

# Memory for Artificial Intelligence

## Patent Landscape Analysis

January 2023

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- IP leadership of patent assignees for emerging NVM

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- Methodology
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- Other notable patent families

**IP PROFILES OF KEY PLAYERS** **68**

- IBM
- Samsung
- Applied Materials
- TDK
- SK Hynix

- Macronix International
- Hewlett Packard
- TetraMem
- Companies with RRAM core business, but being absent of this report since none of their memory-related patents explicitly mention AI/ML application

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- Methodology for patent search, selection and analysis
- Methodology to identify key patents and key IP players
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**KNOWMADE PRESENTATION** **125**

# Questions answered by the patent landscape

In recent years, neuromorphic computing has emerged as a promising technology in the post-Moore's law era. Neuromorphic computing systems are highly connected and parallel and consume relatively low power and processes in memory. Artificial neurons and synapses that mimic biological ones are needed to implement such a system on hardware. Both must be power-efficient, scalable, and capable of implementing relevant learning rules to facilitate large-scale neuromorphic functions. To this end, numerous efforts have been made over the last few years to create artificial neurons and synapses using emerging memories, including magnetoresistive random-access memory (MRAM), phase-change memory (PCM), resistive random-access memory (ReRAM, RRAM or memristors), conductive bridging random-access memory (CB-RAM), ferroelectric random-access memory (FeRAM or FRAM), ferroelectric field-effect transistor (FeFET), synaptic transistors, and others.

Is there a specific memory technology more suitable than others for artificial intelligence/machine learning (AI/ML)?

Who are the key patent owners and the most active applicants in the field?

What are the technical challenges targeted in patents, and what is protected (device, system, method, etc.)?

Are there memory properties developed more specifically for intelligence/machine learning (AI/ML)?

# SCOPE OF THE REPORT (1/2)

We have selected and analyzed more than **2,500 patents and patent applications** published worldwide up to July 2022, representing more than **1,300 patent families** (inventions) relevant to the scope of this report.

The patent search strategy has been implemented by using advanced search equations in the patent data base and by a cautious patent selection, that has been performed by the analyst, in order to get the most out of the corpus.

More details are available in METHODOLOGY part.

Inventions related to **memory and AI/ML** have been selected as follows:

Type of patents	In scope	Out of scope
Specific patents, which mention the type of memory (PCM, RRAM, FeRAM/FeFET, Flash, MRAM, ...)	X	
Patents targeting early-stage research memory technologies and not belonging to the main segments (segment « others »)	X	
Patents where the activation mechanism of the memory device is specified (resistance change, charge storage, polarization ...), making it clear what type of memory device it is and the segment it belongs to	X	
Generic patents, which mention memory without specifying which technology (segment « not specific »)	X	
Patent protecting devices linked with synaptic / neuronal architectures or behavior (synaptic transitory, electronic synapse ...)	X	
Patents protecting an assembly of storage devices or systems made of several components (including memory)	X	
Methods to fabricate or to utilize memory devices	X	
Patents where there are memory elements in the system but the action of the memory elements in the system is not scribed or the memory utilization is not in relation with properties looked for AI/ML		X
Patents related to generic hardware included in semiconductor processing equipment (process monitoring and optimization with AI algorithms) and not focused on memory device		X
Patents related to training methods / learning methods, algorithms, setting weights ... not focused on memory		X

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OUT OF SCOPE OF THIS REPORT?

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# SCOPE OF THE REPORT (2/2)



This report provides a detailed picture of the patent landscape related to **memory technologies for artificial intelligence/machine learning (AI/ML) applications**.

