**REPORT OUTLINE**

- Technology and patent infringement risk analysis of 9-Axis MEMS IMU (LSM9DS0), BMX055 (Bosch Sensortec) and MPU-9250 (InvenSense)
- September 2014
- PDF & Excel file
- 80+ slides
- €5,990

**KEY FEATURES OF THE REPORT**

- Deep insight on technology data and manufacturing processes
- Comparative studies of product features (similarities & differences)
- Key patents related to the target product features per company
- Cross analysis of potential patent infringement risks
- Excel database with all patents analyzed in the report

**OBJECTIVES OF THE REPORT**

- Find the technical and manufacturing process similarities and differences of LSM9DS0, BMX055 and MPU-9250 9-axis IMU components.
- Identify key patents held by STMicroelectronics, Bosch Sensortec and InvenSense, and related to the target product features.
- 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.

**RELATED REPORTS**

- InvenSense MPU-9250 9-Axis IMU
- STMicroelectronics LSM9DS0 9-Axis MEMS IMU
- Bosch BMX055 9-Axis MEMS IMU
- MEMS Gyroscope Patent Investigation

9-Axis MEMS IMU

STMicroelectronics (LSM9DS0), Bosch Sensortec (BMX055), InvenSense (MPU-9250)

Take the benefits of KnowMade and System Plus Consulting combined added value for highlighting potential risks of patent infringement.

Motion sensing combo sensor is a very hot topic, both in terms of market potential and competition among the players. The growth of the applications of 6 and 9 degrees of freedom (DoF) devices is both pushing the leaders (STMicroelectronics, Bosch Sensortec and InvenSense) and their challengers (AKM, Kionix, mCube, Freescale, Alps, Kionix...) to develop innovative technical and manufacturing solutions, and, in parallel of course, to have the right patents to protect their inventions. What are the similarities and the differences in term of technical and manufacturing choices at the devices level? What is the related patent situation?

For the first time, 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 to highlight the risks of patent infringement between STMicroelectronics, Bosch Sensortec and InvenSense in the field of 9 axis MEMS inertial measurement units (IMU). As the 9 axis IMUs are just starting to be adopted by the market, it is the right time now to understand what could happen between these 3 companies and how to differentiate patents and claims compared to the leaders.

MEMS accelero & gyro structure

![MEMS accelero & gyro structure](image)

2012 was seen by many as a turnkey year for consumer combo sensors (6 and 9 axis sensors). Since then, many developments have occurred and the market acceptance of combo solutions has been extremely quick. According to Yole Développement, the combo sensor market is estimated to be $446M in 2013, growing to $1.97B in 2018. This represents 21% of the global inertial consumer market in 2013, and will grow to an impressive 66% by 2018. In this playground, STMicroelectronics (ST), Bosch Sensortec (Bosch) and InvenSense are the 3 market leaders in the inertial consumer sensors with more than 50% of market share.

In a patent infringement action, the potential sales volume plays a major role for assessing the damage award. Thereby, this study is naturally focused on the newest 9-axis inertial MEMS components supplied by these market leaders: LSM9DS0 (STMicroelectronics), BMX055 (Bosch Sensortec) and MPU-9250 (InvenSense). Moreover, there exists a history of patent disputes between these 3 leading players.
This report provides an overview of technology data and manufacturing process of LSM9DS0, BMX055 and MPU-9250 9-axis IMU components. A comparative study of the technology and manufacturing process of 9-axis IMU components supplied by STMicroelectronics, Bosch Sensortec and InvenSense has been performed in order to highlight the technical similarities and differences of the product features.

A LINK BETWEEN PRODUCT AND PATENT

A set of product features, mainly related to the acceler/gyro die, has been selected regarding their interest in terms of patent study:

- Al-Ge eutectic bonding process (Cap/Sensor, Sensor/IC).
- Accelero/Gyro single chip and the required multiple sealed cavities.
- 3-axis gyroscope single structure (sensing area).
- Hybrid MEMS with a vertically integrated electronics and a wafer-scale hermetic packaging.
- SiN as protective layer in sensor area (micromachined layers).

Key patents held by STMicroelectronics, Bosch Sensortec and InvenSense related to these technology features have been identified. For each product feature, the links between the patented technologies and the target product have been established.

AN USEFUL PATENT DATABASE

The report also includes an excel database with all patents analyzed in the report (60+ patent families composed of 200+ patents)

This database allows multi-criteria searches and includes:

- Patent publication number
- Hyperlinks to the original documents
- Priority date
- Title
- Abstract
- Applicants
- Legal status for each patent

HIGHLIGHT PATENT INFRINGEMENT RISK

The potential infringing parties of the target product have been identified. The contents of patents have been compared with actual technological solutions used in the marketed target products LSM9DS0 (STMicroelectronics), BMX055 (Bosch Sensortec) and MPU-9250 (InvenSense), in order to highlight, for each 9-axis inertial MEMS component, the potential risks of patent infringement and related patents requiring more in-depth legal assessments. This report provides discussions on the potential risks of patent infringement by comparing relevant patent claim elements to the target product features.

We have identified several potential risks of patent infringements in some technology features from target products LSM9DS0, BMX055 and MPU-9250. Key patents requiring more in-depth legal assessment have been identified.
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ORDER FORM

9-Axis MEMS IMU (STMicroelectronics, Bosch Sensortec, InvenSense)
Technology and Patent Infringement Risk Analysis

SHIP TO
Name (Mr/Ms/Dr/Pr): ____________________________
Job Title: ____________________________
Company: ____________________________
Address: ____________________________
City: ____________________________
State: ____________________________
Postcode/Zip: ____________________________
Country: ____________________________
VAT ID Number for EU members: ____________________________
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PAYMENT
BY CREDIT CARD
Visa ☐ Mastercard ☐ Amex ☐
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• FAX: +33 (0)472 83 01 83
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• Europe & RoW: Jean-Christophe Eloy - eloy@yole.fr
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The present document is valid 24 months after its publishing date: Sept 4, 2014

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BIC or SWIFT code: CCFRFRPP
IBAN: FR76 3005 6001 7001 7002 0156 587

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