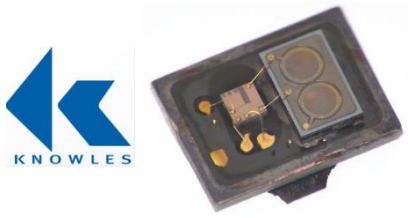
MEMS Microphone

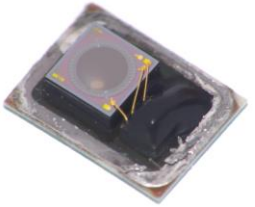
Technology and Patent Infringement Risk Analysis

REPORT SAMPLE

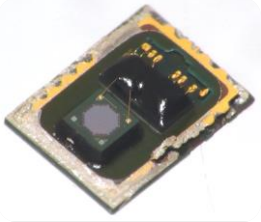


S1157 (iPhone 5S)

MP45DT01



SR595 (iPhone 5S)



ICS-43432

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Web: http://www.knowmade.com

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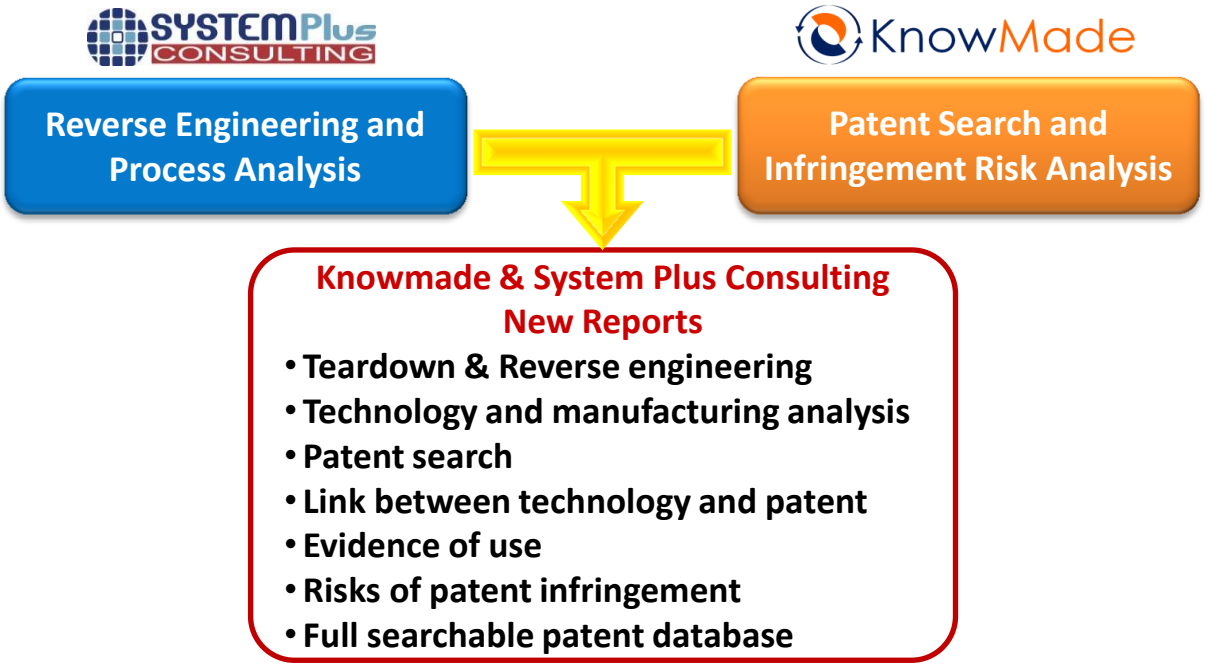
A New Type of Report

KNOWMADE (specialized in patent analysis) and **SYSTEM PLUS CONSULTING** (specialized in reverse engineering and reverse costing) are joining their **unique added value** in order to combined **technology and manufacturing analysis** with **patent claims understanding** in order to **highlight the risks of patent infringement**.

- Knowmade has developed methodologies to identify patents related to product features.
- By combining their technical knowledge, process flow understanding and patent search, System Plus Consulting and Knowmade are able to provide a clear link between patents and marketed products.
- In-depth analysis of the links between technology and patents provided in this report will lead to understanding product features and related patents, and to highlight the potential risks of patent infringement.



The Authors

- Headquartered in Sophia Antipolis, France, **Knowmade** is specialized in analysis of patents and scientific research findings. We provide Patent Search, IP landscape, Patent Analysis, Scientific Literature Landscape, State of the art, Technology Scouting, Technology Transfer and Technology Tracking. Our service offer consists of custom studies, analysis reports, on-demand tracking and strategy consulting. Knowmade combines information search services, scientific expertise, powerful analytics and visualization tools, and proprietary methodologies for analyzing patents and scientific information. With a solid focus on Microelectronics, Compound Semiconductors, LED, MEMS, Nanotechnology and Biotechnology, **Knowmade** supports research laboratories, industrial companies and investors in their business development.

- Headquartered in Nantes, France, **System Plus Consulting** is specialized in technology and cost analysis of electronic components and systems in the fields of Integrated Circuits, Power Devices and Modules, MEMS & Sensors, LED, Image Sensors, Packaging including wafer level, Electronic Boards and Systems. The company offers custom reverse costing analyses, standard reverse costing reports and costing tools. These analyses are used by Purchasing Departments to measure their suppliers' cost structure, R&D Departments to confirm technological choices depending on their impact on costs, and Benchmarking/Marketing Departments to monitor the products on the market.

Disclaimer: Knowmade and System Plus Consulting are research firms that provide technical analysis and opinions. They do not provide any insight analyses or counsel regarding legal aspects or the validity of any individual patent. The research, technical analysis and/or work contained herein is not a legal opinion and should not be construed as such.