**Memory technologies** claimed in patents have been **categorized** as follow for a more detailed overview of the field:

<b>PCM</b> 80+ patent families	<b>FRAM/FeFET</b> 120+ patent families	<b>RRAM</b> 180 patent families	<b>MRAM</b> 110+ patent families	<b>Flash</b> 140+ patent families
<b>DRAM</b> 5 patent families	<b>SRAM</b> 4 patent families	<b>Other</b> 340+ patent families	<b>Not specific</b> 290+ patent families	

More in details, the patent landscape analysis provides an overview of standard and emerging memory technologies:

- To give global trends (**time evolution** of patent filings, **geographical evolution** of patent filings, etc.).
- To identify the **main IP players** and the **newcomers** for each technology segment.
- To determine the status of IP players **patenting activity** (active / inactive) and its **dynamics** (ramping up, slowing down, steady).
- To identify the **IP collaborations** (patent co-filings) and **IP transfers** (changes of patent ownership).
- In addition, the IP report includes the **IP profile of 8 key IP players: IBM, Samsung, Applied Materials, TDK, SK hynix, Macronix, HP, TetraMem**). Each player’s patent portfolio related to memory technologies for AI applications is analyzed to provide an overview of its strengths, potential for reinforcement, level of IP activity, main IP collaborations, recent patenting activity, and inventions that stand out.

# READING GUIDE

Found the right information in the report

SAMPLE

Report sections

Your concern →

Information you get ↘

## TECHNOLOGY

*For R&D teams,  
engineers, scientists*

## IP

*For IP teams,  
patent attorneys*

## MARKET

*For executives,  
business developers*

## PLAYER

*Zoom in a  
competitor / partner*

### PATENT LANDSCAPE OVERVIEW

- **Ranking of players** (enforceability, current activity, geo/tech coverage, prior-art contribution, etc.)
- **Patent filings dynamics per player**
- **IP collaborations** (co-filings, IPR transfers)
- **Patent litigation/oppositions**

Innovators

Main patent owners  
IP risks/opportunities

Ecosystem  
(competitors, newcomers,  
partners, clients)  
Main trends  
IP vs Market

IP position vs Market  
position  
Player relationships  
(collaborations/  
dependencies)

### SEGMENTS ANALYSIS

- **Patent filings dynamics per segment**
- **IP leaders per segment** (enforceability, current activity, blocking potential)
- **Key patents per segment**
- **Recent patenting activity per segment**

Technology trends  
Technology mapping

Blocking players  
IP risks/opportunities  
in each segment  
(FTO, litigation, licensing)

Benchmarking  
Markets of interest  
Future developments

IP position and level  
of investment in each  
segment  
Key IP developments

### IP PROFILE OF KEY PLAYERS

- **Patent portfolio summary** (portfolio size, IP activity evolution, patents legal status, geo/tech coverage, strengths/weaknesses, etc.)
- **Key patents**
- **Recent patenting activity**

