AMORPHOUS MATERIALS, INC.

MANUFACTURER OF IR MATERIALS

AMTIR®

AMTIR-1 Material Properties

PROPERTY	METRIC UNITS	ENGLISH UNITS
Composition	GeAsSe	
Glass Transition Temperature (Tg)	353 °C	667 °F
Annealing Temperature	361 °C	682 °F
Dilatometric Softening Point	374 °C	705 °F
Upper Use temperature	312 °C	594 °F
Thermal Exp. Coefficient (-150 to 25 °C)	11.7 ppm / °C	6.5 ppm / °C
Thermal Exp. Coefficient (RT to 330 °C)	12.8 ppm / °C	12.8 ppm / °C
Specific Heat	0.30 J/gm-K	0.072 BTU/lb-°F
Thermal Conductivity	0.25 W/m-K, 0.0006 cal /sec-cm-K	0.145 BTU/ Hr-ft-°F
Knoop Hardness	170	
Young's Modulus (E)	21.2 GPa	3.07 x 10^6 lbs /in²
Shear Modulus (G)	8.7 GPa	1.26 x 10^6 lbs/ in²
Poisson's Ratio	0.215	
Tensile Strength	7.6 MPa	1100 lbs / in²
Compressive Strength	145 MPa	21,000 lbs / in²
Rupture Modulus (ASTM-C158)	19.7 MPa	2850 lbs / in²
Density	4.43 gm/cm³	276.6 lbs/ft³
Stress Opt. Coeff. (Avg. Tensile & Comp)	3 to 12 μm, x 10^{-12} m²/N	9.7
Dielectric Constant	7.9	
Resistivity (@100Hz)	>2x 10^{12} ohm-cm	>8 x 10^{11} ohm-in
Refractive Index @ 3.0 um (20 °C)	2.51841	
Refractive Index @ 8.0 um (20 °C)	2.50301	
Refractive Index @ 12.0 um (20 °C)	2.48954	
SWIR Abbe Value	23	
MWIR Abbe Value	194	
LWIR Abbe Value	111	
Δn/ΔT @ 3.0 um	0.000076	
Δn/ΔT @ 8.0 um	0.000072	
Δn/ΔT @ 12.0 um	0.000071	
Chemical Durability (weight loss in milligrams in a 4 Hour Period)		
Solution	**Temperature (°C)**	**Milligrams**
H_2O	90 °C	0
2% HH_4OH	60 °C	10
2% KOH	60 °C	32
HCl, H_2SO_4, HNO_3 & EtOH (all conc)	60 °C	0 to 0.02

NOTE: All data provided on these datasheets are typical melt values for standard anneal glass and believed to be accurate and representative of AMI melt practice, at the time of publication. Industry standard tolerances apply to all categories. Current maximum blank size available meeting standard quality specifications is Ø150 mm x 25 mm thick. (Larger diameters may be available in the future.) ***(See AMI Supplemental Datasheet for AMTIR-1 Zemax Optic Studio and Synopsis Code-V information.)***