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  - > Patent Identification
    - *-Knowles S1157*
    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
  - > Patent Infringement Risk
    - *-ST/OMRON MP45DT01 vs Knowles patents*
    - *-Knowles S1157 vs OMRON patents*
- Anti-Sticking Bumps P71
  - > Patent Identification
    - *- Knowles S1157*
    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
  - > Patent Infringement Risk
    - *-Knowles S1157 vs Infineon, OMRON, InvenSense/ADI and AAC patents*
    - *-ST/OMRON MP45DT01 vs Infineon, AAC, InvenSense/ADI and Knowles patents*
    - *-AAC/Infineon SR595 vs OMRON, InvenSense/ADI and Knowles patents*
    - *-InvenSense/Analog Devices ICS-43432 vs Omron, Infineon, Knowles and AAC patents*
- Acoustic Hole Shape P92
  - > Patent Identification
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    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
  - > Patent Infringement Risk
- Transducer, Number & Shape P100
  - > Patent Identification
    - *- Knowles S1157*
    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
  - > Patent Infringement Risk
    - *-Knowles S1157 vs InvenSense/ADI and OMRON patents*

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- Stress Relief P110
  - > Patent Identification
    - *- Knowles S1157*
    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
  - > Patent Infringement Risk
    - *-AAC/Infineon SR595 vs Knowles and InvenSense/ADI patents*
- Port Structure P121
  - > Patent Identification
    - *-Knowles S1157*
    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
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- Metal/PCB Housing P131
  - > Patent Identification
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    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
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    - *-ST/OMRON MP45DT01 vs AAC and Knowles patents*
- Embedded Capacitance P141
  - > Patent Identification
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    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
    - *-InvenSense/Analog Devices ICS-43432*
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    - *-Knowles S1157 vs AAC patents*
    - *-AAC/Infineon SR595 vs Knowles patents*
- RF Protection/Shielding P152
  - > Patent Identification
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    - *-ST/OMRON MP45DT01*
    - *-AAC/Infineon SR595*
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  - > Patent Infringement Risk
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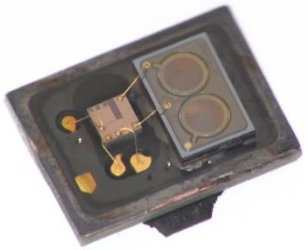
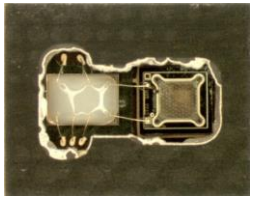
Scope of the Study

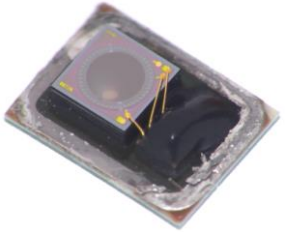
- This report provides a **technology** and **patent infringement** risk analysis of the recent **Microphones** supplied by **Knowles**, **STMicroelectronics/Omron**, **AAC Technologies/Infineon Technologies** and **InvenSense/Analog Devices**.
- This report does not provide detailed claim charts and legal opinions regarding patent infringements. The risks of patent infringement highlighted in this report require more in-depth legal assessments to be confirmed.



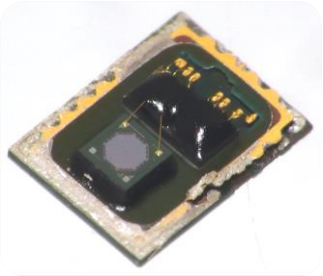
Knowles
S1157
(iPhone 5S)



STMicroelectronics/OMRON
MP45DT01



AAC/Infineon
SR595
(iPhone 5S)



InvenSense/ADI
ICS-43432

The comparative study is focused on following product features

- ✓**Process:** Diaphragm Structure, Anti-Sticking Bumps.
- ✓**Design:** Acoustic Holes Shape, Transducer Number & Shape, Stress Relief.
- ✓**Packaging:** Port Structure, Metal/PCB Housing, Embedded Capacitance, RF Protection.

Rationales for Choice (1/2)

MEMS microphone is a very fast growing market with more than **29% growth** in units in 2013-2014, d... smartphone growth. The mobile phone application dominates the market however tablet market seems very promising with fastest growing.

Knowles is the dominant player with 61% market shares in 2013 and **58% in 2014**. A decrease is again expected in the next years with new challengers in the market:

- **InvenSense(/Analog Devices)**: **InvenSense** acquired **Analog Devices** (ADI) MEMS Microphone business and released HD products recently.
- **AAC Technologies** is a fast Chinese growing company, that has cross licensing agreement with **Knowles** and acquired MEMSTECH.
- **Infineon Technologies** is the supplier of MEMS dies for most Knowles competitors and has lots of collaborations with Asian MEMS Microphone players.
- **STMicroelectronics** has collaboration with CEA-Leti on R&D projects and also with **OMRON** for MEMS Microphones.
- **OMRON** is looking at Infineon business model.

The global market share of these **6 players** account for more than **80% of market share in 2014**. These players are all developing innovative technical and manufacturing solutions, and, in parallel of course, the right patents to protect their inventions. **But what are the similarities and the differences in term of technical and manufacturing choices at the devices level and what is the related patent situation?**

Rationales for Choice (2/2)

This report highlight the **risks of patent infringement** between **Knowles, STMicroelectronics, OMRON, AAC Technologies, Infineon Technologies** and **InvenSense/Analog Devices** in the field of **MEMS Microphone market**. As the MEMS Microphone market is growing very fast, it is the right time now to understand what could happen between these companies and how to differentiate patents and claims compared to the other players.

The **S1157**, **MP45DT01, SR595** and **ICS-43432** are on the last MEMS Microphones from **Knowles**, **STMicroelectronics/OMRON**, **AAC Technologies/Infineon Technologies** and **InvenSense/Analog Devices/ASE(*)** respectively. These devices are contained in different type of applications such as smartphones and tablets. These devices contain an ASIC die and a MEMS die.

(*) *Because of a **doubt about the involvement of ASE in the package manufacturing of the ICS-43432** MEMS microphone, we have made the decision to **not considered this player** in this study.*

According to **similar features** between the 4 selected MEMS microphones and **revealed by the reverse engineering** performed by System Plus Consulting, this report is **focused on some aspects** related to **MEMS die** and **Packaging**. No product features related to the ASIC die have been selected.

