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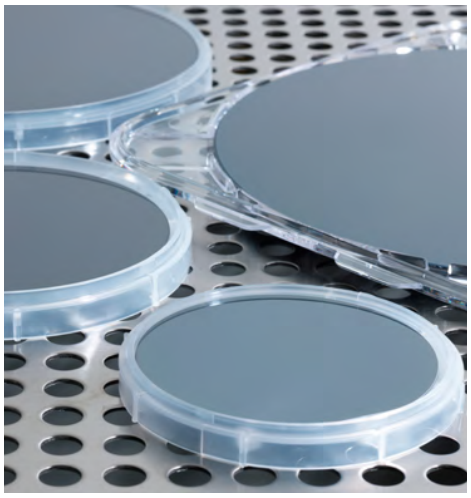
EpiGaN-HV



Key features

- In-situ SiN passivation
  - Superior dynamic behavior
  - Excellent material stability
  - State-of-the-art device reliability
  - High wafer-to-wafer uniformity
  - Compatible with Si wafer fabrication lines
- On 150-mm and 200-mm (111) Si
- Bow: < 50 µm
- Excellent uniformity
  - Crystal quality
  - Layer thickness and composition

Typical applications

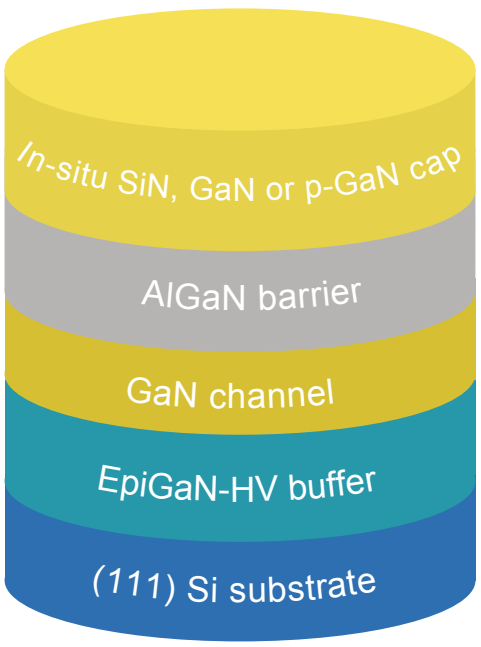
- Power supplies, USB chargers, wireless power
- EV/HEV, PV

GaN-on-Si epitaxial wafers for Power switching

The EpiGaN-HV product family is a state-of-the-art (Al,Ga)N/GaN hetero-epitaxial layer structure deposited crack-free on a (111) Si substrate for power switching applications. Soitec offers d-mode HEMT structures with in-situ SiN passivation or GaN caps and e-mode HEMT structures with p-GaN caps.
Custom barrier and cap designs as well as layer structures suitable for 200V and 650V power switching applications are available.

The proprietary high-voltage buffer design offers low leakage currents, high breakdown voltage, low dispersion and a consistently low wafer bow.

Standard layer structure



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Standard layer specifications

Layer name	Description	Thickness target	Comment
Substrate	150-mm Si substrate (111) 200-mm Si substrate (111)	1000µm 1150µm	
HV buffer	Buffer	~2µm (200V), ~5µm (650V)	
GaN channel	GaN	175nm	Can be customized
Barrier	AlGaN (25% Al)	20nm	Can be customized (In,Al)N barriers on request
Cap layer	d-mode: SiN or GaN e-mode: p-GaN	(2-20)nm SiN or 3nm GaN up to 100nm p-GaN	Thicknesses can be customized

Characterization specifications

Parameter	Measurement	Units	Target
Barrier thickness	X-Ray	nm	±10%
Barrier composition	Photoluminescence, ellipsometry	%	± 1%
Cap thickness	X-Ray	nm	± 10%
Wafer bow	Laser profilometer	µm	± 50 max.
Edge exclusion		mm	5

Electrical specifications (d-mode)

Parameter	Measurement	Units	Target
Electron mobility*	Hall	$cm^2/V.s$	> 1800 (for 20nm AlGaN, 25%Al) (for 20nm AlGaN, 25%Al)
Sheet charge density*	Hall	$/cm^2$	> 9e12
Sheet resistivity*	Eddy current	Ohms/sq	< 400 (for 20nm AlGaN, 25%Al)
Vertical breakdown voltage*	for 650V product	V	> 1000
Lateral breakdown voltage* (L_{G-D} >20 µm)	for 650V product	V	> 1200
Leakage current* (lateral, grounded substrate)	@650V, RT	nA/mm	< 100
Leakage current* (vertical)	@650V, RT	$µA/mm^2$	< 1

* Measurements done on a sample basis on calibration wafers

04/2020