



**Empowering Innovation with
GaN-Dedicated Foundry
Solutions**

Unleash The Power of GaN With **GaN-Dedicated** Foundry Services.

- ❑ I GaN is a leading GaN foundry, offering a streamlined design-to-manufacturing experience for your next-generation power electronics project.
- ❑ We provide access to cutting-edge GaN technology, empowering our customers to:

Achieve Breakthrough Efficiency

Experience significantly lower energy loss compared to traditional silicon (Si) solutions, with high efficiency at high voltages and frequencies.

Unlock Superior Performance

Leverage GaN's wide bandgap (3.4 eV) to achieve higher operating voltages (> 1000 V), higher power densities (up to 10x Si), and faster switching speeds.

Reduce System Size and Weight

Design compact and lightweight systems due to GaN's superior thermal management capabilities.

IGSS GaN (IGaN) provides a **one-stop solution (Epi + Fab.)** for gallium nitride on silicon (**GaN-on-Si**) wafer fabrication for power devices. We manufacture GaN-on-Si epitaxial wafers and offer proprietary wafer fabrication services on CMOS compatible fab. and **GaN-dedicated fab.**

Founded in 2014/2015, we have an expert team with extensive GaN technology experience from Singapore, South Korea, Japan, US/Europe, and GaN leading research institutes.

Core team members from top foundries and Research Institutes with experience > 25 years, for developments and implementing best-in-class quality and management systems.

Over 15 years research work and 14 years of R&D by Singapore's top research institutes and universities, and Production-scale foundry clean rooms, including exclusive licensed IPs for solid in-house IP portfolio.

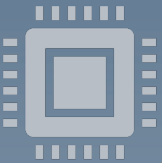
Virtual 8-inch GaN Foundry Services today

- Partnership agreements enables IGaN's "**one-stop solutions**" offering GaN Epi wafers and wafer fabrication.
- Over 10 more global commercial customers for Power, RF, and Sensor applications.

A world map is shown in the background of the lower half of the slide. A white line with a circle at the end points from the Southeast Asian region to a white box containing the company name and location.

IGSS GaN Pte. Ltd.
Singapore

Technical Expertise at Your Fingertips



GaN Technology, Research & Development

We collaborate with industry-leading Research institutions, Foundries, MOCVD equipment manufacturers, and Global GaN Technology experts, ensuring access to the latest GaN epitaxial and device fabrication processes.



Customizable Device Design

Our team of experienced engineers works with you to define your specific device requirements, including:

Epitaxial Layer Structure: layer thickness, doping profiles, and material composition

Device Architecture: based on your application needs.

Advanced Design Engineering: for high breakdown voltages and low ON-resistance.



Production at GaN-Dedicated Foundry Fab.

Where equipment-sets were optimized for GaN-on-Si Technology, to unleash the full potential of GaN-based solutions, delivering superior performance, and faster production rate.



Rigorous Quality Control

Our foundry partners maintain stringent quality control measures throughout the manufacturing process, ensuring exceptional wafer uniformity and device reliability.

SUPPORT LIST

PDK

- ☐ Electrical Parameters
- ☐ Design Guideline
- ☐ Bit Cell Layout
- ☐ Process Flow

Applications

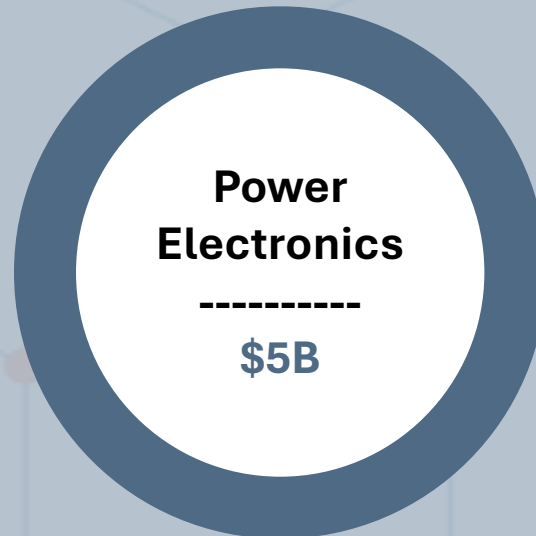
- ☐ Power converters (AC/DC, DC/DC)
- ☐ Electric Vehicles (EV) charging infrastructures and inverters
- ☐ Fast chargers for consumers
- ☐ Emerging GaN applications across various industries
- ☐ RF amplifiers for base stations & Radar systems