Current R&D activities  
Technology roadmap

Blocking patents  
Geo/Tech coverage  
Link between patents  
and products

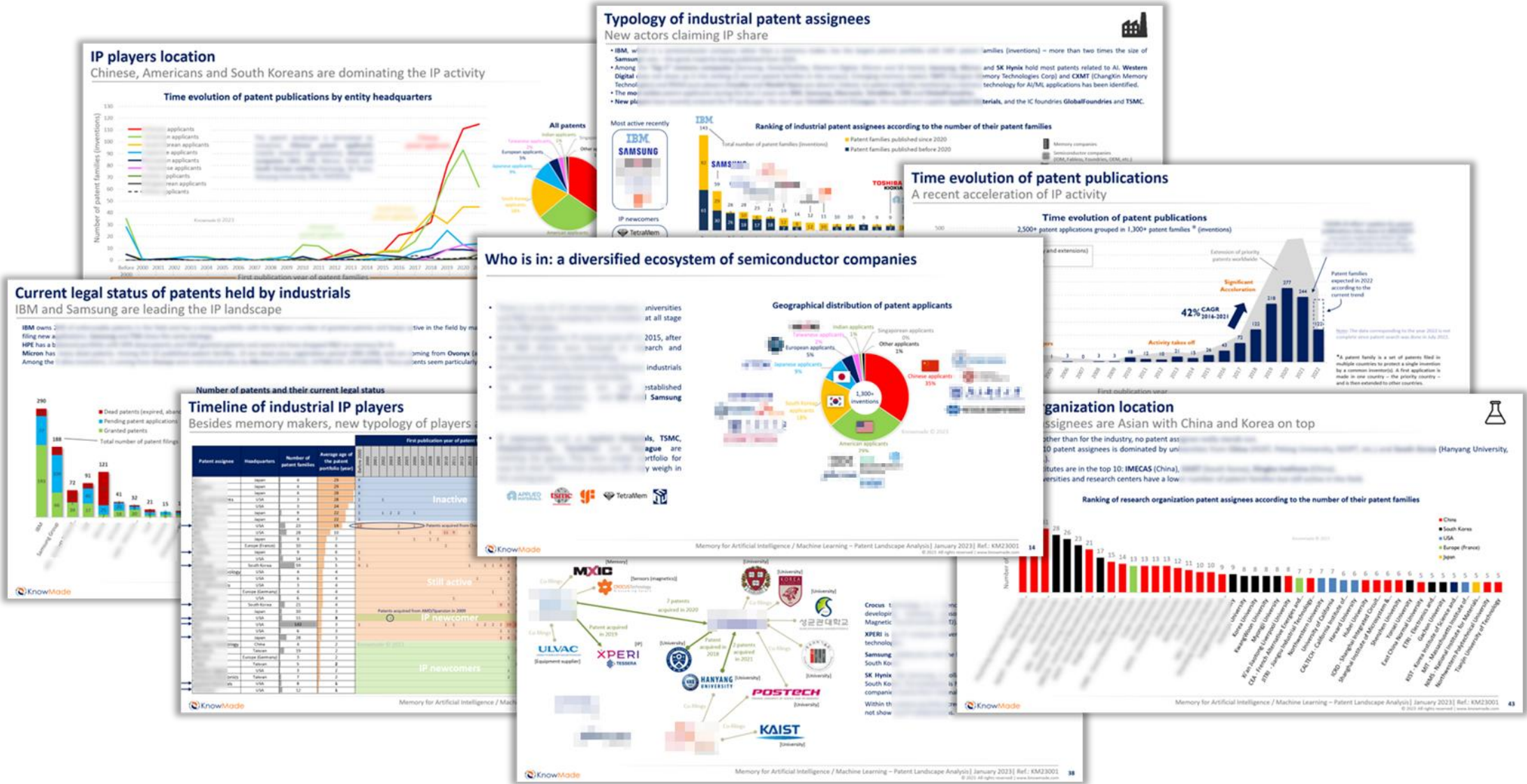
Future products  
Potential partners  
Potential targets

R&D investment level  
Key inventions  
Current IP activities  
Strengths / Weaknesses

# Patent landscape overview

General trends, Key patent assignees, Newcomers, IP collaborations

SAMPLE



IP strategy, IP strength, Geographical coverage of portfolios, Patent legal status