Key Features of the Report

- This report provides a deep insight on **technology data** and **manufacturing processes** (teardown an… **S1157**, **MP45DT01, SR595** and **ICS-43432** components, and **comparative studies of product featu…s** (similarities & differences).
- It provides **patents related to the target product features** and held by **Knowles**, **STMicroelectronics, OMRON**, **AAC Technologies**, **Infineon Technologies** and **InvenSense/ADI**.
- It provides discussions on the **potential patent infringement risks** by comparing relevant patent claim elements to the target product features and manufacturing processes.
- This report also provides an extensive **Excel database with all patents analyzed** in this study (240+ patent families comprising more than of 650 patents). This database allows multi-criteria searches:
  - Patent publication number
  - Hyperlinks to the original documents
  - Priority date
  - Title
  - Abstract
  - Patent Assignees
  - Legal status of the patent

❖ **<u>Disclaimer:</u> This report does not provide any insight analyses or counsel regarding legal aspects or the validity of any individual patent. Knowmade and System Plus Consulting are research firms that provide technical analysis and opinions. The research, technical analysis and/or work contained herein is not a legal opinion and should not be construed as such.**

Objectives of the Report

- Provide an **overview of technology data and manufacturing process** of MEMS Microphone components S1157, MP45DT01, SR595 and ICS-43432 supplied by Knowles, STMicroelectronics/OMRON, AAC Technologies/Infineon Technologies and InvenSense/Analog Devices respectively.

- Find the technical and manufacturing process **similarities and differences** of S1157 (Knowles), MP45DT01 (STMicroelectronics/OMRON), SR595 (AAC/Infineon) and ICS-43432 (InvenSense/Analog Devices) MEMS Microphone components.

- Identify **key patents** held by Knowles, STMicroelectronics, OMRON, AAC Technologies, Infineon Technologies, InvenSense and Analog Devices, **and related to the target product features and manufacturing processes**.

- Find the **link between patented technological solutions and marketed products**.

- Identify the **potential infringing parties**, and help to find **evidence of use**.

- Identify **potential risks of patent infringement**, and identify the patents which require a more in depth legal assessment.

Methodology

Teardown Analysis

- Package is analyzed and measured.
- The dies are extracted in order to get overall data: dimensions, main blocks, pad number and pin out, die marking.
- Setup of the manufacturing process.

Comparative Study

- The similarities and differences of target of products are identified (product features and manufacturing processes).
- A set of product features and manufacturing processes is selected regarding their interest in terms of IP study.

Patent Search

- Patents are extracted from Questel-Orbit worldwide patent database by using keyword-based queries.
- The selection of relevant patents is done manually by expert review of the subject-matter of inventions.
- The patents are manually categorized regarding the selected product features.

Infringement Risks

- The links between the patented technologies and the target product features are established.
- The potential infringing parties of the target product are identified, and the potential risks of patent infringements are discussed.

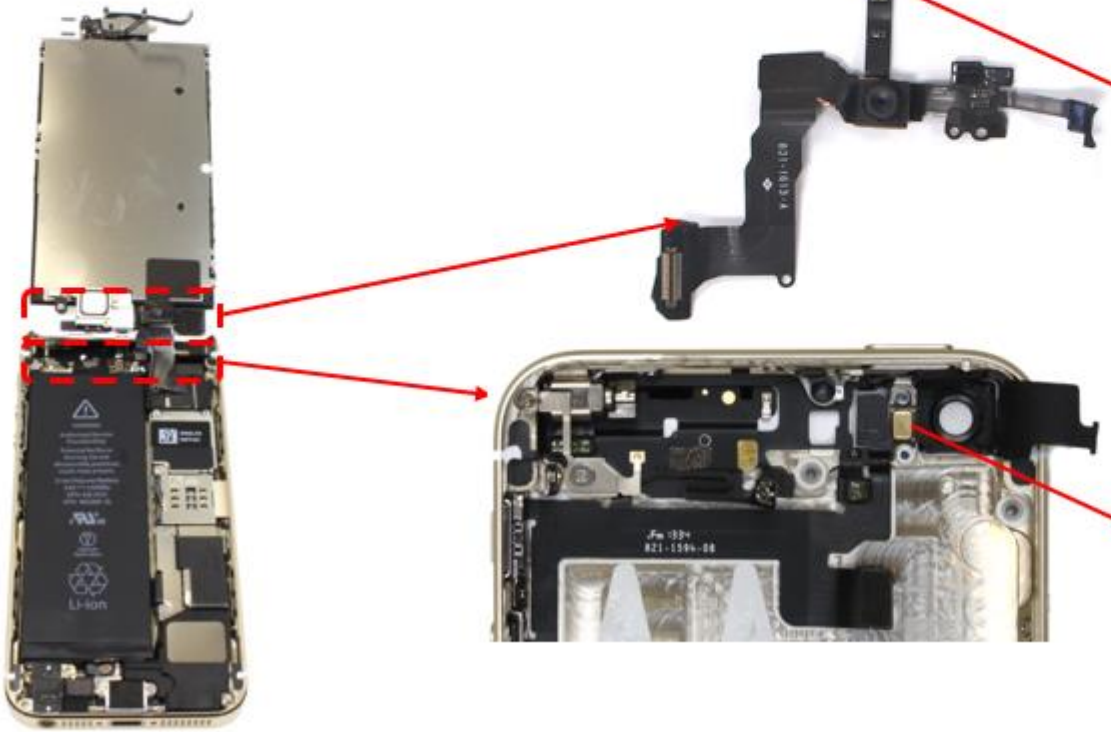
XXXXX (iPhone 5S)

2 dies
✓MEMS Microphone Ref. YYYYY
✓ASIC Microphone

XXXXX (iPhone 5S)

- MEMS die from Company A
- Packaging from Company A
- MEMS Microphone supplied by Company A

Two XXXXX MEMS Microphones manufactured by Company A for consumer applications are contained in the iPhone 5S.



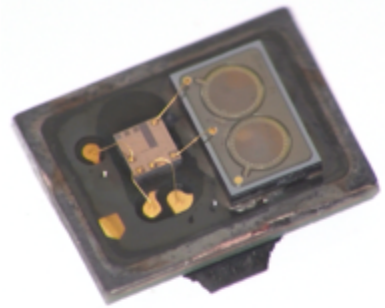
First Company A MEMS Microphone

Front facing top microphone:
→ Presumably for FaceTime and speakerphone capabilities.

