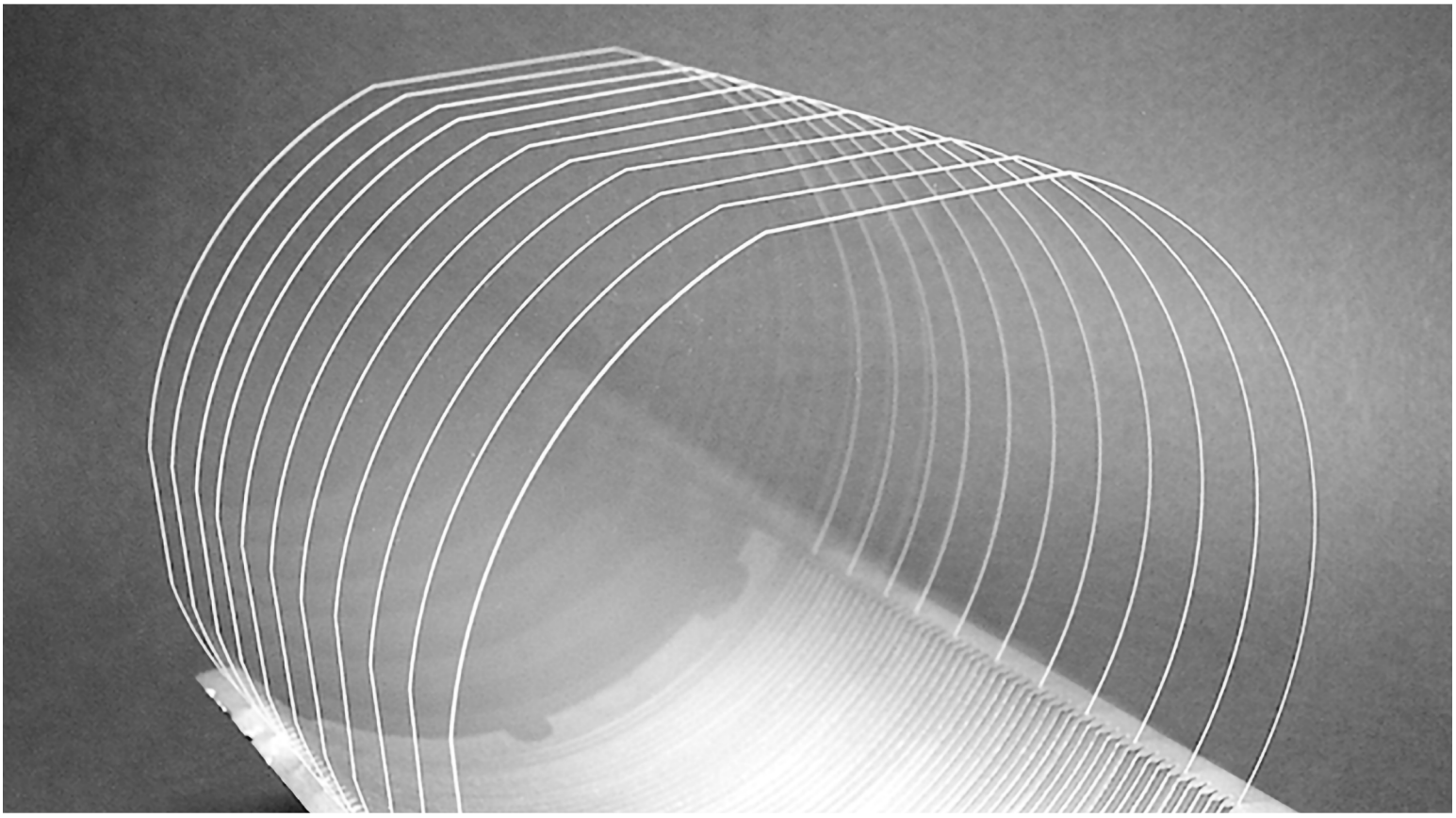
WAFER UNIVERSE



MATERIAL DATASHEET

BOROFLOAT33®

BOROFLOAT33®

Floated borosilicate glass made in germany

high chemical stability
outstanding thermal resistivity
excellent mechanical resilience

low cte adapted to Si

used for wafer level packaging
material for MEMS applications
anodic bonding with Silicon
carrier for wafer handling of thin Silicon wafers

Chemical Composition

SiO_2	B_2O_3	Na_2O	Al_2O_3	K_2O	Fe_2O_3	ZrO_2
80 %	12,75 %	3,55 %	2,4 %	0,55 %	<230 ppm	< 15 ppm

Chemical Properties

Durability:
Durability is measured via weight-loss per surface area after immersion. Values are highly dependent upon actual testing conditions. Unless otherwise noted, concentrations refer to weight percent.