GaN Market Overview



Source: Omedia, IDC, Yole

By 2027, **IGSS GaN**
Technology and Solution
are supplying to:

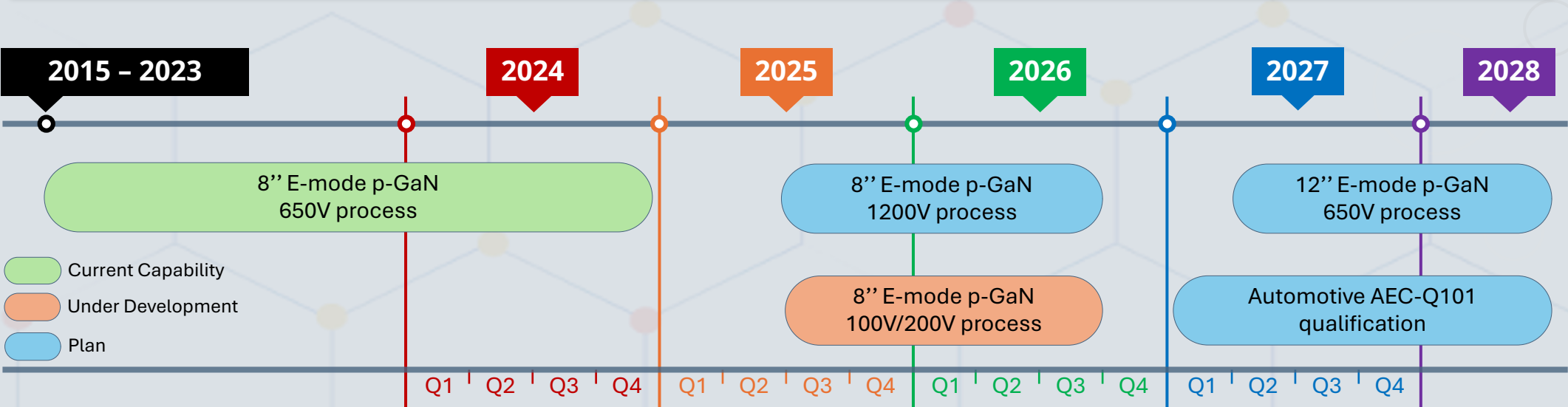


HV applications for GaN-on-Si Solutions: 1200 V Devices

- ✓ Bringing a new technology like 200mm 1.2 kV GaN HEMT to commercial production still likely requires further manufacturing readiness and qualification
- ✓ The 1.2 kV p-GaN gate HEMTs are well-suited for several high voltage power electronics applications, including:
 - 1. Automotive applications**
 - On-board battery chargers for electric vehicles (800-1000V systems)
 - DC-DC converters for 800V electric vehicle systems
 - 2. Industrial motor drives and inverters**
 - Variable speed drives for motors/pumps/compressors (1000-1200V range)
 - Uninterruptible power supplies (UPS)
 - 3. Renewable energy systems**
 - Solar inverters (1000-1500V DC link voltage)
 - Wind turbine converters
 - 4. High voltage DC power transmission**

More devices, lower cost: 300 mm wafers (by 2028)

- ✓ Compared to smaller wafers, 300 mm (12-inch) wafers allow manufacturers to pack more chips onto a single wafer, reducing production costs per chip.
- ✓ **Improved Performance**
The larger wafer size enables designers to incorporate more complex circuitry into power electronics devices. This can lead to better performance characteristics like higher current density and improved efficiency.
- ✓ **Advanced Materials**
12-inch fabs can handle more advanced materials like copper for interconnects, which offer lower resistivity compared to aluminum used in older processes. This allows for better power handling capabilities.
- ✓ **Addressing Shortages**
The shift to 12-inch wafers is expected to contribute to easing the ongoing shortage of certain electronic components, including power semiconductors.



