

Properties of Selected Semiconductors at 300 K

$\epsilon_r(0)$ and $\epsilon_r(\infty)$ represent the relative permittivity at dc (low frequency) and at optical (high) frequencies. $\epsilon_r(\infty)$ excludes ionic polarization but includes electronic polarization. Effective mass related to conductivity (*a*) is different than that related to the density of states (*b*).

Property	Ge	Si	GaAs	In _{0.53} Ga _{0.47} As	InP
Density g cm ⁻³	5.33	2.33	5.32	6.15	4.81
E_g (eV)	0.66	1.12	1.42	0.75	1.35
n_i (cm ⁻³)	2.4×10 ¹³	1.45×10 ¹⁰	1.8×10 ⁶		1.2×10 ⁷
N_c (cm ⁻³)	1.04×10 ¹⁹	2.8×10 ¹⁹	4.7×10 ¹⁷		5.4×10 ¹⁷
N_v (cm ⁻³)	6×10 ¹⁸	1.02×10 ¹⁹	7×10 ¹⁸		1.2×10 ¹⁹
$\epsilon_r(0)$; $\epsilon_r(\infty)$	16	11.9	13.1; 10.6	12.5; 9.61	12.5; 9.61
m_e^*/m_e	0.12 <i>a</i> 0.56 <i>b</i>	0.26 <i>a</i> 1.08 <i>b</i>	0.07 <i>a,b</i>		
m_h^*/m_e	0.23 <i>a</i> 0.40 <i>b</i>	0.38 <i>a</i> 0.56 <i>b</i>	0.40 <i>a</i> 0.50 <i>b</i>		
μ_e (cm ² V ⁻¹ s ⁻¹)	3900	1350	8500	13800	4600
μ_h (cm ² V ⁻¹ s ⁻¹)	1900	450	400	400	150

Selected Semiconductors

Crystal structure, lattice parameter a , bandgap energy E_g at 300 K, type of bandgap (D = Direct and I = Indirect), change in E_g per unit temperature change (dE_g/dT), bandgap wavelength λ_g and refractive index n close to λ_g . (A = Amorphous, D = Diamond, W= Wurtzite, ZB = Zinc blende)

Semiconductors	Crystal	a nm	E_g eV	Type	dE_g/dT meV K ⁻¹	λ_g (μm)	n around λ_g
Group IV							
Ge	D	0.5658	0.66	I	-0.37	1.87	4
Si	D	0.5431	1.12	I	-0.23	1.11	3.45
a-Si:H	A		1.7-1.8			0.73	
SiC			2.9	I		0.42	3.1
III-V Compounds							
AlAs	ZB	0.5661	2.16	I	-0.5	0.57	3.2
AlP	ZB	0.5451	2.45	I	-0.35	0.52	3
AlSb	ZB	0.6135	1.58	I	-0.3	0.75	3.7
GaAs	ZB	0.5653	1.42	D	-0.45	0.87	3.6
GaAs _{0.88} Sb _{0.12}	ZB		1.15	D		1.08	
GaN	W	0.3190 a 0.5190 c	3.44	D	-0.45	0.36	
GaP	ZB	0.5451	2.24	I	-0.54	0.55	3.4
GaSb	ZB	0.6096	0.73	D	-0.35	1.7	4
In _{0.53} Ga _{0.47} As on InP	ZB	0.5869	0.75	D		1.65	
In _{0.58} Ga _{0.42} As _{0.9} P _{0.1} on InP	ZB	0.5870	0.80	D		1.55	
In _{0.72} Ga _{0.28} As _{0.62} P _{0.38} on InP	ZB	0.5870	0.95	D		1.3	
InP	ZB	0.5869	1.35	D	-0.46	0.91	3.4-3.5
InAs	ZB	0.6058	0.35	D	-0.28	3.5	3.8
InSb	ZB	0.6479	0.18	D	-0.3	7	4.2
II-VI Compounds							
ZnSe	ZB	0.5668	2.7	D	-0.72	0.46	2.3
ZnTe	ZB	0.6101	2.25	D		0.55	2.7