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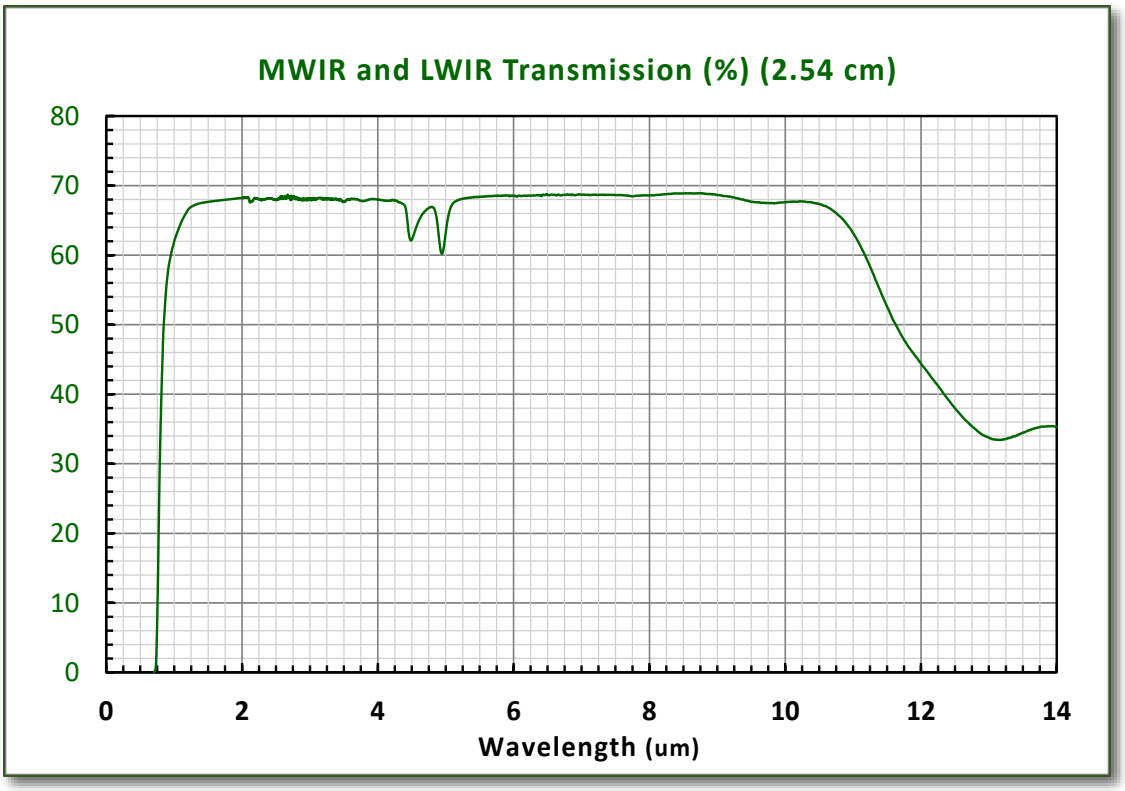
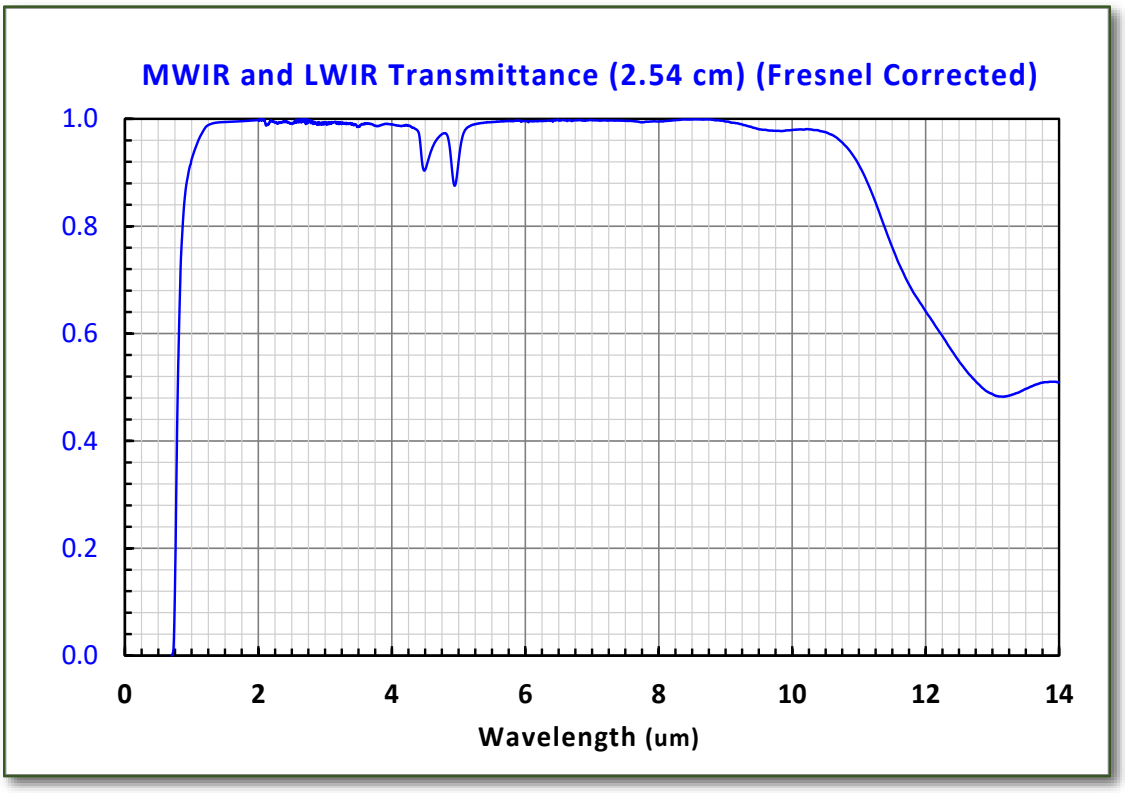
Datasheet Revision AMTIR-1 2024-11-21 (supersedes all others)





