

Standard specifications of 2 inch / 100 mm Sn-doped β -Ga₂O₃ (001) substrates

Items		Specifications	
Orientation		(001)	
Dopant		Sn	
Conductivity		n-type	
Resistivity ($\Omega \cdot \text{cm}$)		0.007–0.042	
Dimensions	Size	2 inch	100 mm
	Diameter (mm)	50.8 ± 0.3	100 ± 0.5
	Orientation flat width (mm)	15.9 ± 2.5	32.5 ± 2.5
	Index flat width (mm)	8.0 ± 2.5	18.0 ± 2.5
	Thickness (μm)	650 ± 20	
	Reference	Fig. 1	
Offset angle (degree)		[010]: 0 ± 1	
		[100]: 0 ± 1	
XRD FWHM (arcsec)		[010]: ≤ 50	
		[100]: ≤ 50	
Surface	Front	CMP	
	Back	CMP	

Remarks

- Chipping may occur within the following limits:
2 inch: $< 8 \text{ mm}$ (opposite OF), $< 15.9 \pm 2.5 \text{ mm}$ (OF side); 100 mm: $< 18 \text{ mm}$ (opposite OF), $< 32.5 \pm 2.5 \text{ mm}$ (OF side).
- These products must be used for research and development purposes only.
- The substrates must not be used as a seed crystal.
- The specifications are subject to change without notice.

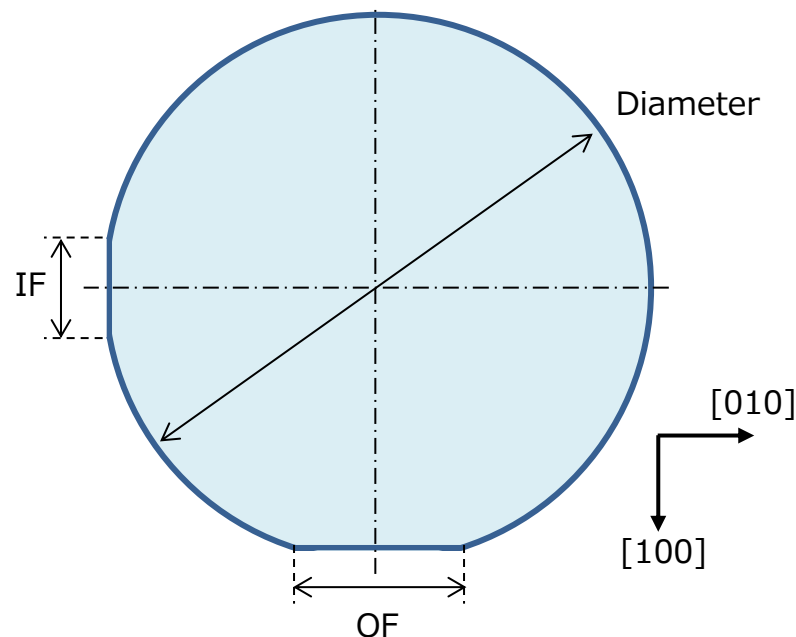


Fig. 1



Specifications of 150 mm Sn-doped β -Ga₂O₃ (001) substrate

Items		Specifications
Orientation		(001)
Dopant		Sn
Conductivity		n-type
Resistivity ($\Omega \cdot \text{cm}$)		0.007–0.042
Dimensions	Diameter (mm)	150 ± 0.5
	Orientation flat width (mm)	57.5 ± 2.5
	Index flat width (mm)	32.5 ± 2.5
	Thickness (μm)	670 ± 20
	Reference	Fig. 2
Offset angle (degree)		[010] : 0 ± 1
		[100] : 0 ± 1
XRD FWHM (arcsec)		[010] : ≤ 50
		[100] : ≤ 50
Surface	Front	CMP
	Back	CMP