GaN-on-Si Device Foundry Services at GaN Dedicated Fab.

650V E-Mode Device

Technical Specifications

Epitaxy

Wafer Diameter

8 inches (200 mm) standard, with low wafer bowing $\pm 40\text{ }\mu\text{m}$ after epitaxy.

Epitaxial Layer Thickness

Up to $5\text{ }\mu\text{m}$, customizable based on device requirements, with good thickness uniformity & crystal quality.

Doping Concentration

$10^{16} - 10^{20}\text{ cm}^{-3}$, offering a wide range for tailored conductivity.

EPI Breakdown

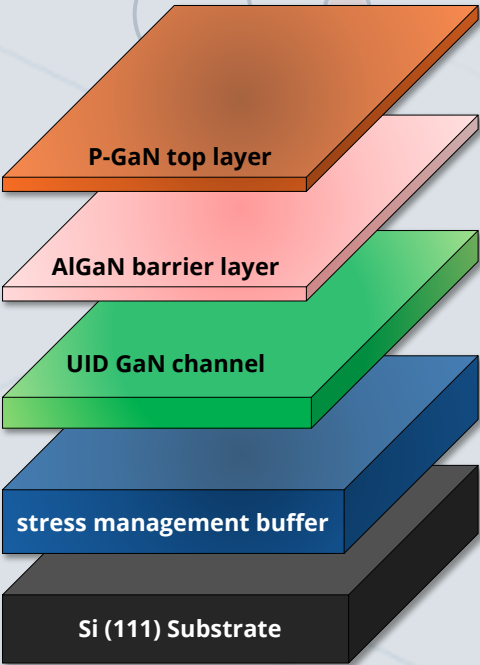
Vertical Breakdown Voltage $\sim 200\text{ V}$ to 1000 V .

Standard Layer Specifications

Epi Layer	Description	Thickness	Comments
Cap Layer	P-GaN	80 – 100 nm	
Barrier Layer	AlGaN	15 – 20 nm	customizable
Channel Layer	UID GaN	1.5 – 2 μm	customizable
Stress Management Buffer	Superlattice-based	3 – 3.5 μm	
Substrate	8-inch Si (111)	1 mm	

Characterizations

Parameter	Technique	Typical Values	Units
GaN 002 FWHM	X-Ray Rocking Curve	< 600	arcsec
GaN 102 FWHM	X-Ray Rocking Curve	< 1000	arcsec
Surface Roughness (RMS)	Atomic Force Microscopy	0.2 – 0.5	nm
P-GaN Sheet Resistance	Hall Measurement	< 55	$\text{K}\Omega/\text{sq}$
Hole Mobility	Hall Measurement	> 11	$\text{cm}^2/\text{V.s}$
Sheet Charge Density	Hall Measurement	> $8\text{E}+12$	cm^{-2}
Vertical Breakdown Voltage	Electrical Probing	> 800	V



GaN-on-Si Device Foundry Services at GaN Dedicated Fab.

Technical Specifications

Device Features

Fabricated at GaN-dedicated 8" Foundry
The fab. equipment-sets and Epi. substrate are optimized for the development and manufacturing of GaN devices on 8" wafers, with wafer breakage-free environment.

Au-free CMOS compatible process
With the following processes and features included:

