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Sanan Product Brochure SiC and GaN Material

SiC EPI Wafer

Hunan Sanan Semiconductor Co., Ltd

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,AlGaN, 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.

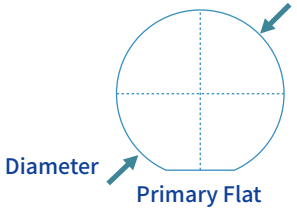


Figure1. Diameter, primary flat location and marking orientation, carbonface up for silicon face polished 150mm n-type wafers

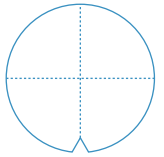


Figure2. Notch location and marking orientation, carbonface up for 200mm 200mm n-type wafers

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

6 Inch N-type SiC EPI Wafer

Items	P grade	D grade	Test Method
Poly-type	4H	4H	-
Conductivity	N-Type	N-Type	-
Dopant	Nitrogen	Nitrogen	-
Substrate thickness	350 μm ± 25 μm	350 μm ± 25 μm	-
Diameter	150 mm ± 0.2 mm	150 mm ± 0.2 mm	-
Primary flat orientation	<11-20> ± 5.0°	<11-20> ± 5.0°	-
Orientation	Off axis: 4° toward <11-20>±0.5°	Off axis: 4° toward <11-20>±0.5°	-
Net doping density	ND-NA	ND-NA	-
Carrier concentration	1E14~1E19 atoms/cm^3	1E14~1E19 atoms/cm^3	Measured with MCV
Carrier concentration tolerance	±15 % of selected carrier concentration	/	Measured with MCV
Carrier concentration uniformity	⩽ 6 %	⩽ 15 %	Measured with MCV, σ/mean
Thickness	4 μm~30 μm	4 μm~30 μm	Measured with FTIR
Thickness tolerance	±8 % of selected thickness	/	Measured with FTIR
Thickness uniformity	⩽ 5 %	⩽ 20 %	Measured with FTIR, σ/mean
Surface Roughness (Ra)	＜ 0.5 nm	/	Measured with AFM (20 μmx 20 μm)
TUA (Total usable area,3mmx3mm, EE=3mm)	⩾ 90 %	⩾ 50 %	1. Measured with Candela or Lasertec or other similar tool (EE=3 mm) 2. Grid size: 3 mmx 3 mm 3. Defects include :Triangle, Downfall, Scratch, Carrot
Scratches (Front side)	Cumulative length ⩽ 1X wafer diameter mm	Cumulative length ⩽ 5X wafer diameter mm	Measured with Candela or Lasertec or other similar tool
Metal Contamination	⩽ 5E10 atoms/cm^2	⩽ 5E10 atoms/cm^2	Na/K/Ca/Fe/Ni/Cu/Zn/Au /Ag/Al/ Ga/Hg/As/Pt, Measured with ICP-MS

