



XENSIV™ – sensing the world

Sensor solutions for automotive, industrial
and consumer applications



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Infineon XENSIV™ – sensing the world

Infineon XENSIV™ sensors are exceptionally precise thanks to industry-leading technologies. They are the perfect fit for various customer applications in automotive, industrial and consumer markets.

From the world leader in sensing technology, XENSIV™ sensors smartify lives by enabling “things” to “see”, “hear”, “feel” and “understand” their environment. Thanks to proven quality and outstanding reliability, customers can rely on XENSIV™ for system stability, durability and integrity. Providing exceptional accuracy and best-in-class measurement performance, XENSIV™ sensors add extraordinary value to customer applications. More than 40 years’ experience in sensing solutions and a deep-rooted system understanding result in the broadest portfolio of ready-to-use sensor solutions on the market. Ecosystem partners and our customers partner with us for leading technologies, perfect-fit solutions and continuous innovation.

At Infineon, we are committed to making cars safer, smarter and greener with our innovative and leading sensor portfolio. Today, a new car features numerous safety, body and powertrain applications that rely on sensors. Clearly focused on future trends, our outstanding portfolio of sensor ICs for numerous safety-relevant automotive systems makes cars much safer. In Electric Power Steering (EPS), our magnetic angle sensors and linear Hall sensors are used to measure the steering angle and steering torque. Since all our newly developed parts are based on an ISO 26262-compliant development flow, we do our utmost to support our customers’ designs in achieving the ASIL classification. This means that they can be deployed directly in all safety-relevant applications – making us a leader in supporting ISO 26262-compliant systems.

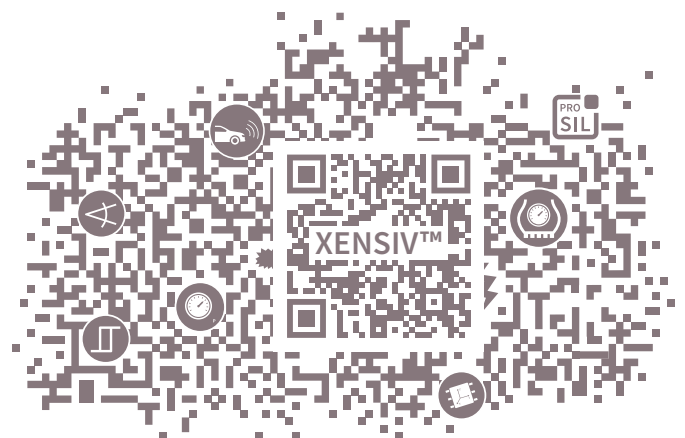
Furthermore Infineon offers a wide range of automotive qualified pressure sensors for side airbag application, barometric and manifold air pressure measurement as well as tire pressure monitoring systems (TPMS).

Infineon’s RASIC™ 77-GHz chips are used in radar-based driver assistance systems – such as adaptive cruise control and collision warning – which recognize objects at a range of up to 250 meters. With 15 million chips already shipped, we are the market leader in radar chips.

Our increasing range of XENSIV™ sensors families like XENSIV™ MEMS microphones or environmental sensors as XENSIV™ barometric pressure supporting support numerous industrial and consumer applications.




















With a proven track record in IoT innovation, we continue to seamlessly and securely connect people and machines. Many IoT trends such as smart devices and wearables, electromobility and connected cars, smart factories and homes, energy intelligence are being driven by technologies that we develop, with our XENSIV™ sensors families being one of the key elements. Today, we are already inspiring the next generation of smart environments – capable of understanding and responding to human communication. Our semiconductors are at the very heart of machine-to-machine (M2M), human-machine interface (HMI), mobile and wireless infrastructure technologies. As the technological boundary between humans and machines gradually disappears, these devices need even more advanced intelligence, enriched with voice assistance capabilities and the latest sensor fusion innovations, not to mention robust security technologies to protect personal data. Sensors and microphones from Infineon are already delivering this intelligent functionality and inspiring the next step in mobile connectivity.

Use the qr-code or visit us on www.infineon.com/sensors to get the whole portfolio overview, our latest downloads and videos.
























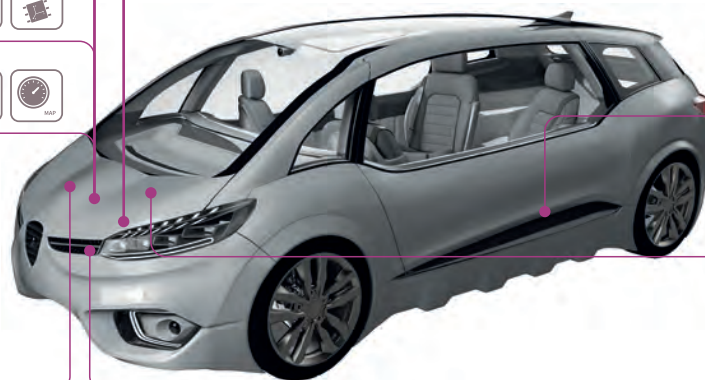
XENSIV™ sensors in powertrain applications