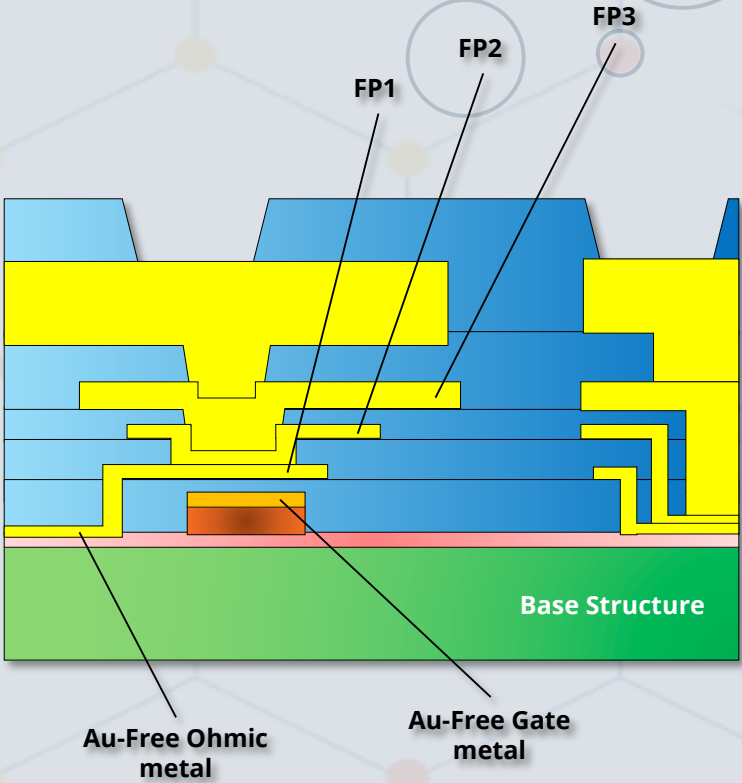
- Implant isolation.
- Gate-metal first scheme.
- Schottky gate contact scheme.
- Ohmic source/drain contact scheme.

Five metal layers
Including the following metal layers

- Gate metal.
- Ohmic metal (used also as metal field plate – FP1).
- Metal 1 (used as metal field plate – FP2).
- Metal 2 (used as field plate – FP3).
- Metal 3 (used as top metal).

Typical Device Description

Parameter	Description
Device	E-Mode HEMT
Technology	Gate-first scheme
Device Isolation	Ion implantation
Gate Contact	Au-free, Schottky
Source/Drain Contacts	Au-free, Ohmic
Gate Length	1 μm
Gate-Drain Spacing	18 μm
Metal Field Plates	3 layers
Breakdown Voltage Rating	> 650V



650V E-Mode Device

GaN-on-Si Device Foundry Services at GaN Dedicated Fab.

Wafer-Level Devices Performance

Static Parameters & Dynamic Ron

650V E-Mode Device

Typical DC parameters @ RT, $W_g=1.2\text{ mm}$ (two-gate fingers).

Threshold Voltage	V_{TH}	1.1 – 1.2	V
Maximum Drain Current	$I_{D(MAX)}$	160 - 190	mA/mm
ON-Resistance	$R_{DS(ON)}$	14 - 16	$\Omega\cdot\text{mm}$
Gate Leakage Current	I_{GSS}	< 1	$\mu\text{A}/\text{mm}$
Drain Leakage Current	I_{DSS}	< 1	$\mu\text{A}/\text{mm}$
Breakdown Voltage	BV_{DSS}	> 1000	V

Device Architecture

Au-free device technology, Up to 3 field plate (FP) layout for better E-field distribution.

Enhanced performance

ON-resistance in the range of 14 – 16 $\Omega\cdot\text{mm}$, based on gate-drain distance of 18 μm . Gate and drain leakage currents are typically < 1 $\mu\text{A}/\text{mm}$.

High Breakdown voltage

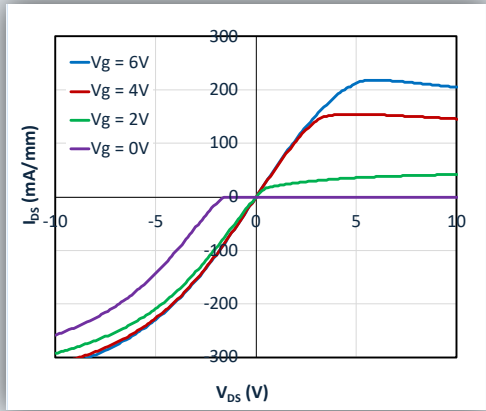
Both lateral breakdown (BV_{DSS}) and vertical breakdown (V_{BR}) voltages are > 1000V.

