

# GaN Electronics

(Power & RF applications)

*From materials to devices,  
modules & circuits*

Patent Landscape Analysis

November 2023

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**KNOWMADE's** analysts combine their strong technology expertise and in-depth knowledge of patents with powerful analytics tools and methodologies to turn patent information and scientific literature into actionable insights, providing high added value reports for decision makers working in R&D, innovation strategy, intellectual property, and marketing. Our experts provide prior art search, patent landscape analysis, freedom-to-operate analysis, IP due diligence, and monitoring services.

**KNOWMADE** has a solid expertise in Compound Semiconductors, Power Electronics, Batteries, RF Technologies & Wireless Communications, Solid-State Lighting & Display, Photonics, Memories, MEMS & Sensors, Semiconductor Packaging, Medical Devices, Medical Imaging, Microfluidics, Biotechnology, Pharmaceuticals, and Agri-Food.

# INTRODUCTION

## Context and objectives of the report

### Power GaN

- The power GaN industry landscape has been reshaped by acquisitions of startup companies and partnerships between well-established players in the power electronics industry.
- The application base for GaN technology is widening. The adoption of GaN power devices in replacement for Si power devices is accelerating, especially in consumer applications.
- Well-established GaN players and newcomers announced the development of high-voltage GaN technology to compete with Si IGBT and SiC MOSFET in EV applications.
- New companies have entered the power GaN market recently or announced their intention to enter this market shortly.
- Early market players look to consolidate their leadership amid growing competition worldwide and geopolitical tensions escalating between US and China.
- As a countermeasure to US trade sanctions, China is driving the development of a domestic supply chain to serve its own market.

### RF GaN

- The RF GaN industry landscape has been reshaped by acquisitions and partnerships (IP, manufacturing) between well-established players in the RF industry.
- The deployment of 5G base stations is driving the RF GaN market, with GaN-on-SiC RF devices progressively replacing Si LDMOS in the telecom infrastructure.
- There is a growing interest for RF GaN-on-Si devices as the telecom infrastructure evolves toward lower power and higher frequencies (e.g., 6G applications).
- The opportunity to offer RF GaN technology at lower cost by leveraging the existing Si manufacturing lines and the GaN-on-Si platform is expected to drive the emergence of new players in the RF GaN market.
- RF GaN-on-Si technology is now close to enter the market. Yet many technical challenges remain to be solved for the large-scale adoption of the RF GaN-on-Si platform (incl. reliability, process maturity and scalability).
- Regardless of the platform, innovations at all levels – from epitaxy to devices, packaging and circuits – are still strongly required to fully unlock the potential of GaN technology in RF applications.
- In the field of telecommunications, US government has recently banned new equipment from Chinese players such as Huawei and ZTE, citing national security risk.

*In this context, this GaN Electronics Patent Landscape report aims to understand what is the strategy of players to consolidate their position in the emerging power and RF GaN markets and to limit the risks and uncertainties related to the adoption, industrialization and commercialization of a new power and RF semiconductor technologies (investment, geopolitical and IP risks).*

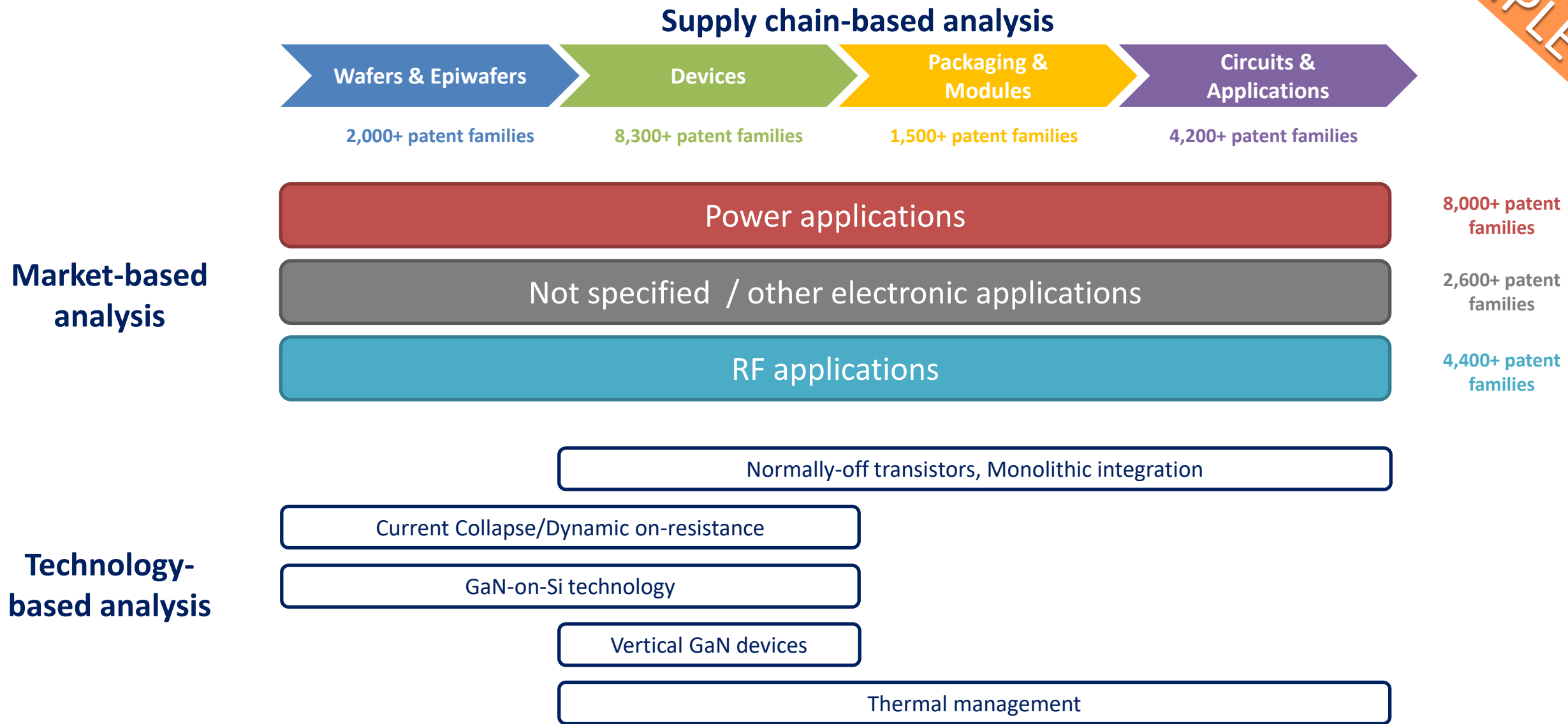
*What's more, the report identifies well-established IP players, IP challengers and newcomers, which are not yet in the power or RF GaN markets and thereby may represent either a threat (future IP and market challengers) or an opportunity to access external innovation (M&A targets, partnerships, IP licensing), depending on the perspective.*

*Eventually, the report positions early market players in the global IP competition, as these players are the most likely to assert their patents against new players entering the power or RF GaN markets, to maintain and expand their market leadership.*

