

### Si Mirror grade

Any dopant, any conductivity, any orientation, not warranted with respect to transmission, suitable for mirror substrates.

### Si Optical grade

CZ, P type doped with Boron, <111> or <100>, Resistivity 5 - 40 ohmcm

FZ, N type doped with Phosphorus, <111>, Resistivity > 50, preferably > 500 ohmcm, the absorption at 9 microns is absent.

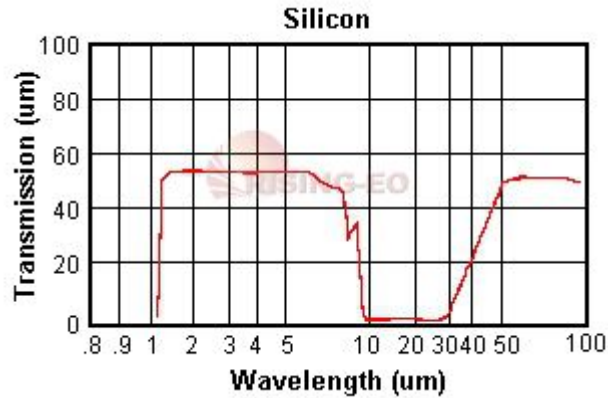
Also we produced Silicon wafers according customers specifications, these substrates can be used in the semiconductor production.

We can offer services like lapping, cutting, grinding, polishing, double-side polishing.

### Main Properties

Crystal properties			
Crystal Growth Method		Czohralski (CZ) & Floatzone (FZ)	
Max. Size (mm)		<350mm	
CZ		<125mm	
FZ			
Optical properties			
Transmission Range		1.2~8um	
Reflection Loss, for two surfaces at 5 渭 m		46.2%	
Refractive Index		See below	
Wavelength (um)	Refractive Index (n)	Wavelength (um)	Refractive Index (n)
1.357	/	5.500	3.4213
1.3951	3.4975	6.000	3.4202
1.6606	3.4929	6.500	3.4195
1.8131	3.4608	7.000	3.4189
2.1526	3.4476	7.500	3.4186
2.3254	3.443	8.000	3.4184
3.000	3.432	8.500	3.4182
3.500	3.4284	10.00	3.4179
4.000	3.4257	10.50	3.4178
4.500	3.4236	11.04	3.4176
5.000	3.4223		

Transmission Curve See below



#### Crystallographic properties

Syngony	Cubic
Lattice Constant, A	5.43

#### Physical properties

Density	2.33g/cm <sup>3</sup>
Hardness, Mohs	7
Dielectric Constant for 9.37 x 10 <sup>9</sup> Hz	13
Melting point, 芯小	1414
Thermal Conductivity, W/m 路 K at 313 K	163
Thermal Expansion, 1/K at 293 K	2.6x10 <sup>-6</sup>
Specific Heat Capacity, J/(kg 掬 C)	712.8
Bandgap, eV	1.1
Knoop Hardness, kg/mm <sup>2</sup>	1100
Young's Modulus, Gpa	130.91
Shear Modulus, GPan	79.92
Bulk Modulus, GPa	101.97
Debye Temperature, K	640
Poisson's Ratio	0.28

#### Chemical properties

Solubility in water	None
Molecular Weight	28.09

**General Specifications**

Optical grade Silicon Window Substrates		
Parameters	Commercial grade	Precision grade
Substrate Material	CZ or FZ optical Silicon mono	
Diameter Tolerance	+0/-0.10mm	
Thickness Tolerance	±0.10mm	
Clear Aperture	>Central 90% of diameter	
Surface Quality	60-40 S/D	40-20 S/D
Parallelism	3~5 arc min	1 arc min
Surface Flatness	1λ per 25mm	λ/4
Chamfer	0.15~0.35mm×45° face width × 45°±15°	
Coating	Coatings are available upon request	

Optical grade Silicon Lens Substrates			
Parameters	Commercial grade	Precision grade	Ultra-precision grade
Substrate Material	CZ or FZ optical Silicon mono		
Diameter Tolerance	+0/-0.10mm		
Thickness Tolerance	±0.10mm		
Focal Length Tolerance	<±1%		
Clear Aperture	>Central 90% of diameter		
Surface Quality	60-40 S/D	40-20 S/D	20-10 S/D
Centration	<3 arc min	<1 arc min	
Surface Flatness	Power<3 fringes(1.5λ) Irregularity<0.5 fringes(λ/4)	Irregularity<0.2 fringes(λ/10)	
Chamfer	0.15~0.35mm×45° face width × 45°±15°		
Coating	Coatings are available upon request		No coating

Silicon Wafers	
Parameters	Value
Substrate Material	CZ Silicon, N or P, R=0.003~50 ohm.cm
Orientation	<100> / <111>
Diameter Tolerance	3"~8"±0.2mm
Thickness Tolerance	According to SEMI or customer's requirements T±15um
Thickness Vary (TTV)	<5um
Surface Flatness (TIR)	<4um
Surface (STIR)	<0.6um
Warp	<30um