Dynamic Ron

Measured at room temperature under V_{DS} stress voltage up to 650 V, showing good stability and low degradation.

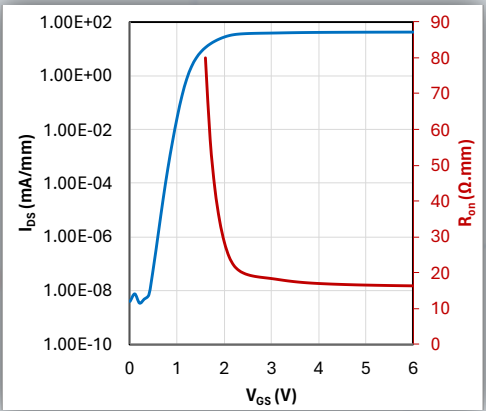
Drain Leakage

$V_G = V_S = 0\text{V}$



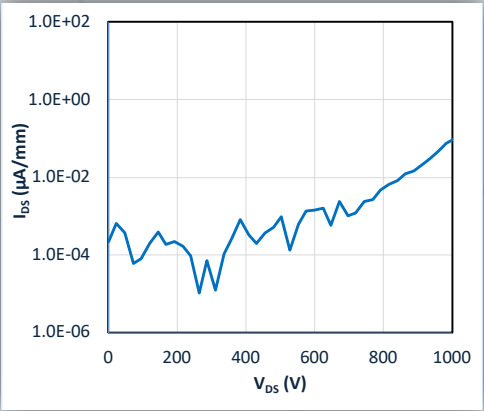
Gate Leakage

$V_S = V_D = 0\text{V}$



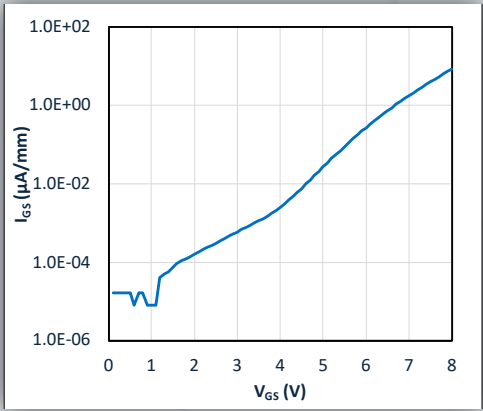
Vds-Ids

$V_{GS} = 0.6\text{ V}$ @ Room Temp



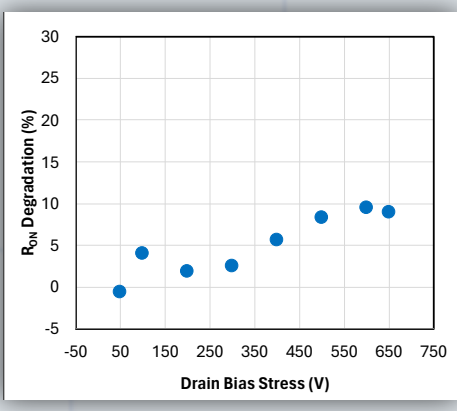
$V_{GS}-I_{DS}$

@ $V_{DS}=1\text{V}$ @ Room Temp



Dynamic Ron

@ RT

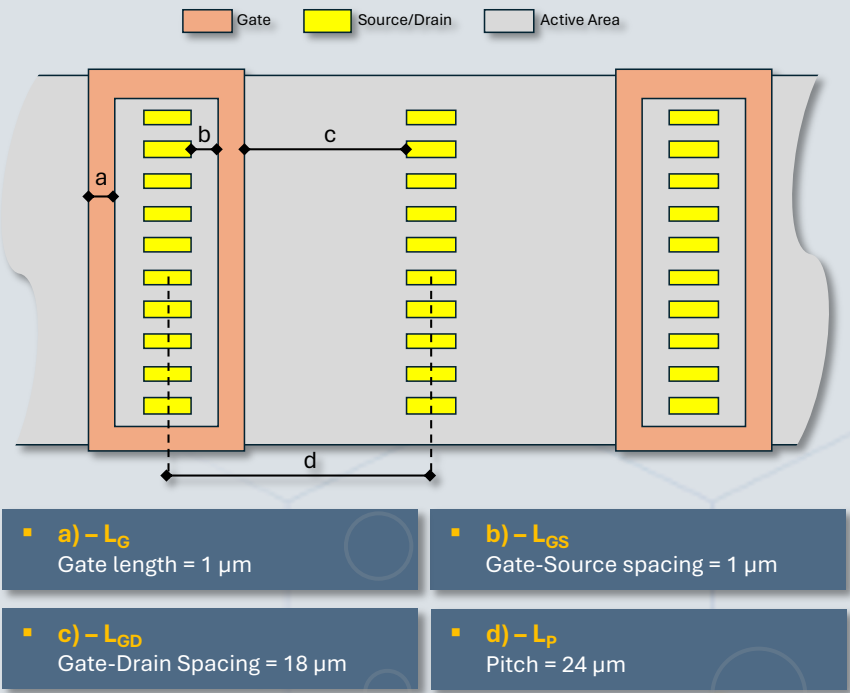


Bit-Cell

Key Dimensions

