晶湛半导体
Enkris Semiconductor

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Enkris Semiconductor, Inc.

Professional GaN Material Manufacturer

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Company Overview

We are dedicated to providing high quality GaN epiwafers for Power electronic, RF and Micro-LED applications.

History	• Founded in 2012 as a pure epi-foundry of GaN wafers
Technology	• Patented technology covering substrate engineering , buffer design, active region optimization for high quality, flat and crack free epi-structures. • Core technical team members all have 10+ years experience in GaN
Capacity	• 3300m^2 class 1000 cleanroom • 200k pcs/year for 150mm GaN epiwafers
Product Diversity	• GaN-on-Si (up to 300mm) • GaN-on-SiC (up to 150mm) • GaN-on-HR_Si (up to 200mm) • GaN-on-Sapphire (up to 150mm) • GaN-on-GaN
IP & Quality	• ~400 patent filed in China, US, Japan etc. with >100 granted • License of ~80 patents from *imec* • ISO9001:2015 certificate for design and manufacture of GaN epi materials

Optimised stress management technology

- Enabling flat and crack-free GaN epiwafers on large-size Si

Customized design

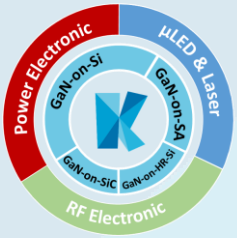
- Achieving high performance to meet customers' requirements

Unique passivation technology

- Avoiding current collapse at high voltage

Specific processing flow

- Developing for particular structural and device design



Enkris GaN Epiwafers

Power

GaN-on-Si
(100mm,150mm,200mm,300mm)
D-mode and E-mode
Breakdown Voltage available from 200V to 1200V

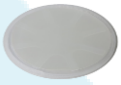
RF

GaN-on-HR_Si
(100mm,150mm,200mm)
GaN-on-SiC
(50.8mm,100mm,150mm)
In-situ SiN/ Al(In)N/ GaN heterostructures

LED

GaN-on-Sapphire
(50.8mm,100mm,150mm)
GaN-on-Si
(100mm,150mm,200mm,300mm)
UVC, Near-UV, Blue, Green & Red

100mm GaN-on-SiC Epi Wafer
(up to 150mm)



100mm GaN-on-Sapphire Epi Wafer
(up to 150mm)

150mm GaN-on-HR_Si Epi Wafer
(up to 200mm)

200mm GaN-on-Si Epi Wafer
(up to 300mm)

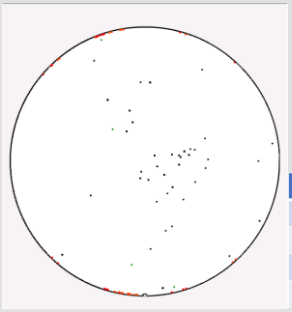
For Power Application

Product Specification

Items	Values/Scope
Substrate	Si
Wafer diameter	100mm,150mm,200mm,300mm
Epi-layer thickness	2-7 µm
Wafer bow	<30 µm, Typical
Surface Morphology	RMS<0.5nm in 5×5 µm²
Barrier	$Al_XGa_{1-X}N$, 0<X<1
Cap layer	In-situ SiN or GaN (D-mode); p-GaN (E-mode)
2DEG density	>9E12/cm² (20nm $Al_{0.25}GaN$, 150mm)
Electron mobility	>1800 cm²/Vs (20nm $Al_{0.25}GaN$, 150mm)

