Magnetic Sensor

Market and Technology Report 2022
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- About Yole Développement
ABOUT THE AUTHORS

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Pierre DELBOS is a Technology & Market Analyst in the Photonics & Sensing division at Yole Développement. Pierre is involved in the development of technology and market reports covering MEMS & sensing technologies, including inertial sensors, microphones, optical MEMS, and particle sensors. He also collaborates with his team on custom studies for the key players in the MEMS Industry.

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Global mega-trends and promising applications will push the magnetic sensor market to $4.5B in 2027

Despite the worldwide chip shortage and the Covid-19 pandemic, the overall magnetic sensor market is expected to grow from $2.6B in 2021 to $4.5B in 2027 with a 9% compound annual growth rate (CAGR21-27).

- Thanks to global trends like Advanced Driver Assistance Systems (ADAS), electrification and sensorization of cars, we expect the Automotive & Mobility market to reach $3B in 2027 with a 10% CAGR21-27. Switches are used to increase the awareness of cars. Speed and position sensors are used for safety and driving assistance applications. Also magnetic current sensors are used for high voltage and battery-related applications. As such, a promising market lies ahead for magnetic sensors.

- There has recently been interest in wearable devices like smartwatches and True Wireless Stereo (TWS) earbuds. Photography requirements of smartphone users are also growing. This means that there will be a strong demand for switches, position sensors and eCompasses. Hence, the magnetic sensor market for Consumer applications will grow with a 7% CAGR21-27, reaching $912M in 2027.

- The Industrial & Infrastructure market is smaller than the others mentioned previously, with $561M estimated revenue by 2027. However, it is driven by mega-trends like Industry 4.0, autonomous industrial vehicles, and the construction of more charging infrastructure due to car electrification. These mega-trends are creating new targetable markets for magnetic switches, latches, position, and current sensors.

Strong dynamics coming from tenacious players to secure future strategic positioning

The magnetic sensor market has been quite dynamic since 2017. Global mega-trends have forced players to align their strategies with the market.

- The two leaders of the magnetic sensor market are Allegro Microsystems and Infineon. They are head-to-head on market shares by value.

- AKM remains a strong competitor as it is evolving in the consumer market with its eCompass. It is also evolving in the Industrial & Infrastructure market with its position and current sensors.

These market trends mean that stakeholders were very active in investments, partnerships, mergers, acquisitions and fundraising to develop magnetoresistance-derived (xMR) technologies. Sinomags acquired Sensitec, for example. MEMSIC raised about $150M, while TDK and AKM partnered to develop a tunnel MR (TMR) eCompass.

A bright future for xMR sensors

Today, the Hall effect remains the most commonly-used technology in the magnetic sensor market. Hall sensors are cheap, small, and easy to integrate. However, new applications in electric and autonomous vehicles are fostering the demand for anisotropic MR (AMR), giant MR (GMR) and TMR sensors, as they require highly accurate measurements. TMR technology is particularly gaining ground in current and position sensing. Crocus Technology succeeded to integrate TMR sensors monolithically, hence shrinking the form factor, reducing power consumption and overall price of the sensor. Key players in the industry are working on TMR sensors, and we see growing interest in this technology.
WHAT’S IN THE REPORT

WHAT’S NEW

• Updated market data and forecasts in US$ and units for the period 2018-2027
• Detailed market breakdown per application, per function and per end-system
• 2021 estimated magnetic sensor stakeholders’ revenue breakdown per end-market and latest released products.
• Updated market trends in Automotive & Mobility, Consumer, and Industrial & Infrastructure
• Key trends at the technology level including Hall, AMR, GMR and TMR and focus on the promising current sensing magnetic sensor function

KEY FEATURES

• Market data and forecasts for 2018-2027 in units, US$ by end-markets, by magnetic sensor functions, by key applications, and by technology, including Hall, AMR, GMR, TMR and others
• Magnetic sensor main trends and market drivers in Automotive & Mobility, Consumer, and Industrial & Infrastructure
• Competitive landscape with player market shares by technology and market, supply chain analysis and market dynamics
• Technology descriptions and comparisons, main trends, and focus on magnetic current sensors