The device layout design considers the impact of each design element on the device performance parameters, including on-resistance and leakage currents.

The next figure shows illustrative example of the Bit-Cell layout of GaN E-HEMT devices.

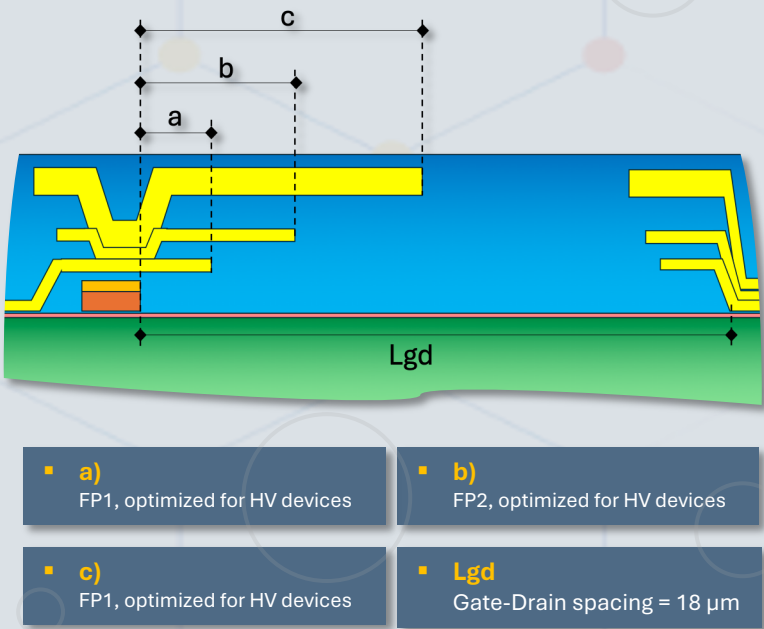


Field-Plate Design

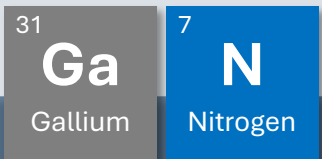
Key Dimensions

By using 3-layers of field plates (FP), the device layout achieves better electric field distribution, which leads to improved breakdown voltage and reduced current collapse.

The next figure shows illustrative example of the FP design.



