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Sanan Product Brochure SiC and GaN Material

GaN on Silicon EPI wafer

Company Profile

Sanan Semiconductor Co., Ltd (Sanan Semiconductor), as a wholly-owned subsidiary of the listed company Sanan Optoelectronics (600703CH), is a manufacturer focusing on the power electronics field, providing power semiconductor materials and foundry services.

We are the technology commercialization leader with the capacity and scale to bring large diameter wafers and high-quality epitaxy to the market in mass production volumes.

Sanan Semiconductor has long-proven expertise in SiC and GaN materials technology advancement. We have achieved stable supply to over 20 domestic and international customers. Our current production capacity includes 360,000 6-inch wafers and 520,000 8-inch wafers annually, with a long-term planned capacity of 1 million wafers per year. Our products primarily serve the manufacturing of SiC MOSFETs, with end applications spanning automotive, photovoltaic and energy storage systems (PV & ESS), charging infrastructure, power supplies, and home appliances.

Polytype	Single-Crystal 4H	
Supported diameters	150 mm & 200 mm	
Crystal structure	Hexagonal	
Bandgap	3.26 eV	
Thermal conductivity (n-type; 0.020 Ω·cm)	a~4.2 W/cm · K @ 298 K	c~3.7 W/cm · K @ 298 K
Lattice parameters	a=3.073 Å	c=10.053 Å
Mohs hardness	9	

n-TYPE SiC Substrate	High Purity Semi-insulating SiC Substrate	SiC Optical Substrate
SiC Heatsink Substrate	SiC EPITAXY n-type and p-type Epitaxial Layers	NITRIDE EPITAXY GaN, AlGaIn, AlInN Epitaxial Layers

DIMENSIONAL PROPERTIES, TERMINOLOGY AND METHODS*

DIMENSIONAL

The linear dimension across the surface of a wafer. Measurement is performed using an automated optical micrometer, providing the average value for each individual wafer.

THICKNESS,CENTER POINT

Measured with non-contact tools at the center of each individual wafer.

SURFACE ORIENTATION

Denotes the orientation of the surface of a wafer with respect to a crystallographic plane within the lattice structure. In wafers cut intentionally “off orientation,” the direction of cut is parallel to the primary flat or notch, away from the secondary flat (if present). Measured with x-ray goniometer on a sample of one wafer per boule in the center of the wafer.

ORTHOGONAL MISORIENTATION

In wafers intentionally cut “off orientation,” the angle between the projection of the surface normal onto a (0001) plane and the nearest <11-20> direction.

SUBSTRATE	EPITAXY
6” N-Type	6” N-Type
8” N-Type	8” N-Type
8” Optical	

FLATLENGTH

Linear dimension of the flat measured with automated optical micrometer on a sample of one wafer Per boule (see Figure 1).

PRIMARY FLAT

The flat of the longest length on the wafer, oriented such that the chord is parallel with a specified Low-index crystal plane.

PRIMARY FLAT ORIENTATION

The primary flat is the (1-100) plane with the flat face parallel to the <11-20> direction. Measured with XRD back reflection technique.

NOTCH

The notch position is parallel to the <11-20> direction, with the notch bisector is in the (1-100) plane (see Figure 2).

MARKING*

For silicon face polished material, the carbon face of each individual wafer is laser-marked with OCR compatible font, similar to definitions and characteristics in SEMI M12. The laser markings are positioned upright when the major flat or notch is oriented up, making the scribe easier to read when the wafers are loaded into cassettes. This format includes a wafer supplier identification code, validating the wafer’s authenticity. It also includes a checksum, which is an error-detection method that prevents OCR mis-read errors and reduces the instance of processing errors associated with such events.

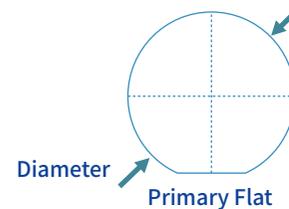


Figure1. Diameter, primary flat location and marking orientation, carbonface up for silicon face polished 150mm n-type wafers

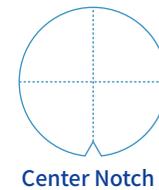


Figure2. Notch location and marking orientation, carbonface up for 200mm 200mm n-type wafers

Note: * SEMI M12 coding rule is only for 200 mm wafer.