Second Company A MEMS Microphone

Rear facing top microphone:
→ Partners up with the rear-facing camera for recording video, and is also used for canceling out background noise when on calls.

XXXXX (iPhone 5S)



2 dies
✓MEMS Microphone Ref. YYYYY
✓ASIC Microphone

XXXXX (iPhone 5S)

- MEMS die from Company A
- Packaging from Company A
- MEMS Microphone supplied by Company A

The **XXXXX from Company A in iPhone 5S:**

- Package:

The package structure is a bottom port with bottom PCB portion and metal cap that allows RF protection. Embedded capacitance is contained in the PCB portion.

- MEMS Microphone:
  - Process

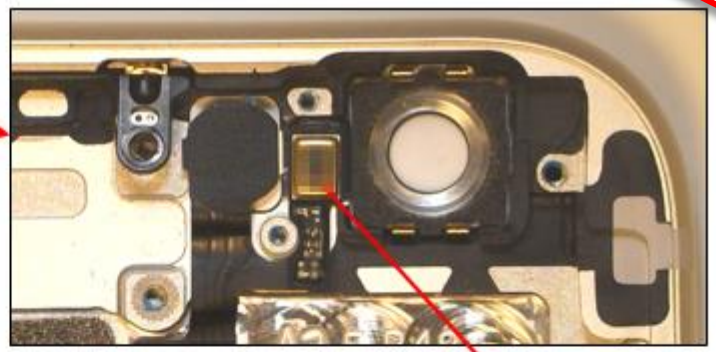
MEMS Microphone uses a floating diaphragm and only supported by posts at the edge of the backplate (branches free-floating structure). The diaphragm is under the backplate with an airgap of 4.65µm. Anti-sticking bumps are present under the diaphragm and under the backplate to prevent the diaphragm from sticking to the substrate/backplate.

  - Design

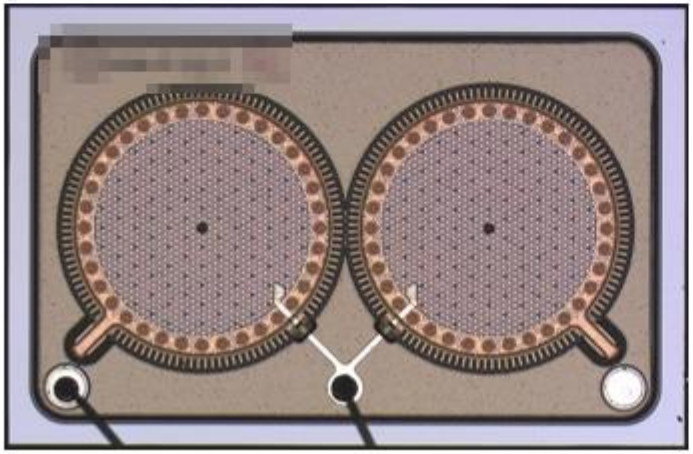
MEMS Microphone contains 1, 2 or 4 circular transducers connected in parallel. The acoustic holes in the backplate are of round shape. No stress relief is present on the diaphragm or the backplate.

Note: iPhone 6

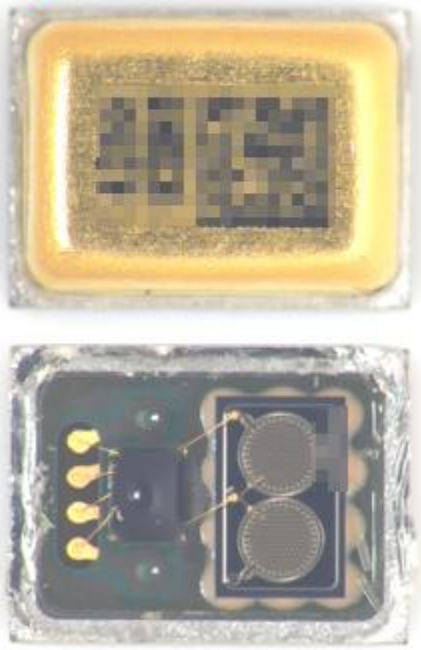
Apple iPhone 6 Opened



Latest Company A microphones integrated in iPhone 6 and 6 Plus use a very close MEMS design/manufacturing process/packaging. Therefore, the conclusion of the report should be the same by using this reference.



Company A MEMS Microphone Die



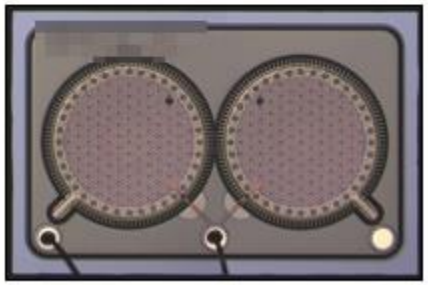
Company A iPhone 6 MEMS Microphone

MEMS Microphone Comparison: *Process & Design*

Company A

Product 1

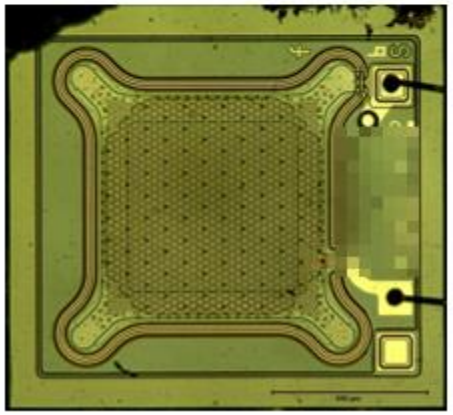
- ✓ [illegible]
- ✓ Round shaped acoustic holes.
- ✓ [illegible]
- ✓ [illegible]
- ✓ Presence of anti-sticking bumps [illegible]



