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IP position on far-field technologies

Key IP players on far-field technologies IP leadership IP strength index Geographic coverage vs. Impact factor IP portfolio size vs. IP strength index IP blocking potential Overview of main assignee's IP position Market position vs IP position

IP and market position overview

Integrators and end-users Component and device makers Pure play companies and R&D laboratories

PATENT LITIGATIONS

147

Potential future plaintiffs Boston Scientific vs. Nevro Creative Kingdoms vs. Nintendo

IP PROFILE OF KEY PLAYERS

151

Qualcomm/NXP, Intel, Broadcom/Avago, Access Business, Samsung, Panasonic/Sanyo, LG, Toyota, Sony, Philips, Apple, Auckland UniServices, PowerbyProxi, WiTricity, Powermat Technologies, Moio Mobility, Energous, Ossia, uBeam.

For each of them:

Company profile Summary of WPT patent portfolio Key WPT patents **Recent WPT patents**

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INTRODUCTION TO WIRELESS POWER TRANSFER Wireless Power Transfer : Current Applications

- Nowadays, wireless power charging is mainly used in **consumer applications**, i.e. smartphones and tablets. More and more cellphone OEMs integrates a wireless power charging component in their devices.
- Wireless power transfer is expected to extend into numerous application fields, including **home appliances, medical devices, military devices and electrical vehicles**.
- Despite numerous announcements from car manufacturers, there are still several issues to overcome to see electrical vehicles equipped with wireless power charging: cost, safety, charging station-car positioning, efficiency and worldwide standards compliance.



Source: Yole développement, Power GaN 2016: Epitaxy, devices, applications and technology trends



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INTRODUCTION TO WIRELESS POWER TRANSFER Wireless Power Transfer Technologies

- Wireless power techniques mainly fall into two categories: non-radiative and radiative.
- In **non-radiative** techniques, power is transferred by magnetic fields using inductive coupling or magnetic resonance between coils of wire, or by electric fields using capacitive coupling between metal electrodes. Inductive coupling is the most widely used wireless technology; its applications include charging handheld devices like phones and electric toothbrushes, RFID tags, and chargers for implantable medical devices like artificial cardiac pacemakers, or electric vehicles.
- In radiative techniques, also called power beaming, power is transferred by beams of electromagnetic radiation, like microwaves or laser beams. These techniques can transport energy on longer distances but must be aimed at the receiver. Proposed applications for this type are solar power satellites, and wireless powered drone aircraft.
- The performance and efficiency of wireless power systems strongly depends on power devices. The MHz frequency range need power electronics for a static magnetic field, an electric field and high-frequency wireless communication technology.

Те	chnology	Radiative	Radiative Distance range		Power (W) Frequency		Antenna devices	Commercialized applications	Future applications	
	Inductive coupling	No	Short (several mm)	Low	10-5K	Hz-MHz	Wire coils	Consumer electronics, smartphones	Computer	
Near-field technology	Resonant inductive coupling	No	Medium (several cm)	Low	10-500 kHz-GHz		Tuned wires coils, lumped element resonators	Consumer electronics, smartphones	Biomedical implants, electrical vehicles	
	Capacitive coupling	No	Short (several mm)	Low	2.5-2K	kHz-MHz	Metal plate electrodes	Portable devices, smartcards	Routing in large-scale integrating circuits	
Far-field technology	Microwaves/RF	Yes	Long (several m)	High	1-50m	GHz	Parabolic dishes, phased arrays, rectennas	-	Solar power satellite, drone aircraft, consumer devices	
	Laser	Yes	Long (several m)	High	3-1K	≥THz	Lasers, photocells, lenses	-	Drone aircraft, space elevator climbers	
	Ultrasounds	No	Long (several m)	High	5µ-50k	>20kHz	Ultrasound transmitter/receiver	-	Consumer devices	

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INTRODUCTION TO WIRELESS POWER TRANSFER Standards (1/3)

There are two leading wireless charging standard associations.



- The **Wireless Power Consortium** was created in 2008 to create and promote wide market adoption of **Qi** international standard for interoperability across rechargeable electronic devices. It is now the world's most-used standard.
- It is an open-membership cooperation between Asian, European and American companies (215 companies as of September 2016) working toward the global standardization of wireless charging technology.



• In June 2015, A4WP (Alliance for Wireless Power) and PMA (Power Matters Alliance) merge and rename AirFuel Alliance. This merger could boost the wireless power market.

REPOKI SAMPLE

• Airfuel Resonant (Rezence[™]) developed by AW4P is a wireless power transfer technology and specification based on the principles of magnetic resonance.



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SCOPE AND OBJECTIVES OF THE REPORT Scope of the report

- This report provides a global picture of the patent landscape for Wireless Power Transfer.
- This report covers patents published worldwide up to July 2017.
- We have selected and analyzed more than 42,800 patents and patent applications (21,900+ patent families) relevant to the scope of this report.

Included in the report

• Patents related to **wireless power transfer**, including all devices and methods related to wireless power charging (inductive coupling, magnetic resonance, capacitive coupling, RF/microwaves, laser transfer, ultrasounds) and devices charged via wireless power transfer.





US2017085120



CN103581390



• Patents related to other methods and devices of wireless/contactless energy harvesting from the environment (sun, heat, wind, vibrations, etc.)