# INTRODUCTION

## Patent search strategy: a three-fold analysis

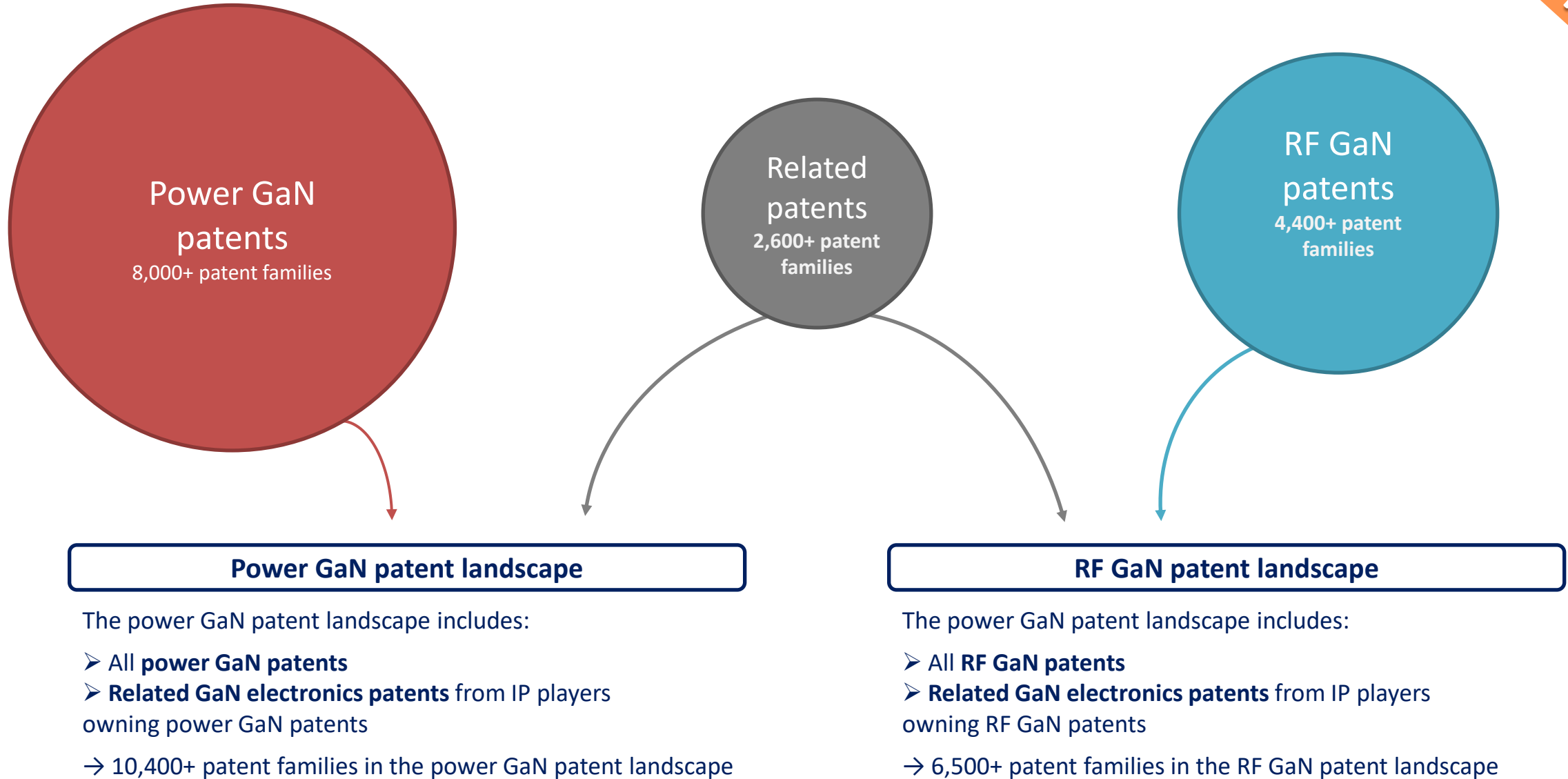
SAMPLE



# INTRODUCTION

## Patent corpus for Power GaN and RF GaN IP landscapes

SAMPLE

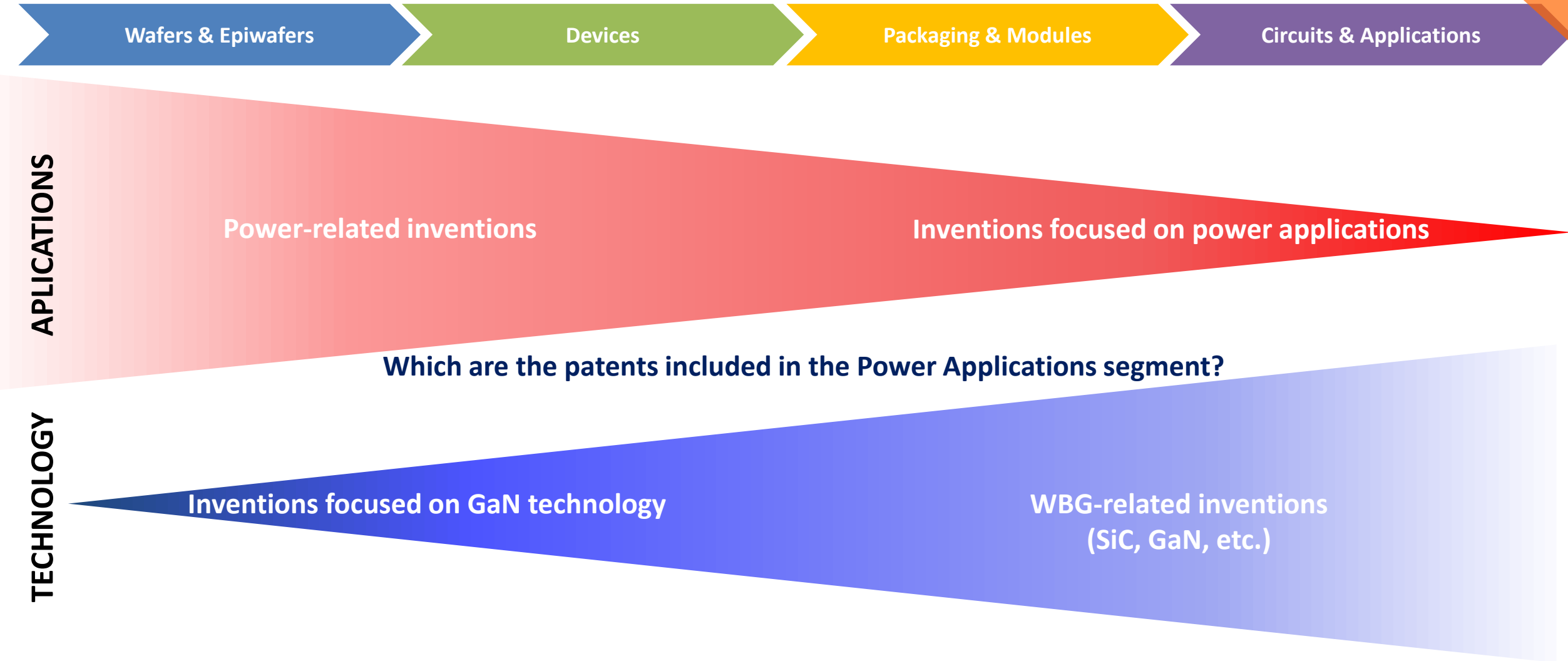


# INTRODUCTION

**Power GaN patent selection:** Focus of the invention depends on its position on the supply chain

Due to different strategies of patent filings across the supply chain, the scope of the patent selection must be tuned according to the position in the supply chain:

SAMPLE

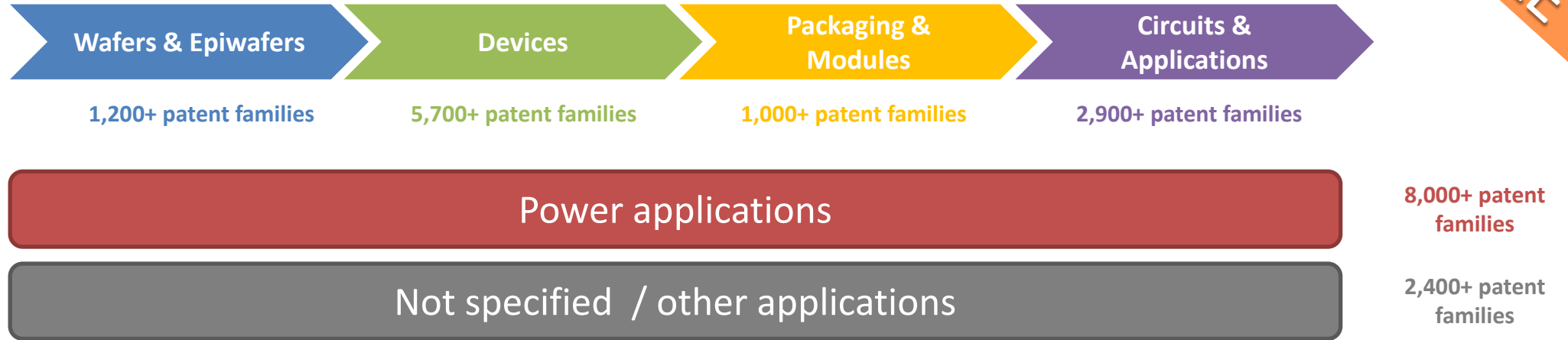


# INTRODUCTION

## Building the patent corpus for power applications

SAMPLE

Which are the patents included in the Power Applications overview?



- All the patents focused on power applications (8,000+ patent families)  
→ **77% of the Power GaN Electronics patent corpus**
- The nonspecific/generic GaN Electronics patents assigned to IP players with several patents focused on power applications (2,400+ patent families)  
→ **23% of the Power GaN Electronics patent corpus**

This approach aims to provide a more comprehensive view of the patenting activities of IP players in the Power GaN competitive landscape.



# INTRODUCTION

**RF GaN patent selection:** Focus of the invention depends on its position on the supply chain

Due to different strategies of patent filings across the supply chain, the scope of the patent selection must be tuned according to the position in the supply chain:

SAMPLE



APPLICATIONS

RF-related inventions

Inventions focused on RF applications

Which are the patents included in the RF Applications segment?

TECHNOLOGY

Inventions focused on GaN technology

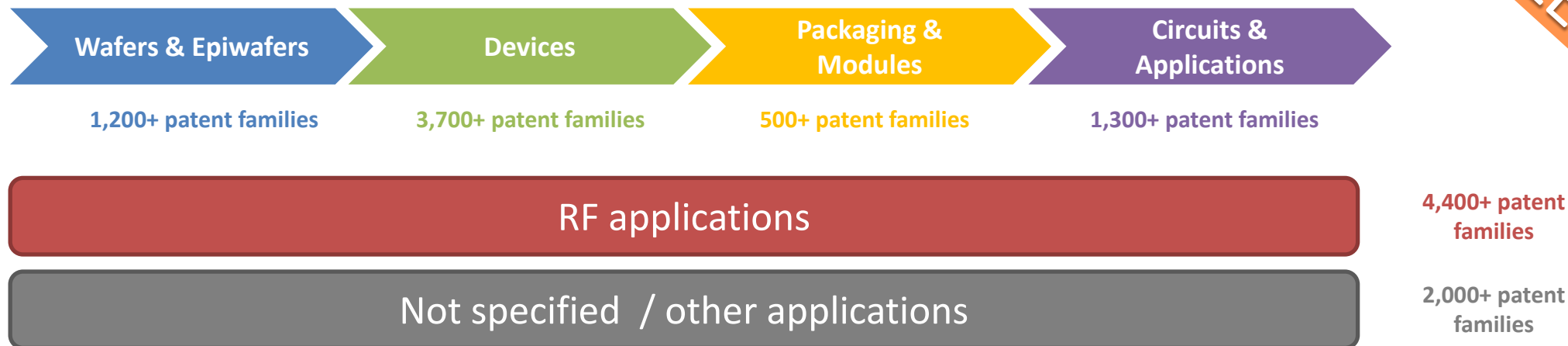
Compound semiconductor-related inventions  
(InP, GaAs, GaN, etc.)

# INTRODUCTION

## Building the patent corpus for RF applications

SAMPLE

Which are the patents included in the RF Applications overview?



- All the patents focused on power applications (4,400+ patent families)  
→ **69% of the RF GaN Electronics patent corpus**
- The nonspecific/generic GaN Electronics patents assigned to IP players with several patents focused on RF applications (2,000+ patent families)  
→ **31% of the RF GaN Electronics patent corpus**

This approach aims to provide a more comprehensive view of the patenting activities of IP players in the RF GaN competitive landscape.