**SAMPLE**

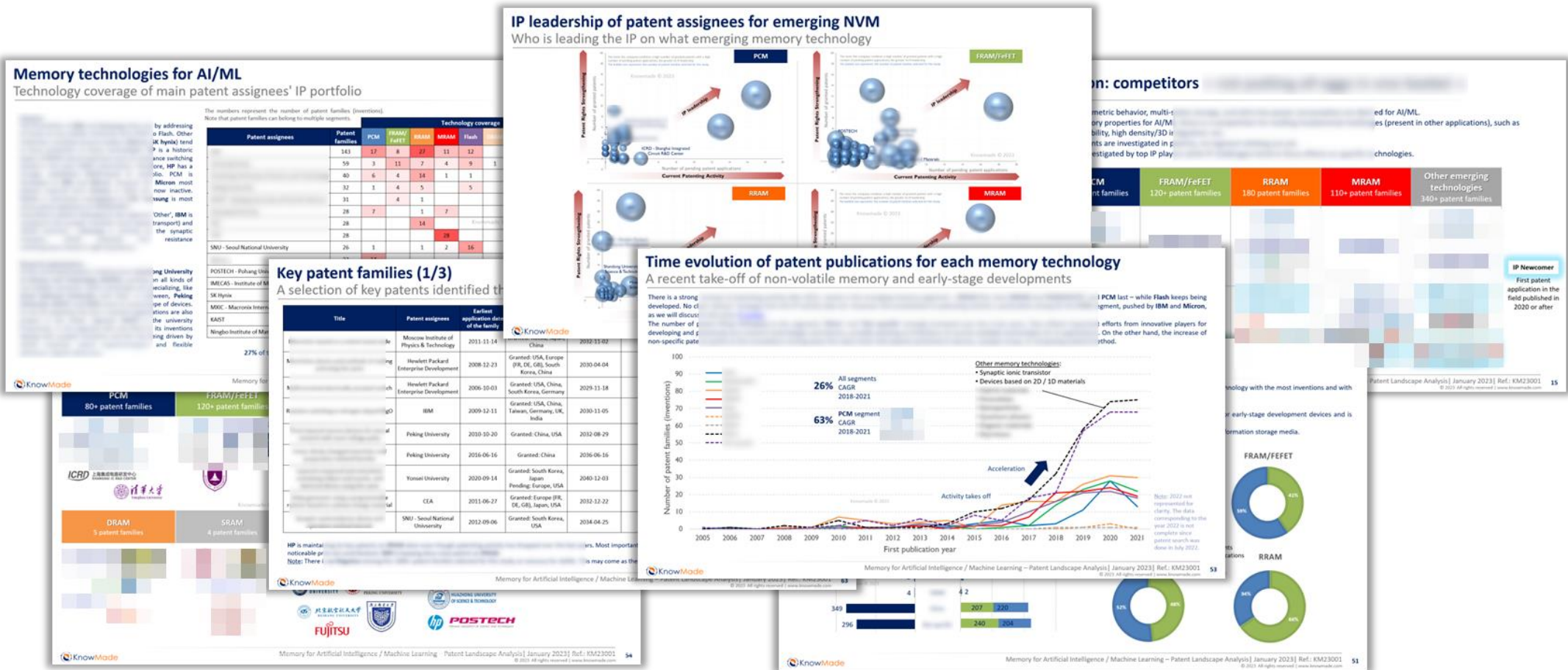


# Patent segmentation

By segment: IP dynamics, Key patent assignees, Newcomers, Key patents

The patents have been **categorized according to the memory technologies** developed for neuromorphic computation: resistance-based emerging memory technology (**ReRAM, PCM, MRAM**), polarization-based emerging memory technology (**FRAM/FeFET**), traditional memory technologies (**Flash, DRAM, SRAM**), **other memory technologies** (synaptic ionic transistor, devices based on 2D or 1D materials, hybrid materials, perovskites, nanoparticles, quantum physics, organic materials, skyrmions, etc.), and **not specific** (type of memory technology not specified).