Not included in the report





US2015115867





6

CN102324871

US2017104369

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SCOPE AND OBJECTIVES OF THE REPORT Objectives of the report

Understand the competitive landscape

Identify the major IP players and new comers Evaluate the relative strength of their patent portfolio Understand their IP strategy (dynamics, countries, technologies...), their strengths and weaknesses Identify their IP collaboration network Compare their IP and market position

Understand current and future technological trends and choices

Identify key and new technologies Identify key patents by technologies and assignees Identify current legal status of patented technologies

Compare market and IP trends

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Dynamics Geographic coverage Companies Technologies

Understand the competitive environment from technology and patent perspective

Identify risks and opportunities

Discover new markets & technology directions. Overview of past and current litigations and licensing agreements Avoid patent infringement

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MAIN PATENT ASSIGNEES MENTIONED IN THIS REPORT

Access Business, Amosense, Apple, Auckland Uniservice, Audi, Avago/Broadcom, BMW, Bombardier, BYD, Canon, Chery, Daimler, Energous, Ford, Fujitsu, General electric, Hitachi, Honda, Hyundai, Integrated Device Technology, Intel, Kia, Kthepower, LG, Mitsubishi, Murata Manufacturing, NASA, Nec, Nissan, Nitto Denko, Nokia, Ossia, Panasonic/Sanyo, Philips, Postech, Powerbyproxi, Powermat, Qualcomm/NXP, Samsung, Seiko-Epson, SEL, SEW, Siemens, Sony, TDK, Texas Instruments, Toshiba, Toyota, Ubeam, Witricity...



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METHODOLOGY Patent search, Patent selection, Patent analysis (1/2)

- The data were extracted from the FamPat worldwide database (Questel-ORBIT) which provides 100+ million patent documents from 95 offices.
- The search for patents was performed in **July 2017** hence patents published after this date will not be available in this report.
- The patents were grouped by **patent family**. A patent family is a set of patents filed in multiple countries to protect a single invention by a common inventor(s). A first application is made in one country the priority country and is then extended to other countries.
- The selection of the patents has been done both automatically and manually (all details in next slides).

More than 21,900 patent families related to Wireless Power Transfer have been selected for the study

- The statistical analysis was performed with **Orbit IP Business Intelligence** web based patent analysis software from Questel.
- The patents were **manually categorized in technical segments** using keyword analysis of patent title, abstract and claims, in conjunction with expert review of the subject-matter of inventions (all details in next slides).
- For legal status of European (EP) and PCT (WO) patent applications, EPO Register Plus has been used. For legal status of US patents, USPTO PAIR has been used. For legal status of other patents, information has been gotten from their respective national registers.



AMPLE

METHODOLOGY Patent segmentation





* A patent family is a set of patents filed in multiple countries to protect a single invention by a common inventor(s). A first application is made in one country – the priority country – and is then extended to other countries.

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Time Evolution of Patent Publications



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Ranking of main Patent Assignees





Main License Agreements and Partnerships





PATENT LANDSCAPE OVERVIEW Mapping of Global Patenting Activity



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PATENT LANDSCAPE OVERVIEW Wireless Power Transfer Technology Breakdown



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PATENT LANDSCAPE OVERVIEW Wireless Power Transfer Applications

- WPT components are either directly integrated in the consumer device or in accessories that can be adapted on electronic devices so that they can be wirelessly charged (for instance, cover for smartphone ...).
- A major current trend is to integrate a wireless power charging device for smartphones in vehicles. Some car manufacturers commercialize their own smartphone cover adapted for wireless power transfer.



Consumer

Transport



Ranking of WPT applications

(according to the number of related patent families)



REPORI I SAMPLE









Healthcare







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Main Patent Assignees by Technologies/Applications



17

Countries of Granted/Pending Patents for Main R&D Labs, Pure play companies and Component



 Most of companies being both an integrator and a component and device maker hold numerous granted patents and pending patent applications worldwide. It suggests a strong interest for this field for many years and a willpower to secure their developments in numerous countries from the perspective to make/commercialize their products worldwide.

REPORT SAMPLE



 Contrary to other component and device makers who mainly have alive patents in their operating countries, holds the highest number of granted patents and pending patent applications worldwide, suggesting a strong interest and a willpower to globally secure their developments.

 Most of pure play companies owned few granted patents, but they have numerous pending patent applications, reflecting the recent and strong interest for wireless charging technologies.



NEAR-FIELD TECHNOLOGIES

IP portfolio size vs. IP strength index





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Number of forward citations (excluding self-citations)

The more the number of forward citations from different patent applicants is high, the more the capacity to limit the patenting activity of other firms is important. <u>Note</u>: This graph is at patent family level. The identification of a "blocking patent" requires an in-depth specific analysis of each patent documents composing the patent families.

has the strongest IP blocking potential. Its patents related to far-field WPT received a lot of forward citations from numerous different patent applicants. That
means the company have the capacity to limit the patenting activity of other firms on far-field WPT technologies. Furthermore, the company owns a lot of enforceable patents in
key countries enabling it to hamper the freedom-to-operate of other firms.

Even if have the largest patent portfolios, they show a lower IP blocking potential than

Despite their weaker patenting activity

have a relatively high IP blocking potential.

NEAR-FIELD TECHNOLOGIES

Market position vs IP position

* IP position of each companies has been evaluated from the IP leadership. IP Strength Index and IP Blocking Potential of their patent portfolio in each supply chain segments.