6 inch D-mode GaN on Silicon EPI wafer

Semiconductor	Substrate	Diameter
GaN	Si	150 mm

6 inch GaN on Si <111> EPI Wafer		
Information	Sub. Type	Si <111>
	Epi structure	In suit SiNx cap D-mode
	Applicable Scope	6 inch GaN on Si Epi Product
	Package/Storage	Shipping box package

Table 1. 6 inch GaN Epitaxy Specifications		
Parameter	D-Mode HEMT	
Substrate	Orientation	Si <111>
	Conductivity Type	P
	Dopant	Boron
	Thickness	1000 ± 25µm
	Location Type	Flat 57.5 ± 2.5 mm (or notch)
PL Thickness	Range	> 5 µm
	Tolerance	± 0.1 µm
	Uniformity	≤ 2 %
Roughness (Rq)		< 1.0 nm (5 µm X 5 µm)

Table 2. 6 inch GaN Epitaxy Characteristics			
Parameter	Specification	Method	Definition and Detail
Surface Particles	Total count< 100ea	Laser imaging	> 0.3 µm (E.E. 5 mm)
Edge Epi layer crack length	< 3.0 mm	Accent light	NA
Bow	< 50 µm	Distance of reflection Laser	NA
Crystalline Quality	< 450 arcsec	XRD (002)	FWHM
	< 850 arcsec	XRD (102)	FWHM
SiN thickness	< 3 nm	XRR	NA

Table 3. 6 inch GaN Epitaxy Electrical Characteristics			
Parameter	Specification	Method	Definition and Detail
2DEG Sheet Resistance	< 500 Ω/□	Hall	NA
2DEG Density	> 8E12 cm ⁻²	Hall	NA
2DEG Mobility	>1800 cm ² /Vs	Hall	NA
Vertical Buffer Leakage	< 1 µA/mm ²	I-V	@700V, R.T.

Important Notice

The information in this document contains general purpose specifications; customer-specific requirements can be considered on a case-by-case basis.

The information in this document is subject to change without notice.

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6 inch E-mode GaN on Silicon EPI wafer

Semiconductor	Substrate	Diameter
GaN	Si	150 mm

6 inch GaN on Si <111> EPI Wafer		
Information	Sub. Type	Si <111>
	Epi structure	E-mode
	Applicable Scope	6 inch GaN on Si Epitaxy Product
	Package/Storage	Shipping box package

Table 1. 6 inch GaN Epitaxy Specifications		
Parameter	E-Mode HEMT	
Substrate	Orientation	Si <111>
	Conductivity Type	P
	Dopant	Boron
	Thickness	1000 ± 25 μm
	Location Type	Flat 57.5 ± 2.5 mm (or notch)
Total Thickness	Range	> 5 μm
	Tolerance	± 0.1 μm
	Uniformity	≤ 2 %
Roughness (Rq)		< 1.0 nm (5 μm X 5 μm)

Table 2. 6 inch GaN Epitaxy Characteristics			
Parameter	Specification	Method	Definition and Detail
Surface Particles	Total count< 100ea	Laser imaging	> 0.3 μm (5mm E.E.)
Crack length	< 3.0 mm	Accent light	NA
Bow	< 50 μm	Distance of reflection Laser	NA
Crystalline Quality	< 450 arcsec	XRD (002)	FWHM
	< 850 arcsec	XRD (102)	FWHM
Hole concentration	> 1E17 cm ⁻³	Hall	NA

Table 3. 6 inch GaN Epitaxy Electrical Characteristics			
Parameter	Specification	Method	Definition and Detail
2DEG Sheet Resistance	< 500 Ω/□	Hall	NA
2DEG Density	> 8E12 cm ⁻²	Hall	NA
2DEG Mobility	>1800 cm ² /Vs	Hall	NA
Vertical Buffer Leakage	< 1 μA/mm ²	I-V	@700V, R.T.

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