 Yours needs are out of the report’ scope?
Contact us for a customized inquiry:
COMPANIES CITED IN THE REPORT

Ablic, Acelnna, AKM, Allegro MicroSystems, Alps Alpine, AMS, Analog Devices, Angsemi, Bosch, Crocus Technology, Diodes, Honeywell, Infineon, Isentek, Melexis, MEMSIC, MultiDimension, Murata, NVE, NXP, PNI, Polar Semiconductor, Rohm, Sensitec (Sinomags), ST Microelectronics, TDK (TDK Japan and TDK Micronas), TE Connectivity, Texas Instruments, Tower Semiconductor, TSMC, Voltafield, Xfab, Yamaha and more….
DEFINITIONS

Magnetic sensors TECHNOLOGY

Hall

AMR

GMR

TMR

Others (fluxgate, inductive...)

Magnetic sensors FUNCTIONS

Position sensors

Speed

Current

Switches /latches

1D, 2D, 3D

Rotation movement

Linear movement

eCompass

Magnetic sensors APPLICATIONS

Speed and rotation direction sensing in BLDC motors

Twist throttle

Thumb throttle

Case sensing

Steering assistance

AND MANY MORE...
MAGNETIC SENSOR MARKET GROWTH

- **2021**
  - $2.6B
  - **Switches**: $976M
  - **Latches**: $414M
  - **Position sensors**: $430M
  - **Speed sensors**: $512M
  - **Current sensors**: $80M
  - **Ecompass**: $216M

- **2027**
  - $4.5B
  - **Switches**: $1.6B (CAGR 9%)
  - **Latches**: $1B (CAGR 16%)
  - **Position sensors**: $750M (CAGR 10%)
  - **Speed sensors**: $719M (CAGR 6%)
  - **Current sensors**: $109M (CAGR 5%)
  - **Ecompass**: $246M (CAGR 2%)

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Knowing exactly what is happening inside the car (and outside for wipers, mirrors…) is a key feature for high-quality vehicles. It increases the safety and comfort of passengers.

In addition to the pre-existing magnetic sensors for:
- Crankshaft
- Camshaft
- Transmission
- Wheel speed for ABS
- Steering assistance
- …
MAGNETIC SENSORS IN AUTOMOTIVE

Magnetic sensor content (in $) in cars

- Electrification pushes adoption of magnetic current sensors (high ASP)
- ADAS and sensorization increases the overall number of magnetic sensors in cars
- Position sensors are used for BTM due to electrification of cars
- The number of hybrid vehicles increases, having both IC and electric engines

2017 $12.38 → 2021 $17.35 → 2027

However, by 2030, the number of ICE cars will decrease and ICE-related applications for magnetic sensors like camshaft, crankshaft, EGR, ETR, clutch pedal… will decrease.
The two leaders of the magnetic sensor market are Allegro MicroSystems and Infineon. They are head-to-head in revenue.

AKM remains a strong competitor as it is evolving in the Consumer market with its eCompass, and in Industrial & Infrastructure with its position and current sensors. However, AKM is losing some share in the eCompass market with the strong growth of MEMSIC’s AMR eCompass business. AKM has roughly 60% of the eCompass market and MEMSIC about 15%, which is expected to increase in the next 5 years.