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IP AND MARKET POSITION OVERVIEW

	Near-field technologies Far-field technologies									Applications Products on the ma							
roducts on he market	No. of patent families	IP leadership	Geographic coverage	Impact Factor	Strength Index / IP Blocking potential	No. of patent families	IP leadership	Geographic coverage	Impact Factor	Strength Index / IP Blocking potential	Consumer	Transport	Healthcare	Components	Accessories	Devices integratin WPT	
		Low	Small	Very high	High		Low	Small	Very high	High				Х			
		Medium	Medium	High	High		Medium	Medium	Very High	High				Х			
		Medium	Large	High	Medium		Low	Large	Medium	Medium			1.1	X	X		
	100	Low	Very large	Very high	Low		Medium	Large	Medium	Low				X			
		Medium	Medium	Medium	Low		Medium	Medium	Low	Medium				X			
		Medium	Small	LOW Voru low	LOW		Very Low	Large	Venulow	Low				× ×			
		High	Very large	High	High		Low	Jarge	Low	Low				^			
		Very low	Very large	Verv high	Low		Verv Low	Large	High	Medium				х			
mainly file patents related to their operating field and commercialized products (near-field technologies and consumer applications for near-field technologies and transport applications . Despite its noticeable IP position, doesn't commercialize products related to wireless power charging. Contrary to ther car manufacturers, files numerous patents on far-field technologies. It is worth to highlight that a major current trend is that's why most of car manufacturers and some electronic integrators file patents on both consumer and transport. They commercialize products specially have a relatively strong IP position.																	
	also file numerous patents on far-field technologies and commercialize products related to near-field technologies for consumer applications, except who are the main who commercialize wireless power charging components for transport applications has a strong IP position.																

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INTEL

Patent portfolio summary for Wireless Power Transfer





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INTEL Key patent families related to Wireless Power Transfer

SAMPLE In this study, a "key patent" refers to a "seminal patent". A seminal patent has a strong technology impact and an important prior art contribution. It has the capability to limit the patenting activity of other firms identification of seminal patents is based on the number of citations received by the patents (forward citations). A seminal patents has a high number of forward citations compared to the other patents published the same year. or it has received a high number of citations per year on average since its publication. Note: The patents listed below are the representative members of the key patent families.



INTEL Recent patent families related to Wireless Power Transfer

Note: The patents listed below are the representative members of the most recent patent families.





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EXCEL PATENT DATABASE

With patents of Top20 companies analyzed in the report with segmentation





This database allows multi-criteria searches and includes patent publication number, hyperlinks to the original documents, priority date, title, abstract, patent assignees, technological segments and legal status for each member of the patent family.