Wafer Design & Prototyping

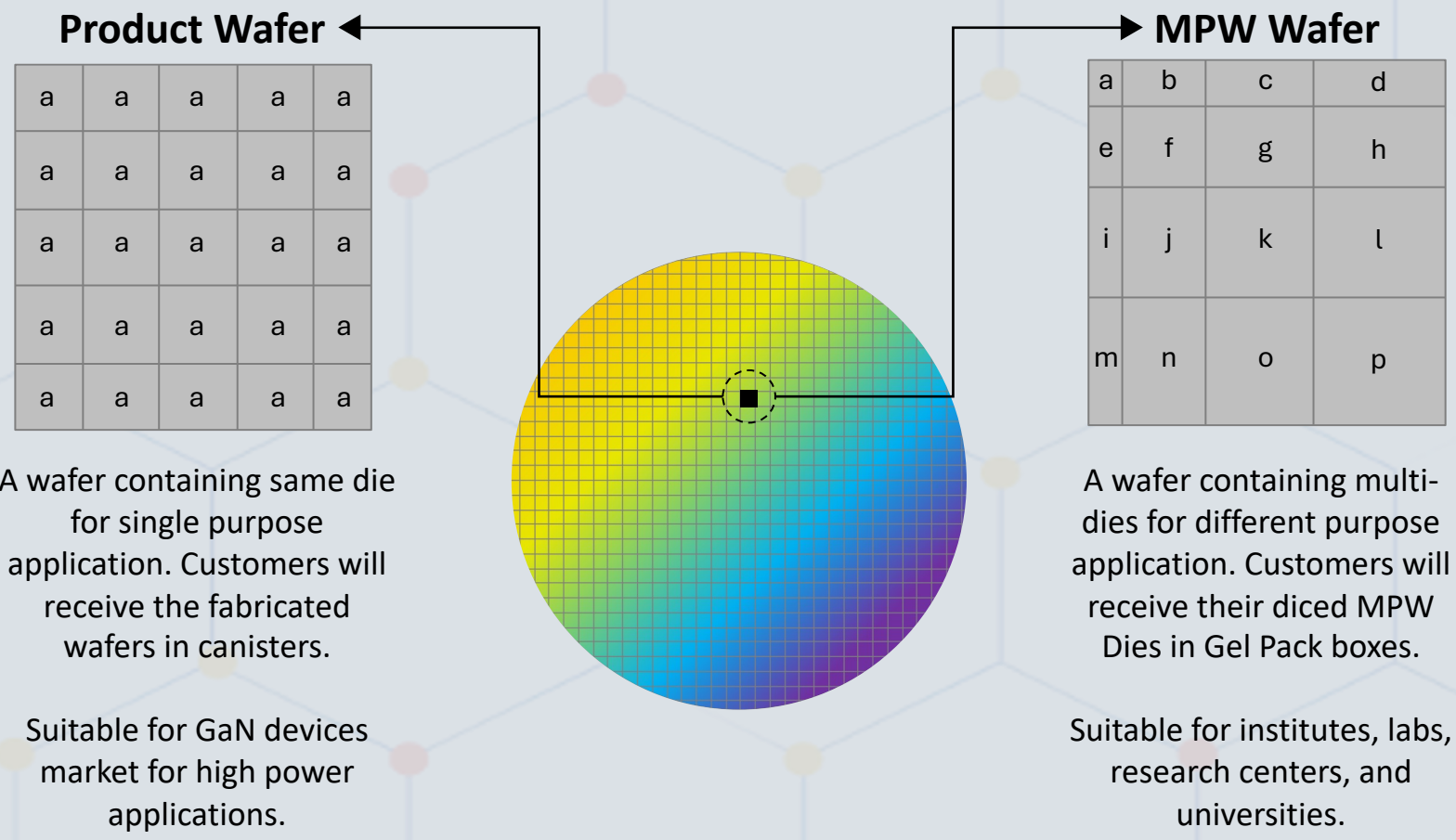


IGaN provides the customers with the design and prototyping capability to fabricate:

- Product Wafer
- Multi-Project Wafer (MPW)

A dedicated engineering team is ready to support the customers for reticle design, mask fabrication, manufacturing, and dicing.

Before shipment, we provide the electrical performance of the test structures, to ensure the quality of the fabricated wafers.