Reagent	Time	Temp	Weight Loss [mg/cm^2]
HCl – 5%	24 hrs	95°C	<0.01
0.02 n H_2SO_4	24 hrs	95°C	<0.01
H_2O	24 hrs	95°C	<0.01
NaOH – 5%	6 hrs	95°C	1.1
0.02 n NaOH	6 hrs	95°C	0.16
0.02 n Na_2CO_3	6 hrs	95°C	0.16
HF – 10%	20 min	23°C	1.1
NH_4F x HF – 10%	20 min	23°C	0.14

Hydrolytic resistance acc. to DIN ISO 719	Class HGB 1
Acid Resistance acc. to DIN 12116	Class 1
Alkali resistance acc. to DIN ISO 695	Class A 2

Mechanical Properties

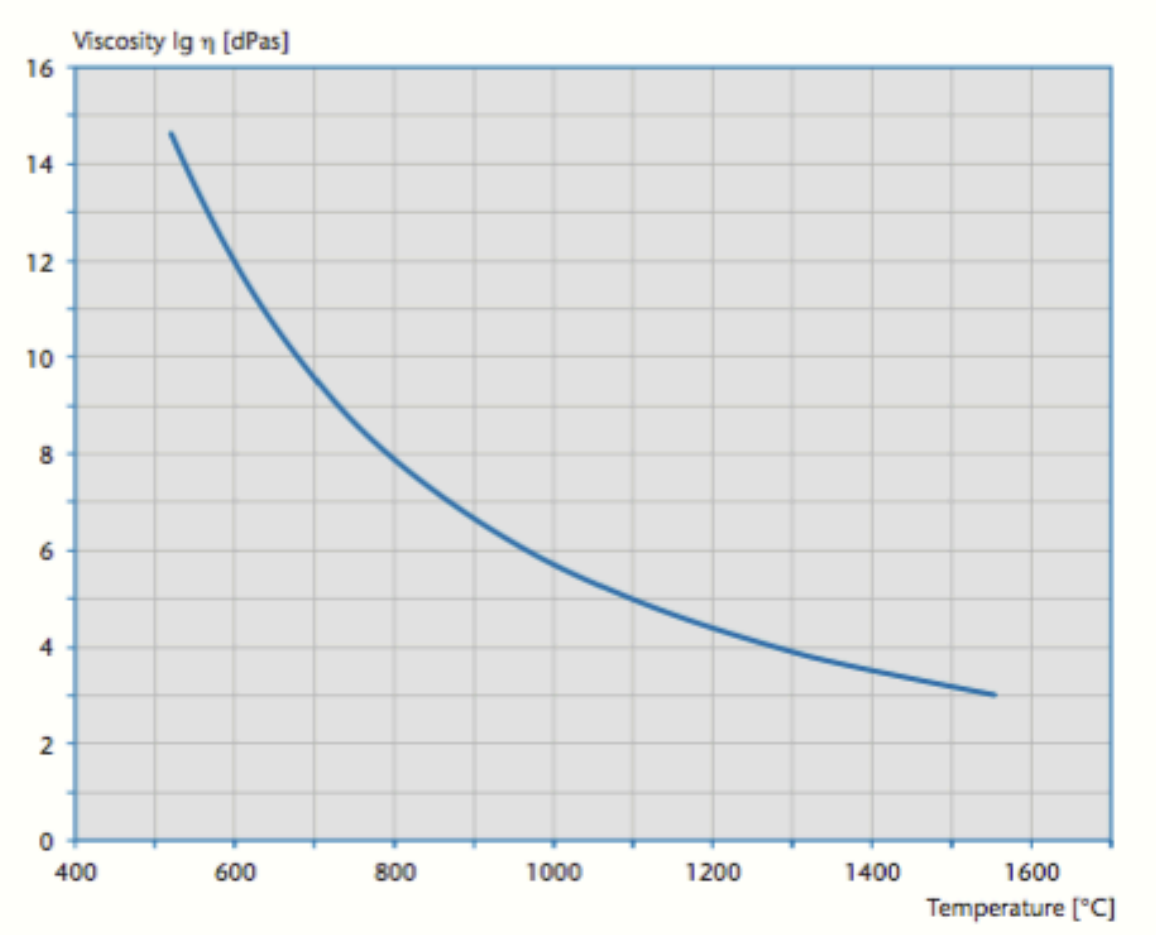
Density [g/cm^3]	2.2
Young's Modulus [MPa]	64,000
Poisson's Ratio	0.20
Knoop Hardness $HK_{0.1/20}$	480
Bending strength [MPa]	25

Thermal Properties

Viscosity	
Working Point (10^4 dPas) [°C]	1270
Softening Point ($10^{7.6}$ dPas) [°C]	815
Annealing Point (10^{13} dPas) [°C]	560
Strain Point ($10^{14.5}$ dPas) [°C]	518

