SD-2 Glass Substrate for Silicon Sensors

PRODUCT DESCRIPTION

HOYA's SD-2 substrate is designed with a coefficient of thermal expansion curve which closely matches Si single crystal.

THERMAL EXPANSION PROPERTIES

Borosilicate glass has been widely used as a bonding material to Silicon Wafer. CTE curves of Borosilicate glass and Silicon Single Crystal Wafer cross at about 240LC. When anodic bonding is performed at 400LC, the difference of the expansions at high temperature creates residual stress in the Si chip during cooling to room temperature. As precision of LSI circuit patterning moves to less than 0.25 microns, distortion between the silicon and glass wafers becomes a critical issue.

HOYA's SD-2 substrate is engineered to minimize the distortion or bowing effect caused by the thermal mismatch between the two wafers.

ANODIC BONDING

Silicon and glass wafers are generally put together by way of Anodic Bonding. This bonding is formed when positive (+) DC voltage is applied to the Si wafer and negative (-) is applied to the glass wafer while the wafers are pressed and heated. During the bonding process, a small amount of Na⁺ions, engineered into SD-2, move as electroconductive carriers to facilitate a very short bonding time.



Coefficient of Thermal Expansion Curve

APPLICATIONS

- Silicon Wafer Bonding
- Photolithography
- Pressure Sensors
- Displacement Sensors
- Semi Conductor



FEATURES

- Matching CTE to Si Wafer
- No Phase Separation
- Optimized for Anodic Bonding
- Reduced Fresnel Diffraction
- High Flatness Mask
- High Young's Modulus



PRODUCT SPECIFICATIONS

Thermal Properties		Unit	SD-2	Borosilicate	
 Coefficient of Thermal Expansion 		x10 ⁻⁷ /LC	32.0	32.5	
	 Transformation Point (Tg) 		°C	721	552
	 Sag Point (Ts) 		°C	787	
	Strain Point		°C	669	510
	Annealing Point		°C	720	560
►	Thermal Conductivity		Cal/secZcmZ°C	0.0026	0.0027
	Specific Heat		Cal/gZºC	0.176	0.180
Mechanical Properties		Unit	SD-2	Borosilicate	
	Specific Gravity			2.60	2.23
	Young's Modulus		kgf/mm ²	8860	6400
	Modulus of Rigidity		kgf/mm ²	3560	
	Poisson's Ratio			0.244	0.200
	Knoop Hardness		kgf/mm ²	638	418
Electrical Properties		Unit	SD-2	Borosilicate	
	Volume Resistivity	20LC	Ω Zcm	4.1x10 ¹⁴	1.4x10 ¹⁶
	(DC500V)	100LC	Ω Zcm	4.2x10 ¹¹	4.6x10 ¹¹
		200LC	Ω Zcm	3.8x10 ⁹	0.9x10 ⁹
	Dielectric Coefficient	20LC		6.0	4.8
	(1MHz)	100LC		7.0	4.9
		200LC		7.0	5.1
	Dielectric Loss	20LC		1.0x10 ⁻²	5.5x10 ⁻³
	(1MHz)	100LC		1.9x10 ⁻²	1.0x10 ⁻²
				4.9x10 ⁻²	2.9x10 ⁻²
Chemical Properties		Unit	SD-2	Borosilicate	
	Acid Durability		mg/cm ² (loss)	1.20	0.50
	(30% HNO3 80LC 50H)				
	Alkaline Durability		mg/cm ² (loss)	0.01	0.02
	(0.01N NaOH 50°C 15H)				
Optical Properties		Unit	SD-2	Borosilicate	
	Refractive Index (n _d)			1.531	1.474
	Abbe-Number (V _d)			59	

Specifications subject to change without notice. REV.11/02