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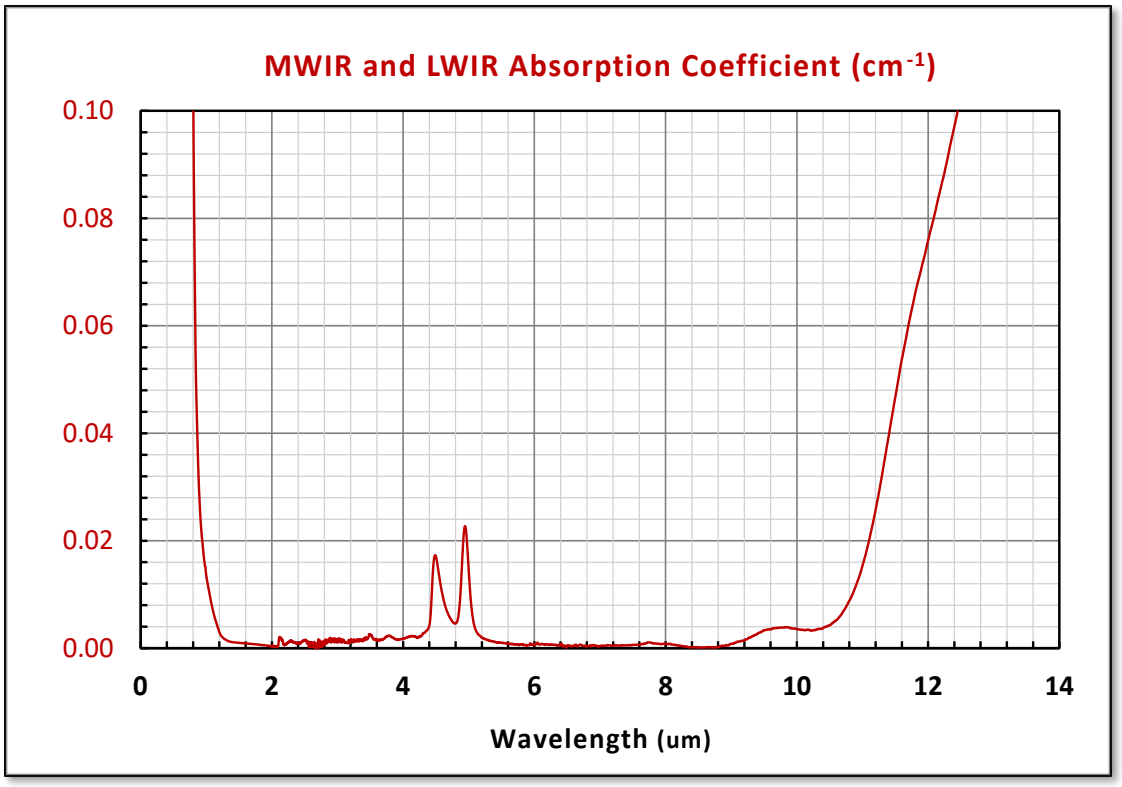