Transformation Temperature [°C]	525

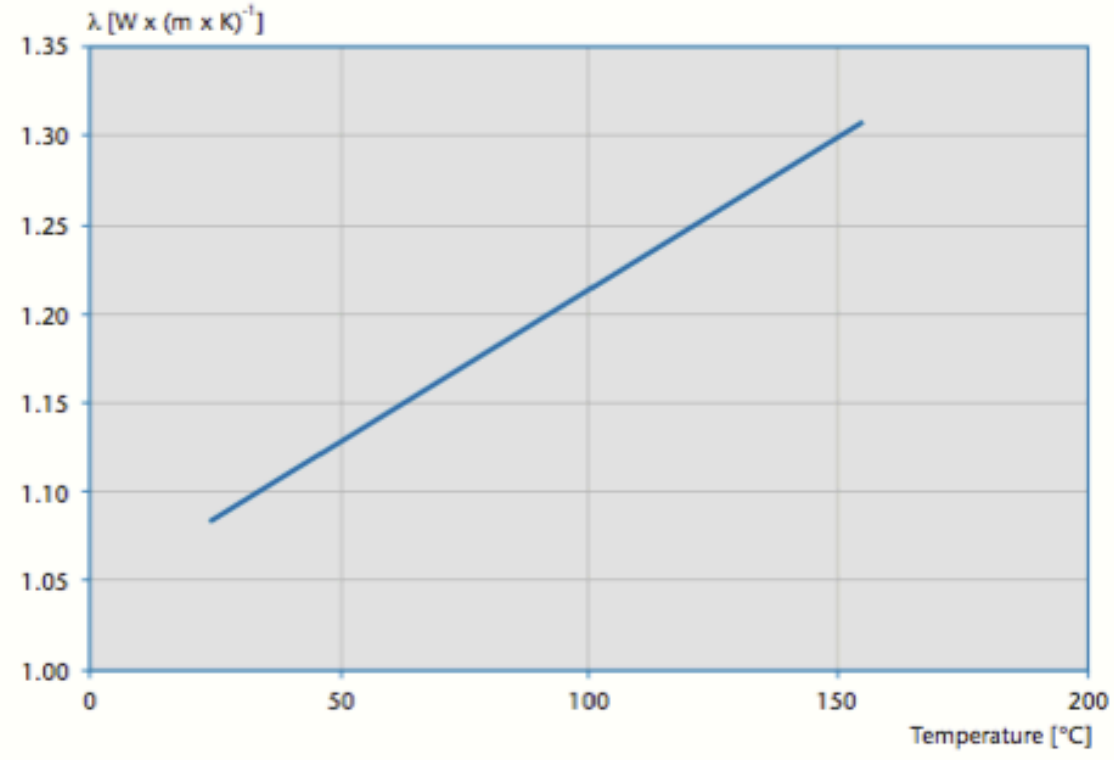
- Temperature Dependency of the Viscosity:



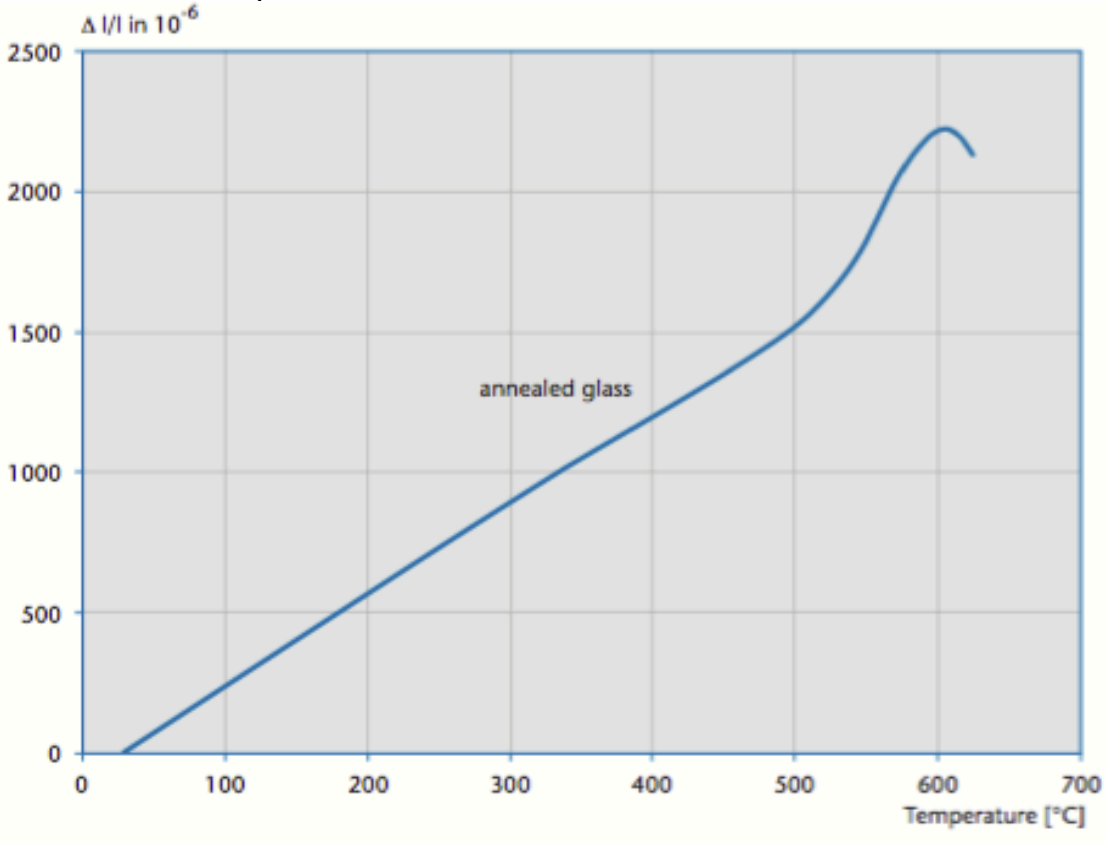
Maximum operating Temperature (short-term < 10h) [°C]	500
Maximum operating Temperature (long-term ≥ 10h) [°C]	450

