

000C06EP02

6" AlGaIn/GaN EPI-WAFERS on SiC-Sub

GALLIUM NITRIDE GaN on SiC EPI-WAFERS

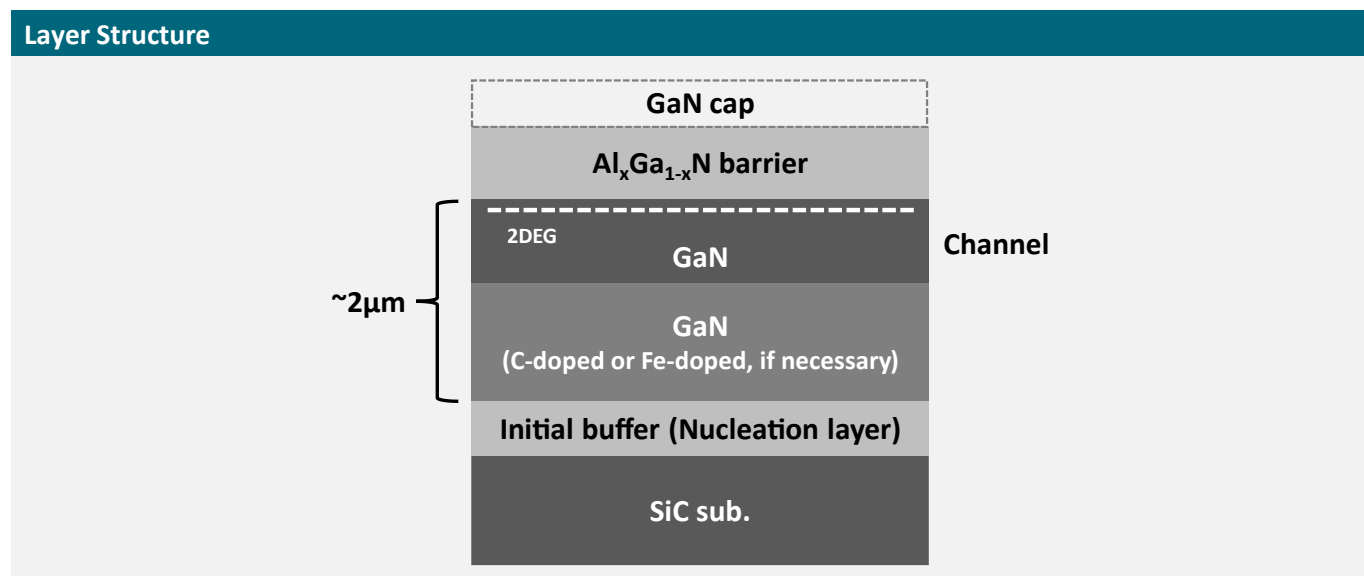
- Lowest defect density of the crystal
- Sophisticated buffer layer for low leakage current
- Perfect base for all kind of RF devices
- Highest power density

Superior thermal conductivity due to the SiC substrate







SUBSTRATE SPECIFICATION

Item		Characteristics
Substrate		6-inch high-purity semi-insulating SiC substrate
Wafer Diameter		150.00 ± 0.20mm
Thickness		500 ± 25μm
Orientation		(0001) just ± 0.2°
Orientation Indicator	Notch Axis	<1-100> ± 5°
	Depth	1.00 ~ 1.25mm
Surface Finishing		Si-face, CMP polish, C-face optical polish

TYPICAL HEMT STRUCTURE ON SiC SUBSTRATE



APPLICATIONS

Hybrid Amplifiers	Radar Systems	Receive/Transmit Modules	RF Devices	Telecom Systems	Wireless Communication
					

EPITAXIAL LAYER STRUCTURE

Layer	Material	Al Composition	Thickness (nm)	Dopant	Doping (cm ⁻³)
5	i-GaN	-	2	-	-
4	i-AlGaN	0.2 ~ 0.3	15 ~ 25	-	-
3	i-GaN	-	300	-	- Note 1
2	Buffer layer (Fe-doped)	-	1600	(Fe)	-
1	Nucleation	-	-	-	-
Substrate	SiC				

Note:

- Standard high resistivity condition.
- Al content and thickness of AlGaN barrier shall be modified in order to obtain target sheet resistance value.

