

TDG HOLDING CO., LTD

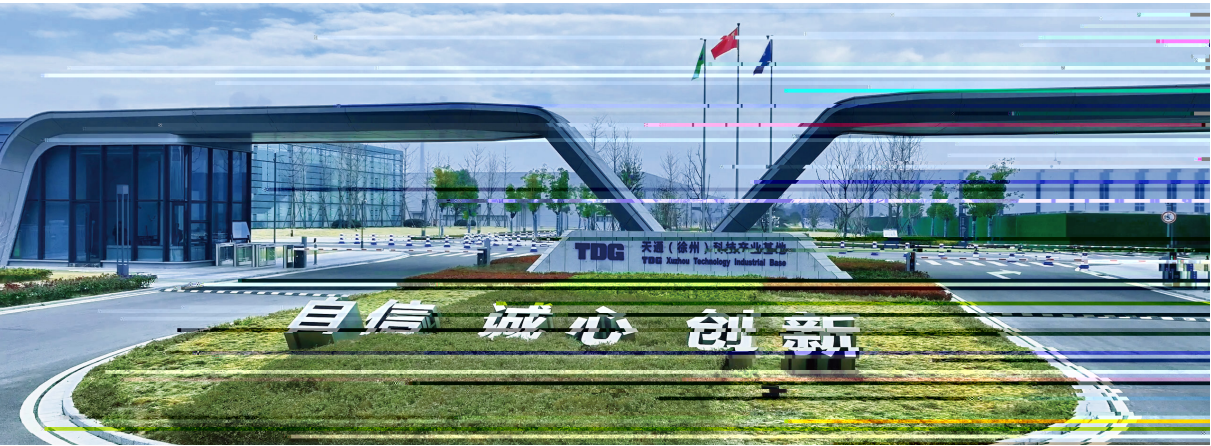
(600330) 1984 2001

TDG Holdings Co., Ltd. (stock code: 600330) was founded in 1984 and listed on the Shanghai Stock Exchange in 2001. It is the first listed company in China directly controlled by a natural person. After forty years of arduous entrepreneurship, TDG has multiple holding and participating companies, and has now formed four major business segments: electronic materials, electronic modules, green energy, and intelligent equipment. Its business covers the upstream and downstream of the electronic information materials industrial chain, and it is a high-tech enterprise integrating scientific research, manufacturing, and sales.

TDG KAIJU TECHNOLOGY CO., LTD

2021

TDG Kaiju Technology Co., Ltd. was established in 2021 and is a wholly-owned subsidiary of TDG Holding Co., Ltd. Our main products are piezoelectric crystal materials. We have gathered top international technical teams and developed a number of key core technologies to realize independent and controllable technology. By setting up a perfect quality management system, using advanced management methods and matching high-end testing equipment, the product quality has been highly recognized by domestic and foreign customers. TDG Kaiju always adheres to the market-oriented and customer-centered, relying on intelligent research and development design, digital operation management, refined cost control, automated manufacturing, and a professional, young and passionate management team, and continues to provide customers with better products and services. Guided by digital empowerment, innovation drive and green development, TDG Kaiju has built an international leading piezoelectric crystal material production base and continuously led the progress and development of the industry.



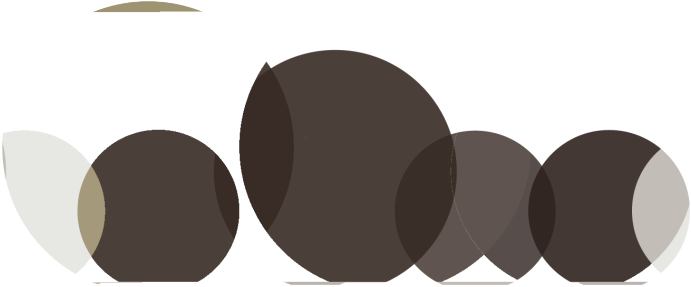
SAW Grade LiTaO₃ (LT) Wafer

SAW	BAW	LT
SAW	-	LT

Providing various LT wafers for SAW and BAW fabrications.
Key properties influencing the yield of SAW devices are examined.
And our patented product-low static black or gray LN wafers, are also available.

	42°rot. Y-cut±0.2°	X-cut±0.2°	42°rot. Y-cut±0.2°
	32±2mm, 47.5±2mm Perpendicular to X±0.2°	32±2mm, 47.5±2mm Perpendicular to 112.2°Y±0.2°	Notch
	10mm±2mm SOF:Cw270°±1° from OF	10mm±2mm SOF:Cw315°±1° from OF TOF:Cw270°±1° from OF	
	“+”side Ra≤10Å		
	GC#1000 lapped/etched, GC#2000 lapped/etched		
TTV	≤5um		
LTV	≤0.5um within an area of 5*5mm		
PLTV	≥95%(3mm from edge excluded		

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* The above index are for reference
* Other specifications are available on request



SAW Grade LiNbO₃ (LN) Wafer



- ▶ SAW BAW LN
- ▶ SAW
- ▶ - LN

- ▶ Providing various LN wafers for SAW and BAW fabrications.
- ▶ Key properties influencing the yield of SAW devices are examined.
- ▶ And our patented product-low static black or gray LN wafers, are also available.