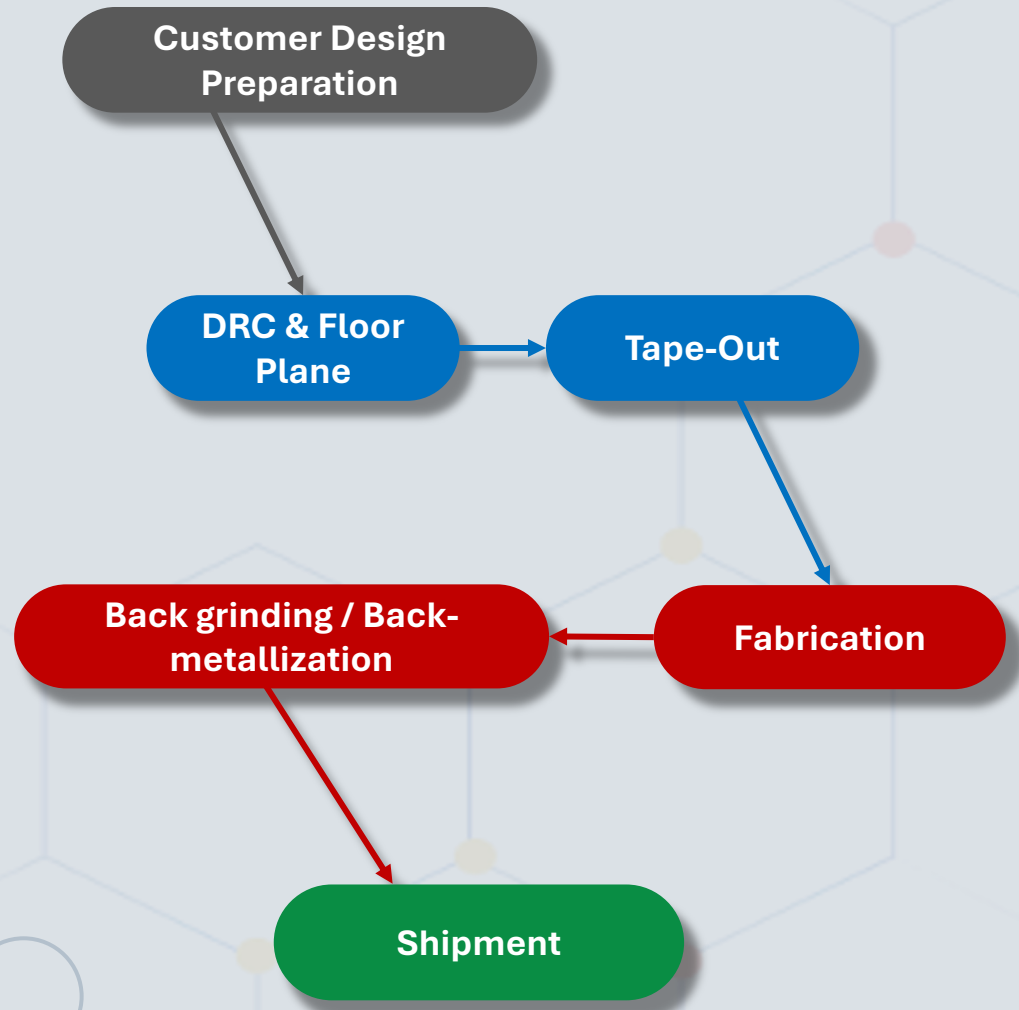


Focus on Design, We'll Handle the Manufacturing

IGaN allows you to focus on your core design expertise while we manage the complexities of GaN fabrication. Partner with us to achieve groundbreaking performance and efficiency in your next-generation power electronics project.

Process Flow

Seamless and automated process that guarantees the timeline from design to production with high standards.



Beyond Technology

Streamlined Design Flow
Our user-friendly design kit and comprehensive documentation provide a clear path from concept to production.

IP Protection
We prioritize your intellectual property (IP) with secure design flow procedures and strict confidentiality agreements.

Fast Turn-around Times
Benefit from expedited production cycles through established foundry partnerships.

In a nutshell



GaN-Dedicated Fab
Guaranteed manufacturing quality



E-Mode HEMTs
For efficient power devices



8" GaN-on-Si Epitaxy
With excellent wafer quality



650V And More
For all your application needs



Global Network
For wide range of facilities



Contact Us

For more information about IGaN services and other enquiries:

Website
www.igssgan.com

Email
enquiries@igssgan.com

Phone
+65 6515 0170

Address
5 International Business Park, #02-07A Mewah Building, Singapore, 609914