# Executive summary

Take away messages, IP leaders, IP activities, IP competition

SAMPLE

- Take away messages
- IP leaders
- Players ramping up their IP activities
- New IP players reshaping the landscape
- Global IP competition
- IP activities in the different ecosystems (Japan, China, US, Europe, Taiwan, South Korea)
- IP activities across the supply chain (wafer & epiwafers, device, module & packaging, circuit & applications)
- Key players triggering innovations

The collage consists of several overlapping executive summary slides. Key slides include:

- EXECUTIVE SUMMARY: Power GaN: Flat patenting activity from South Korean players** - Discusses the contrast between South Korean ambitions and their patenting activity.
- EXECUTIVE SUMMARY: Power GaN: IP competition accelerating on e-mode devices** - Focuses on GaN MOSFET & IGBTs as a competitive space for patent applicants.
- EXECUTIVE SUMMARY: Power GaN: US-China trade war reshuffles the cards of the global competition** - Analyzes the impact of trade wars on the global IP landscape.
- EXECUTIVE SUMMARY: Power GaN: Key GaN IP is still at its infancy** - Examines the status of GaN IP in various regions.
- EXECUTIVE SUMMARY: Power GaN: US players looking to expand their market leadership** - Details how US players are leveraging external IP and establishing their own positions.
- EXECUTIVE SUMMARY: Power GaN: Building a power GaN supply chain in Europe** - Discusses major research organizations driving the establishment of a European supply chain.
- EXECUTIVE SUMMARY: Power GaN: US market players in the power GaN IP landscape** - Identifies key players like Wafer & Epiwafers, Devices, and Modules.
- EXECUTIVE SUMMARY: Power GaN: Supply chain IP coverage of main US players in the power GaN IP landscape** - Shows IP coverage across the supply chain from LED to applications.
- EXECUTIVE SUMMARY: Power GaN: European market players in the power GaN IP landscape** - Lists major industrial players like SOITEC, AZUR SPACE, and IMEC.
- EXECUTIVE SUMMARY: RF GaN-on-Si IP activities** - Analyzes RF GaN-on-Si inventive activity with a bar chart showing growth from 2015 to 2022.

# Excel file with all patents analyzed in the report

Useful patent database allows multi-criteria searches

SAMPLE

With the present report is provided an extensive **Excel database with the 15,000+ patent families** (inventions) analyzed in this study. This useful patent database allows for multicriteria searches and includes patent publication numbers, **hyperlinks to an updated online database** (original documents, legal status, etc.), priority date, title, abstract, patent assignees, patent's current legal status, and **segments** (power applications, RF applications, wafers & epiwafers, devices, modules & packaging, circuits, dynamic on-resistance, e-mode, GaN-on-Silicon, monolithic integration, thermal management, vertical devices, etc.).

Assignee name used in the report	Title	Abstract	APPLICATION			SUPPLY CHAIN				TECHNICAL SEGMENT						
			Power	Related patents selected for the Power GaN IP landscape	RF	Related patents selected for the RF GaN IP landscape	Wafers & Epiwafers	Devices	Modules & Packaging	Circuits & Applications	Dynamic on-resistance	e-mode	GaN-on-Si	Monolithic integration	Thermal management	Vertical devices
NING BAISHI ELECTRONIC TECHNO	(CN114823853) Nitride semiconductor epitaxial structure	(CN114823853) The invention discloses a nitride semiconductor epitaxial structure, which		X					X							
NINGUO MICROELECTRONICS WU	(CN110620143) Hybrid channel compound semiconductor device	(CN110620143) The invention discloses a hybrid channel compound semiconductor device. A	X													X
laoscience	(WO2023123318) Semiconductor device and method for	(WO2023123318) A semiconductor device includes a first and a second nitride-based semiconductor		X		X										
CoolSemi	(CN115111501) GaN HEMT power device and preparation method	(CN115111501) The invention discloses a GaN HEMT power device for realizing a CASCODE	X													X
Mitsubishi Electric	(WO202244123) Drive control circuit for power semiconductor	(WO202244123) According to the present invention, a gate current detector (8) detects a gate	X													X
Georgia Tech	(US11463126) Highly efficient dual-drive power amplifier for high	(US20230084443) A dual-drive power amplifier (PA) where the PA core includes a differential pair of			X											
laoscience	(WO2023137588) Nitride-based bidirectional switching device for	(WO2023137588) A nitride-based bidirectional switching device is provided for working with a	X													
CTM MAGNETICS	(US201903961) Distributed gap inductor filter apparatus and method for	(US201903961) The invention comprises a high frequency inductor filter apparatus and method of														
laoscience	(CN11483336) Semiconductor device and method for	(CN11483336) A nitride-based bidirectional switching device is provided for working with a								X						
CoolSemi	(WO2022219861) Recessed Fin-JFET gate structure HEMT and	(WO2022219861) The invention discloses a recessed Fin-JFET HEMT device and method for														
Soay	(WO2022219861) Semiconductor device and method for	(WO2022219861) The invention discloses a recessed Fin-JFET HEMT device and method for								X						
Eakris Semiconductor	(WO2022217541) Semiconductor structure and preparation method	(WO2022217541) A semiconductor structure and a preparation method for a semiconductor								X						X
Eakris Semiconductor	(WO2022217541) Semiconductor structure and preparation method	(WO2022217541) A semiconductor structure and a preparation method for a semiconductor								X						
Ampleon	(CN11207034) Semiconductor device and method of	(CN11207034) The present disclosure provides a semiconductor device and method of														
HC Semitec	(CN11207083) Epitaxial structure of radio frequency device and	(CN11207083) The invention provides an epitaxial structure of a radio frequency device and a														
HC Semitec	(CN11207083) Epitaxial structure of radio frequency device and	(CN11207083) The invention provides an epitaxial structure of a radio frequency device and a														
Richsound Electronic Industrial	(CN11208215) Environment-friendly high-voltage	(CN11208215) The invention relates to a wireless electric energy transmission distance														
Shanghai Dianji University	(CN11208215) Wireless power transmission distance	(CN11208215) The invention relates to a wireless electric energy transmission distance														
HC Semitec	(CN11207083) Epitaxial structure of radio frequency device for	(CN11207083) The invention provides an epitaxial structure of a radio frequency device and a														
GiantSea Power	(CN11205023) Intelligent distribution circuit for blind mating of	(CN11205023) The invention discloses a double PD port blind mating intelligent distribution														
National Yang Ming Chiao Tung U	(US20230033515) Synchronous buck converter using a single gate	(US20230033515) A synchronous buck converter using a single gate drive control is provided and	X													
Toyota Group	(JP2022152043) Manufacturing method for nitride semiconductor	(JP2022152043) PROBLEM TO BE SOLVED: To provide a technique of activating impurities	X													
Fujitsu	(WO2022217056) Nitride semiconductor device and manufacturing	(WO2022217056) PROBLEM TO BE SOLVED: To provide a nitride semiconductor device in which			X		X									
Merata / pSemi	(WO2022217057) Circuit assembly including gallium nitride devices	(WO2022217057) A circuit assembly includes a first printed circuit board (PCB), a switching device	X													
Merata / pSemi	(WO2022217057) Circuit assembly including gallium nitride devices	(WO2022217057) A circuit assembly includes a printed circuit board (PCB) with a metal inlay and an	X													

## Patent information

Dates and numbers of priority/application/publication/grant

Title, abstract, claims

Patent applicants, current assignees, inventors

Current legal status of patents (granted, pending, expired, etc.)

Hyperlinks to an updated online database

## Segments

Applications: power, power-related patents, RF, RF-related patents

Supply chain: wafers & epiwafers, devices, modules & packaging, circuits & applications

Technical challenges: dynamic on-resistance, e-mode, GaN-on-Silicon, monolithic integration, thermal management, vertical devices

# Patent landscape overview

General trends, key patent assignees and newcomers along the power supply chain

SAMPLE

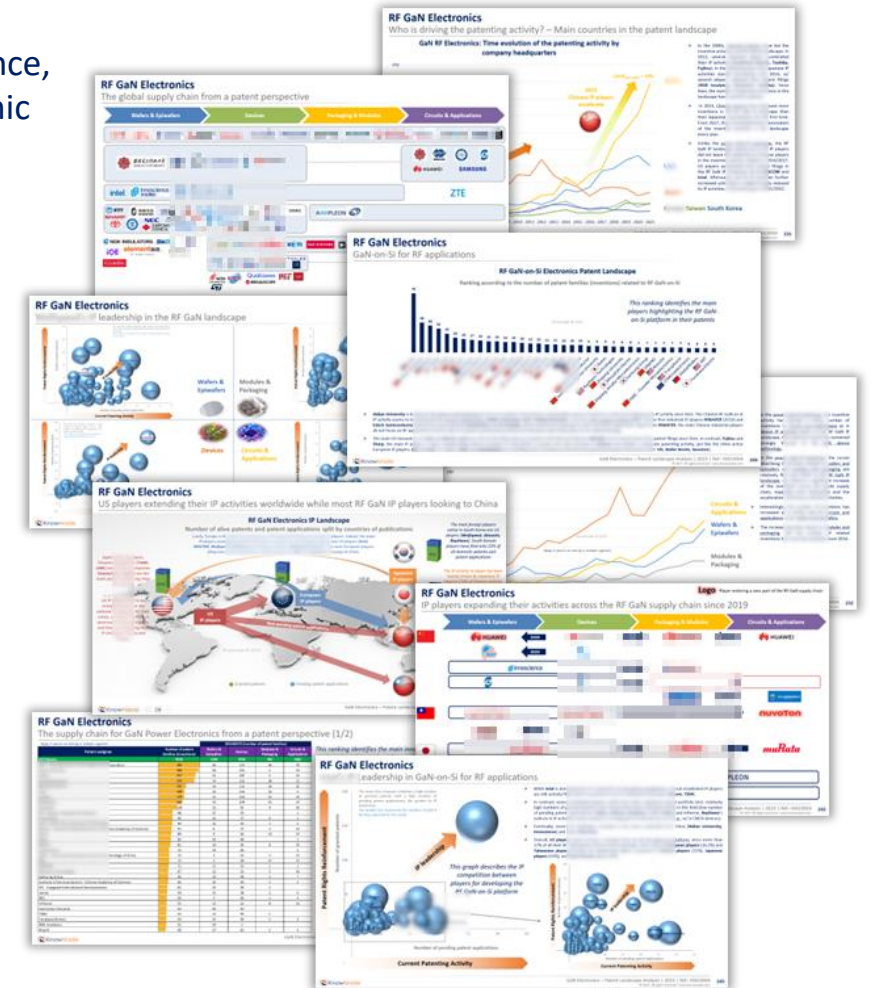


## Power GaN

Who is driving the patenting activity?  
The global supply chain from a patent perspective.  
Most active IP players and new entrants.  
Main technical challenges (dynamic on-resistance, e-mode, GaN-on-Si, vertical devices, monolithic integration, thermal management, etc.).