Remarks

1 Chipping may be up to <32.5 mm on the opposite side of the OF, and $<57.5 \pm 2.5$ mm on the OF side.

2 These products must be used for research and development purposes only.

3 The substrates must not be used as a seed crystal.

4 The specifications are subject to change without notice.

Tentative

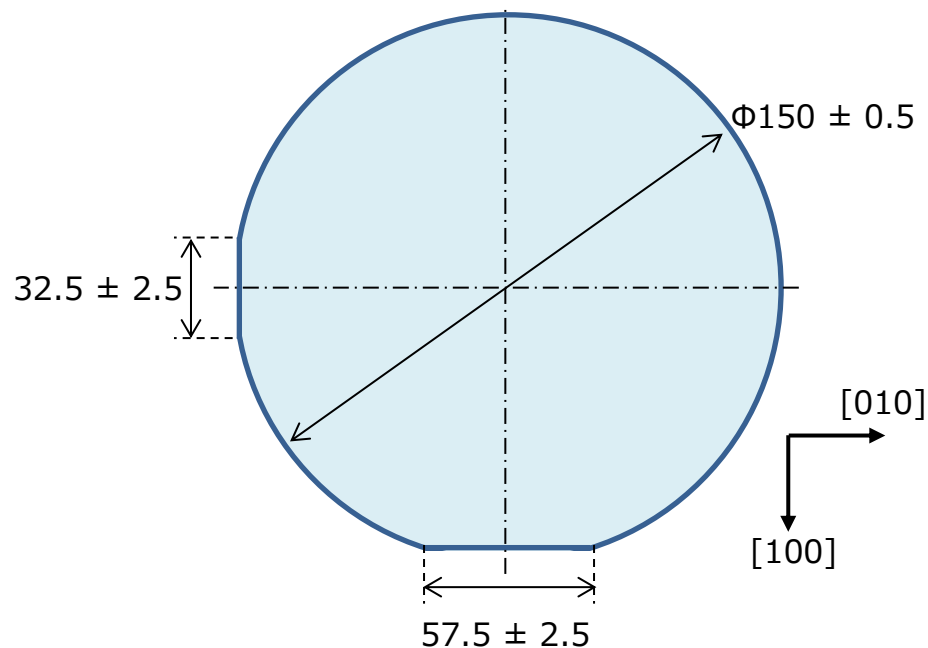


Fig. 2



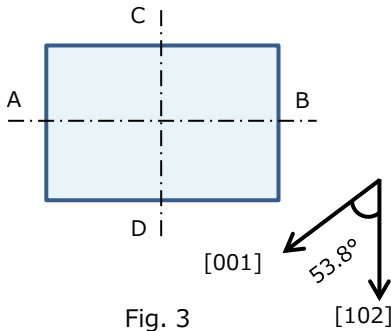
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Standard specifications of 10 × 15 mm² β-Ga₂O₃ (010) substrates

Items		Specifications		
Orientation		(010)		
Dopant		Sn	Undoped	Fe
Conductivity		n-type	n-type	Insulating (> 10 ¹⁰ Ω · cm)
N _d -N _a (cm ⁻³)		1×10 ¹⁸ –9×10 ¹⁸	≤ 9×10 ¹⁷	-
Dimensions	A-B (mm)	15 ± 0.3	15 ± 0.3	15 ± 0.3
	C-D (mm)	10 ± 0.3	10 ± 0.3	10 ± 0.3
	Thickness (μm)	500 ± 20	500 ± 20	500 ± 20
	Reference	Fig. 3	Fig. 3	Fig. 3
Offset angle (degree)		⊥[102]: 0 ± 1	⊥[102]: 0 ± 1	⊥[102]: 0 ± 1
		[102]: 0 ± 1	[102]: 0 ± 1	[102]: 0 ± 1
XRD FWHM (arcsec)		⊥[102]: ≤ 150	⊥[102]: ≤ 150	⊥[102]: ≤ 150
		[102]: ≤ 150	[102]: ≤ 150	[102]: ≤ 150
Surface	Front	CMP	CMP	CMP
	Back	Grinding	Grinding	Grinding

- Remarks
- 1 These products must be used for research and development purposes only.
 - 2 The substrates must not be used as a seed crystal.
 - 3 The specifications are subject to change without notice.