Wireless Po	vireless Power Charging: Patent Landscape Analysis (November 2017)																								
KnowM	ade																								
																					Techno	logies	Applications		
Family Number FamPat Database - ORBIT-QUESTEL)	Patent Number	Publicati on country	Publicati on Stage	Publicati on Date (yyyy- mm-dd)	Original Docume nt (PDF)	Applicati on Data	Applicati on Date (yyyy- mm-dd)	Priority Details	Earliest Priority Date of the Patent Fami	Expiratio n Date (yyyy- mm-dd)	Action Taken	Current Legal Status	Grant date	Current Patent Assignee (s)	Inventor (s)	Title	Abstract	Claims	Cited Patents	Citing patents	Non-radiatives	Radiatives 🗸	Consumer	Transport 🗸	Healthcare
13682882	DE19812728	DE	(A1) Doc.	1999-09-	Open	(DE19812	1998-03-	(DE19812	1998-03-	2003-01-	(DE19812	LAPSED		PHILIPS	GIESLER	(DE19812728)	The	(DE19812728)		DE10045695	x				
13682882	US6320508	US	(B1)	2001-11-	Open	(US63205	1999-03-	(US63205	1998-03-	2019-03-	(US63205	GRANTE	2001-11-	NXP	GIESLER	(US6320508)	The	(US6320508)	US3820103	CN1824342;C	X				
13682882	EP-945829	EP	(A2)	1999-09-	Open	(EP-	1999-03-	(EP-	1998-03-	2019-03-	(EP-	GRANTE	2006-09-	PHILIPS	GIESLER	(EP-945829)	The	(EP-945829)	FR2751148		x				
13682882	DE59913869	DE	(D1)	2006-11-	Open	(DE59913	1999-03-	(DE59913	1998-03-	2019-03-	(DE59913	GRANTE	2006-11-	PHILIPS	GIESLER	(DE59913869)	The				X				
13682882	JP2000049657	JP	(A)	2000-02-	Open	(JP20000	1999-03-	(JP20000	1998-03-	2019-03-	(JP41988	GRANTE	2008-12-	PHILIPS	GIESLER	(JP200004965	PROBLEM TO	(JP200004965	JP0512049	JP200603150	X				
76190954	WO200118936	WO	(A1)	2001-03-	Open	(WO2001	2000-09-	(WO2001	1999-09-	2003-03-	(WO2001	LAPSED		AUCKLAN	BOYS	(WO20011893	Aseries	(WO20011893	W0992632	EP1634355	x		x	X	
76190954	NZ-337716	NZ	(A)	2002-10-	Open	(NZ-	1999-09-	(NZ-	1999-09-	2019-09-	(NZ-	GRANTE		AUCKLAN	BOYS	(NZ-337716)	An inductive				X		X	X	
76190954	US6705441	US	(B1)	2004-03-	Open	(US67054	2000-09-	(US67054	1999-09-	2020-09-	(US67054	GRANTE	2004-03-	AUCKLAN	BOYS	(US6705441)	Aseries	(US6705441)	US5207304	CN101138144	X		X	X	
76190954	AU200074620	AU	(A) Open	2001-04-	Open	(AU20007	2000-09-	(AU20007	1999-09-	2020-09-	(AU-	GRANTE	2004-05-	AUCKLAN	BOYS	(AU-772748)	A series		W0992632		X		X	X	
76190954	CA2383644	CA	(A1)	2001-03-	Open	(CA23836	2000-09-	(CA23836	1999-09-	2008-09-	(CA23836	LAPSED	2007-01-	AUCKLAN	STIELAU	(CA2383644)	A series	(CA2383644)			X		X	X	
76190954	JP2003509991	JP	(A)	2003-03-	Open	(JP20035	2000-09-	(JP20035	1999-09-	2020-09-	(JP44567	GRANTE	2010-04-	AUCKLAN		(JP4456789)	Aseries	(JP4456789)	US5207304	EP1898510	X		X	X	
76190954	EP1219000	EP	(A1)	2002-07-	Open	(EP12190	2000-09-	(EP12190	2000-09-	2020-09-	(EP12190	GRANTE	2011-01-	AUCKLAN	BOYS	(EP1219000)	A series	(EP1219000)	W0962419		X		X	X	
76190954	ATE495566	AT	(T) EP	2011-01-	Open	(ATE4955	2000-09-	(ATE4955	1999-09-	2011-07-	(ATE4955	LAPSED	2011-01-	AUCKLAN	BOYS	(ATE495566)	A series				X		X	X	
76190954	DE60045515	DE	(D1)	2011-02-	Open	(DE60045	2000-09-	(DE60045	1999-09-	2020-09-	(DE60045	GRANTE	2011-02-	AUCKLAN	BOYS	(DE60045515)	A series				X		X	X	
61274081	WO201420464	WO	(A2)	2014-02-	Open	(WO2014	2013-07-	(WO2014	2012-07-	2016-01-	(WO2014	LAPSED		PHILIPS	VAN	(WO20142046	An inductive	(WO20142046	US2010022	CN106464307	X		X		
61274081	CN104508935	CN	(A)	2015-04-	Open	(CN10450	2013-07-	(CN10450	2013-07-	2033-07-	(CN10450	PENDING		PHILIPS	VAN	(CN104508935	An inductive	(CN104508935	US2010022		X		X		
61274081	MX2015001258	MX	(A)	2015-05-	Open	(MX2015	2013-07-	(MX2015	2012-07-	2033-07-	(MX2015	GRANTE		PHILIPS	WAGENI	(MX20150012	An inductive				X		X		
61274081	EP2880736	EP	(A2)	2015-06-	Open	(EP28807	2013-07-	(EP28807	2012-07-	2033-07-	(EP28807	PENDING		PHILIPS	VAN	(EP2880736)	An inductive		US2010022		X		X		
61274081	JP2015523848	JP	(A)	2015-08-	Open	(JP20155	2013-07-	(JP20155	2012-07-	2033-07-	(JP20155	PENDING		PHILIPS		(JP201552384	An inductive	(JP201552384	JP2010213	JP6095866	X		X		
61274081	US20150249339	US	(A1)	2015-09-	Open	(US20150	2013-07-	(US20150	2013-07-	2033-07-	(US20150	PENDING		PHILIPS	VAN	(US201502493	An inductive	(US201502493		US201503187	X		X		
61274081	IN2015CN00957	IN	(A)	2016-07-	Open	(IN2015C	2015-02-	(IN2015C	2012-07-	2035-02-	(IN2015C	PENDING		PHILIPS	Andries	(IN2015CN009	An inductive				X		X		
61274081	RU2015106525	RU	(A)	2016-09-	Open	(RU20151	2013-07-	(RU20151	2012-07-	2033-07-	(RU20151	PENDING				(RU201510652	An inductive				X		X		
61274081	BR112015001867	BR	(A1)	2015-03-	Open	(BR11201	2013-07-	(BR11201	2012-07-	2033-07-	(BR11201	PENDING		PHILIPS	WAGENI	(BR112015001					X		X		
45655540	GB201309593	GB	(D0)	2013-07-	Open	(GB20130	2013-05-	(GB20130	2013-05-	2016-05-	(GB24993	LAPSED	2013-11-	ACCESS	POOLEY	(GB2499349)	An electrical-	(GB2499349)	GB2042788		X		X		
7474069	CA2801920	CA	(A1)	2011-12-	Open	(CA28019	2011-06-	(CA28019	2010-06-	2017-06-	(CA28019	LAPSED		ACCESS	BAARMA	(CA2801920)	An inductive	(CA2801920)			X				
7474069	WO2011156555	WO	(A2)	2011-12-	Open	(WO2011	2011-06-	(WO2011	2011-06-	2013-12-	(WO2011	LAPSED		ACCESS	BAARMA	(WO20111565	An inductive	(WO20111565	WO201062	CN104025219	X				
7474069	EP2580837	EP	(A2)	2013-04-	Open	(EP25808	2011-06-	(EP25808	2011-06-	2016-10-	(EP25808	LAPSED		ACCESS	BAARMA	(EP2580837)	An inductive		WO201062		X				
7474069	KR20130087489	KR	(A)	2013-08-	Open	(KR20130	2011-06-	(KR20130	2010-06-	2031-06-	(KR20130	PENDING		ACCESS	BAARMA	(KR201300874	An inductive	(KR201300874			X			0 201	-
7474069	US20110304216	US	(A1)	2011-12-	Open	(US20110	2011-06-	(US20110	2011-06-	2034-03-	(US90545	GRANTE	2015-06-	ACCESS	BAARMA	(US9054542)	An inductive	(US201103042	US2010023	CN103208790	x	K	nowmac	ie © 201	/
7474069	US20150236520	US	(A1)	2015-08-	Open	(US20150	2015-05-	(US20150	2015-05-	2031-06-	(US20150	PENDING		ACCESS	BAARMA	(US201502365	An inductive	(US201502365		US201501158	X				
7474069	CN103098330	CN	(A)	2013-05-	Open	(CN10309	2011-06-	(CN10309	2011-06-	2031-06-	(CN10309	GRANTE	2016-01-	CCESS	BAARMA	(CN103098330	An inductive	(CN103098330	US2010005	CN103248139	X				
7474069	TW201230586	TW	(A) Laid	2012-07-	Open	(TW2012	2011-06-	(TW2012	2010-06-	2031-06-	(TWI5273	GRANTE	2016-03-	ACCESS	BAARMA	(TWI527331)	An inductive	(TW20123058		US201403127	X				
7474069	JP2013536664	JP	(A)	2013-09-	Open	(JP20135	2011-06-	(JP20135	2011-06-	2031-06-	(JP60548	GRANTE	2016-12-	ACCESS	David	(JP6054863)	An inductive	(JP201353666	WO201101	JP201217895	X				
7474069	JP2017063611	JP	(A)	2017-03-	Open	(JP20170	2016-12-	(JP20170	2011-06-	2031-06-	(JP20170	PENDING		ACCESS	DAVID W	(JP201706361	PROBLEM TO	(JP201706361			x				
8034472	WO201197608	WO	(A2)	2011-08-	Open	(WO2011	2011-02-	(WO2011	2010-02-	2013-08-	(WO2011	LAPSED		ACCESS	BAARMA	(WO20119760	A system and	(WO20119760	US2004013	EP2689512	X		Х		