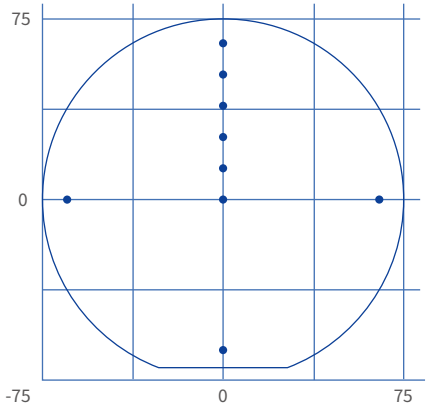
8 Inch N-type SiC EPI Wafer

Items	P grade	D grade	Test Method
Poly-type	4H	4H	-
Conductivity	N-Type	N-Type	-
Dopant	Nitrogen	Nitrogen	-
Substrate thickness	350 μm ± 25 μm 500 μm ± 25 μm	350 μm ± 25 μm 500 μm ± 25 μm	-
Diameter	200 mm ± 0.2 mm	200 mm ± 0.2 mm	-
Notch orientation	<11-20> ± 5.0°	<11-20> ± 5.0°	-
Notch depth	1 mm~1.25 mm	1 mm~1.25 mm	-
Orientation	Off axis: 4° toward <11-20>±0.5°	Off axis: 4° toward <11-20>±0.5°	-
Net doping density	ND-NA	ND-NA	-
Carrier concentration	1E14~1E19 atoms/cm^3	1E14~1E19 atoms/cm^3	Measured with MCV
Carrier concentration tolerance	±15 % of selected carrier concentration	/	Measured with MCV
Carrier concentration uniformity	⩽ 6 %	⩽ 15 %	Measured with MCV, σ/mean
Thickness	4 μm~30 μm	4 μm~30 μm	Measured with FTIR
Thickness tolerance	±8 % of selected thickness	/	Measured with FTIR
Thickness uniformity	⩽ 5 %	⩽ 20 %	Measured with FTIR, σ/mean
Surface Roughness (Ra)	＜ 0.5 nm	/	Measured with AFM (20 μmx 20 μm)
TUA (Total usable area,3mmx3mm, EE=3mm)	⩾ 90 %	⩾ 50 %	1. Measured with Candela or Lasertec or other similar tool (EE=3 mm) 2. Grid size: 3 mmx 3 mm 3. Defects include :Triangle, Downfall, Scratch, Carrot
Scratches (Front side)	Cumulative length ⩽ 1X wafer diameter mm	Cumulative length ⩽ 5X wafer diameter mm	Measured with Candela or Lasertec or other similar tool
Metal Contamination	⩽ 5E10 atoms/cm^2	⩽ 5E10 atoms/cm^2	Na/K/Ca/Fe/Ni/Cu/Zn/Au /Ag/Al/ Ga/Hg/As/Pt, Measured with ICP-MS

Appendix A – 6 inch EPI Measurement Point

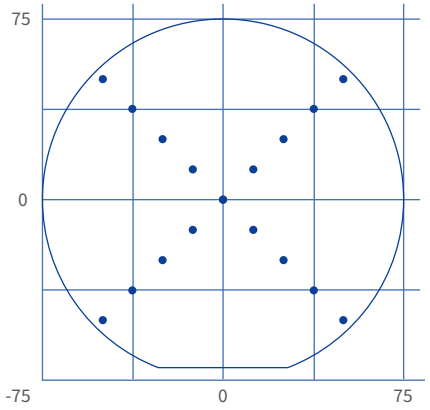
CV MEASUREMENT POINTS (EPI DOPING)*:

Pt.	X mm	Y mm
1	0	0
2	0	14
3	0	28
4	0	42
5	0	56
6	0	70
7	-70	0
8	0	-65
9	70	0



FTIR POINTS (EPI THICKNESS)*:

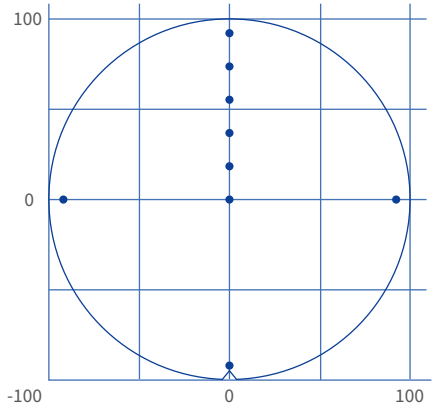
Pt.	Θ °	R mm	X mm	Y mm
1	-45	70	49.50	-49.50
2	-45	52.5	37.15	-37.15
3	-45	35	24.71	-24.71
4	-45	17.5	12.40	-12.40
5	-45	0	0.00	0.00
6	135	17.5	-12.40	12.40
7	135	35	-24.70	24.70
8	135	52.5	-37.10	37.10
9	135	70	-49.50	49.50
10	45	70	49.50	49.50
11	45	52.5	37.15	37.15
12	45	35	24.71	24.71
13	45	17.5	12.40	12.40
14	-135	17.5	-12.40	-12.40
15	-135	35	-24.70	-24.70
16	-135	52.5	-37.10	-37.10
17	-135	70	-49.50	-49.50



Appendix A – 8 inch EPI Measurement Point

CV MEASUREMENT POINTS (EPI DOPING)*:

Pt.	X mm	Y mm
1	0	0
2	0	20
3	0	40
4	0	60
5	0	80
6	0	95
7	-95	0
8	0	-95
9	95	0



FTIR POINTS (EPI THICKNESS)*:

Pt.	Θ °	R mm	X mm	Y mm
1	135	95	66.60	-66.60
2	135	75	52.58	-52.58
3	135	50	35.05	-35.05
4	135	25	17.53	-17.53
5	0	0	0.00	0.00
6	315	25	-17.53	17.53
7	315	50	-35.05	35.05
8	315	75	-52.58	52.58
9	315	95	-66.60	66.60
10	225	95	66.60	66.60
11	225	75	52.58	52.58
12	225	50	35.05	35.05
13	225	25	17.53	17.53
14	45	25	-17.53	-17.53
15	45	50	-35.05	-35.05
16	45	75	-52.58	-52.58
17	45	95	-66.60	-66.60