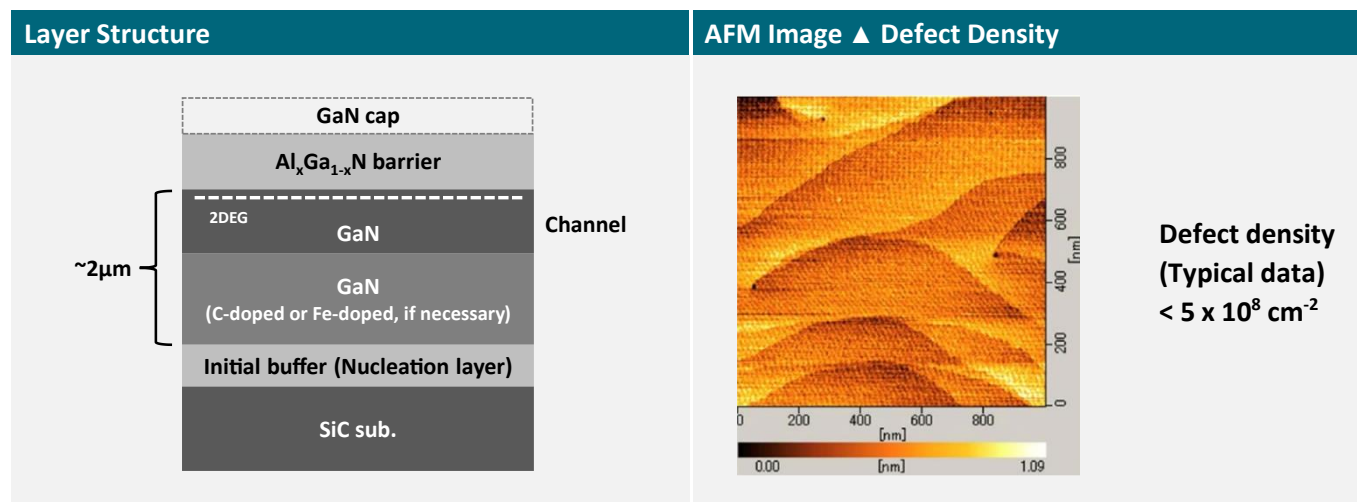
EPITAXIAL WAFER SPECIFICATION

Item	Specification		Comments
Barrier layer thickness (nm)	15 ~ 25 ± 10% C.V. < 3% (< 2% [Target])	XRD	3 points
Barrier layer Al composition ³	0.20 ~ 0.30 ± 0.02 C.V. < 3% (< 2% [Target])	XRD	3 points
Total EPI thickness (nm) ⁴	Average Designed ± 10% Var ≤ ±10% C.V. < 3% (< 2% [Target])	Optical interferometer	5 points
Sheet resistivity (Ω/sq.) ⁵	Average 300 ~ 500 ± 10% C.V. < 2% (< 1.5% [Target])	Non-destructive reference	
Surface defect density	≤ 1 x 10 ⁹ cm ⁻²	AFM, center, one wafer per batch	

Note:

- Will be tuned according to the expected R_s value.
- The value of total EPI thickness includes that of the nucleation layer. Please be aware that there should be the difference between the designed value.
- The value of sheet resistance is varied according to the Al content and thickness of AlGaN barrier and/or existence of AlN.

TYPICAL ATOMIC FORCE MICROSCOPY (AFM) IMAGE



TYPICAL CHARACTERISTICS OF HEMT ON SiC

Item	Performance
Sheet Resistance ¹ (Eddy Current)	Average 300 ~ 500 Ω/sq
Electron Mobility ² (Eddy Current)	~ 2.1 x 10 ³ cm ² /Vs
Sheet Carrier Density ³	6 ~ 10 x 10 ¹² cm ⁻²
XRD-FWHM (0002)	~ 300 arcsec
XRD-FWHM (10-12)	~ 700 arcsec

Barrier specification: Al_xGa_{1-x}N Barrier: x = 0.2 ~ 0.3, thickness = 15 ~ 25nm

Notes:

- Barrier specification (Thickness and Al composition) can be tuned
- AlN spacer can be inserted
- Actual 2DEG characteristics will be varied depending on Al specification. Please note the 2DEG value as reference

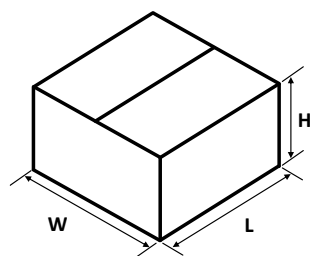
6 INCH SiC SUBSTRATE

Item	Characteristics
Material	SiC
Poly-type	4H
Orientation	(0001) just ± 0.2°
Wafer Diameter	150.00 ± 0.20mm
Thickness	500 ± 25μm
Orientation Indicator	<1-100> ± 5°
Depth	1.00 ~ 1.25mm
Surface Finishing	Si-face, CMP polish, C-face optical polish
Resistivity	> 1 x 10 ⁸ Ωcm

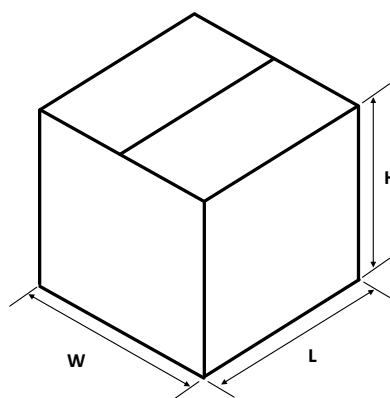
ORDERING INFORMATION AND PACKAGING

Part Number	Quantity (pcs) Wafer / Inner Box	Quantity Inner Box (pcs)	L x W x H (mm) Inner Box	Quantity (pcs) Wafer / Outer Carton	L x W x H (mm) Outer Carton
000C06EP02-12	3	4	230 x 160 x 180	12	385 x 320 x 475
000C06EP02-18	3	6	230 x 160 x 180	18	565 x 320 x 475

Inner Box



Outer Carton



Each wafer packed in cassette and vacuum bag.

CONFIRMATION TABLE

Items to be confirmed

- The structure of nucleation layer is based on GPT standard specification.
- The total thickness of epi wafer will be evaluated using optical interferometer.
- The composition and layer thickness of AlGaN barrier layer shall be tuned based on the x-ray diffraction measurement result of the evaluation wafer prior to the growth of the actual wafers. The Al composition and the layer thickness of the barrier layer will be configured based on the spectrum fitting results obtained from the x-ray diffraction measurement results.
- No visible cracks on the wafer surface.
- The wafer margin of 5mm from the edge is excluded for the guaranteed specifications listed above.
- The device characteristics using the delivered wafers are not guaranteed.
- Attached documents are
 - Delivered epi wafer list
 - Total thickness data (for each wafer)
 - Evaluated values of the barrier layer composition and thickness by X-ray diffraction curve fitting (3 points, "calibration epi"*)
 - XRD-FWHM [(0002) and (10-12)] (center, for each wafer)
 - Wafer bowing (for each wafer)

REVISION TABLE

Revision	Date	Status	Notes
001	29/03/2022	Initial release	Initial publication

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