## RF GaN



# Patent landscape analysis by country/geographical area

IP dynamics, IP supply chain, IP strategies of players, main technical challenges, IP newcomers

SAMPLE



## Power GaN



## AMERICAN PLAYERS

Time evolution of patenting activity.  
Supply chain from a patent perspective.

Status of players' IP activity.

Main patent assignees.

Most active IP players and new entrants.

Main technical challenges addressed by IP players.

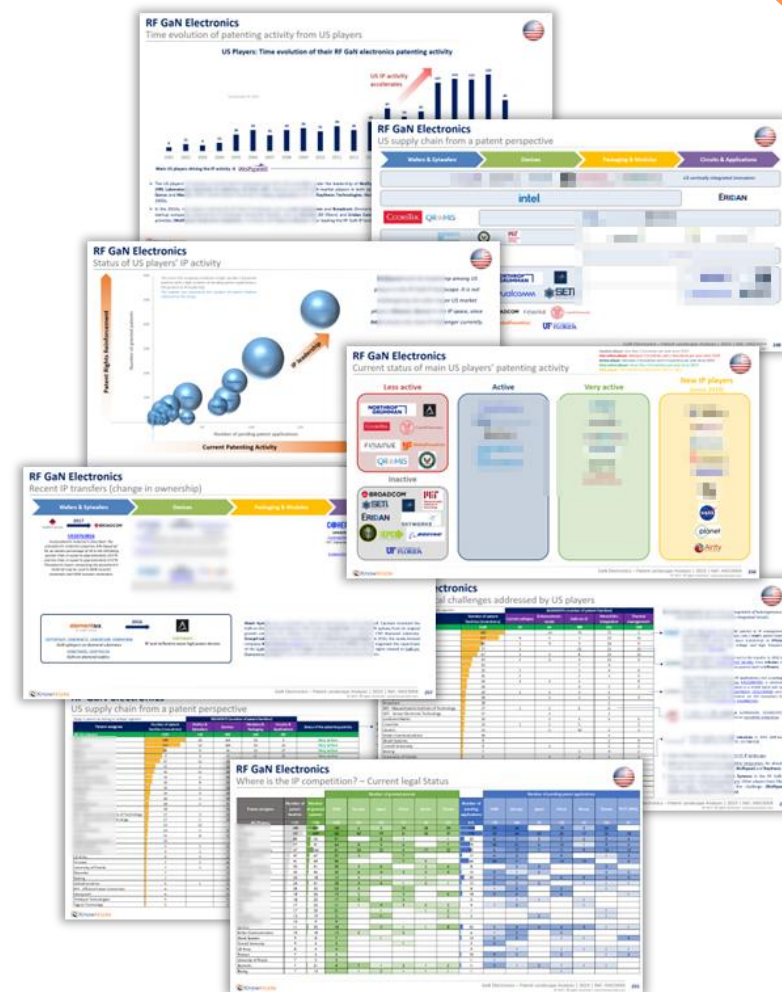
IP strategies of players and current legal status of their patents (pending, granted, protected countries, etc.).

Recent IP collaborations (patent co-filings) and IP transfers (change in ownership).

Focus on key players' patent portfolio.



## RF GaN



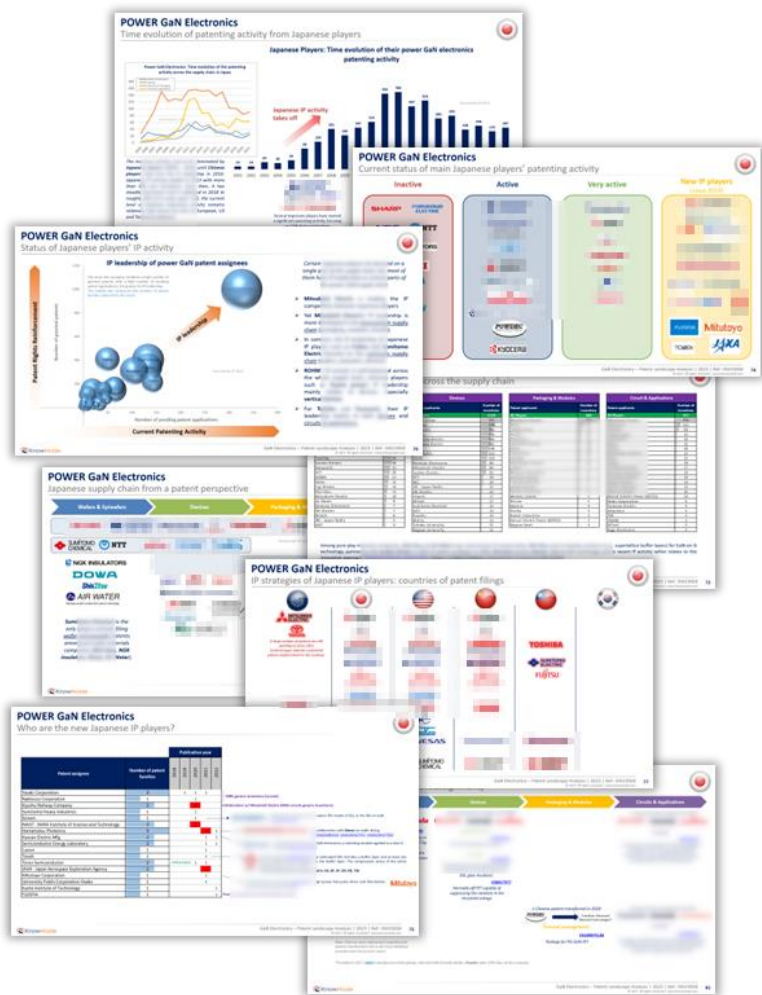
# Patent landscape analysis by country/geographical area

IP dynamics, IP supply chain, IP strategies of players, main technical challenges, IP newcomers

SAMPLE



## Power GaN



## JAPANESE PLAYERS

Time evolution of patenting activity.  
Supply chain from a patent perspective.

Status of players' IP activity.

Main patent assignees.

Most active IP players and new entrants.

Main technical challenges addressed by IP players.

IP strategies of players and current legal status of their patents (pending, granted, protected countries, etc.).

Recent IP collaborations (patent co-filings) and IP transfers (change in ownership).

Focus on key players' patent portfolio.



## RF GaN



# Patent landscape analysis by country/geographical area

IP dynamics, IP supply chain, IP strategies of players, main technical challenges, IP newcomers

SAMPLE



## Power GaN



## EUROPEAN PLAYERS

Time evolution of patenting activity.  
Supply chain from a patent perspective.  
Status of players' IP activity.  
Main patent assignees.

Most active IP players and new entrants.

Main technical challenges addressed by IP players.

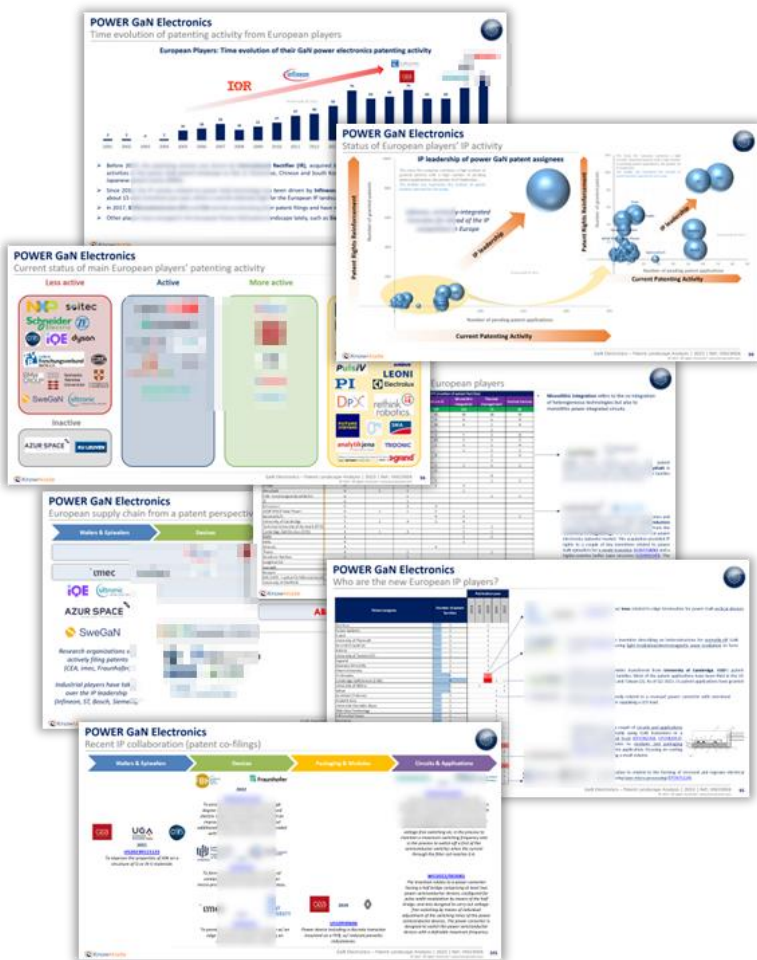
IP strategies of players and current legal status of their patents (pending, granted, protected countries, etc.).