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NMC Lithium-ion batteries: patent landscape (Knowmade, July 2017)



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Power GaN 2016: Epitaxy and Devices, Applications, and Technology Trends (Yole développement, September 2016)





Status of the Power Electronics Industry 2017 (Yole développement, July 2017)



Power MOSFET 2017: Market and Technology Trends (Yole développement, April 2017)



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Ref.: KM17010

SHIP TO	PAYMENT METHODS	ORDER								
Name (Mr/Ms/Dr/Pr):	Check	ONLINE								
	To pay your invoice using a check, please mail your check to the follo	wing address:								
Job Title:	KnowMade S.A.R.L.	4								
	2405 route des Dolines, BP 65									
Company:	06902 Valbonne Sophia Antipolis									
	FRANCE									
Address:	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									
City:	to submit the payment:	to submit the payment:								
	Payee: KnowMade S.A.R.L.	Payee: KnowMade S.A.R.L.								
State:	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									
Postcode/Zip:	BIC/SWIFT: CCBPFRPPNCE	BIC/SWIFT: CCBPFRPPNCE								
	Paypal									
Country:	In order to pay your invoice via PAYPAL, you must first register at ww	w.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 enteri	ing the invoice amount.								
VAT ID Number for EU members:										
	RETURN ORDER BY									
 Tel:	E-mail: contact@knowmade.fr									
	Mail: KnowMade S.A.R.L. 2405 route des Dolines, 06902 Sophia Antipolis, FRANCE									
 Fmail:										
	PRODUCT ORDER	I hereby accept Knowmade's Terms and Conditions of Sale								
Date [.]	€4,990 – Single user license*	Signature:								
bute.	€5,990 – Corporate license									
	For price in dollars, please use the day's exchange rate. For French									
	customer, add 20% for VAT.									
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Terms and Conditions of Sales

DEEINITIONS

"Accentance": Action by which the Buver accepts the terms and conditions of sale in their entirety. It is produce sufficient evidence of such defects. done by signing the purchase order which mentions "I hereby accept Knowmade's Terms and Conditions of 2.6 No return of Products shall be accepted without prior information to the Seller, even in case of delayed Sale"

"Buver": Any business user (i.e. any person acting in the course of its business activities, for its business under article 2.5 shall remain at the Buver's risk needs) entering into the following general conditions to the exclusion of consumers acting in their personal intoracte

"Contracting Parties" or "Parties": The Seller on the one hand and the Buyer on the other hand

natents. trademarks. registered models. designs. copyrights, inventions, commercial secrets and know-how, time to time. The effective price is deemed to be the one applicable at the time of the order. technical information. company or trading names and any other intellectual property rights or similar in any 3.2 Payments due by the Buyer shall be sent by cheque payable to Knowmade, PayPal or by electronic nart of the world. notwithstanding the fact that they have been registered or not and including any pending transfer to the following account: 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 BIC or SWIFT code: CCREERPPACE 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 case, the need of down payments will be mentioned on the order. included

"Products": Reports are established in PowerPoint and delivered on a PDE 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 are delivered only after reception of the payment. landscapes and scientific state of the art with high added value to businesses and research laboratories. Our 3.4 in the event of termination of the contract, or of misconduct, during the contract, the Seller will have 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 4.1 The Buver or any other individual or legal person acting on its behalf, being a business user buying the consequences in their entirety. BUVER and the Seller ANY ADDITIONAL DIFFERENT OR CONFLICTING TERMS AND CONDITIONS IN ANY BF WHOLLY INAPPLICABLE TO ANY SALE MADE HEREUNDER AND SHALL NOT BE BINDING IN ANY WAY ON acts it deduces thereof. THE SELLER

1.2 This agreement becomes valid and enforceable between the Contracting Parties after clear and non- arising from a material breach of this agreement equivocal consent by any duly authorized person representing the Buyer. For these purposes, the Buyer 4.3 In no event shall the Seller be liable for: 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 17 days] from the date of order, to be sent either by email or to the Buyer's address. In the absence of any on the website, or in the Products: 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 progress

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

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.

