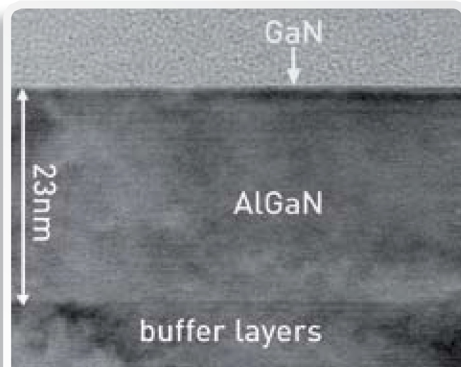
Picogiga
A Soitec Group Company International

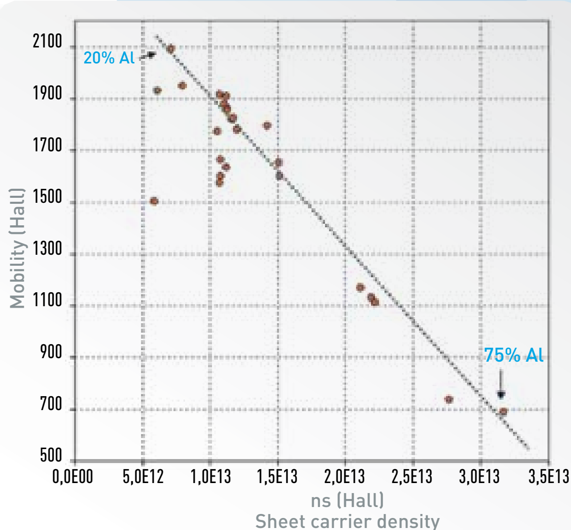
Epiwafers

GaN Thin Epiwafers

For discrete power devices, RF & microwave components



1. Cross section of a standard HEMT structure



2. SP3 type structures with super lattice barrier

Features

- GaN HEMT structure dedicated to very high power density applications from DC up to microwave
- Low-noise application (Noise Figure: 0.75dB at 10GHz)
- Excellent buffer isolation (typically > 600V with 1.8µm GaN buffer)

Benefits

Epistructure *(1)*

- **SP1:** standard structure with a sheet resistivity: 420 Ohm.sq; mobility: 1500cm^2/V/s
- **SP2:** greater mobility (+30% compared with SP1)
- **SP3:** greater sheet carrier density (+20% compared with SP1) *(2)*
- **SP4:** less gate leakage current (10 times less than standard SP1)
- **PSP:** Higher buffer breakdown voltage, better electron confinement

Substrate compatibility with

- SiC substrate: 2”; 3” diameter
- Silicon HR [111]: 2”; 3”; 100mm diameter, possible scalability to 150mm
- SopSiC^{TM} substrate: 2”; 3”; 100mm diameter, possible scalability to 150mm

Manufacturing

- GaN buffer up to 3µm thick
- High electrical isolation: iron-free process
- Very low bow (< 30µm)
- Crack-free material, low dislocation density (typically 3E9cm^{-2})
- Capability to dope N$^+$ with Silicon doping up to 5E17cm^{-3}

Device applications:

DC power devices: rectifier, switch…
Power and low-noise amplifiers
C, K, Ku, X and Q band amplifiers

System applications:

Wireless: WiMAX base station *(3)*
Military-Defense: satellite, radar *(4)*
Consumer: power supply for appliances and computers *(5)*
Automotive: power train *(6)*

Soitec

3.

4.

5.

6.

Photos credits: Cristian Matei, Bluestocking, Marius Hainal / FOTOLIA

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General Product Characteristics

	Parameter	Product Solutions				
Layer		SP1	SP2	SP3	SP4	PSP
Electrical Properties	Sheet carrier resistivity (Ohm.sq)	420	320	270	350	380
	Carrier density (cm^{-2})	9.0E12	1.0E13	1.2E13	8.0E12	8.0E12
	Mobility ($cm^2/V/s$)	1500	1900	1700	1900	1800
Cap Layer	Material	GaN				
	Silicon doped	Undoped up to 5E17cm^{-3}				
	Thickness	1-5nm				
Barrier	Type	Ternary Alloy		Binary Super-Alloy	Mix Ternary/ Binary Super-Alloy	Any type (SP1, SP2, SP3 & SP4)
	Material	AlGaN	AlGaN with AlN spacer	AlN/GaN	AlGaN/AlN/GaN	All types of material
	Content	10 to 40%		10 to 70%		
	Thickness	from 10nm to 30nm				
Channel	Material	GaN				
	Thickness	from 15nm to 30nm				
Buffer	Material	GaN				AlGaN
	Al Content	–				2 to 10%
	Thickness	1000-3000nm				1000-2000nm
Nucleation	Thickness	500nm				

Please note that these are typical specifications. Customized options are also available.
Please contact your sales representative for more information.

Definitions **SopSiC™ wafer:** *product resulting from a silicon transfer onto polycrystalline Silicon Carbide*
SP: *HEMT structure with Super-Piezoelectric barrier*
PSP: *Pseudo HEMT structure with Super-Piezoelectric barrier*
Binary Alloy: *compound semiconductor composed of 2 metallic elements*
Ternary Alloy: *compound semiconductor composed of 3 metallic elements*
Super Alloy: *multilayer succession composed with at least 2 binary alloys*

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