SAMPLE

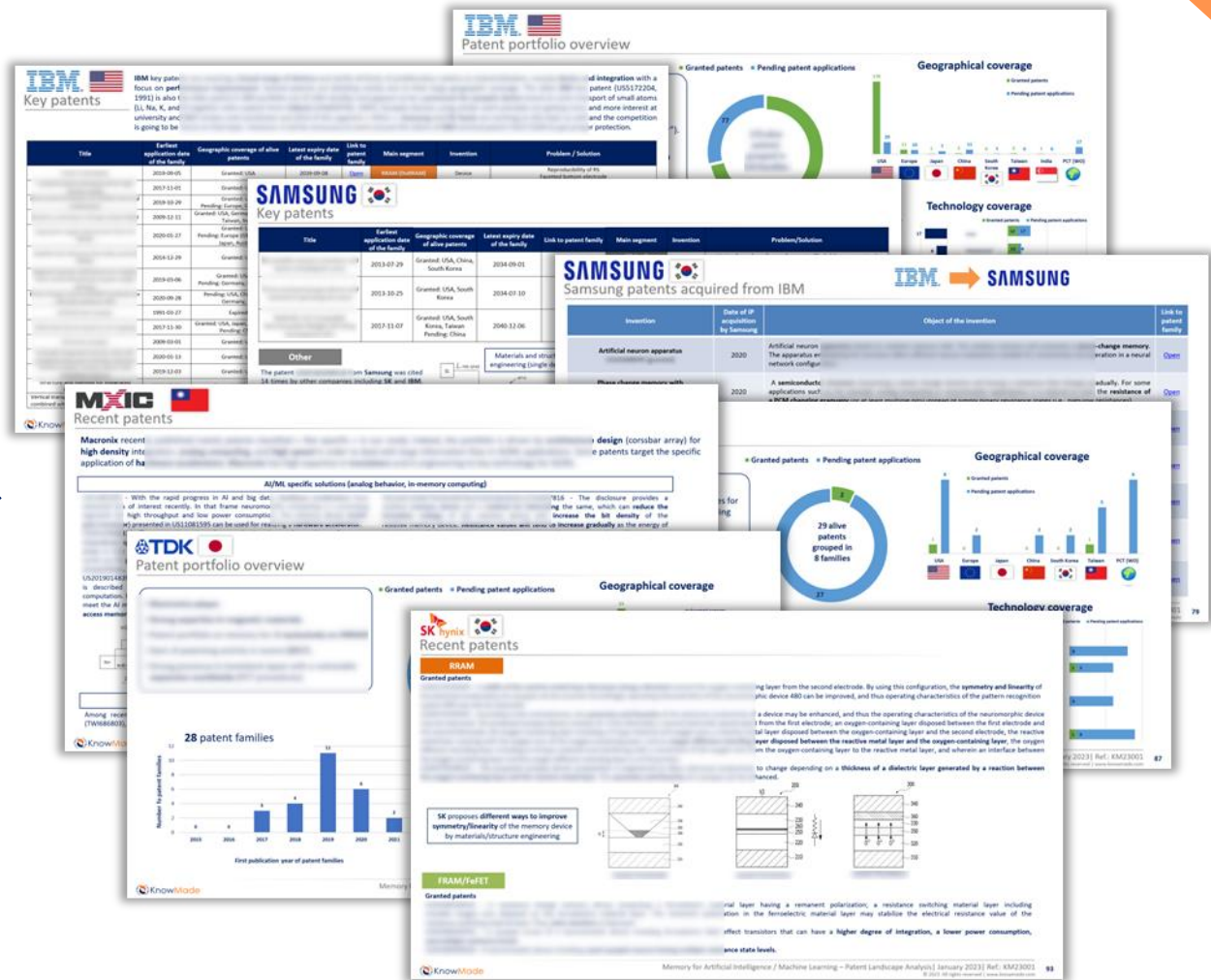


# IP profile of key players

IP portfolio summary, IP strategy, IP collaborations and recent IP activity

SAMPLE

A focus on the key IP players is provided in a dedicated section. For each player, the patent portfolio related to memory technologies for AI/ML applications is analyzed to provide an overview of its strengths, potential for reinforcement, level of IP activity, main IP collaborations, recent patenting activity, and inventions that stands out.



# 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 1,300+ 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 **nine segments** (RRAM, PCM, MRAM, FeRAM/FeFET, Flash, DRAM, SRAM, other, not specific).

### KNOWMAGE

Memory for AI - Patent Landscape Analysis (January 2023)

The data are extracted from the FamPat worldwide patent database (Questel-ORBIT) which provides 100+ million patent documents from 100 worldwide patent offices.

The search for patents was completed in July 2022.

The patents are grouped in patent families. A patent family is a set of patent applications filed in multiple countries to protect a single invention by a common inventor(s).