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 first down payment to the exclusion of any further damages. Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be 4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of and Conditions.

sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to saleability and fitness for a particular purpose, with respect to the Products. Although the Seller shall take

delivery. Any Product returned to the Seller without providing prior information to the Seller as required guarantee that any Product will be free from infection

3. PRICE, INVOICING AND PAYMENT

"Intellectual Property Rights" ("IPR") means any rights held by the Seller in its Products, including any annual subscriptions. They are expressed to be inclusive of all taxes. The prices may be reevaluated from

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IBAN. · FR76 1560 7000 6360 6214 5695 126

3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a narticular written agreement. If the Buyer fails to nay 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...)

the right to invoice at the stage in progress, and to take legal action for damages

4. LIABILITIES

Products for its business activities, shall be solely responsible for choosing the Products and for the use and

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or

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 may be borne by the Seller, following this decision.

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.

the liability of the Seller, provided that the Seller ensures the substituted Product is similar to the Product Buyer. initially ordered

The Seller shall by no means be responsible for any delay in respect of article 2.2 above, and including in 4.6 In the case where. after inspection, it is acknowledged that the Products contain defects, the Seller by the other Party. cases where a new event or access to new contradictory information would require for the analyst extra undertakes to replace the defective products as far as the supplies allow and without indemnities or The Seller may, from time to time, update these Terms and Conditions and the Buyer, is deemed to have compensation of any kind for labor costs, delays, loss caused or any other reason. The replacement is accepted the latest version of these terms and conditions, provided they have been communicated to him guaranteed for a maximum of two months starting from the delivery date. Any replacement is excluded for in due time. any event as set out in article 5 below.

2.4 The mailing is operated through electronic means either by email via the sales department. If the 4.7 The deadlines that the Seller is asked to state for the mailing of the Products are given for information 9. GOVERNING LAW AND JURISDICTION Product's electronic delivery format is defective, the Seller undertakes to replace it at no charge to the only and are not guaranteed. If such deadlines are not met, it shall not lead to any damages or cancellation 9.1 Any dispute arising out or linked to these Terms and Conditions or to any contract (orders) entered into of the orders, except for non-acceptable delays exceeding [4] months from the stated deadline, without in application of these Terms and Conditions shall be settled by the French Commercial Courts of Grasse, information from the Seller. In such case only, the Buyer shall be entitled to ask for a reimbursement of its which shall have exclusive jurisdiction upon such issues.

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

5 FORCE MAIFURE

The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from 3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to 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 convright law and conventions

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish the Product, or any To ensure the payments the Seller reserves the right to request down payments from the Buyer. In this 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

6.4 The Buyer shall define within its company point of contact for the needs of the contract. This person will OTHER DOCUMENTS ISSUED BY THE BUYER AT ANY TIME ARE HEREBY OBJECTED TO BY THE SELLER, SHALL interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and 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 accepts these conditions of sales when signing the purchase order which mentions "I hereby accept a) damages of any kind, including without limitation, incidental or consequential damages (including, but 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

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may b) any claim attributable to errors, omissions or other inaccuracies in the Product or interpretations 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

4.5 All the Products that the Seller sells may, upon prior notice to the Buyer from time to time be modified. All the provisions of these Terms and Conditions are for the benefit of the Seller itself, but also for its use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in by or substituted with similar Products meeting the needs of the Buyer. This modification shall not lead to licensors, employees and agents. Each of them is entitled to assert and enforce those provisions against the

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

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







www.knowmade.com contact@knowmade.fr KnowMade S.A.R.L., 2405 route des Dolines, CS 10065, 06902 Sophia Antipolis, France

KNOWMADE

Technology Intelligence and IP Strategy consulting company

Microelectronics | Compound Semiconductors | Power Devices & Systems | RF & Microwave Devices | LED/OLED | Imaging & Display | MEMS Sensors & Actuators | Photonics | Battery | Manufacturing & Advanced Packaging | Micro & Nanotechnology | Biotechnology | Cellular & Molecular Biology | Microbiology | Dermatology | Pharmacology | Oncology | Immunology | Medical Devices & Medical Imaging | Agri-Food & Environment

Executive team



Dr. Nicolas Baron

CEO and co-founder of Knowmade.

He leads the Microelectronics and Compound Semiconductors department. He holds a PhD in Physics from the University of Nice Sophia-Antipolis, and a Master degree in Intellectual Property Strategies and Innovation from the European Institute for Enterprise and Intellectual Property (IEEPI Strasbourg), France.



Dr. Brice Sagot

CTO and co-founder of Knowmade.

He leads the Biotechnology and Life Sciences department. He holds a PhD in molecular biology from the University of Nice Sophia-Antipolis, France.

Analyst team

5 full time analysts with PhD degree and in-depth knowledge in Intellectual Property and Scientific Information.