Specifications of 2 inch VB Fe-doped β -Ga₂O₃ (010) substrate

Items		Specifications
Orientation		(010)
Dopant		Fe
Conductivity		Insulating ($> 10^{10} \Omega \cdot \text{cm}$)
Dimensions	Diameter (mm)	50.8 ± 0.5
	Orientation flat width (mm)	Unspecified (aiming at 10–20)
	Thickness (μm)	500 ± 50
	Reference	Fig. 4
Offset angle (degree)		[001]: 0 ± 1
		$\perp[001]$: 0 ± 1
XRD FWHM (arcsec)		[001]: ≤ 150
		$\perp[001]$: ≤ 150
Surface	Front	CMP
	Back	Lapping

Remarks

- 1 Minor chipping (approx. 5–10 mm wide) may occur on the opposite side of the OF.
- 2 These products must be used for research and development purposes only.
- 3 The substrates must not be used as a seed crystal.
- 4 The specifications are subject to change without notice.

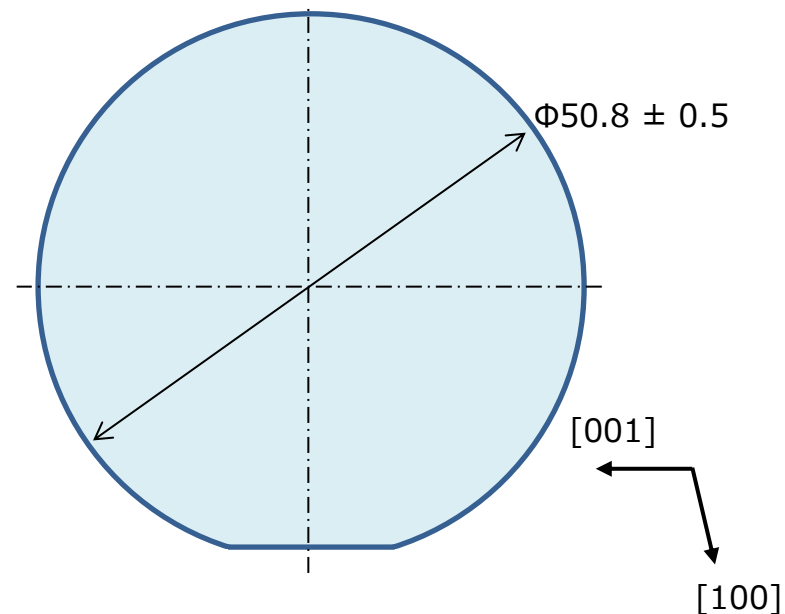


Fig. 4

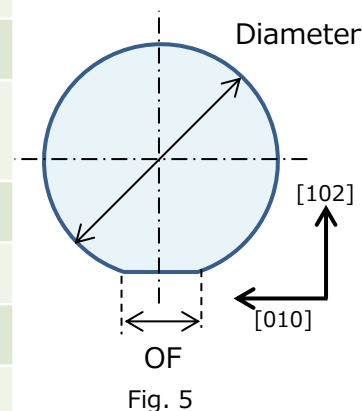


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Standard specifications of 2 inch β -Ga₂O₃ (-201) substrates

Items		Specifications		
Orientation		(-201)		
Dopant		Sn	Undoped	Fe
Conductivity		n-type	n-type	Insulating ($> 10^{10}\Omega \cdot \text{cm}$)
$N_d - N_a$ (cm ⁻³)		$1 \times 10^{18} - 2 \times 10^{19}$	$\leq 9 \times 10^{17}$	-
Dimensions	Diameter (mm)	50.8 ± 0.3	50.8 ± 0.3	50.8 ± 0.3
	Orientation flat width (mm)	15.9 ± 2.5	15.9 ± 2.5	15.9 ± 2.5
	Thickness (μm)	680 ± 20	680 ± 20	680 ± 20
	Reference	Fig. 5	Fig. 5	Fig. 5
Offset angle (degree)		[010]: 0 ± 0.4	[010]: 0 ± 0.4	[010]: 0 ± 1
		[102]: -0.7 ± 0.4	[102]: -0.7 ± 0.4	[102]: -0.7 ± 1
XRD FWHM (arcsec)		[010]: ≤ 150	[010]: ≤ 150	[010]: ≤ 150
		[102]: ≤ 150	[102]: ≤ 150	[102]: ≤ 150
Surface	Front	CMP	CMP	CMP
	Back	Grinding	Grinding	Grinding



Remarks

- 1 There are cases in which the opposite side of OF is chipped less than 8 mm.
- 2 There are cases in which the OF side is chipped less than 15.9 ± 2.5 mm.
- 3 These products must be used for research and development purposes only.
- 4 The substrates must not be used as a seed crystal.
- 5 The specifications are subject to change without notice.

