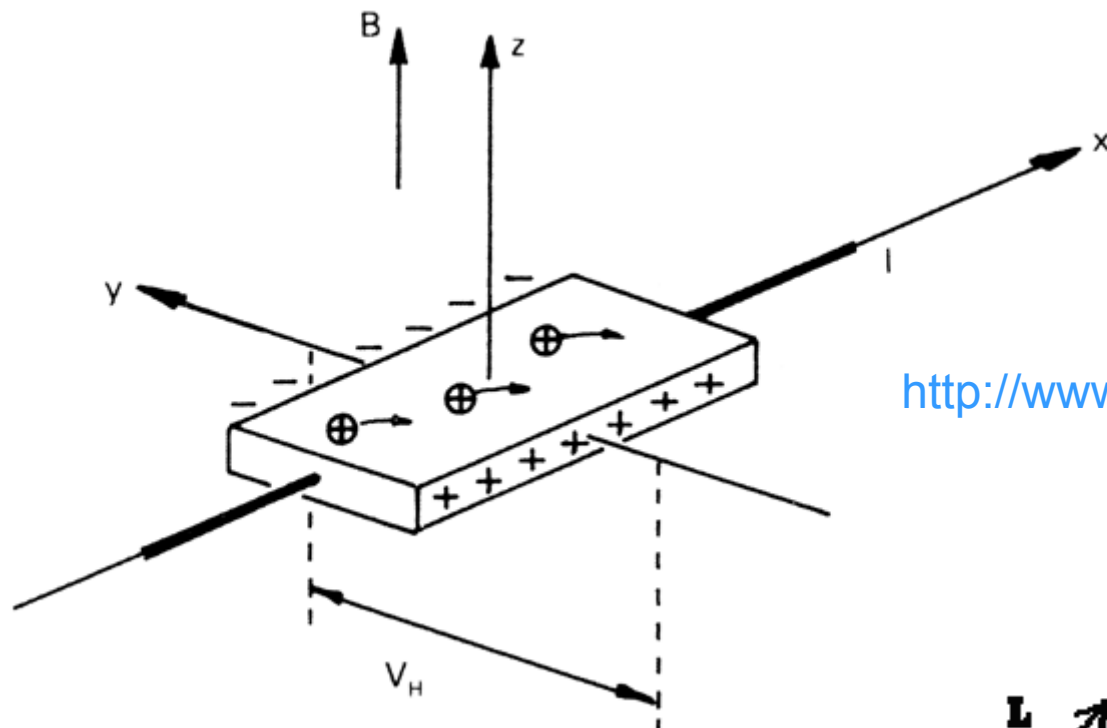
Nome	Tipo	Pinos		Largura (W)	Comprimento (L)	Valor [Ω]	Medida [Ω]
R ₁	Polysilicon	31	30	33	1584	1 k	
R ₂	Polysilicon	32	35	33	1584	1 k	
R ₃	NWELL	30	35	33	239	4,7 k	
R ₄	Polysilicon	36	37	64	1542	500	
R ₅	Polysilicon	22	27			300	
		23	27			300	
		24	27			300	
		25	27			300	
		26	27			300	
R ₆	NWELL	28	29	40	520	10 k	
R ₇	Polysilicon	38	39	33	741	500	

Parte experimental – Efeito Hall

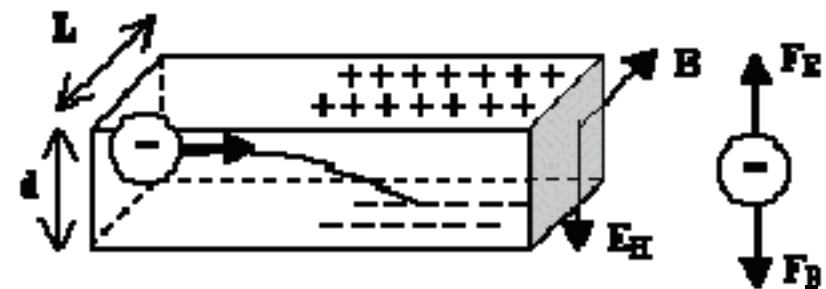


http://pt.wikipedia.org/wiki/Efeito_Hall

Parte experimental – Efeito Hall

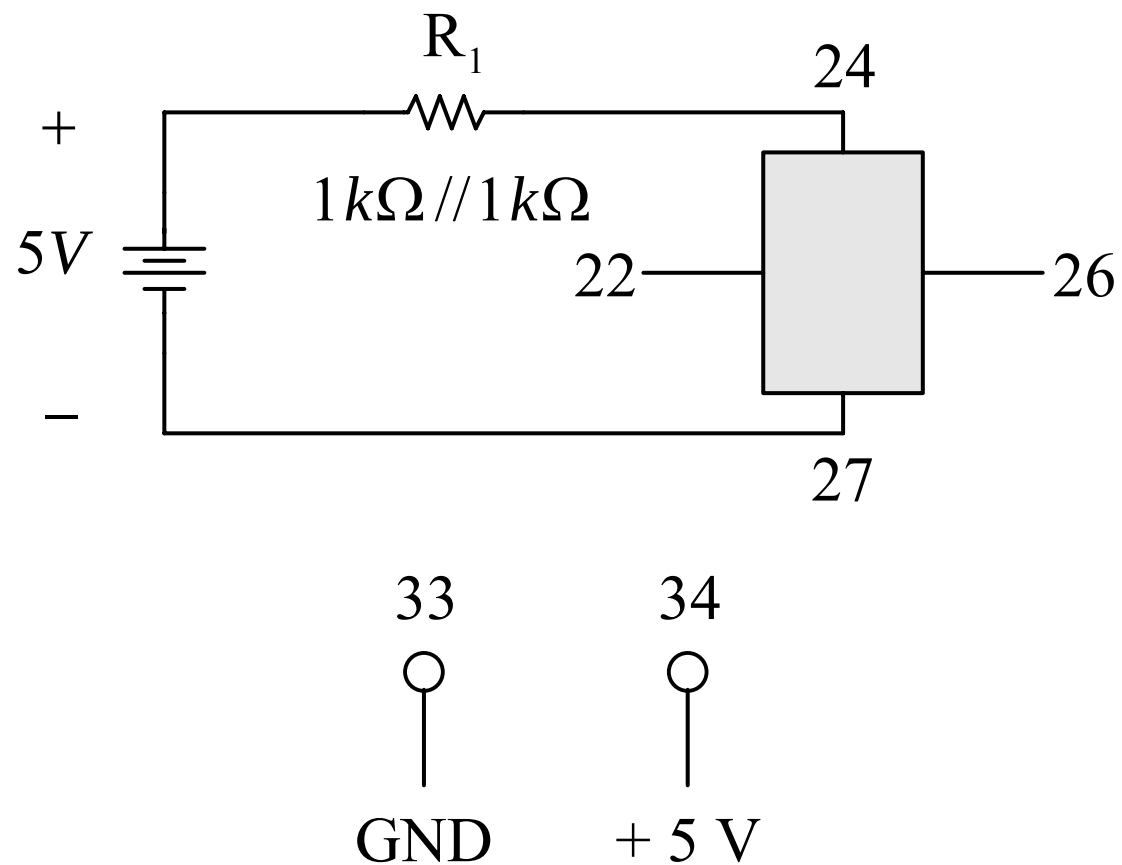


<http://www.if.ufrj.br/teaching/hall/hall.html>



http://www.if.ufrgs.br/tex/fis142/mod08/m_s03.html

Parte experimental – Efeito Hall



Parte experimental – Efeito da temperatura