Thermal Conductivity $\lambda_{(25\ °C)}$ [W/(m*K)]	1.2
Specific Heat Capacity $C_{p\ (20\ °C;\ 100\ °C)}$ [J/(g*K)]	900
Coefficient of Linear Thermal Expansion (cte) $\alpha_{(20\ °C;\ 300\ °C)}$ [K^{-1}]	3.25 x10^{-6}

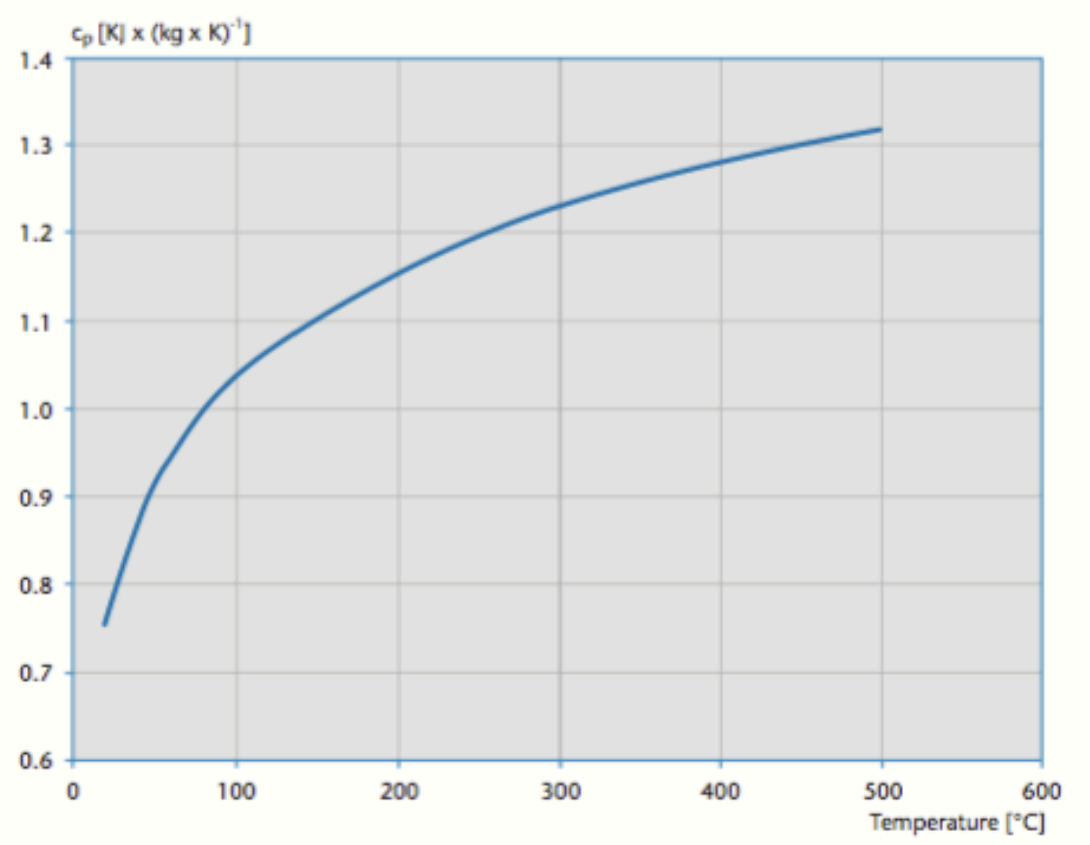
- Thermal Conductivity:



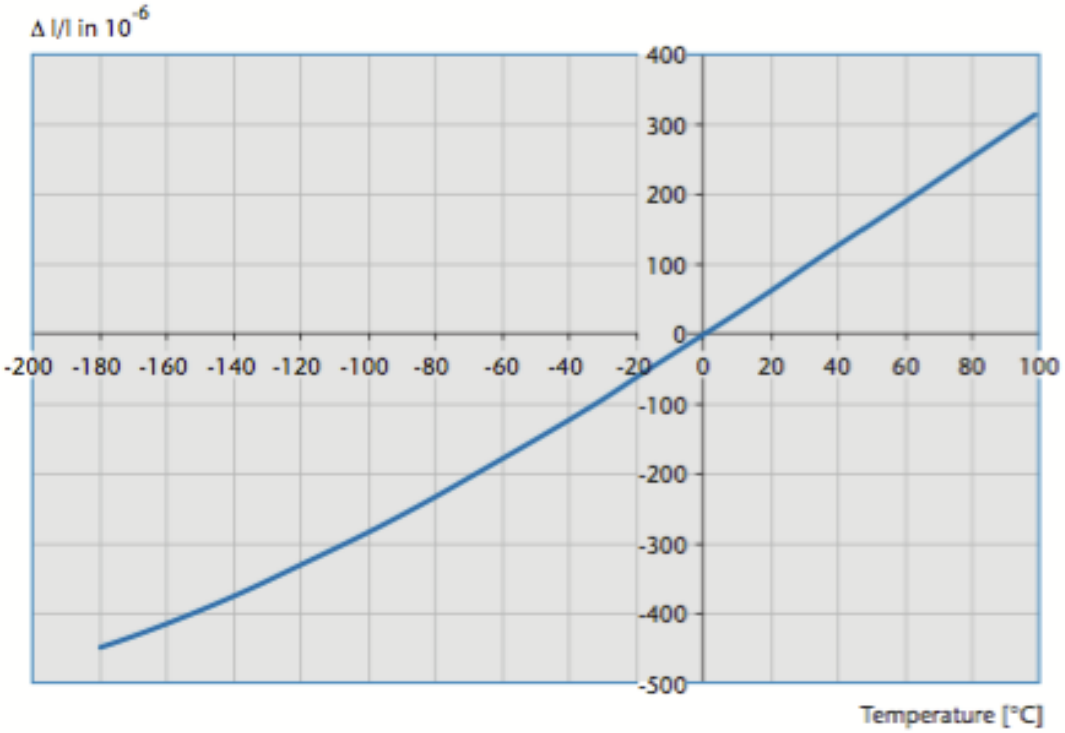
- Thermal Expansion:



- Specific Heat Capacity:



- Behavior in the Cyrogenic Temperature Range:

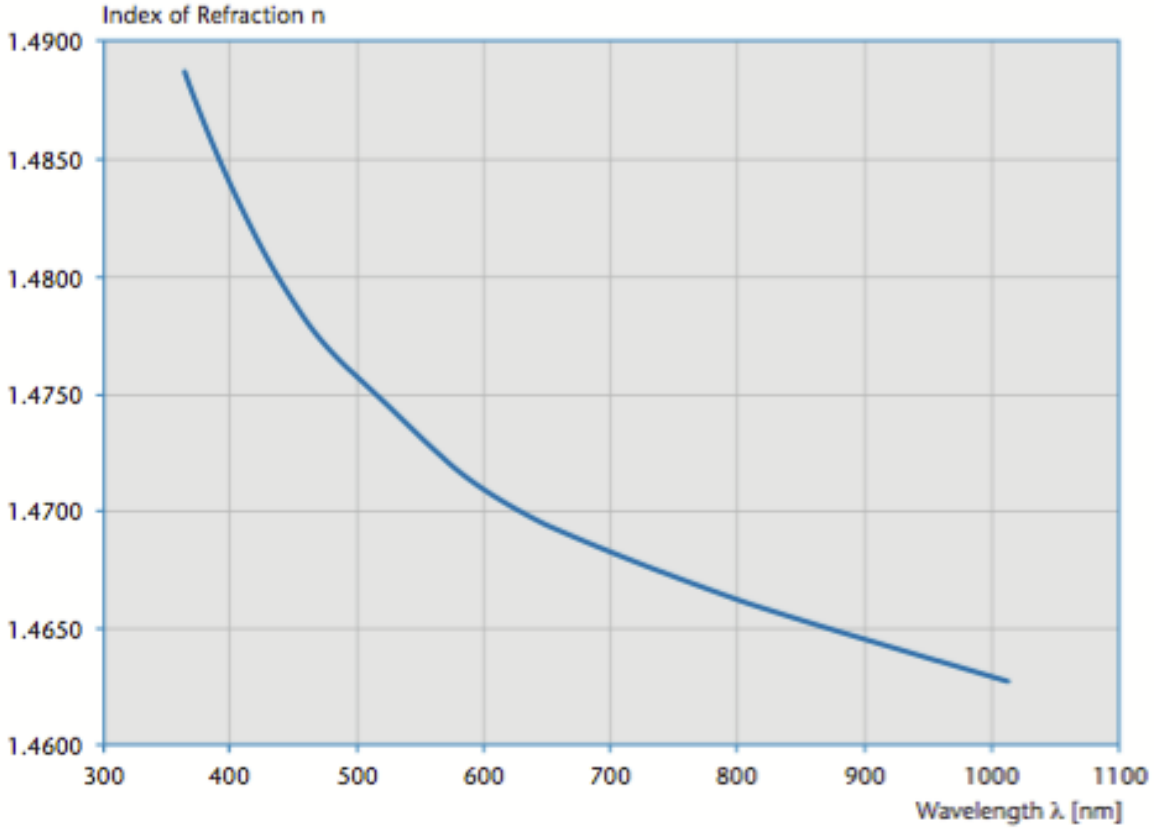


Optical Properties

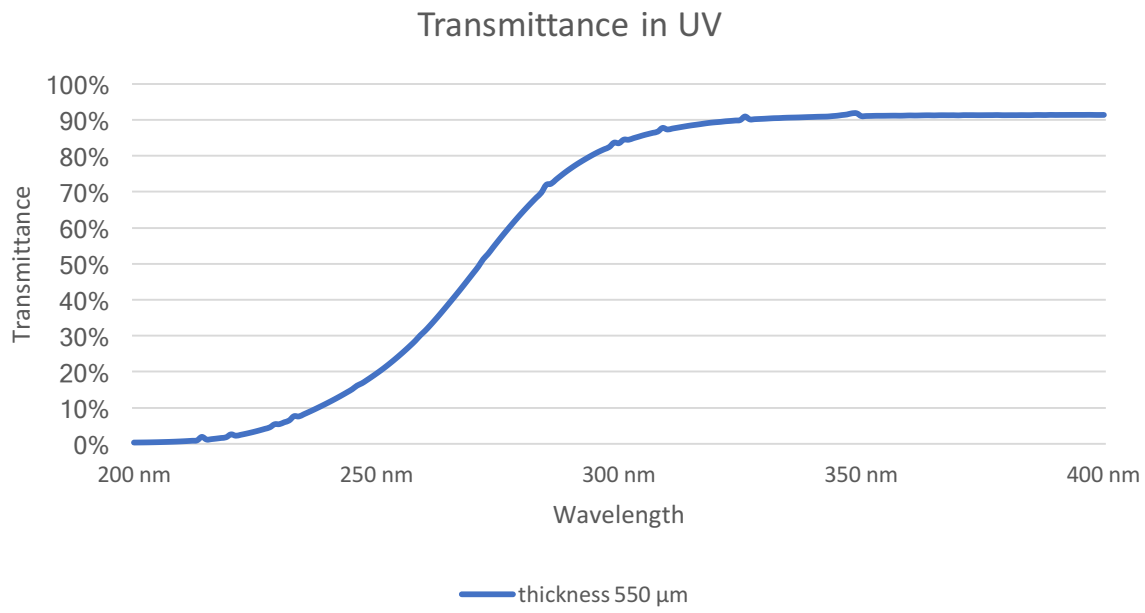
Wavelength [nm]	Refractive Index
435.8	1.48015
479.9	1.47676
546.1	1.47311
589.3	1.47133
643.8	1.46953
656.3	1.46916

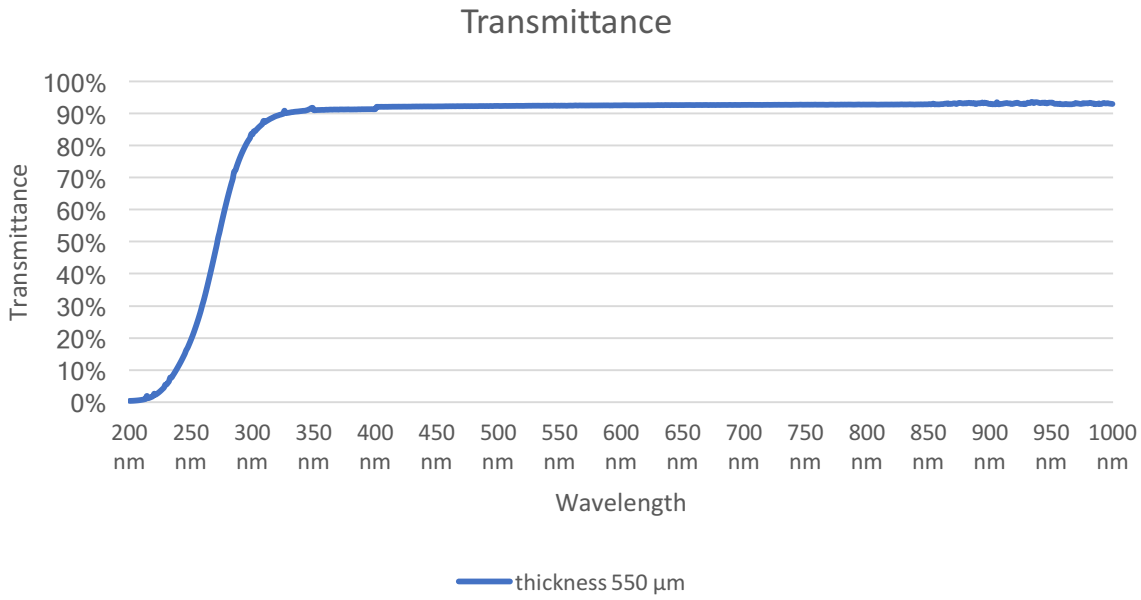
Abbe Constant	65.41
Dispersion	71.4 x10^{-4}
Birefringence Constant [mm^2/N]	400

- Dispersion of Borofloat 33, Index of Refraction vs. Wavelength:


Index of Refraction n
1.4900
1.4850
1.4800
1.4750
1.4700
1.4650
1.4600
300
400
500
600
700
800
900
1000
1100
Wavelength λ [nm]

Wavelength	Transmittance
200 nm	0.4 %
250 nm	19.6 %
300 nm	83.58 %
350 nm	91.1 %
400 nm	91.4 %
500 nm	92.5 %
750 nm	92.9 %
1000 nm	93.1 %