Family number (Questel unique family ID from FamPat database)	Patent numbers (publication numbers)	Current patent assignees (as mentioned in the patent database)	Patent assignee name used in the report	Title	Abstract	Biblio Summary (Link to full patent description)	Earliest application date (yyyy-mm-dd)	Earliest publication date (yyyy-mm-dd)	Earliest grant date (yyyy-mm-dd)	Expected expiry dates (yyyy-mm-dd)	Legal status (Pending, Granted, Revoked, Expired, Lapsed)	SEGMENTS								
												RRAM	MRAM	PCM	FRAM/FeFET	Flash	DRAM	SRAM	Other	
68437147	KR10-2074342	SAMSUNG	SAMSUNG Group	(US20160269418)	(US20160269418)	<a href="#">Open</a>	2013-07-23	2015-01-23	2016-06-28	(US3373319B2)	(US3373319B2)					X			X	
61894387	US9165242	SEOUL NATIONAL	SNU - Seoul National	(US9165242)	(US20140067743)	<a href="#">Open</a>	2012-09-06	2014-03-06	2014-07-31	(US9165242B2)	(US9165242B2)									
72214441	KR10-2016-0019682	POHANG	POSTECH - Pohang	(WO201624676)	(WO2016024676)	<a href="#">Open</a>	2014-08-12	2016-02-18		(WO201624676A1)	(WO201624676A1)								X	
7494232	KR10-1468521	HEWLETT PACKARD	HPE - Hewlett	(US8605483)	(US20110182108)	<a href="#">Open</a>	2006-12-23	2010-07-01	2013-12-10	(US8605483B2)	(US8605483B2)	X								
6833544	US11283012	HEWLETT PACKARD	HP - Hewlett Packard	(US7763880)	(US20080079023)	<a href="#">Open</a>	2006-10-03	2008-04-03	2010-07-27	(US7763880B2)	(US7763880B2)	X								
62021830	KR10-0860134	CYPRESS	CYPRESS	(US6815286)	(US20030053350)	<a href="#">Open</a>	2001-08-13	2003-02-27	2004-10-19	(US6806526B2)	(US6806526B2)								X	
77034637	US20180277552	BEIHANG	Beihang University	(US20180277552)	(US10083974)	<a href="#">Open</a>	2017-03-23	2017-08-18	2018-09-25	(US20180277552A1)	(US20180277552A1)								X	
68293688	US6858481	GLOBALFOUNDRIES	GlobalFoundries	(US6858481)	(US20030173612)	<a href="#">Open</a>	2003-04-15	2003-09-18	2004-07-27	(US6768157B2)	(US6768157B2)								X	
7649396	CN102456157	UNIVERSITY BEIJING	Peking University	(US8924321)	(US20120284218)	<a href="#">Open</a>	2010-10-20	2012-04-26	2014-12-30	(US8924321B2)	(US8924321B2)	X								
44460206	US20160010221	GTRC - GEORGIA	GTRC - GEORGIA	(US20160010221)	(US20160010221)	<a href="#">Open</a>	2010-06-25	2010-12-29		(US20160010221A1)	(US20160010221A1)									
42636466	US4833700A	CALTECH - California	CALTECH - California	(US4833700)	(US4833700)	<a href="#">Open</a>	1987-12-16	1989-06-13	1993-06-13	(US4833700A)	(US4833700A)								X	
74536039	CN106098332	UNIVERSITY BEIJING	Peking University	(CN106098332)	(CN106098332)	<a href="#">Open</a>	2016-05-16	2016-11-03	2019-01-15	(CN106098332B)	(CN106098332B)	X								
77793077	US20210142157	PURDUE RESEARCH	PURDUE RESEARCH	(US20210142157)	(US20210142157)	<a href="#">Open</a>	2017-11-16			(US20210142157A1)	(US20210142157A1)		X							
72138679	CN105304813	FUDAN UNIVERSITY	Fudan University	(CN105304813)	(CN105304813)	<a href="#">Open</a>	2016-02-03	2016-02-03		(CN105304813A)	(CN105304813A)								X	
63275747	KR10-2051041	POHANG	POSTECH - Pohang	(US9224946B2)	(US9224946B2)	<a href="#">Open</a>	2015-04-30	2015-12-23		(US9224946B2)	(US9224946B2)								X	
5060052	JP4167628	PANASONIC	Panasonic	(US6847071)	(US20020185630)	<a href="#">Open</a>	2002-05-29	2002-12-11	2003-08-21	(US6847071B2)	(US6847071B2)									
7739542	US1086180	UNIVERSITY BEIJING	Peking University	(US1086180)	(US20170034887A)	<a href="#">Open</a>	2016-01-01	2017-08-15	2017-08-15	(KR20170034887A)	(KR20170034887A)								X	
77083682	KR10-2017-0034887	INTEL	Intel	(US9734880)	(US9734880)	<a href="#">Open</a>	2016-04-01	2017-08-15	2017-08-15	(US9734880B1)	(US9734880B1)		X							
7691325	US9353690	ROYAL MELBOURNE	ROYAL MELBOURNE	(US9353690)	(US20161123)	<a href="#">Open</a>	2016-11-23	2017-06-01	2021-04-20	(US9353690B2)	(US9353690B2)								X	