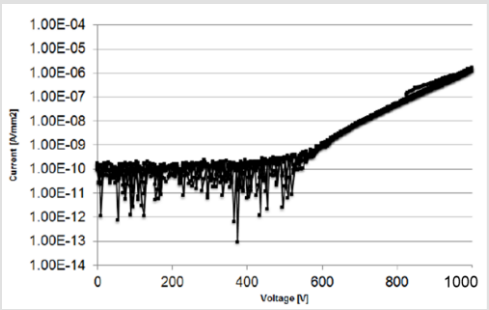
200mm GaN-on-Si Epiwafer

Defect Mapping



Defects	Counts
Crack	45
Epi	0
Micropits	4
Particle	40

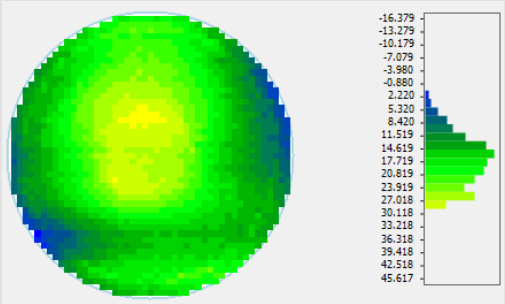
Vertical Breakdown Behavior



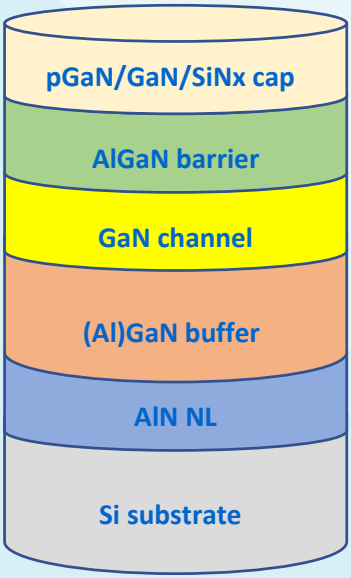
Sheet Resistance Mapping

Avg.= 309.12 Ω/□
Std.= 1.2%

Wafer Bow Mapping



Highlights of GaN HEMT on Si



Optimising AlN nucleation layer
Enable crack-free thick AlGaN or GaN buffer layer

Stress engineering
Introduction of compliant substrates
Interlayer technology

Buffer layer
High vertical breakdown voltage (for lateral devices)
Minimise wafer bow

Good defect control
Cracks
Micropits
Particles

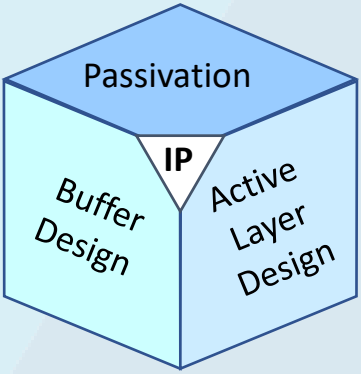
GaN layer for D-MODE

pGaN layer for E-MODE

In-situ SiNx passivation layer

IP & Quality

- ~400 patent filed in China, US, Japan etc. with >100 granted
- ISO9001:2015 design and manufacture of GaN epi materials
- Multiple inspection methods: PL, XRD, EL, Defect Inspection, etc.

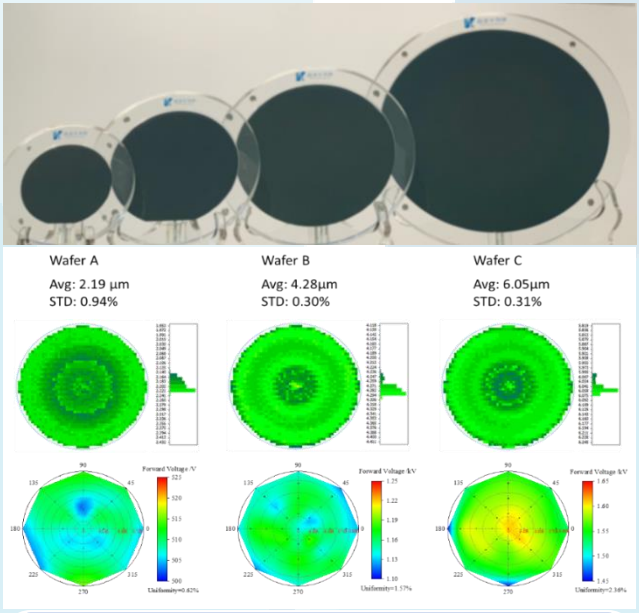



SGS

Enkris Semiconductor, Inc.

ISO 9001:2015

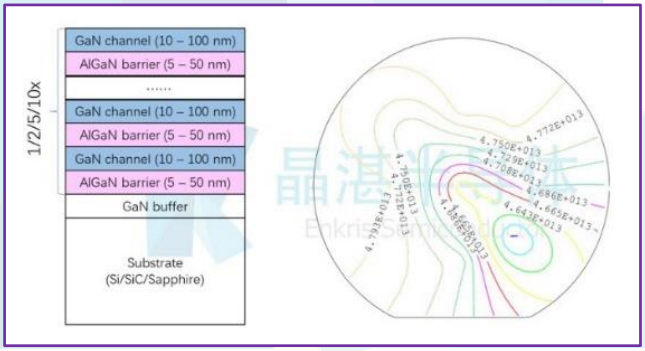
Recent Progress with 300mm GaN-on-Si HEMT



Highlights:

- Based on totally Enkris owned IP;
- A series of high quality 300mm GaN-on-Si HEMT epi wafers for 200V, 650V and 1200V power applications with excellent thickness uniformity and lower wafer bow within 50µm;

Recent Progress with Multi-channel epi-wafers



Highlights:

- Multi-channel AlGaN/GaN hetero-structure builds several conductive channels into the component so as to distribute the flow of current - much like new lanes that are added to a highway to allow traffic to flow more smoothly and prevent traffic jams.
- Enkris is able to integrate multi-channel hetero-structure on Si/SiC/Sapphire, etc.

Reference:

[1] Multi-channel AlGaN/GaN hetero-structure, BV>10kV
IEEE Electron Device Letters, vol. 42, No. 6, June 2021
[2] Nanowire transistor on multi-channel hetero-structure
Nature Electronics volume 4, pages 284–290 (2021)

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