Recent IP collaborations (patent co-filings) and IP transfers (change in ownership).

Focus on key players' patent portfolio.



## RF GaN





# Patent landscape analysis by country/geographical area

IP dynamics, IP supply chain, IP strategies of players, main technical challenges, IP newcomers

SAMPLE



## Power GaN



## CHINESE PLAYERS

Time evolution of patenting activity.  
Supply chain from a patent perspective.

Status of players' IP activity.

Main patent assignees.

Most active IP players and new entrants.

Main technical challenges addressed by IP players.

IP strategies of players and current legal status of their patents (pending, granted, protected countries, etc.).

Recent IP collaborations (patent co-filings) and IP transfers (change in ownership).

Focus on key players' patent portfolio.



## RF GaN



# Patent landscape analysis by country/geographical area

IP dynamics, IP supply chain, IP strategies of players, main technical challenges, IP newcomers

SAMPLE



## Power GaN



## TAIWANESE PLAYERS

Time evolution of patenting activity.  
Supply chain from a patent perspective.

Status of players' IP activity.

Main patent assignees.

Most active IP players and new entrants.

Main technical challenges addressed by IP players.

IP strategies of players and current legal status of their patents (pending, granted, protected countries, etc.).

Recent IP collaborations (patent co-filings) and IP transfers (change in ownership).

Focus on key players' patent portfolio.



## RF GaN



# Patent landscape analysis by country/geographical area

IP dynamics, IP supply chain, IP strategies of players, main technical challenges, IP newcomers

SAMPLE



## Power GaN



### SOUTH KOREAN PLAYERS

Time evolution of patenting activity.  
Supply chain from a patent perspective.

Status of players' IP activity.

Main patent assignees.

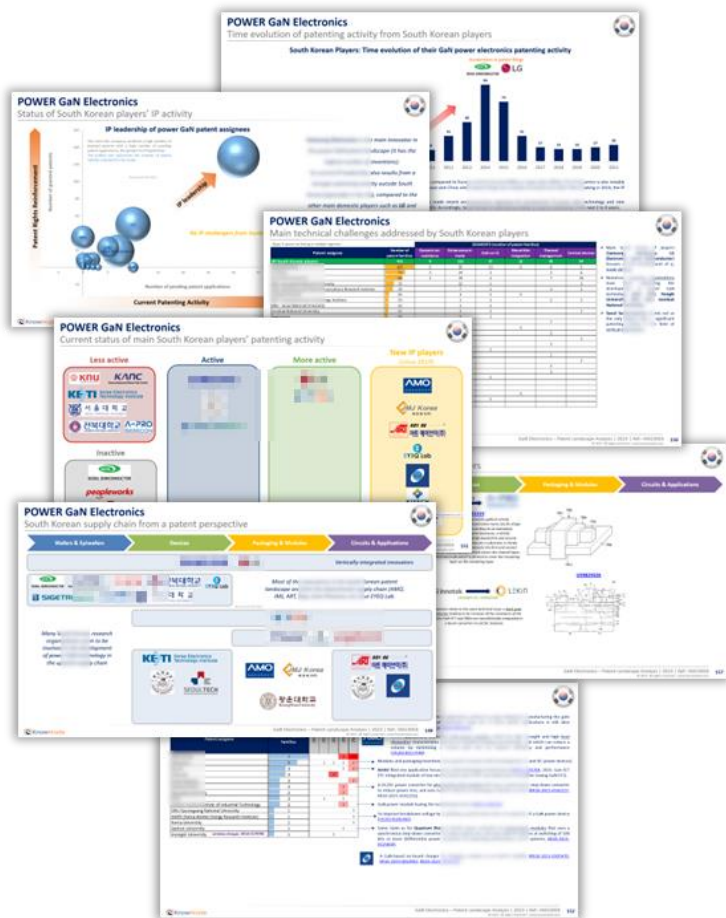
Most active IP players and new entrants.

Main technical challenges addressed by IP players.

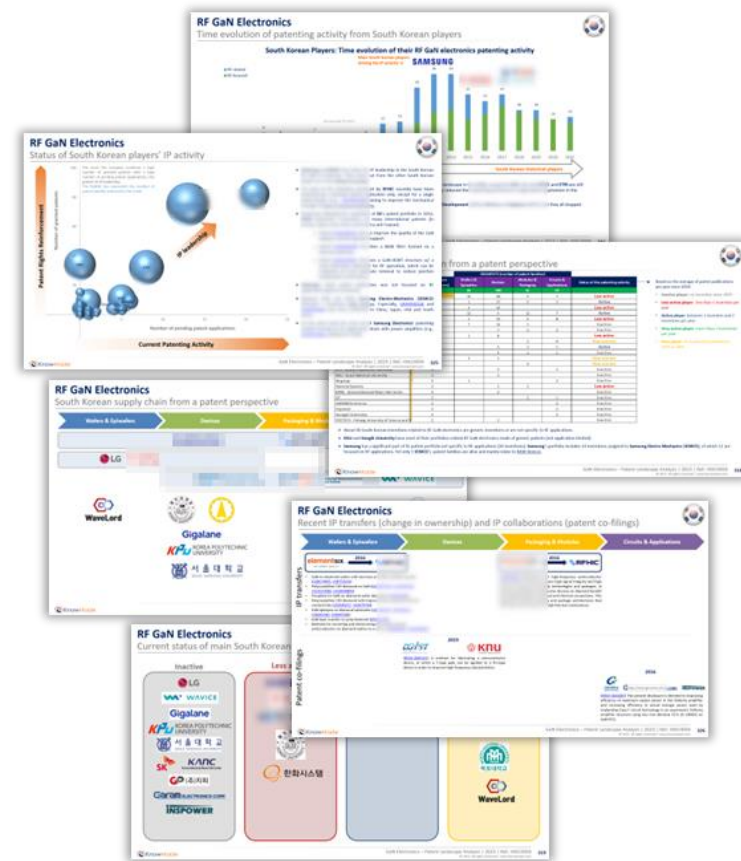
IP strategies of players and current legal status of their patents (pending, granted, protected countries, etc.).

Recent IP collaborations (patent co-filings) and IP transfers (change in ownership).

Focus on key players' patent portfolio.



## RF GaN



# IP profile of key players

IP portfolio summary, IP strategy, key patents and recent IP activity

SAMPLE



## Power GaN



## IP PROFILE OF KEY PLAYERS

For each player, the GaN patent portfolio is statistically analyzed to provide an overview of its strengths, its potential for reinforcement and level of IP activity. The recent patenting activity of the player is then reviewed in light of recent announcements related to GaN and related challenges.



## RF GaN



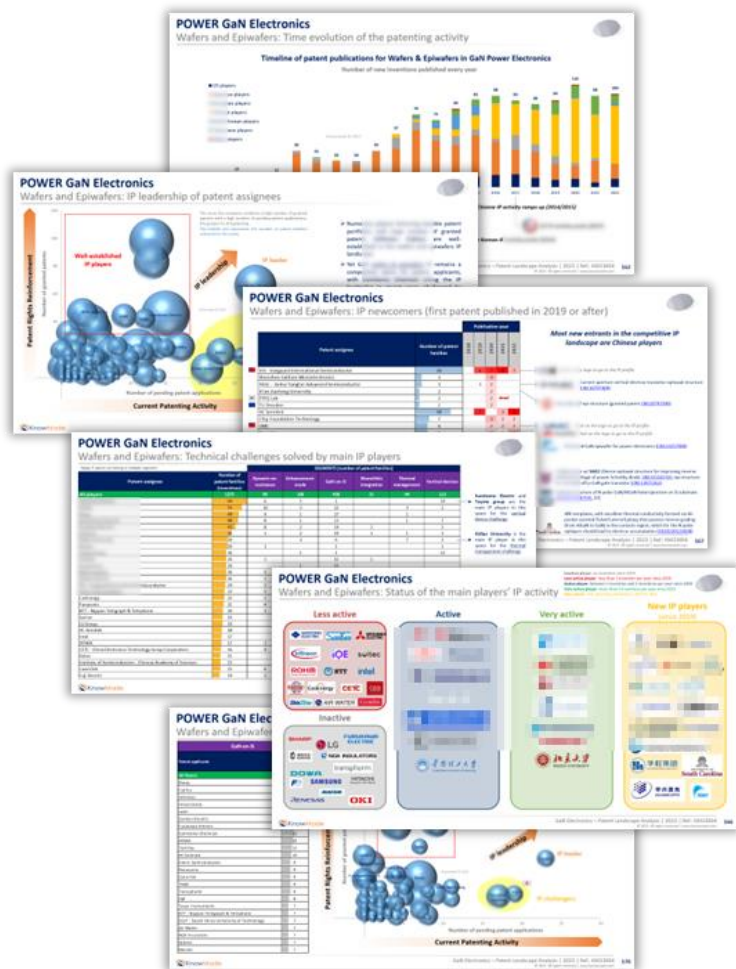
# Patent landscape analysis by supply chain segments

IP dynamics, main patent assignees, most active player, new entrants, technical challenges

SAMPLE



## Power GaN



## Wafers & Epiwafers

Time evolution of patent publications from US players, Japanese players, European players, etc.

Main patent assignees, most active IP players, and new entrants.