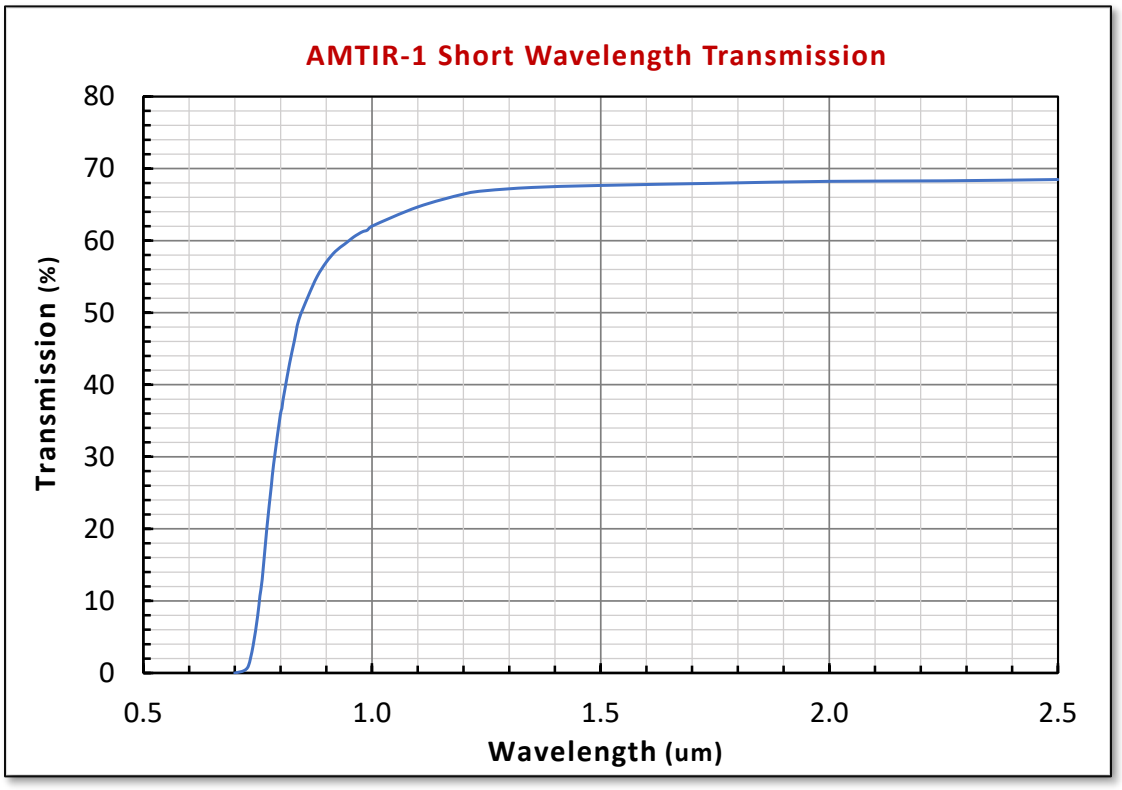

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AMTIR -1 Transmission Properties

Wavelength (um)	Fresnel Coefficient	Transmission (%) (2.54 cm)	Transmittance (2.54 cm) (corrected)	Absorption Coefficient (cm^{-1})
1.000	0.671	62.00	0.925	0.0133
2.000	0.684	68.22	0.998	0.0003
3.000	0.686	68.17	0.994	0.0010
4.000	0.687	67.97	0.990	0.0017
4.500	0.687	62.22	0.905	0.0171
4.960	0.687	60.64	0.882	0.0215
5.000	0.688	63.25	0.920	0.0143
6.000	0.688	68.51	0.996	0.0007
7.000	0.689	68.69	0.998	0.0003
8.000	0.689	68.57	0.995	0.0009
9.000	0.690	68.64	0.995	0.0009
10.000	0.690	67.60	0.979	0.0036
11.000	0.691	63.15	0.914	0.0154
12.000	0.692	44.38	0.642	0.0758
13.000	0.693	33.76	0.487	0.1230
14.000	0.694	35.31	0.509	0.1155