TDK also grew strongly thanks to its design wins in smartphone OIS+AF using its TMR technology. TE Connectivity grew strongly thanks to the numerous automotive applications targeted by their portfolio.
NEW MAGNETIC POSITION SENSORS SINCE Q3 2017

2017
- Q3: Allegro ALS31300
- Q4: Melexis MLX90380

2018
- Q3: Allegro ATS 344
- Q4: TDK HAR 379x

2019
- Q3: Melexis MLX90378
- Q4: Crocus Technology TA903

2020
- Q3: TDK HAR 39yy

2021
- Q3: Melexis MLX90374
- Q4: TDK HAL 1890

*non-exhaustive list of companies

LEGEND:
- Hall
- AMR
- GMR
- TMR
Market breakdown

• Hall technology still dominates the magnetic sensor market as it is used for switches which are shipped in massive numbers to all markets.
• AMR technology is gaining ground as it has higher sensitivity than Hall and is less expensive than other technologies like GMR or TMR. Moreover, AMR has been strongly adopted in the consumer market with eCompass, thanks to design wins from MEMSIC and ALPS Alpine.
• GMR technology is also expected to gain ground thanks to its sensitivity and measurement range.
• Finally, TMR sensors will experience a particular boom thanks to the strong penetration rate of this technology in current and position sensors. Moreover, TMR sensors can now be mass produced monolithically thanks to the developments by Crocus Technology.
• Other technologies like fluxgate and SQUID are still expected to be used for specific applications requiring very high sensitivity.
MAGNETIC SENSOR FUNCTIONS

Competitive analysis

- Reed switch
- Resolver
- Potentiometer
- Optical wheel speed sensor
- Shunt sensor

Global market share*

* qualitative

- REED
- POTENTIOMETERS RESOLVER OPTICAL SENSOR
- OPTICAL SENSOR RESOLVER
- SHUNT

- MAGNETIC
- MAGNETIC
- MAGNETIC
- MAGNETIC
- MAGNETIC

- SWITCHES
- LATCHES
- POSITION SENSORS
- eCOMPASS
- CURRENT SENSORS

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Status of the MEMS Industry 2021

Consumer eCompass Comparison 2021

Power Electronics for E-Mobility 2021

DC Charging for Plug-in Electric Vehicles 2021

Automotive Semiconductor Trends 2021
YOLE GROUP OF COMPANIES RELATED ANALYSES
System Plus Consulting

Contact our Sales Team for more information

Automotive Teardown Track

Consumer Teardown Track
The Yole Group of Companies, including Yole Développement, System Plus Consulting, and PISEO are pleased to provide you a glimpse of our accumulated knowledge.

Feel free to share our data with your own network, within your presentations, press releases, dedicated articles, and more. But before doing so, **contact our Public Relations department to make sure you get up-to-date, licensed materials.**

We will be more than happy to give you our latest results and appropriate formats of our approved content.

Your contact: Sandrine Leroy, Dir. Public Relations
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  - Supply chain changes analysis
  - Reverse costing and reverse engineering
- **Format**
  - PDF files with analyses
  - Excel files with graphics and data
- **Topics**
  - Photonics, Imaging & Sensing
  - Lighting & Displays
  - Power Electronics & Battery
  - Compound Semiconductors
  - Semiconductor Manufacturing and Packaging
  - Computing & Memory

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- **Insight**
  - Quarterly updated market data and technology trends in units, value and wafer
  - Direct access to the analyst
- **Format**
  - Excel files with data
  - PDF files with analyses graphs and key facts
  - Web access (to be available soon)
- **Topics**
  - Advanced Packaging
  - Application Processor
  - DRAM
  - NAND
  - Compound Semiconductor
  - CMOS Image Sensors
  - Smartphones

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- **Insight**
  - Teardowns of phones, smart home, wearables and automotive modules and systems
  - Bill-of-Materials
  - Block diagrams
- **Format**
  - Web access
  - PDF and Excel files
  - High-resolution photos
- **Topics**
  - Consumer: Smartphones, smart home, wearables
  - Automotive: Infotainment, ADAS, Telematics

**CUSTOM SERVICE**
- **Insight**
  - Specific and dedicated projects
  - Strategic, financial, technical, supply chain, market and other semiconductor-related fields
  - Reverse costing and reverse engineering
- **Format**
  - PDF files with analyses
  - Excel files with graphics and data
- **Topics**
  - Photonics, Imaging & Sensing
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