Company B

Product 2

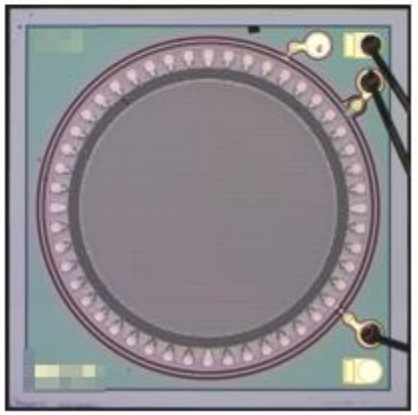
- ✓ 1 rectangular transducer with [illegible]
- ✓ [illegible]
- ✓ [illegible] of stress relief on [illegible]
- ✓ [illegible]
- ✓ Presence of stoppers under [illegible]



Company C

Product 3

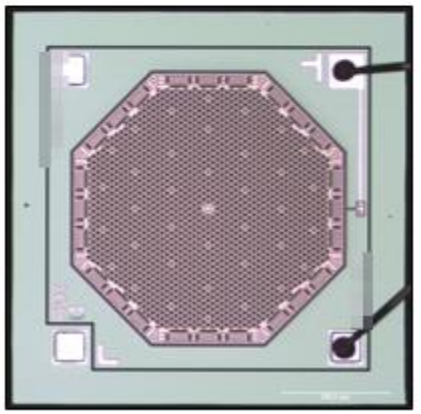
- ✓ 1 circular transducer.
- ✓ [illegible]
- ✓ Edges of the membrane include corrugations.
- ✓ [illegible]
- ✓ [illegible]



Company D

Product 4

- ✓ 1 octagonal transducer with [illegible]
- ✓ [illegible]
- ✓ Suspended diaphragm by [illegible]
- ✓ Diaphragm coupled with an [illegible]
- ✓ [illegible] bottom of the diaphragm.



MEMS Microphone Comparison: *Packaging*

Company 1

Product 1

- ✓ Bottom port package.
- ✓ Bottom PCB portion and metal cap that allows RF protection.
- ✓ Embedded capacitance is contained in the PCB portion.

Company 2

Product 2

- ✓ Top port package.
- ✓ PCB top and bottom portions and metallized cavity that allows RF protection.
- ✓ Absence of embedded capacitance in the PCB substrate.

Company 3

Product 3

- ✓ Bottom port package.
- ✓ Bottom PCB portion and metal cap that allows RF protection.
- ✓ Embedded capacitance contained in the PCB portion.

Company 4

Product 4

- ✓ Bottom port package.
- ✓ Bottom PCB portion and metal cap that allows RF protection.
- ✓ Absence of embedded capacitance in the PCB substrate.

Matrix Product Features/Patent Portfolio

MEMS micro & Patents / Product Features	Company A		Company B		Company C		Company D	
	Product A	Identified patents	Product B	Identified patents	Product C	Identified patents	Product D	Identified patents
[illegible]	✓	6 relevant patent families	✓	[illegible]	✗	[illegible]	✗	[illegible]
[illegible]	✓	[illegible]	✓	1 relevant patent family	✓	[illegible]	✓	[illegible]
Design *Uncommon Acoustic Holes Shape*	✗ *Round Shape*	[illegible]	✗ *Round Shape*	[illegible]	✓	[illegible]	✓	[illegible]
[illegible]	✓	[illegible]	✓	[illegible]	✗	[illegible]	✓	[illegible]
[illegible]	✗	1 relevant patent family on [illegible]	✗	[illegible]	✓	[illegible]	✓	3 relevant patent families

Embedded Capacitance in PCB
Patent Identification

TEARDOWN

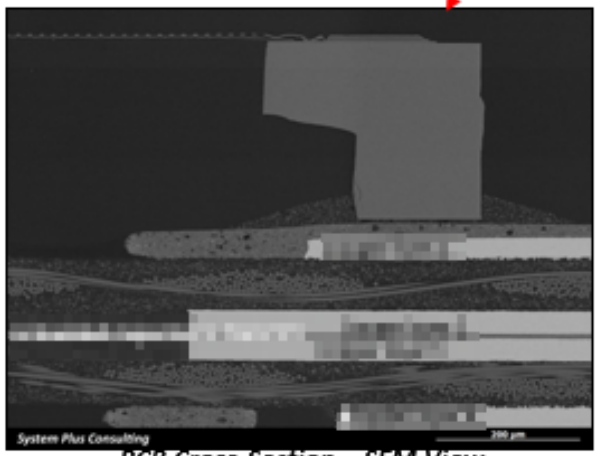
Product 1

Design: Company 1

Packaging: Company 2

integrated in the middle of the PCB.

Package Cross-Section Overview – SEM View



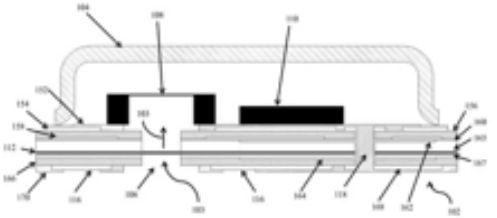
PCB Cross-Section – SEM View

IDENTIFIED PATENT FAMILIES

No Relevant Patent Family on

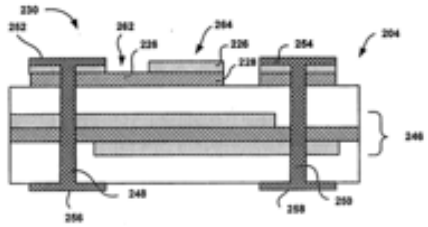
Related Patent Families

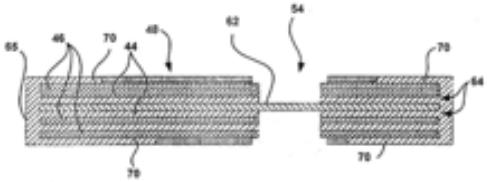
(2014)



(2007)

246 offers many benefits, for example, improved electrical performance, increased packaging density, improved reliability and potential cost reduction.