Engine

Crankshaft	
Camshaft position	
Manifold air pressure	
Secondary air valve	
Turbo charger	  
Throttle position	 
Variable valve position	
HEV electric motor	 
Pedal position	  
Exhaust Gas Recirculation (EGR)	  
DC/DC converter	

Transmission

Clutch position	
Clutch actuator	 
Transmission speed	
Transmission actuator	 
Transmission gear position	  
Oil pump	  
Park lock	 
Gear stick	  
Transercase	
Starter generator	 
Barometric air pressure	

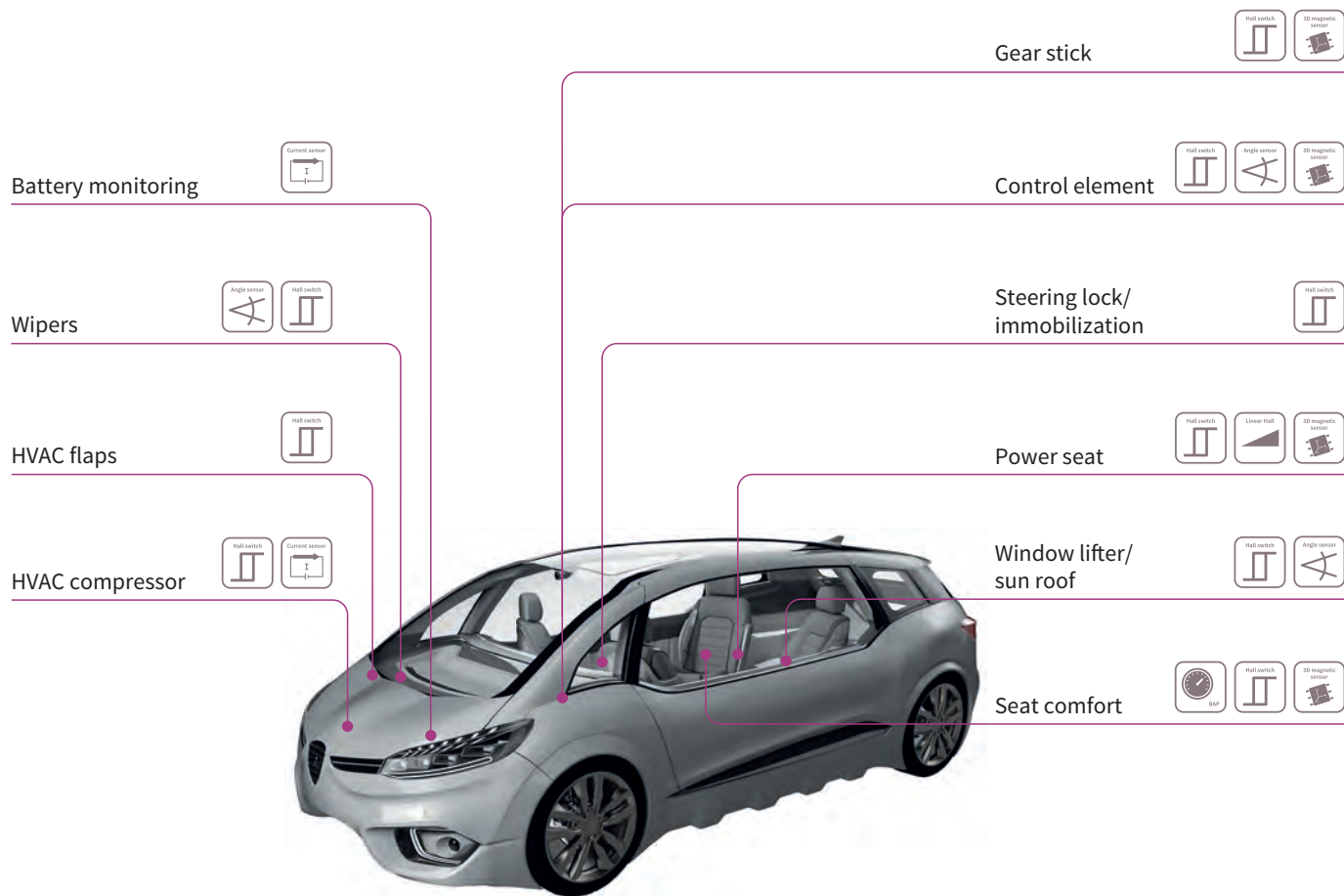








 Switches
  Linear Hall
  Angle sensors
  Current sensors
  BAP
  MAP
  Speed sensors
  3D magnetic sensors

Crankshaft, camshaft and transmission speed sensors as well as MAP and BAP pressure sensors are only some of the key elements of multiple modern powertrain applications,

such as engine and transmission, which significantly boost drivetrain efficiency. Our broad portfolio of products fits every customer requirement.