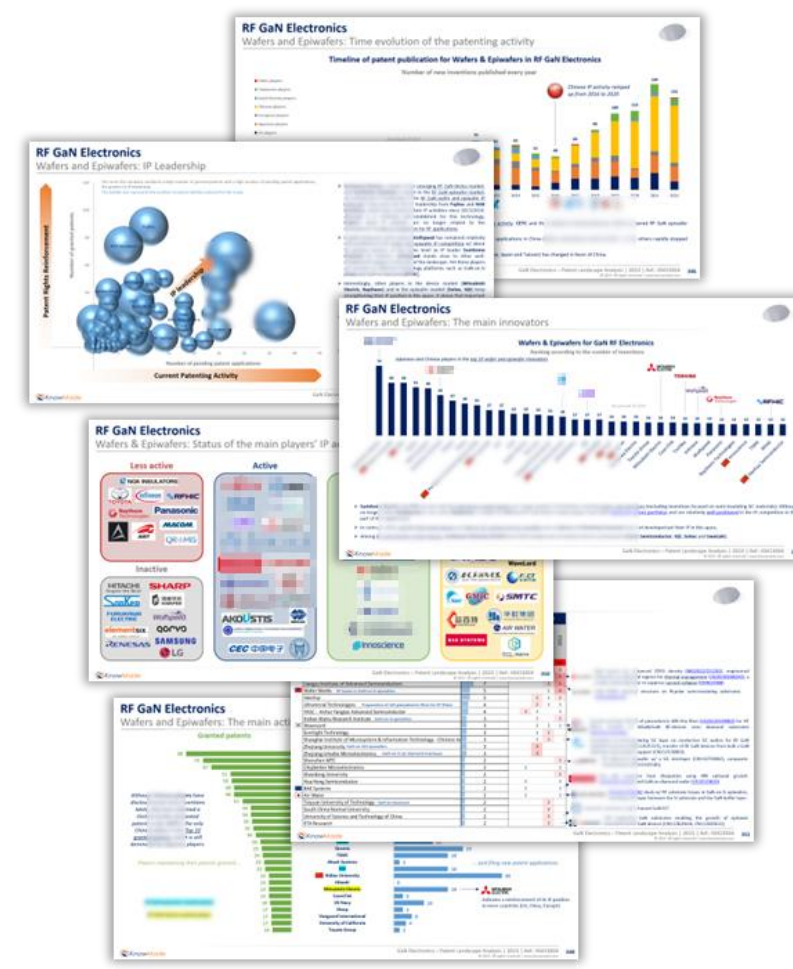
Current legal status of their patents (pending, granted).

Technical challenges addressed by IP players.

Main patent assignees and new entrant by technical challenge.



## RF GaN



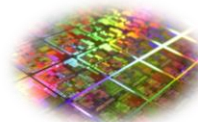
# Patent landscape analysis by supply chain segments

IP dynamics, main patent assignees, most active player, new entrants, technical challenges

SAMPLE



## Power GaN



## Devices

Time evolution of patent publications from US players, Japanese players, European players, etc.

Main patent assignees, most active IP players, and new entrants.

Current legal status of their patents (pending, granted).

Technical challenges addressed by IP players.

Main patent assignees and new entrant by technical challenge.

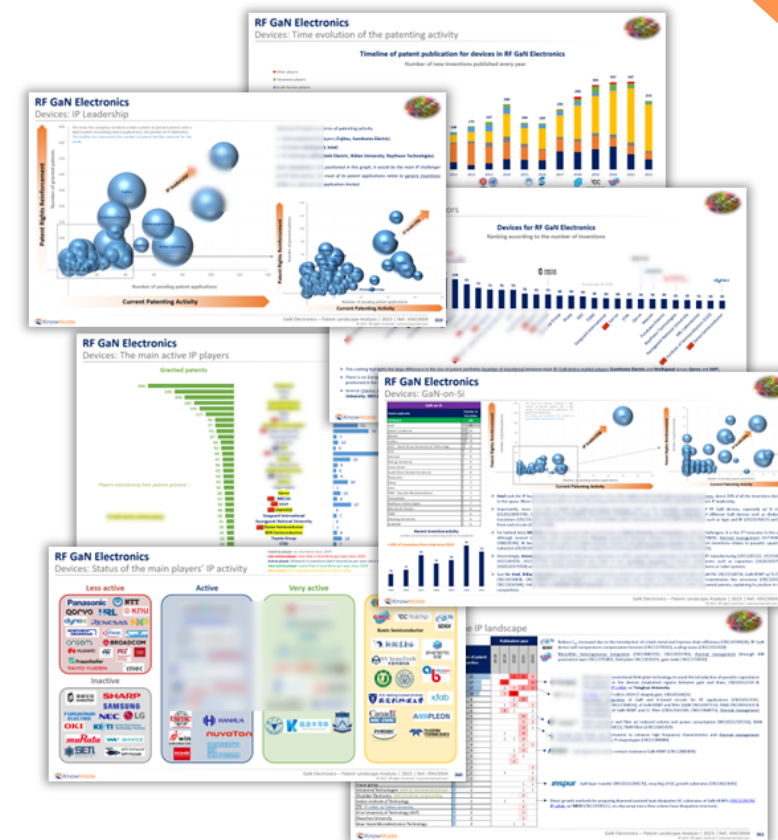
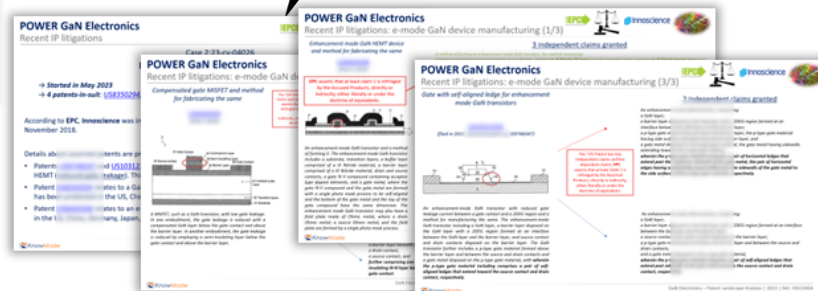


## RF GaN



## Patent litigation

EPC → Innoscience



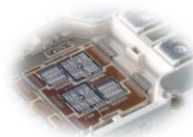
# Patent landscape analysis by supply chain segments

IP dynamics, main patent assignees, most active player, new entrants, technical challenges

SAMPLE



## Power GaN



## RF GaN

### Modules & Packaging

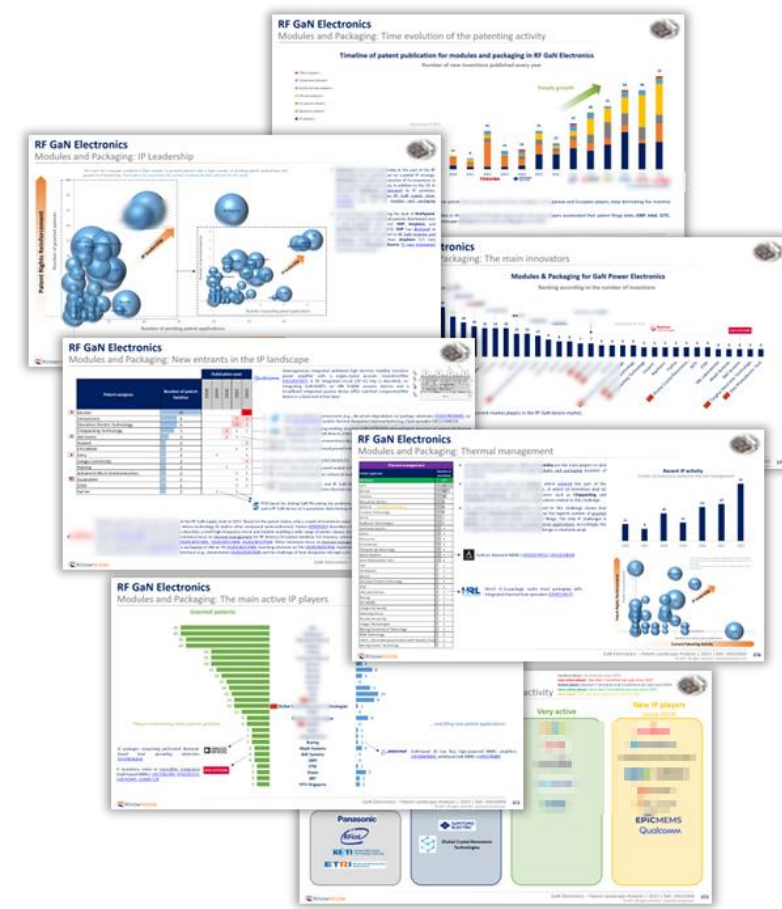
Time evolution of patent publications from US players, Japanese players, European players, etc.

Main patent assignees, most active IP players, and new entrants.

Current legal status of their patents (pending, granted).

Technical challenges addressed by IP players.

Main patent assignees and new entrant by technical challenge.