Acoustic Holes Shape & Distribution
Patent Identification

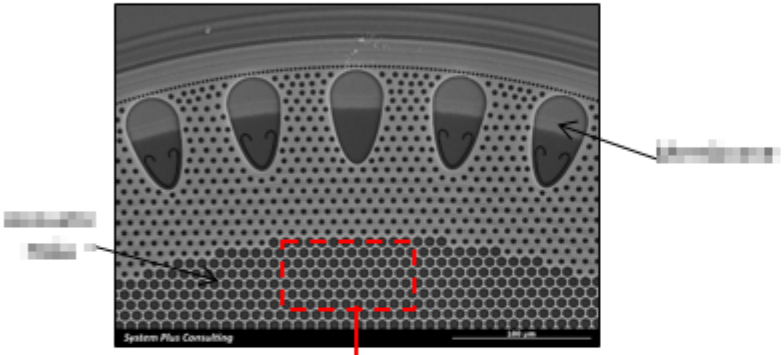
TEARDOWN

Product 1

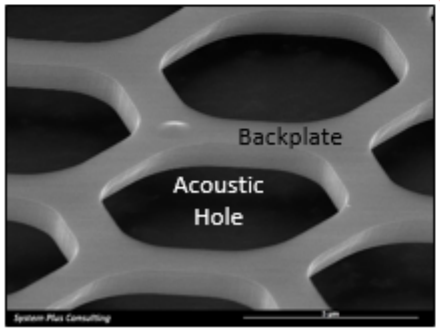
Design: Company 1

Packaging: Company 2

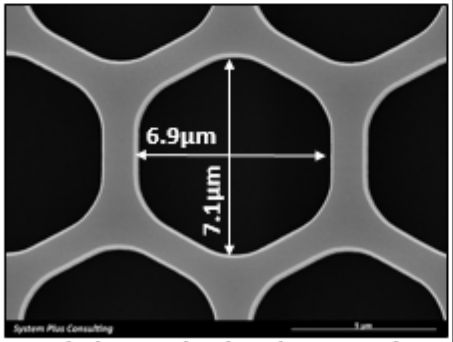
Acoustic holes are in hexagonal shape.



Backplate Overview – SEM View



MEMS Backplate – Bottom SEM View



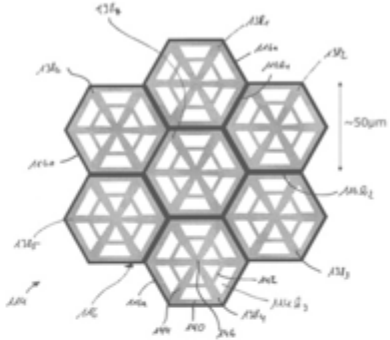
Backplate Holes (Hex) – SEM View

IDENTIFIED PATENT FAMILIES

Relevant Patent Families

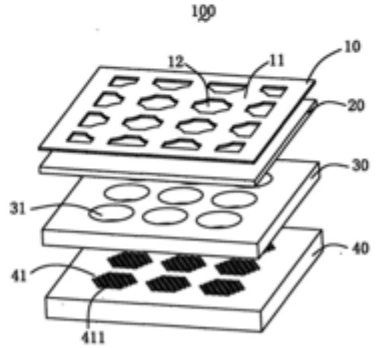
[redacted] (2014) [redacted]

*having a plurality of **hexagonal** cells.*



[redacted]

*assumed of **polygon**, **hexagon** or circular shape.*



Transducer, Number & Shape
Patent Identification

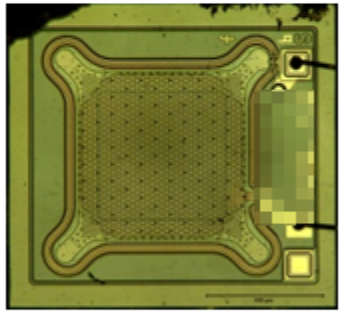
TEARDOWN

Product 1

Design: Company A

Packaging: Company B

The MEMS microphone is constituted with 1 transducer of rectangular shape with 4 corners.



MEMS Die Overview

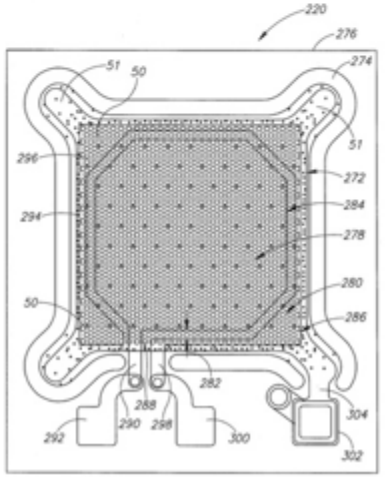
IDENTIFIED PATENT FAMILIES

No Relevant Patent Family on the transducer configuration used by Company A or B.

Related Patent Family

The vibrating membrane 22 of the acoustic sensor 11 of this embodiment has a base portion shaped

This configuration allows



Risk of Patent Infringement

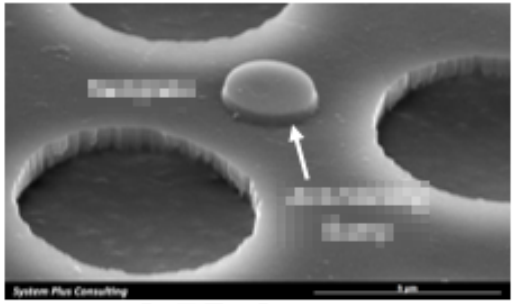
In this technology and patent infringement risk analysis, we have chosen the 3 following levels for characterizing the potential risk of patent infringement.

Unlikely infringement	Not any elements of the patent's claims match with the product features being investigated.
Likely infringement	At least one element of the patent's claims partly matches with the product features being investigated.
Highly likely infringement	At least one element of the patent's claims is demonstrably present in the product being investigated.

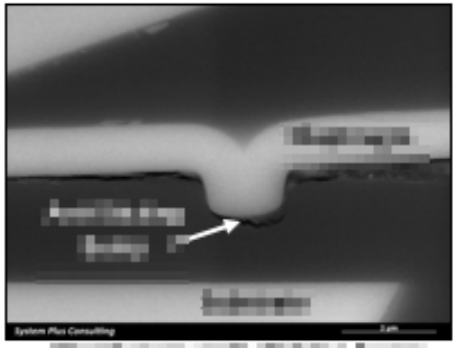
Anti-sticking bumps
Patent Infringement Risk

Company A
Product X

[illegible] under the backplate.



