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

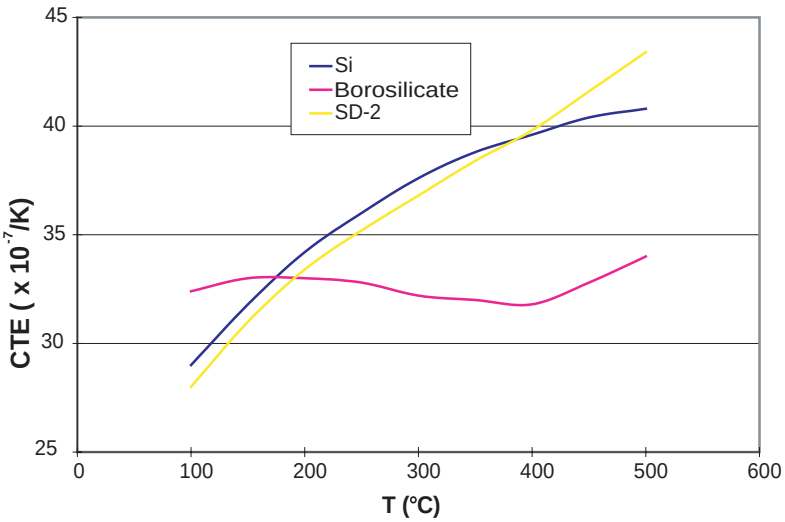
Borosilicate glass has been widely used as a bonding material to Silicon Wafer. CTE curves of Borosilicate glass and Silicon Single Crystal Wafer cross at about 240°C. When anodic bonding is performed at 400°C, the difference of the expansions at high temperature creates residual stress in the Si chip 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 mis-match between the two wafers.

ANODIC BONDING

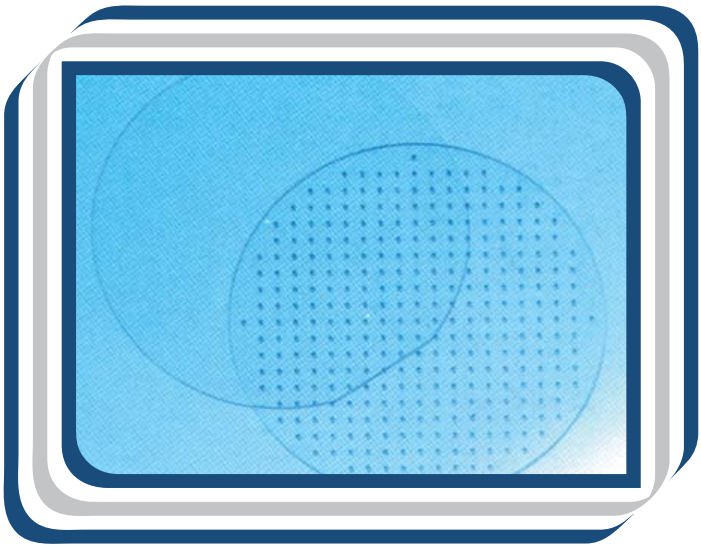
Silicon and glass wafers are generally put together by way of Anodic Bonding. This bonding is formed when positive (+) DC voltage is applied to the Si wafer and negative (-) is applied to the glass wafer while the wafers are pressed and heated. During the bonding process, a small amount of Na^+ ions, 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
- Semiconductor



FEATURES

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

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PRODUCT SPECIFICATIONS

Thermal Properties	Unit	SD-2	Borosilicate
▶ Coefficient of Thermal Expansion	$x10^{-7}$/ºC	32.0	32.5
▶ Transformation Point (Tg)	ºC	721	552
▶ Sag Point (Ts)	ºC	787	
▶ Strain Point	ºC	669	510
▶ Annealing Point	ºC	720	560
▶ Thermal Conductivity	Cal/sec·cm·ºC	0.0026	0.0027
▶ Specific Heat	Cal/g·ºC	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	20ºC	&!·cm	$4.1x10^{14}$	$1.4x10^{16}$
(DC500V)	100ºC	&!·cm	$4.2x10^{11}$	$4.6x10^{11}$
	200ºC	&!·cm	$3.8x10^{9}$	$0.9x10^{9}$
▶ Dielectric Coefficient	20ºC		6.0	4.8
(1MHz)	100ºC		7.0	4.9
	200ºC		7.0	5.1
▶ Dielectric Loss	20ºC		$1.0x10^{-2}$	$5.5x10^{-3}$
(1MHz)	100ºC		$1.9x10^{-2}$	$1.0x10^{-2}$
			$4.9x10^{-2}$	$2.9x10^{-2}$

Chemical Properties	Unit	SD-2	Borosilicate
▶ Acid Durability	mg/cm^2 (loss)	1.20	0.50
(30% HNO_3 80ºC 50H)			
▶ Alkaline Durability	mg/cm^2 (loss)	0.01	0.02
(0.01N NaOH 50ºC 15H)			

Optical Properties	Unit	SD-2	Borosilicate
▶ Refractive Index (n_d)		1.531	1.474
▶ Abbe-Number (ν_d)		59	

Specifications subject to change without notice.

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