# Patent landscape analysis by supply chain segments

IP dynamics, main patent assignees, most active player, new entrants, technical challenges

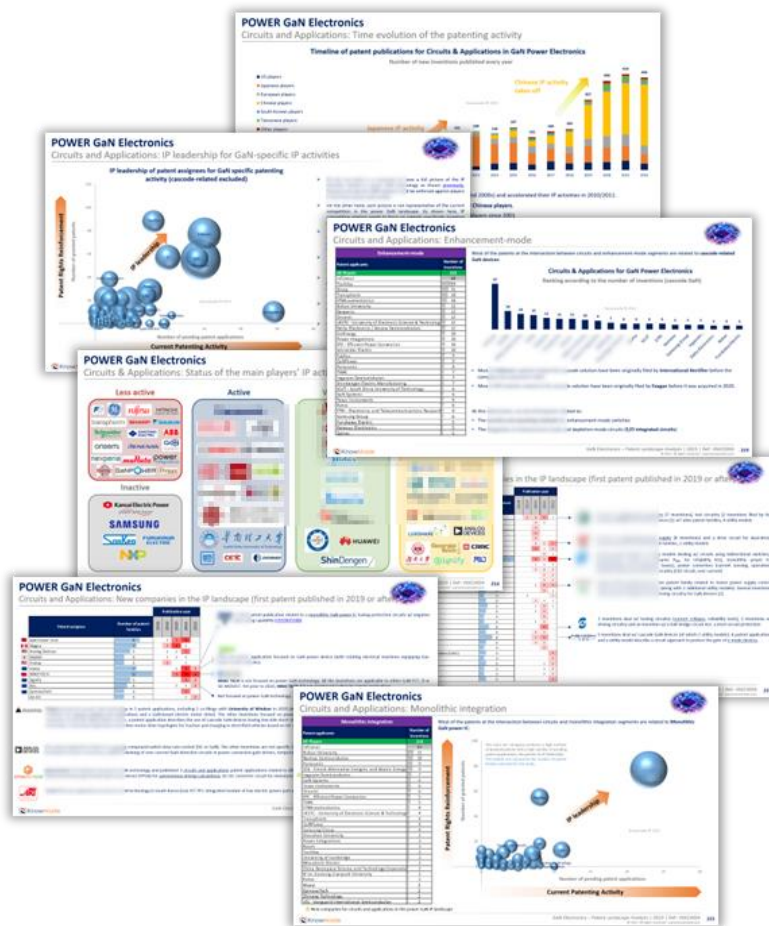
SAMPLE



## Power GaN



## RF GaN



## Circuits & Applications

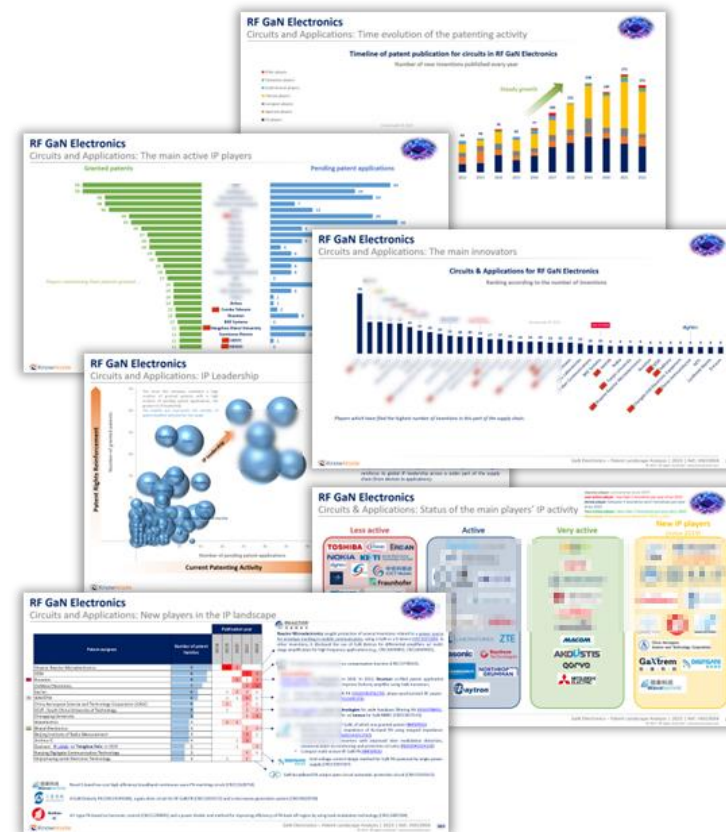
Time evolution of patent publications from US players, Japanese players, European players, etc.

Main patent assignees, most active IP players, and new entrants.

Current legal status of their patents (pending, granted).

Technical challenges addressed by IP players.

Main patent assignees and new entrant by technical challenge.





# ORDER FORM

## GaN Electronics (Power & RF applications)

Patent Landscape Analysis – November 2023

Ref.:KM23004



### SHIP TO

Name (Mr/Ms/Dr/Pr):

Job Title:

Company:

Address:

City:

State:

Postcode/Zip:

Country:

VAT ID Number for EU members:

Tel:

Email:

Date:

### PAYMENT METHODS

#### Check

To pay your invoice using a check, please mail your check to the following address:

KnowMade S.A.R.L.  
2405 route des Dolines, Le Drakkar,  
06560 Valbonne Sophia Antipolis  
FRANCE

#### Money Transfer

To pay your invoice using a bank money wire transfer please contact your bank to complete this process. Here is the information that you will need to submit the payment:

Payee: KnowMade S.A.R.L.  
Bank: Banque Populaire Méditerranée, CAP 3000 Quartier du lac, 06700 St Laurent du Var, France  
IBAN: FR76 1460 7003 6360 6214 5695 139  
BIC/SWIFT: CCBPFRPPMAR

#### Paypal

In order to pay your invoice via PAYPAL, you must first register at [www.paypal.com](http://www.paypal.com). Then you can send money to the KnowMade S.A.R.L. by entering our E-mail address [contact@knowmade.fr](mailto:contact@knowmade.fr) as the recipient and entering the invoice amount.

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**E-mail:** [contact@knowmade.fr](mailto:contact@knowmade.fr)

**Mail:** KnowMade S.A.R.L., 2405 route des Dolines, Le Drakkar, 06560 Valbonne Sophia Antipolis, FRANCE

### PRODUCT ORDER

4,990 EUR – Multi user license\*

For price in dollars, please use the day's exchange rate.

For French customer, add 20% for VAT.

All reports are delivered electronically in pdf format at payment reception.

*\*The report can be shared with the employees of the company purchasing the report. Subsidiaries and joint-ventures are excluded. Please be aware that the report is watermarked on each page, with the name of the recipient and the organization (the name mentioned in the PO). This watermark also reaffirms that report sharing is not allowed.*

*I hereby accept Knowmade's Terms and Conditions of Sale*  
**Signature:**

# Terms and Conditions of Sales

## DEFINITIONS

“Acceptance”: Action by which the Buyer accepts the terms and conditions of sale in their entirety. It is done by signing the purchase order which mentions “I hereby accept Knowmade’s Terms and Conditions of Sale”.

“Buyer”: Any business user (i.e. any person acting in the course of its business activities, for its business needs) entering into the following general conditions to the exclusion of consumers acting in their personal interests.

“Contracting Parties” or “Parties”: The Seller on the one hand and the Buyer on the other hand.

“Intellectual Property Rights” (“IPR”) means any rights held by the Seller in its Products, including any patents, trademarks, registered models, designs, copyrights, inventions, commercial secrets and know-how, technical information, company or trading names and any other intellectual property rights or similar in any part of the world, notwithstanding the fact that they have been registered or not and including any pending registration of one of the above mentioned rights.

“License”: For the reports and databases, 2 different licenses are proposed. The buyer has to choose one license:

1. One user license: a single individual at the company can use the report.

2. Corporate license: the report can be used by unlimited users within the company. Subsidiaries and joint ventures are not included.

“Products”: Reports are established in PowerPoint and delivered on a PDF format and the database may include Excel files.

“Seller”: Based in Sophia Antipolis (France headquarters), Knowmade is a technology intelligence company specialized in the research and analysis of scientific and technical information. We provide patent landscapes and scientific state of the art with high added value to businesses and research laboratories. Our intelligence digests play a key role to define your innovation and development strategy.

## 1. SCOPE

1.1 The Contracting Parties undertake to observe the following general conditions when agreed by the Buyer and the Seller. Any additional, different, or conflicting terms and conditions in any other documents issued by the buyer at any time are hereby objected to by the seller, shall be wholly inapplicable to any sale made hereunder and shall not be binding in any way on the seller.

1.2 This agreement becomes valid and enforceable between the Contracting Parties after clear and non-equivocal consent by any duly authorized person representing the Buyer. For these purposes, the Buyer accepts these conditions of sales when signing the purchase order which mentions “I hereby accept Knowmade’s Terms and Conditions of Sale”. This results in acceptance by the Buyer.

1.3 Orders are deemed to be accepted only upon written acceptance and confirmation by the Seller, within [7 days] from the date of order, to be sent either by email or to the Buyer’s address. In the absence of any confirmation in writing, orders shall be deemed to have been accepted.

## 2. MAILING OF THE PRODUCTS

2.1 Products are sent by email to the Buyer:

- within [1] month from the order for Products already released; or

- within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in progress.

2.2 Some weeks prior to the release date the Seller can propose a pre-release discount to the Buyer.

The Seller shall by no means be responsible for any delay in respect of article 2.2 above, and including in cases where a new event or access to new contradictory information would require for the analyst extra time to compute or compare the data in order to enable the Seller to deliver a high quality Products.

2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in article 3.

2.4 The mailing is operated through electronic means either by email via the sales department. If the Product’s electronic delivery format is defective, the Seller undertakes to replace it at no charge to the Buyer provided that it is informed of the defective formatting within 90 days from the date of the original download or receipt of the Product.

2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to

produce sufficient evidence of such defects.

2.6 No return of Products shall be accepted without prior information to the Seller, even in case of delayed delivery. Any Product returned to the Seller without providing prior information to the Seller as required under article 2.5 shall remain at the Buyer’s risk.

## 3. PRICE, INVOICING AND PAYMENT

3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to annual subscriptions. They are expressed to be inclusive of all taxes. The prices may be reevaluated from time to time. The effective price is deemed to be the one applicable at the time of the order.

3.2 Payments due by the Buyer shall be sent by cheque payable to Knowmade, PayPal or by electronic transfer to the following account:

Banque Populaire Méditerranée, CAP 3000 Quartier du lac, 06700 St Laurent du Var, France

BIC or SWIFT code: CCBPFRPPMAR

IBAN: : FR76 1460 7003 6360 6214 5695 139

To ensure the payments, the Seller reserves the right to request down payments from the Buyer. In this case, the need of down payments will be mentioned on the order.

3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a particular written agreement. If the Buyer fails to pay within this time and fails to contact the Seller, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. Our publications (report, database, tool...) are delivered only after reception of the payment.

3.4 In the event of termination of the contract, or of misconduct, during the contract, the Seller will have the right to invoice at the stage in progress, and to take legal action for damages.

## 4. LIABILITIES

4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for choosing the Products and for the use and interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and acts it deduces thereof.

