# Optical Grade Silicon Blanks for Infrared Optics

## Crystal Structure
monocrystalline

## Purity
> 99.999%

## Orientation
- <100>
- <111>

## Conductivity
- n type (Phosphorus doped)
- p type (Boron doped)

## Resistivity
- **standard optical grade**
  - n type > 10 Ωcm
  - p type > 30 Ωcm
- **EXT grade**
  - > 50 Ωcm
- **mirror grade**
  - 1 - 10 Ωcm

## Products
- Window blanks
- Mirror blanks
- Filter blanks
- Prism blanks
- Beamsplitter blanks
- Lens blanks
- Dome blanks
- Rods
- Disks
- Sputtering targets

## Size
- diameter 10 to 300 mm

## Shape and Tolerances
- according to customer drawing

## Standard Tolerances
- **Lens blanks**
  - diameter ± 0.025 mm
  - edge thickness variation ± 0.025 mm
- **Window blanks**
  - length/width ± 0.025 mm
  - flatness ± 0.020 mm

## Surface Finish
- cut
- fine ground $R_{\text{a, max}}$ 0.2 μm to 4.0 μm (D7 to D46)
- polished or diamond turned upon request

## Applicable Standards
- ASME Y14.5M (2009)
- Traceability: MIL 130
# Optical Grade Silicon
## Physical and Optical Properties

<table>
<thead>
<tr>
<th>Physical Properties [1]</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Point</td>
<td>1687 K</td>
</tr>
<tr>
<td>Density</td>
<td>2.329 g/cm³</td>
</tr>
<tr>
<td>Thermal Expansion Coefficient</td>
<td>2.6 × 10⁻⁶ K</td>
</tr>
<tr>
<td>Young's Modulus (&lt;111&gt; orientation)</td>
<td>1187 GPa</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Refractive Index (at 5.20 µm)</td>
<td>3.4144</td>
</tr>
<tr>
<td>dn/dT (at 5.20 µm)</td>
<td>1.56 × 10⁻⁴ K</td>
</tr>
<tr>
<td>Transmission (at 5.20 µm)</td>
<td>52 %</td>
</tr>
</tbody>
</table>

### Refractive Index Silicon at 20°C

![Graph showing refractive index as a function of wavelength in micrometers.]

### Transmission of Silicon at 23°C [3]

![Graph showing transmission as a function of wavelength in micrometers.]

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[1] Taken from NIST Database  
[3] Sample thickness 10 mm