NOTE: Amorphous Materials, Inc. calculates the values for Absorption Coefficients, using the standard formulas and approach recommended by the Optical Society of America (OSA) and used routinely by most Optical Engineers. The applicable determines the ABSORBANCE, at a given wavelength ($\alpha\lambda$), by correcting for multiple-internal reflections (i.e., Fresnel losses) and dividing this value by the light path (i.e., sample thickness ("t") in centimeters).

FRESNEL REFLECTION COEFFICIENT (r) at wavelength (λ) $r = \frac{(n-1)^2}{(n+1)^2}$

OVERALL TRANSMITTANCE (T) at wavelength (λ), $T = \frac{\%T}{100}$

ABSORBANCE at wavelength (λ) (a_λ) $a = -\left(\frac{1}{t}\right)\ln\left\{\left[\frac{(1-r)^4}{4r^4T^2} + \frac{1}{r^2}\right]^{\frac{1}{2}} - \frac{(1-r)^2}{2r^2T}\right\}$

ABSORPTION COEFFICIENT (A_λ) = a / thickness(cm)

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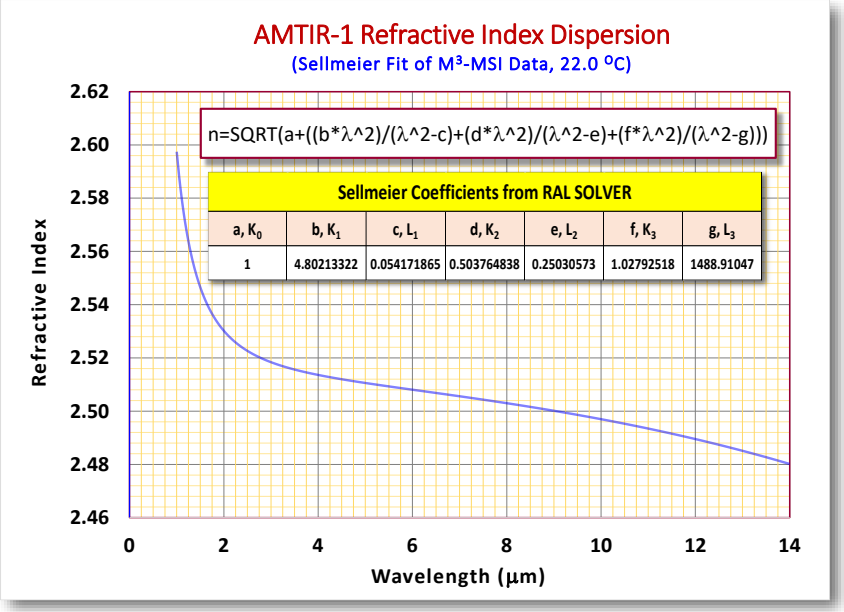

Wavelength (microns)	Refractive Index 20.0 °C	Average Δn/ΔT
1.0000	2.59744	0.000166
1.5000	2.54655	0.000095
2.0000	2.53018	0.000085
3.0000	2.51841	0.000076
4.0000	2.51362	0.000074
5.0000	2.51060	0.000074
6.0000	2.50808	0.000073
7.0000	2.50561	0.000073
8.0000	2.50301	0.000072
9.0000	2.50016	0.000071
10.0000	2.49701	0.000071
11.0000	2.49348	0.000071
12.0000	2.48954	0.000071
13.0000	2.48513	0.000070
14.0000	2.48019	0.000071

NOTE: Refractive Index values are typical production values. The specification for this optical property is ±0.0008 at absolute wavelength. The specification for Δn/ΔT values is ±0.000003 at absolute wavelength.