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or arising from a material breach of this agreement

4.3 In no event shall the Seller be liable for:

a) damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or information) arising out of the use of or inability to use the Seller’s website or the Products, or any information provided on the website, or in the Products;

b) any claim attributable to errors, omissions or other inaccuracies in the Product or interpretations thereof.

4.4 All the information contained in the Products has been obtained from sources believed to be reliable. The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

4.5 All the Products that the Seller sells may, upon prior notice to the Buyer from time to time be modified by or substituted with similar Products meeting the needs of the Buyer. This modification shall not lead to the liability of the Seller, provided that the Seller ensures the substituted Product is similar to the Product initially ordered.

4.6 In the case where, after inspection, it is acknowledged that the Products contain defects, the Seller undertakes to replace the defective products as far as the supplies allow and without indemnities or compensation of any kind for labor costs, delays, loss caused or any other reason. The replacement is guaranteed for a maximum of two months starting from the delivery date. Any replacement is excluded for any event as set out in article 5 below.

4.7 The deadlines that the Seller is asked to state for the mailing of the Products are given for information only and are not guaranteed. If such deadlines are not met, it shall not lead to any damages or cancellation of the orders, except for non-acceptable delays exceeding [4] months from the stated deadline, without information from the Seller. In such case only, the Buyer shall be entitled to ask for a reimbursement of its first down payment to the exclusion of any further damages.

4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of saleability and fitness for a particular purpose, with respect to the Products. Although the Seller shall take

reasonable steps to screen Products for infection of viruses, worms, Trojan horses or other codes containing contaminating or destructive properties before making the Products available, the Seller cannot guarantee that any Product will be free from infection.

## 5. FORCE MAJEURE

The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labor difficulties, equipment failure, late deliveries by suppliers or other difficulties which are beyond the control, and not the fault of the Seller.

## 6. PROTECTION OF THE SELLER’S IPR

6.1 All the IPR attached to the Products are and remain the property of the Seller and are protected under French and international copyright law and conventions.

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish the Product, or any part of it to any other party other than employees of its company. The Buyer shall have the right to use the Products solely for its own internal information purposes. In particular, the Buyer shall therefore not use the Product for purposes such as:

- Information storage and retrieval systems;

- Recordings and re-transmittals over any network (including any local area network);

- use in any timesharing, service bureau, bulletin board or similar arrangement or public display;

- Posting any Product to any other online service (including bulletin boards or the Internet);

- Licensing, leasing, selling, offering for sale or assigning the Product.

6.3 The Buyer shall be solely responsible towards the Seller of all infringements of this obligation, whether this infringement comes from its employees or any person to whom the Buyer has sent the Products and shall personally take care of any related proceedings, and the Buyer shall bear related financial consequences in their entirety.

6.4 The Buyer shall define within its company point of contact for the needs of the contract. This person will be the recipient of each new report in PDF format. This person shall also be responsible for respect of the copyrights and will guaranty that the Products are not disseminated out of the company.

## 7. TERMINATION

7.1 If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer of such delay or cancellation. This may also apply for any other direct or indirect consequential loss that may be borne by the Seller, following this decision.

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may send a notification to the other by recorded delivery letter upon which, after a period of thirty (30) days without solving the problem, the non-breaching Party shall be entitled to terminate all the pending orders, without being liable for any compensation.

## 8. MISCELLANEOUS

All the provisions of these Terms and Conditions are for the benefit of the Seller itself, but also for its licensors, employees and agents. Each of them is entitled to assert and enforce those provisions against the Buyer.

Any notices under these Terms and Conditions shall be given in writing. They shall be effective upon receipt by the other Party.

The Seller may, from time to time, update these Terms and Conditions and the Buyer, is deemed to have accepted the latest version of these terms and conditions, provided they have been communicated to him in due time.

## 9. GOVERNING LAW AND JURISDICTION

9.1 Any dispute arising out or linked to these Terms and Conditions or to any contract (orders) entered into in application of these Terms and Conditions shall be settled by the French Commercial Courts of Grasse, which shall have exclusive jurisdiction upon such issues.

9.2 French law shall govern the relation between the Buyer and the Seller, in accordance with these Terms and Conditions.

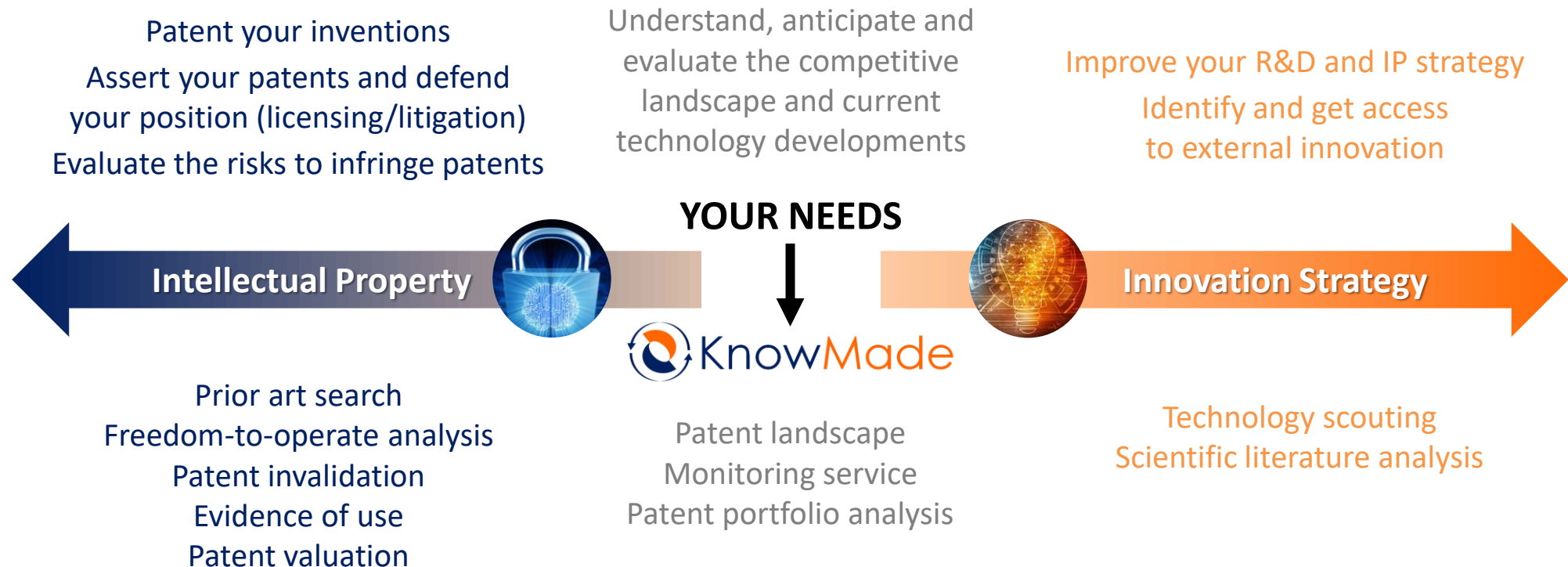
# KNOWMADE

## Patent and Technology Intelligence

# KNOWMADE PURPOSE

Turning **patent information** and **scientific literature** into actionable insights, providing high added value reports for **decision-makers** working in **R&D, Innovation Strategy, Intellectual Property, and Marketing**

Competitive landscape | Technology trends | Opportunities / Risks | R&D and IP strategy



# WHAT INFORMATION CAN YOU GET ?



## MARKET

*For executives,  
business developers*

- Identify competitors
- Compare IP with market position
- Evaluate the level of investment
- Future products & target markets



## TECHNOLOGY

*For R&D teams,  
engineers, scientists*

- R&D activities
- Technological roadmap
- Position on the supply chain



## INTELLECTUAL PROPERTY

*For IP teams,  
patent attorneys*

- Risks and opportunities  
(FTO, litigations, licensing)
- Key patents
- Link between patents and products

# KNOWMADE OFFER

## CUSTOM SERVICES

(Tailor-made analysis)

*To meet your needs and budget/lead time constraints*

- Specific and dedicated report.
- Prior-art search, freedom-to-operate, patent landscape, patent valuation, technology scouting, monitoring service, etc.

Format

- PDF file with analyses.
- Excel file with data.
- Access to the analyst.

## REPORTS

(multi-client product)

*To understand the competitive landscape and explore the emerging ecosystems and new technologies*

- Stand alone report
- Patent landscape.
- Overview on IP dynamics, trends and players.
- Competitor, technology and strategy analysis.
- Benchmark of patent portfolios.
- Key IP players & key patents.

Format

- PDF file with analyses.
- Excel file with patent data.

## MONITORS

(multi-client product)

*To track the latest R&D developments and IP activities, and to be sensitive to weak signals*

- Annual subscription
- Patent monitoring service.
- Quarterly updated patent data and technology trends.
- Current R&D and IP activities.
- Early detect weak signals, opportunities and risks.
- Open discussion with analyst.

Format

- PDF file with analyses.
- Excel file with patent data.
- Direct access to the analyst.

## INSIGHTS

(free article)

*To get unique information about industry and technology*

- Analyst point of view about industry news (product release, M&A, start-up, fund-raising, etc.) from a patent perspective.

Format

- Knowmade website

# MAIN FIELDS OF EXPERTISE

## SEMICONDUCTORS

- Materials & Substrates
- Power electronics
- RF & Wireless datacom
- MEMS, Sensing & Imaging
- Photonics, Lighting & Display
- Memory
- Packaging

## ENERGY

- Batteries
- Fuel-cells
- Solar PV
- Power management

## HEALTHCARE

- Therapeutic tools
- Diagnostics and Theragnostics
- Medical devices and imaging
- Drug discovery and delivery

## AGRI-FOOD

- Food processing & formulation
- Vegan food
- Next-gen packaging
- Agriculture 4.0



# SEMICONDUCTORS

## Expertise







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06902 Sophia Antipolis, France

[www.knowmade.com](http://www.knowmade.com)  
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