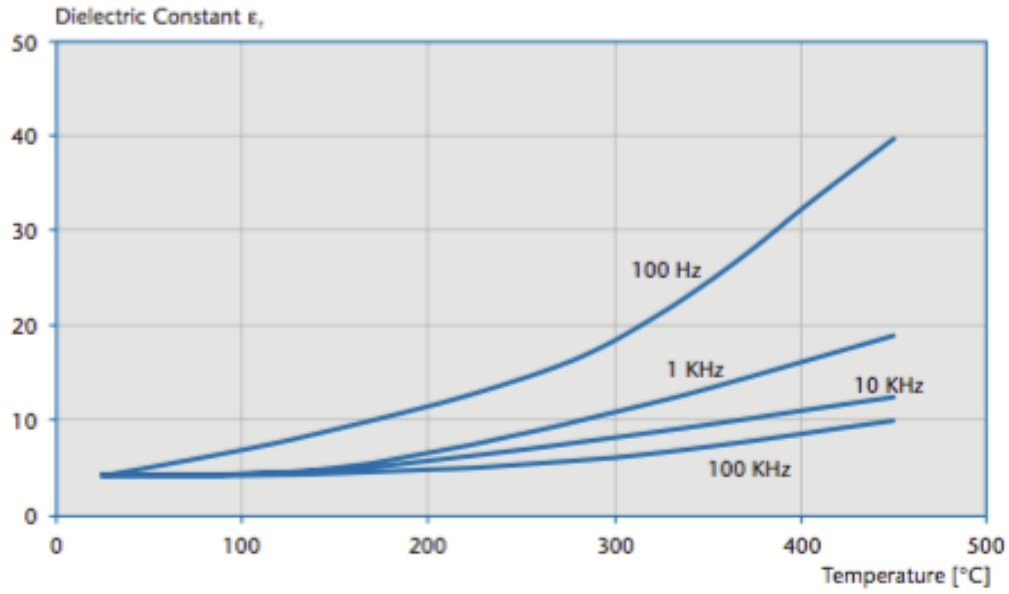




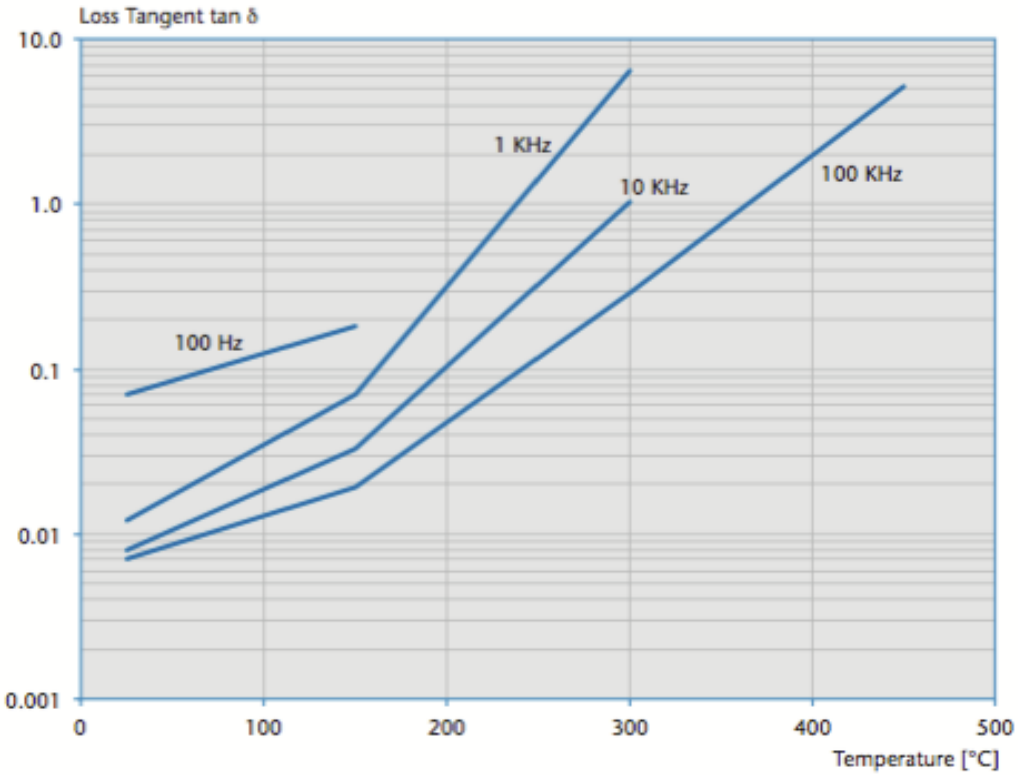
Electrical Properties

Dielectric Constat @ 25°C, 1 MHz	4.6
Loss Tangent @ 25°C, 1 MHz	0.0037
LOG10 Volumen Resistivity @ 250°C [Ω cm]	8.0
LOG10 Volumen Resistivity @ 230°C [Ω cm]	6.5