Backplate [illegible] Tilted SEM View



[illegible] – Cross-Section SEM View

Highly likely infringement

Highly likely infringement

Intellectual Property (IP) rights

Company B

Granted patent: [illegible]

Pending patents: [illegible]

Scope of the secondary claims:

Forming a plurality of [illegible]

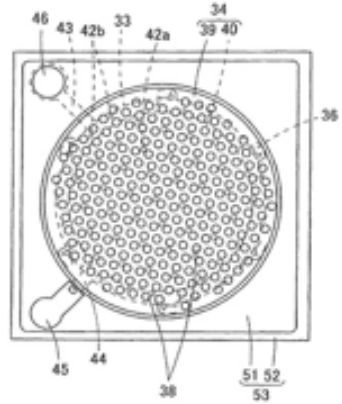
Company C

Granted patents: [illegible]

Pending patent: [illegible]

Scope of the main claim:

An acoustic sensor comprising: a plurality of types [illegible]



Anti-sticking bumps
Patent Infringement Risk

Company A

Product 1

Highly likely infringement

Company B

Intellectual Property (IP) rights

- According to **System Plus**, the **XXXXX** component supplied by **Company A** is composed of anti-sticking bumps present [redacted] to prevent the diaphragm from sticking to the substrate/backplate.

- From **Knowmade** point of view, these anti-sticking bumps [redacted] used in the **XXXXX** component highly likely infringe valid and enforceable patent [redacted] held by **Company B** and might infringe pending patent applications [redacted]. Indeed, **Company B**' patents claim [redacted]

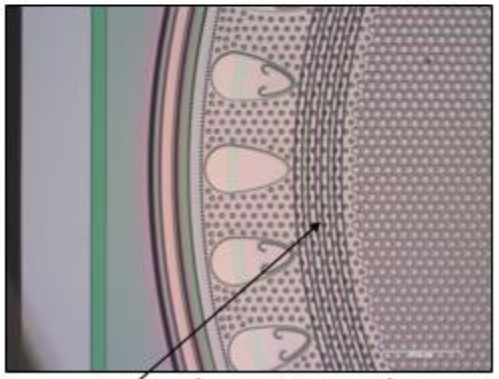
Stress Relief
Patent Infringement Risk

Company A

Product X

The edges of the membrane include corrugations (like waves). The corrugations allow to relieve

[redacted]



Membrane Corrugations – Optical View

Membrane corrugations

Likely infringement

Intellectual Property (IP) rights

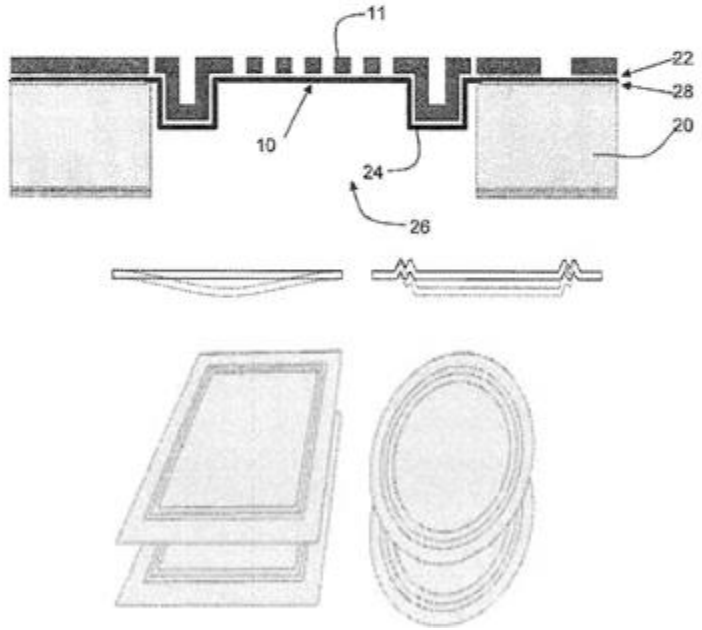
Company B

Pending patents: [redacted]

Scope of the main claim:

A microphone comprising: a microphone periphery area comprises [redacted]

For corrugated membranes, significantly more sensitivity can be [redacted]



Stress Relief
Patent Infringement Risk

Company A

Product X

Company B

Intellectual Property (IP) rights

- According to **System Plus**, the **XXXXX** component supplied by **Company A** contains corrugations on the membrane that allow to [redacted]

- From **Knowmade** point of view, these membrane corrugations used in the **XXXXX** component might infringe pending patent applications filed by **Company B** [redacted]. Indeed, Company B' patents claim presence of [redacted] (the legal status of Company B' patents should be kept under surveillance). So, the presence of corrugations provide [redacted]

Summary of Patent Infringement Risks

Potential risk of patent infringement: Unlikely patent infringement / Likely patent infringement / Highly likely patent infringement

Devices / Patents	Product A	Product B	Product C	Product D
Company A		Diaphragm Structure Anti-Sticking Bumps Acoustic Hole Shape Port Structure PCB Housing RF Protection	Anti-Sticking Bumps Acoustic Hole Shape Stress Relief Embedded Capacitance	Anti-Sticking Bumps Acoustic Hole Shape
Company B	Diaphragm Structure Anti-Sticking Bumps Acoustic Hole Shape Transducer		Anti-Sticking Bumps Acoustic Hole Shape	Anti-Sticking Bumps Acoustic Hole Shape
Company C	Anti-Sticking Bumps Embedded Capacitance	Anti-Sticking Bumps Port Structure PCB Housing		Anti-Sticking Bumps Acoustic Hole Shape
Company D	Anti-Sticking Bumps Transducer	Anti-Sticking Bumps Transducer	Anti-Sticking Bumps Acoustic Hole Shape Stress Relief	

Excel Patent Database

with all patents analyzed in the report

More than 240 patent families composed of more than 650 patents.
This database allows multi-criteria searches and includes patent publication number, hyperlinks to the original documents, priority date, title, abstract, patent assignees, legal status for each member of the patent family.