	127.86°rot. Y-cut±0.2°	Y-cut±0.2°	127.86°rot. Y-cut±0.2°
	100.0±0.2mm	150.0±0.2mm	200.0±0.2mm
	32±2mm, 47.5±2mm Perpendicular to X±0.2°	32±2mm, 47.5±2mm Perpendicular to X±0.2°	Notch
	10mm±2mm SOF:Cw225°±1° from OF	10mm±2mm SOF:Cw270°±1° from OF TOF:Cw225°±1° from OF	
	500±20um, 350±20um, 200~250±20um		500±20um
	"+"side Ra≤10Å		
	GC#1000 lapped/ etched, GC#2000 lapped/ etched		
TTV	≤5um		
LTV	≤0.5um within an area of 5*5mm		
PLTV	≥95%(3mm from edge excluded)		
	-25um≤Bow≤+25um		
	1142 ±3 (DTA method)		
	Edge grinding		

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Black-LT/Black-LN



- ▶ LT LN
- ▶ LT LN LT LN
- ▶
- ▶ (1.0E+10~9.0E+11 Ω*cm)

- ▶ High ability of electrical charge neutralization. Black-LT and Black-LN wafers shall neutralize the instantaneous electrical charge.
- ▶ Black-LT and Black-LN shall have no difference at piezoelectric properties from usual LT and LN wafers.
- ▶ High uniformity of Bulk resistivity throughout the surface and depth of wafers.
- ▶ Bulk resistivity shall be voluntarily controllable at each level (1.0E+10~9.0E+11 Ω*cm).

	0.9E+11~9.9E+11	1.0E+11~9.9E+10
	1.11E-11~1.11E-12	1.0E-10~1.11E-11

	1.0E+10~9.9E+10
	1.00E-10~1.00E-11

36° Y-cut 38.7° Y-cut 42° Y-cut 48° Y-cut X-112° Y-cut	100.0(mm) 150.0(mm) 200.0(mm)	0.20(mm) 0.25(mm) 0.35(mm) 0.50(mm)	Mirror Polished	GC#1000 GC#2000

Y-Zcut 41° Y-cut 64° Y-cut 127.86° Y-cut	100.0(mm) 150.0(mm) 200.0(mm)	0.20(mm) 0.25(mm) 0.35(mm) 0.50(mm)	Mirror Polished	GC#1000 GC#2000

			3	
Lattice Constant(nm)		a=0.515428, c=1.378351	Moh's Hardness	5.5
Point Group	High Temperature Phase	-3m	SAW Speed(m/s)	See Cha r 2
	Low Temperature Phase	3m		
Cleavage Plane		(01T2)	Electromechanical Coupling Factor(K ² /%)	See Cha r 2
Melting Point		1650	Temperature Coe f cient10 ⁻⁶ /	See Cha r 2
Pyroelectric Coe f cient		23×10 ⁻⁵ C/(k·m2)	Relative Dielectric Constant	ε ₁₁ =53.6, ε ₃₃ =43.4
Curie Temperature		603	Insoluble in acid except HF and HNO ₃	
Optical Transparency Range		350~5000 nm	Speci f c Heat Cal/K·cm ³	0.79
Refractive Index		= 2.180 n _e =2.176 @632.8nm		
Electro-optic Coe f cient		r ₁₃ =8.4pm/v, r ₃₃ =30.5pm/V		
Nonlinear Optical Coe f cient		₃₃ =15.1pm/v@852nm	Piezoelectric Constant 10 ⁻¹¹ C/N	₁₅ =2.67, d ₃₃ =0.57
Coe f cient of Thermal Expansion (10 ⁻⁶ / (°25 °))		α ₁₁ =16.1, α ₃₃ =4.1	Heat Conductivity(w/cm·k)	0.05

SAW Propagation Direction	112.2°Y-Direction	X-Direction	X-Direction
Electromechanical Coupling Coe f ficient K ² (%)	0.75	7.6	5
Temperature Coe f ficient of Delay Time T ₀ t(ppm/ °C)	-18	-40	-36
SAW Speed V _s (m/s)	3296	4022	4178

LN C r stal Features



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			3	
Lattice Constant(nm)		a=0.514829, c=1.38631	Moh's Hardness	5
Point Group	High Temperature Phase	-3m	SAW Speed(m/s)	See Cha r 2
	Low Temperature Phase	3m		
Cleavage Plane		(01T2)	Electromechanical Coupling Factor(K²/%)	See Cha r 2
Melting Point		1260	Temperature Coe f cient10 ⁻⁶ /	See Cha r 2
Pyroelectric Coe f cient		-4×10 ⁻⁵ C/(k·m2)	Relative Dielectric Constant	ε ₁₁ =85.2, ε ₃₃ =28.7
Curie Temperature		1142	Insoluble in acid except HF and HNO ₃	
Optical Transparency Range		400~5000 nm	Specif c Heat Cal/K·cm³	0.76
Refractive Index		= 2.286 n _e =2.202 @632.8nm		
Electro-optic Coe f cient		r ₁₃ =9.6pm/v, r ₃₃ =30.9pm/V		
Nonlinear Optical Coe f cient		₃₃ =33pm/v@852nm	Piezoelectric Constant 10 ⁻¹¹ C/N	₁₅ =6.8, d ₃₃ =0.6
Coe f cient of Thermal Expansion (10 ⁻⁶ / (@25 °C))		α ₁₁ =15.4, α ₃₃ =7.5	Heat Conductivity(w/cm·k)	0.029

SAW Speed V _s (m/s)	Rotate128°Y-X	3950/3990	Y-Z	3470/3510
SAW Electromechanical Coupling Coe f cient K ² (%)	Rotate128°Y-X	5.4 6.0	Y-Z	4.1 4.6
Temperature Coe f cient of SAW Delay Time T ₀ t(ppm/ °C)	Rotate128°Y-X	73 78	Y-Z	91 97
Temperature Coe f cient of SAW Speed T ₀ V(ppm/ °C)	Rotate128°Y-X	-57 -61	Y-Z	-84 -90

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