76239449	AU2016361453	NINGBO INSTITUTE	Ningbo Institute of	(CN106654009)	(CN106654009)	<a href="#">Open</a>	2016-12-13	2017-05-10	2019-04-02	(CN106654009B)	(CN106654009B)								X	
76063681	CN106654009	NANJING	Nanjing University	(CN106653850)	(CN106653850)	<a href="#">Open</a>	2016-09-23	2017-05-10		(CN106653850A)	(CN106653850A)								X	
75068070	CN106239114	NINGBO INSTITUTE	Ningbo Institute of	(CN106239114)	(CN106239114)	<a href="#">Open</a>	2015-11-03	2016-05-12	2019-04-02	(US20030142533A1)	(US20030142533A1)								X	
73730681	JP3833174	PANASONIC	Panasonic	(US9431099B2)	(US9431099B2)	<a href="#">Open</a>	2015-11-03	2016-05-12	2019-04-02	(US9431099B2)	(US9431099B2)								X	
72960632	KR10-1695737	SEOUL NATIONAL	SNU - Seoul National	(US9431099B2)	(US9431099B2)	<a href="#">Open</a>	2015-11-03	2016-05-12	2019-04-02	(US9431099B2)	(US9431099B2)								X	
71239612	US20180248117	UNIVERSITY BEIJING	Peking University	(US20180248117)	(US20180248117)	<a href="#">Open</a>	2016-05-16	2016-11-03	2019-01-15	(US20180248117A1)	(US20180248117A1)								X	
71055633	CN104379472	QUALCOMM	Qualcomm	(US8625337)	(US20110273326)	<a href="#">Open</a>	2011-05-05	2011-11-10	2014-01-07	(US8625337B2)	(US8625337B2)		X						X	
8061658	US9135976	THALES	Thales	(US9135976)	(US20120163063)	<a href="#">Open</a>	2009-04-30	2010-11-04	2012-03-30	(US9070455B2)	(US9070455B2)									
15039570	EP2425434	HEWLETT PACKARD	HPE - Hewlett	(US8093575)	(US200904020)	<a href="#">Open</a>	2009-04-20	2010-10-21	2012-01-10	(US8093575B2)	(US8093575B2)	X								
4381412	US8093575	HEWLETT PACKARD	HPE - Hewlett	(US8093575)	(US200904020)	<a href="#">Open</a>	2009-04-20	2010-10-21	2012-01-10	(US8093575B2)	(US8093575B2)								X	
54969749	US8614432	SYNOPSYS	Synopsys	(US8614432)	(US20131224)	<a href="#">Open</a>	2013-12-24	2013-12-24	2013-12-24	(US8614432B2)	(US8614432B2)								X	
1709869	US7540460	IBM	IBM	(US5172204)	(US5172204)	<a href="#">Open</a>	1991-03-27	1992-03-30	1992-12-15	(US5172204A)	(US5172204A)								X	
1468493	JP1987108	NINGBO INSTITUTE	Ningbo Institute of	(CN110610384)	(CN110610384)	<a href="#">Open</a>	2019-03-23	2019-12-24		(CN110610384A)	(CN110610384A)								X	
87069552	CN110610384	UNIVERSITY OF	UNIVERSITY OF	(US1018660B2)	(US1018660B2)	<a href="#">Open</a>	2017-03-28	2018-10-04	2019-01-22	(US1018660B2)	(US1018660B2)	X								
81474362	US1018660B2	TOSHIBA	Toshiba	(US10505108B2)	(US10505108B2)	<a href="#">Open</a>	2016-09-20	2018-03-22	2019-11-06	(US10505108B2)	(US10505108B2)								X	
79098907	US10505108	MONOLITHIC 3D	Monolithic 3d	(US10014318B2)	(US20170117231)	<a href="#">Open</a>	2016-10-24	2017-04-27	2018-07-03	(US10014318B2)	(US10014318B2)								X	
75949149	US10014318	POHANG	POSTECH - Pohang	(KR101588980)	(KR101588980)	<a href="#">Open</a>	2014-12-04	2016-01-27	2016-01-27	(KR101588980B1)	(KR101588980B1)	X								
72128311	KR10-1588980	NORTHEAST	Northeast Normal	(CN104795493)	(CN104795493)	<a href="#">Open</a>	2015-04-21	2015-07-22		(CN104795493A)	(CN104795493A)								X	
70325996	CN104795493	PHILIPS	Philips	(US5530275)	(US5530275)	<a href="#">Open</a>	1995-05-03	1995-11-16	1996-06-25	(US5530275A)	(US5530275A)					X				
3974152	CN10304679	PANASONIC	Panasonic	(US5153681)	(US5153681)	<a href="#">Open</a>	1989-07-25	1991-03-11	1992-10-06	(US5153681A)	(US5153681A)								X	
13947619	JP2052782	FUDAN UNIVERSITY	Fudan University	(CN110416312)	(CN110416312)	<a href="#">Open</a>	2019-07-19	2019-11-05	2020-09-04	(CN110416312B)	(CN110416312B)					X				
86512249	CN110416312	NATIONAL	Honeywell	(US10423343)	(US10423343)	<a href="#">Open</a>	2017-02-09	2018-10-01	2019-10-01	(US10423343B1)	(US10423343B1)								X	
86133530	US10423343					<a href="#">Open</a>														