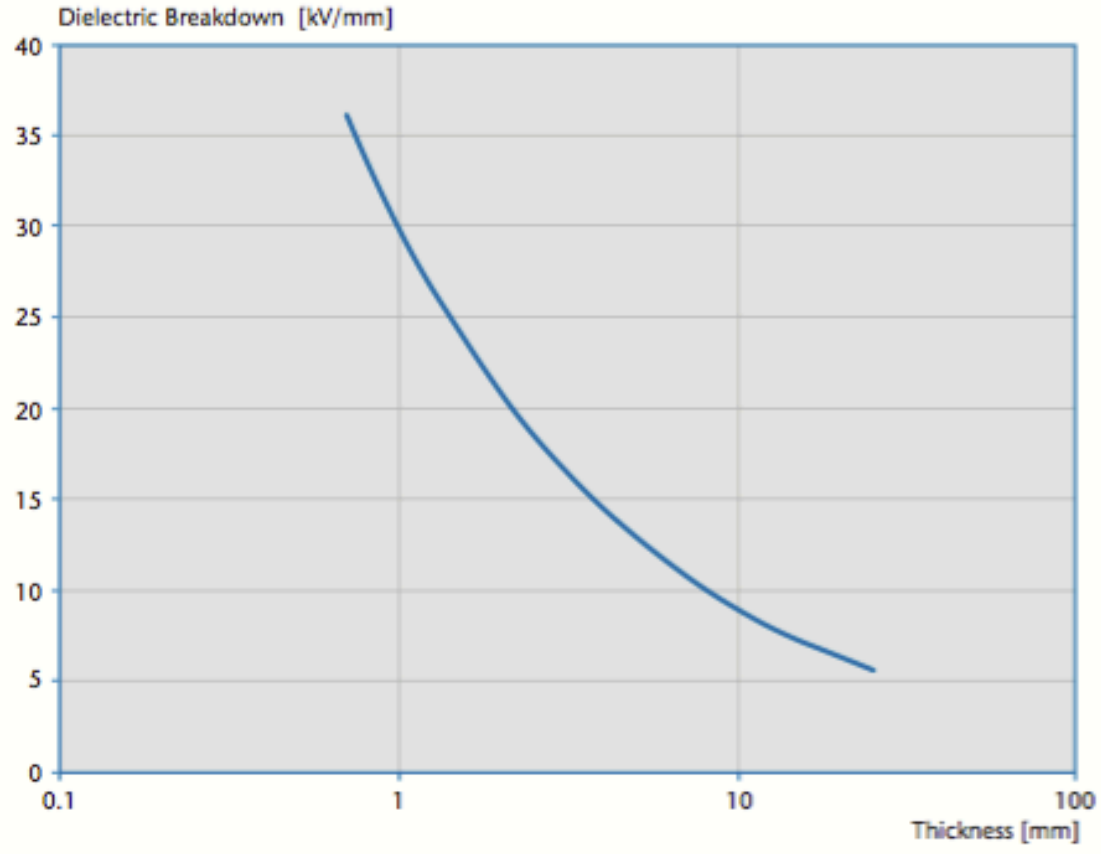
- Dielectric Constant as Function of Temperature:



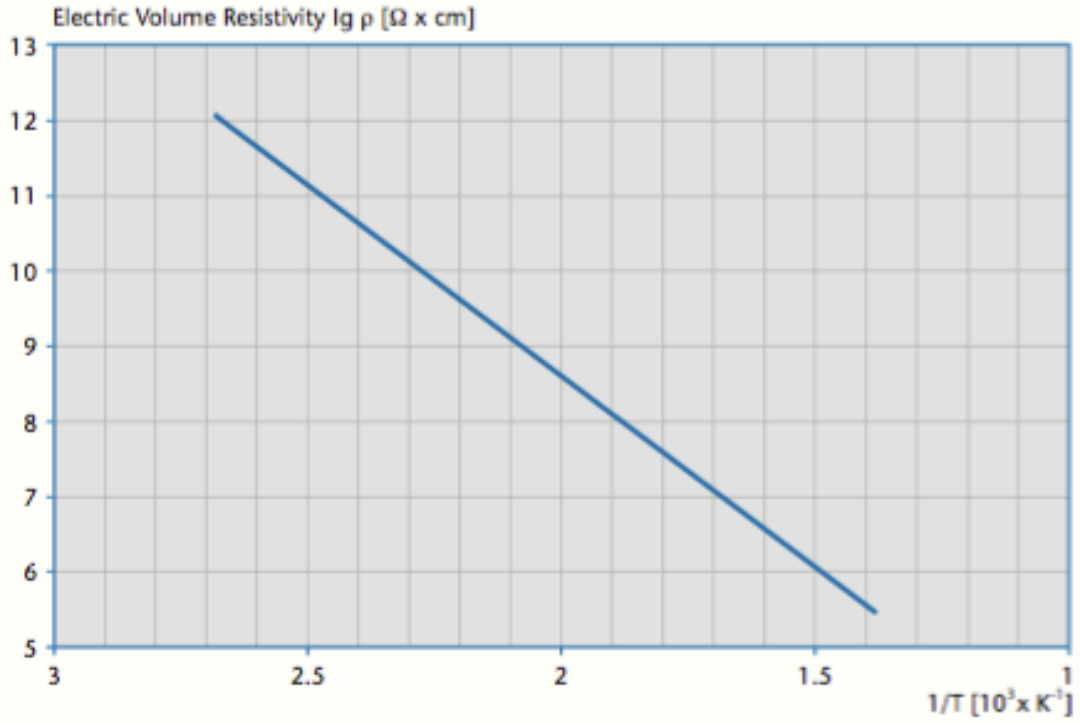
- Loss Tangent as a Function of Temperature:



- Dielectric Breakdown as a Function of Glass Thickness:



- Electric Volume Resistivity as a Function of Temperature



Disclaimer:
The above data has been taken from the original raw material specification of the raw material producer. Completeness and validity cannot be guaranteed.

CONTACT:

Wafer Universe
A brand of Plan Optik AG
Ueber der Bitz 3
56479 Elsoff
Germany

Phone: +49 2664 239 929 0

Mail: sales@waferuniverse.com
Web: www.waferuniverse.com