

Germanium (Ge)

The highest-index IR workhorse — thermal imaging optics for 8–12 μm .

PHYSICAL PROPERTIES	
Crystal structure	Cubic diamond (mono- or polycrystalline)
Density	5.33 g/cm ³
Bulk resistivity	5 – 40 $\Omega\cdot\text{cm}$ (optical grade)
OPTICAL PROPERTIES	
Useful transmission range	2 – 14 μm
Refractive index	4.003 @ 10.6 μm
dn/dT	+396 $\times 10^{-6}/\text{K}$
THERMAL PROPERTIES	
Thermal conductivity	59 W/m·K
Specific heat	0.31 J/g·K
Thermal expansion (CTE)	6.1 $\times 10^{-6}/\text{K}$
MECHANICAL PROPERTIES	
Young's modulus	102.7 GPa
Knoop hardness	780 kgf/mm ²
Poisson's ratio	0.28
Rupture modulus	~90 MPa

Typical Applications

LWIR thermal imaging lenses, windows and domes; MWIR/LWIR objectives; high-index elements that minimize component count; substrates for high-efficiency AR coatings.

Fabrication & Specification Notes

Absorption rises steeply above ~70–100 °C (thermal runaway) — not recommended for CO₂ power delivery. Very high dn/dT drives athermalization requirements. Ask about our U.S. Germanium reclaim program — strategic material stays domestic.

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