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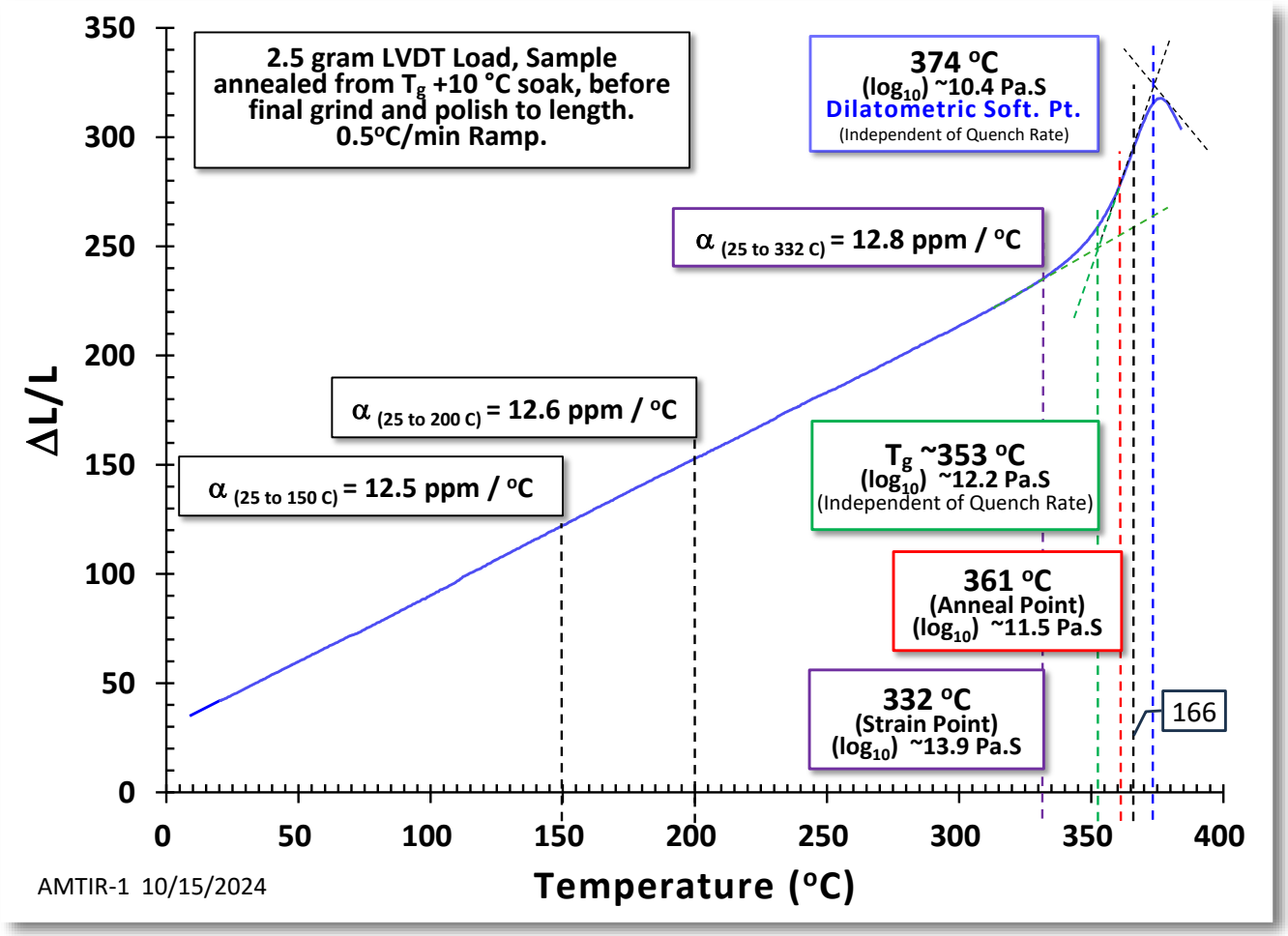
AMTIR-1 Thermal Expansion Data



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