Number amPat tabase)	Publication Numbers	Publication Date	Kind	Publication Stage History	PDF	Mosaic	Biblio	Register	BIB	Title	Abstract	Assignee	Application Date (YYY-MM-DD)	Applic Num
442	CN104254046	2014-12-31	A	(A) Published	Open	Open	Open	Open	Open	Has in the	A MEMS	INFINEON TECHNOLOGIES	2014-06-24	CN20141
442	KR201500025	2015-01-07	A	(A) Published	Open	Open	Open	Open	Open	Mems	A MEMS	INFINEON TECHNOLOGIES	2014-06-27	KR20140
442	US201500016	2015-01-01	A1	(A1)	Open	Open	Open	Open	Open	MEMS	A MEMS	INFINEON TECHNOLOGIES	2013-06-28	US13/931
442	DE102014212	2015-01-15	A1	(A1) Doc. laid	Open	Open	Open	Open	Open	MEMS	A MEMS	INFINEON TECHNOLOGIES	2014-06-26	DE10201
583	CN104254045	2014-12-31	A	(A) Published	Open	Open	Open	Open	Open	Pre-pattern	A microphone	INFINEON TECHNOLOGIES	2014-06-23	CN20141
583	DE102014108	2014-12-31	A1	(A1) Doc. laid	Open	Open	Open	Open	Open	Gathering	A microphone	INFINEON TECHNOLOGIES	2014-06-26	DE10201
583	US201500016	2015-01-01	A1	(A1)	Open	Open	Open	Open	Open	Pre-mold for a	A microphone	INFINEON TECHNOLOGIES	2013-06-26	US13/927
559	CN104254047	2014-12-31	A	(A) Published	Open	Open	Open	Open	Open	Has great back	An electronic	INFINEON TECHNOLOGIES	2014-06-25	CN20141
559	DE102014108	2014-12-31	A1	(A1) Doc. laid	Open	Open	Open	Open	Open	Electronic	An electronic	INFINEON TECHNOLOGIES	2014-06-26	DE10201
559	US201500036	2015-01-01	A1	(A1)	Open	Open	Open	Open	Open	Electronic	An electronic	INFINEON TECHNOLOGIES	2013-06-26	US13/927
732	CN204046818	2014-12-24	U	(U)	Open	Open	Open	Open	Open	Electric	Questel	AAC ACOUSTIC	2014-07-28	CN20142
742	CN104244154	2014-12-24	A	(A) Published	Open	Open	Open	Open	Open	The opening	An acoustic	KNOWLES ELECTRONICS	2014-06-17	CN20141
742	US201403678	2014-12-18	A1	(A1)	Open	Open	Open	Open	Open	Open Cavity	An acoustic	KNOWLES ELECTRONICS	2014-06-05	US14/297
737	WO20142047	2014-12-24	A1	(A1)	Open	Open	Open	Open	Open	Varistor in	A micro electro	KNOWLES ELECTRONICS	2014-06-11	WOUS20
737	US201403678	2014-12-18	A1	(A1)	Open	Open	Open	Open	Open	Viristor In Base	A micro electro	KNOWLES ELECTRONICS	2014-06-04	US14/295
909	US201403537	2014-12-04	A1	(A1)	Open	Open	Open	Open	Open	Detection	A	ST MICROELECTRONICS	2014-05-27	US14/288
909	IT2013TO0441	2014-12-01	A1	(A1)	Open	Open	Open	Open	Open	Struttura di	A	ST MICROELECTRONICS	2013-05-30	ITTO2013
707	US201403483	2014-11-27	A1	(A1)	Open	Open	Open	Open	Open	Vad detection	A microphone	KNOWLES ELECTRONICS	2014-05-20	US14/282
707	WO20141899	2014-11-27	A1	(A1)	Open	Open	Open	Open	Open	Vad detection	A microphone	KNOWLES ELECTRONICS	2014-05-20	WOUS20
707	US201500437	2015-02-12	A1	(A1)	Open	Open	Open	Open	Open	Vad detection	A microphone	KNOWLES ELECTRONICS	2014-10-23	US14/522
519	IT2013TO0350	2014-10-31	A1	(A1)	Open	Open	Open	Open	Open	Assemblaggio	An assembly of	ST MICROELECTRONICS	2013-04-30	ITTO2013
519	US201403196	2014-10-30	A1	(A1)	Open	Open	Open	Open	Open	Wafer level	An assembly of	ST MICROELECTRONICS	2014-04-29	US14/265
519	CN104140071	2014-11-12	A	(A) Published	Open	Open	Open	Open	Open	Wafer level	An assembly of	ST MICROELECTRONICS	2014-04-28	CN20141
218	CN104113810	2014-10-22	A	(A) Published	Open	Open	Open	Open	Open	MEMS	The invention	AAC TECHNOLOGIES	2014-07-18	CN20141

ORDER FORM

MEMS Microphone - April 2015

Technology and Patent Infringement Risk Analysis

Knowles - STMicroelectronics - OMRON - AAC Technologies - Infineon Technologies - InvenSense - Analog Devices

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, BP 65
06902 Valbonne Sophia Antipolis
FRANCE

Bank 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 St Laurent du Var CAP 3000 - Quartier du lac- 06700 St Laurent du Var
IBAN: FR76 1560 7000 6360 6214 5695 126
BIC/SWIFT: CCBPFRPPNCE

Paypal

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

RETURN ORDER BY

E-mail: contact@knowmade.fr
Mail: KnowMade S.A.R.L. 2405 route des Dolines, 06902 Sophia Antipolis, FRANCE

PRODUCT ORDER

☐ **€5,990**
☐ **Bundle with Knowmade and/or System Plus Consulting other related reports (contact us)**

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.

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. Multi user license: the report can be used by unlimited users within the company. Subsidiaries 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.

Terms and Conditions of Sales

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 St Laurent du Var CAP 3000 - Quartier du lac- 06700 St Laurent du Var

BIC or SWIFT code: CCBPFRPPNCE

IBAN: : FR76 1560 7000 6360 6214 5695 126

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.

Terms and Conditions of Sales

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.