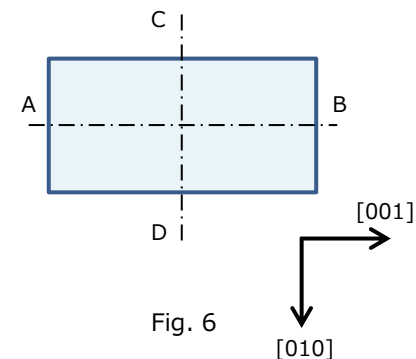


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Standard specifications of β -Ga₂O₃ (100) substrates

Items		Specifications
Orientation		(100)
Dopant		Sn, Undoped, Fe
Dimensions	A-B (mm)	-(Typical: 20–23)
	C-D (mm)	-(Typical: 10)
	Thickness (μm)	-(Typical: 200–1000)
	Reference	Fig. 6
Surface	Front	Cleavage
	Back	Cleavage



Remarks

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- 3 The specifications are subject to change without notice.



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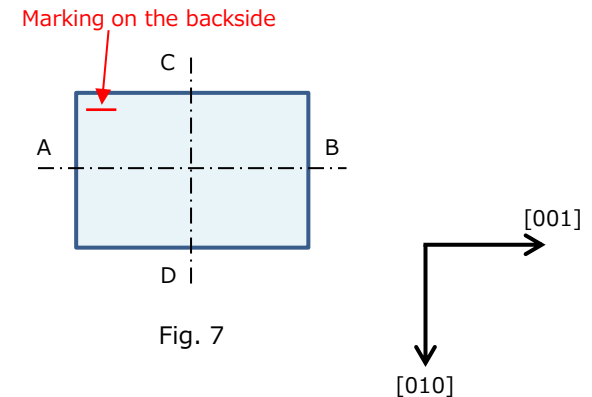
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Standard specifications of 10×15 mm² β-Ga₂O₃ (100) substrates with miscut angle

Items		Specifications	
Orientation		(100)	
Dopant		Sn	Fe
Conductivity		n-type	Insulating ($>10^{10}\Omega \cdot \text{cm}$)
N_d-N_a (cm ⁻³)		$1 \times 10^{18} - 2 \times 10^{19}$	-
Dimensions	A-B (mm)	15 ± 0.3	15 ± 0.3
	C-D (mm)	10 ± 0.3	10 ± 0.3
	Thickness (μm)	500 ± 20	500 ± 20
	Reference	Fig. 7	Fig. 7
Offset angle (degree)		[010]: 0 ± 1	[010]: 0 ± 1
		[00-1]: 6 ± 1 or [00-1]: 4 ± 1	[00-1]: 6 ± 1 or [00-1]: 4 ± 1
XRD FWHM (arcsec)		[010]: ≤ 150	[010]: ≤ 150
		[001]: ≤ 150	[001]: ≤ 150
Surface	Front	CMP	CMP
	Back	Grinding	Grinding

Remarks

- 1 These products must be used for research and development purposes only.
- 2 The substrates must not be used as a seed crystal.
- 3 The specifications are subject to change without notice.



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Standard specifications of 10×15 mm² β-Ga₂O₃ (011) substrates

Items		Specifications	
Orientation		(011)	
Dopant		Sn	Fe
Conductivity		n-type	Insulating ($>10^{10}\Omega \cdot \text{cm}$)
N_d-N_a (cm ⁻³)		$2 \times 10^{18} - 2 \times 10^{19}$	-
Dimensions	A-B (mm)	15 ± 0.3	15 ± 0.3
	C-D (mm)	10 ± 0.3	10 ± 0.3
	Thickness (μm)	500 ± 20	500 ± 20
	Reference	Fig. 8	Fig. 8
Offset angle (degree)		[100]: 0 ± 1	[100]: 0 ± 1
		$\perp[100]$: 0 ± 1	$\perp[100]$: 0 ± 1
XRD FWHM (arcsec)		[100]: ≤ 150	[100]: ≤ 150
		$\perp[100]$: ≤ 150	$\perp[100]$: ≤ 150
Surface	Front	CMP	CMP
	Back	Grinding	Grinding

Remarks

- 1 These products must be used for research and development purposes only.
- 2 The substrates must not be used as a seed crystal.
- 3 The specifications are subject to change without notice.