Founded in 2009 Headquartered in Sophia Antipolis FRANCE



JEI since 2013 (Innovative New Company) CIR accreditation since 2012 (Research Tax Credit)

Partners



+ expert network (Industrial & Academics)



WHAT WE DO

KNOWMADE OFFERS YOU THE CAPABILITY TO

- ✓ **Understand** your competitive environment
- ✓ **Follow** technology trends
- ✓ **Indentify** patent/technology opportunities
- ✓ Assess patent/technology risks
- ✓ Strategize your IP and R&D
- ✓ Monetize your technologies and know-how
- ✓ **Defend** your business

KNOWMADE OPERATES IN THE FOLLOWING SECTORS

Semiconductors

Compound semiconductors, Power & RF electronics, LED lighting & display, Photonics, Memories, Advanced packaging

MEMS, Sensors & Actuators

Inertial sensor, Microphone & Microspeaker, RF switch, filter & resonator, Environmental sensor, Optical sensor & actuator, Microfluidics, Microfabrication technologies

Batteries & Energy Management

Energy storage, Battery cell & pack, Power electronics, Renewable energies

MedTech

(C)KnowMade

Biotech, Pharma, Medical devices, Medical imaging



Make strategic decisions Sustain competitive advantages Speed R&D and enhance innovation process Align R&D and IP with key business objectives Strengthen IP portfolio and acquire technologies Anticipate risks and defend core businesses Explore new opportunities and monetize IP

Wireless Charging – Patent Landscape Analysis | November 2017 | Ref.: KM17010 © 2017 All rights reserved | www.knowmade.com

INTELLIGENCE CYCLE

Tracking key technologies and competitors' R&D activities in order to anticipate changes, early detect business opportunities, mitigate risks, and make strategic decisions







Knowmade team of experts work all year long to collect patent and scientific information, identify and analyze the trends, the challenges, the emerging technologies, the competitive environments, and turn it into results to give you a complete picture of your industry landscape.

Each year, **Knowmade** publishes a comprehensive **collection of reports** in various technology fields. These **fact-based analyses** can provide you with the reliable information you need to advance your **business** and your **competitive position**.

TYPE OF REPORT		CONTENT													
	Competitive IP landscape	IP trends	Key patents	Key IP players	IP strategy	IP collaboration network	Licensing agreements	Patent legal status	Patent Litigation	Patent database	Risk assessment	Market trends	Reverse engineering		
Patent Landscape Analysis	I		V		V			I	I	V					
Patent-to-Product Mapping			Ø	V	V	Ø		V		V			Ø		
Patent Infringement Risk Analysis					Ø	V	V	V	V		V		V		
Patent Portfolio Analysis			Ø			Ø	V		I	V					
Patent Watch (monthly updated)															



COMPOUND SEMICONDUCTORS

- GaN Substrate Patent Landscape 2017*
- Patent Trolls in the Semiconductor Market Litigation Risk and Potential Targets 2017
- GaN Technology Top-100 IP Profiles 2016
- GaN Devices for Power Electronics Patent Landscape 2015
- GaN-on-Silicon Substrate Patent Landscape 2014
- GaN Substrate Patent Landscape 2014
- FD-SOI Patent Landscape 2014

POWER ELECTRONICS

GaN Devices for Power Electronics – Patent Landscape 2015

RF DEVICES & TECHNOLOGIES

• RF Acoustic Wave Filters (SAW, BAW, FBAR/SMR) – Patent Landscape 2017*

LED

- Phosphors and QDs for LED Applications Patent Landscape 2015
- Nanowire LED Patent Landscape 2014

IMAGING

- Uncooled Infrared Imaging Patent Landscape 2017*
 Consumer Physics SCiO Molecular Sensor Patent-to-Product Mapping 2017
- Biomedical Photoacoustic Imaging Patent Landscape 2015
- Honeywell Microbolometer Patent Portfolio Analysis 2015
- Capsule Endoscopy Patent Landscape 2014

MEMORY

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- 3D Monolithic Memory Patent Landscape 2017*
- Patent Trolls in the Semiconductor Market Litigation Risk and Potential Targets 2017
- ReRAM and Memristor Technologies Patent Landscape 2015
- Emerging Non-Volatile Memories (eNVM) Patent Landscape 2014

BATTERY AND ENERGY MANAGEMENT

- NMC Li-ion Batteries Patent Landscape 2017
- Wireless Power Charging Patent Landscape 2017
- Microbattery Patent Landscape 2016

MEMS SENSORS & ACTUATORS

- RF Acoustic Wave Filters (SAW, BAW, FBAR/SMR) Patent Landscape 2017*
- Uncooled Infrared Imaging Patent Landscape 2017*
- Pumps for Microfluidics Patent Landscape 2017
- Knowles MEMS Microphones in Apple iPhone 7 Plus Patent-to-Product Mapping 2017
- Microfluidic Technologies for Diagnostic Applications Patent Landscape 2017
- Consumer Physics SCiO Molecular Sensor Patent-to-Product Mapping 2017
- Miniaturized Gas Sensors Patent Landscape 2016
- Microbattery Patent Landscape 2016
- MEMS Microphone Patent Infringement Risk Analysis 2015
- Capacitive Fingerprint Sensors Patent Landscape 2015
- Honeywell Microbolometer Patent Portfolio Analysis 2015
- 9-Axis MEMS IMU Patent Infringement Risk Analysis 2014
- Emerging MEMS Patent Landscape 2014