9 segments

RRAM  
PCM  
MRAM  
FRAM/FeFET  
Flash  
DRAM  
SRAM  
Other type  
Not specific

# ORDER FORM

## Memory for Artificial Intelligence

Patent Landscape Analysis – January 2023

Ref.:KM23001



### SHIP TO

Name (Mr/Ms/Dr/Pr):

Job Title:

Company:

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State:

Postcode/Zip:

Country:

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Tel:

Email:

Date:

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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

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For French customer, add 20% for VAT.

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**Signature:**

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“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.

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## 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



## Intellectual Property

Patent your inventions  
Assert your patents and defend your position in case of licensing/litigation  
Evaluate the risks to infringe patents

*Prior art search, Freedom-to-operate analysis, Patent invalidation, Evidence of use, Patent valuation*

Understand, anticipate and evaluate the competitive landscape and current technology developments

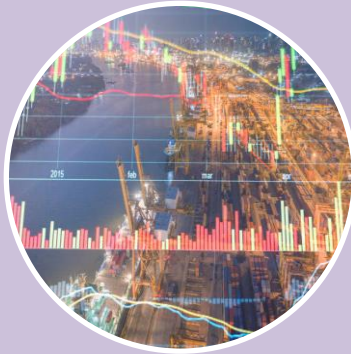
*Patent landscape, Monitoring service, IP due diligence*

## Innovation Strategy

Improve your R&D and IP strategy  
Identify and get access to external innovation

*Technology scouting, Scientific literature analysis*

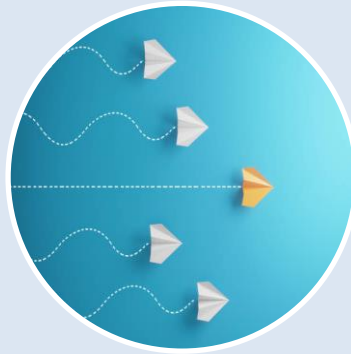
# WHAT INFORMATION CAN YOU GET ?



## 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

## REPORTS

(multi-client product)

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

- 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 and IP developments on batteries*

- 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.

## 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.

## 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





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