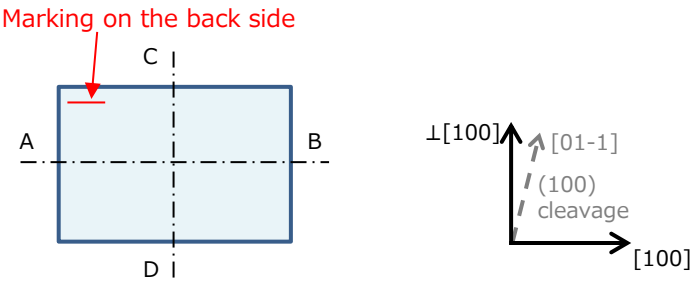


Fig. 8

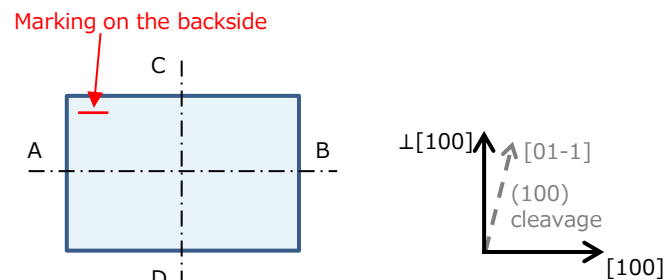


Standard specifications of 10×15 mm² β-Ga₂O₃ (011) substrates with miscut angle

Items		Specifications
Orientation		(011)
Dopant		Sn
Conductivity		n-type
$N_d - N_a$ (cm ⁻³)		$2 \times 10^{18} - 2 \times 10^{19}$
Dimensions	A-B (mm)	15 ± 0.3
	C-D (mm)	10 ± 0.3
	Thickness (μm)	500 ± 20
	Reference	Fig. 9
Offset angle (degree)		[01-1]: For 3 ± 1
		[100]: 0.63 ± 1
		[01-1]: For 6 ± 1
		[100]: 1.26 ± 1
		$\perp[100]$: 2.93 ± 1
		$\perp[100]$: 5.87 ± 1
XRD FWHM (arcsec)		[100]: ≤ 150
		$\perp[100]$: ≤ 150
Surface	Front	CMP
	Back	Grinding

Remarks

- 1 These products must be used for research and development purposes only.
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Standard specifications of 10×15 mm² β-Ga₂O₃ (110) substrate

Items		Specifications
Orientation		(110)
Dopant		Sn
Conductivity		n-type
N_d-N_a (cm ⁻³)		$2 \times 10^{18} - 2 \times 10^{19}$
Dimensions	A-B (mm)	15 ± 0.3
	C-D (mm)	10 ± 0.3
	Thickness (μm)	500 ± 20
	Reference	Fig. 10
Offset angle (degree)		[100]: 0 ± 1
		⊥[100]: 0 ± 1
XRD FWHM (arcsec)		[100]: ≤ 150
		⊥[100]: ≤ 150
Surface	Front	CMP
	Back	Grinding

Remarks

- 1 These products must be used for research and development purposes only.
- 2 The substrates must not be used as a seed crystal.
- 3 The specifications are subject to change without notice.

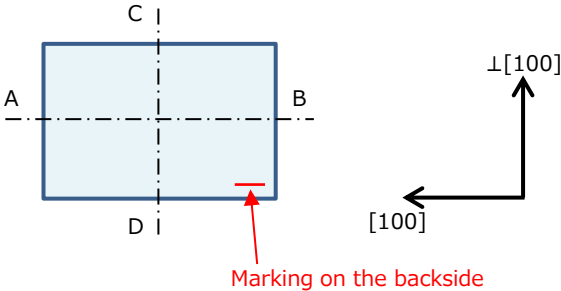


Fig. 10