ADVANCED PACKAGING

- Hybrid Bonding for 3D Stack Patent Landscape 2017*
- 3D Monolithic Memory Patent Landscape 2017*
- Fan-Out Wafer Level Packaging Patent Landscape 2016
- TSV Stacked Memory Patent Landscape 2016

MEDTECH

- Pumps for Microfluidics Patent Landscape 2017
- Microfluidic Technologies for Diagnostic Applications Patent Landscape 2017
- 3D Cell Culture Technologies Patent Landscape 2016
- Miniaturized Gas Sensors Patent Landscape 2016
- Non-Invasive Glucose Monitoring Patent Landscape 2015
- Biomedical Photoacoustic Imaging Patent Landscape 2015
- Capsule Endoscopy Patent Landscape 2014

* Comina soon

Complete list of reports on www.knowmade.com

CUSTOM STUDY & CONSULTING

Tailor-made analysis to meet your needs and budgetary constraints

Prior art search

Evaluate the patentability of your invention in the course of a patent filing.

Invalidate competitor's patents in the course of patent litigation or in anticipation of one. Make third-party observations concerning the patentability of competitor's inventions.

Patent landscape analysis

Understand the competitive environment and the technology trends from a patent perspective. Identify key players, their IP strategy and their key patents.

Know IP collaborations, licensing agreements and litigation history.

Freedom-to-operate analysis

Assess the risks to infringe third-party patents. Ensure that your products/processes can be safely manufactured, sold and used in specific countries without infringing patents held by others.

Litigation and licensing support

Evidence of infringement/non-infringement for offensive/defensive support.

Defend your position in licensing negotiation or patent litigation.



Patent assessment

Identify most valuable patents prior to patent acquisition/sales, licensing agreement, capital fundraising process, M&A or IP due diligence. Estimate the financial value of your patent portfolio.

IP due diligence

Assess the patent portfolio of a company and reveal the SWOT matrix prior to patent acquisition/sale, licensing agreement or M&A.

Scientific literature analysis

Pinpoint key research findings and new emerging research fields, key laboratories and scientific experts, industrial/academic research collaborations, and identify prospective R&D partners.

Technology scouting

Identify, qualify and get access to external innovation.

IP & Technology watch service

Follow IP/technology trends, keep a watch on your competitors and identify new entrants, anticipate the changes, early detect business opportunities and mitigate the risks.

CUSTOM STUDY & CONSULTING

Tailor-made analysis to meet your needs and budgetary constraints

	CUSTOM STUDY												
YOUR NEED	Prior art search	Patent landscape analysis	Freedom-to- operate analysis	Patent-to- product mapping	Litigation & Licensing support	Patent assessment	IP due diligence	Scientific literature analysis	Technology scouting	Technology watch service			
Understand the competitive landscape			V				I	V					
Know the key players and their key patents			V				I	V					
Follow the technology trends and identify emerging technologies		I						 Image: A set of the set of the		V			
Track competitors, their IP activity, strategy and future intents				V				V		V			
Know your competitors' strengths and weaknesses			V			Ø	I	V					
Early detect business opportunities		I						V		V			
Evaluate the patentability of your inventions	 Image: A start of the start of												
Invalidate competitors' patents					V			V					
Prevent registration of critical patents from competitors	V				V								
Identify patents used in products				 Image: A set of the set of the	V	V	 Image: A set of the set of the						
Make evidence of patent infringement			V	 Image: A start of the start of	V								
Evaluate the risks to infringe someone else's patents			V	 Image: A set of the set of the	V		 Image: A set of the set of the						
Mitigate the risks of patent litigation			V		I		 Image: A start of the start of						
Defend your position in licensing negotiation or patent litigation	V		I	V	V	I							
Reduce the risks in M&A			V				 Image: A start of the start of						
Evaluate your real patent protection					V		 Image: A set of the set of the						
Benchmark patent portfolios		V				V							
Identify the most valuable patents and estimate their financial value				 Image: A start of the start of		 Image: A set of the set of the			 Image: A set of the set of the				
Monetize your patents and identify potential licensees/buyers					V	 Image: A set of the set of the							
Acquire technologies or identify potential licensors						 Image: A set of the set of the			 Image: A set of the set of the				
Speed your R&D and enhance your innovation process		~								V			
Decrease R&D and IP costs			V		V								
Identify free technologies which can be used safely			V										
Identify key research laboratories and potential R&D partners		V						~	\checkmark				



TRAINING & WORKSHOP

Benefit from face-to-face meeting with our experts

Training

Knowmade provides guidance to companies and research laboratories seeking to gain an understanding of the issues linked with competitive intelligence, set up an internal intelligence process or improve their existing processes.

- ✓ Patent information for R&D, strategy and marketing
- ✓ Patent Intelligence: Tapping the economic potential of patent information
- ✓ Technology Intelligence and Innovation
- ✓ Setting up a strategic intelligence unit
- ✓ Intelligence process optimization

Workshop

Objective

One day face-to-face presentation of our data and analysis with Q&A session on specific questions of your choice (direct interaction with our experts at your site)

- > Have the ability to ask questions or for specific analysis before the workshop
- Access to Knowmade ongoing analyses
- Direct contact with Knowmade analysts
- > Open Q&A session with the key persons of your company

Content

(C)KnowMade

- ✓ Presentation of updated Knowmade analyses
- ✓ Presentation of the analysis done for your company
- ✓ Executive synthesis
- ✓ Q&A session and open discussion







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> www.knowmade.com contact@knowmade.fr