XENSIV™ sensors in body applications



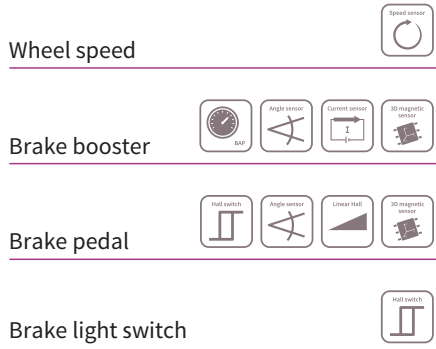
 Switches	 Linear Hall	 Angle sensors	 Current sensors	 BAP	 3D magnetic sensors
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The body segment presents the most diverse target market for sensors. Hall switches, for example, are deployed in classic applications such as window lift modules, whereas

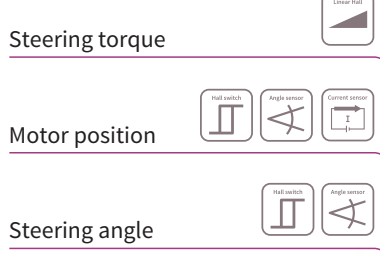
new seat comfort systems deploy pressure sensors to control individual pressure levels in seat cushions.

XENSIV™ sensors in safety applications

Braking



Power steering



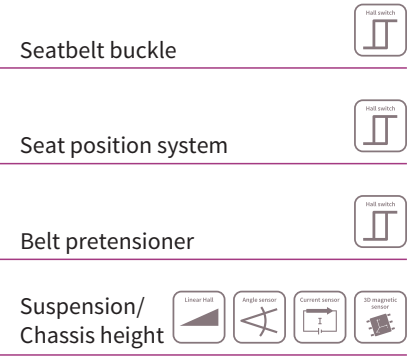
Pedestrian protection



Radar



Restraint systems



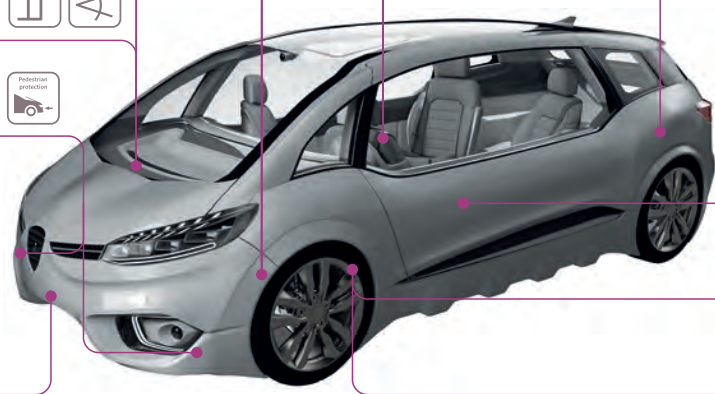
Side crash detection







Tire Pressure Monitoring System (TPMS)



Indirect TPMS System (iTTPMS)



 Switches	 Linear Hall	 Angle sensors	 Pedestrian protection	 Current sensors	 3D magnetic sensors
 Radar	 BAP	 Speed sensors	 Side airbag	 Tire Pressure Monitoring System (TPMS)	

At Infineon, we focus in particular on sensors for safety applications. These include radars in automatic cruise control systems, wheel speed sensors in ABS and ESP features, pressure sensors in side airbags and pedestrian protection

systems and TPMS sensors. We are the global market leader in most of these areas and our customers value the outstanding levels of quality and reliability that we deliver.

Magnetic position sensors for highest energy efficiency and functional safety in Electric Power Steering (EPS)

Compared to conventional hydraulic power steering solutions, Electric Power Steering (EPS) enables higher energy efficiency, increased steering functionality and reduced space requirements in passenger vehicles.

The functionality of EPS is based on several system-side position sensors, that measure the steering torque input from the driver, the position of the EPS motor, that moves the steering rack and the steering wheel's absolute position.

Typical application for Infineon magnetic position sensors in EPS

Steering torque sensing



TLE499x – linear Hall sensor series

Torque index sensor



TLE4906 – switches

Steering angle sensing

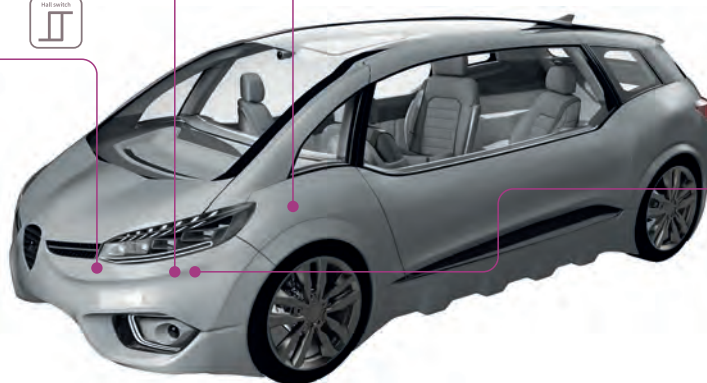


TLE5014/TLE5012B – angle sensor
TLE5009 – angle sensor

EPS motor position sensing



TLE5x09D – dual-sensor angle
TLE5012BD – dual-sensor angle



Linear Hall



Angle sensors



Steering torque



BLDC motor



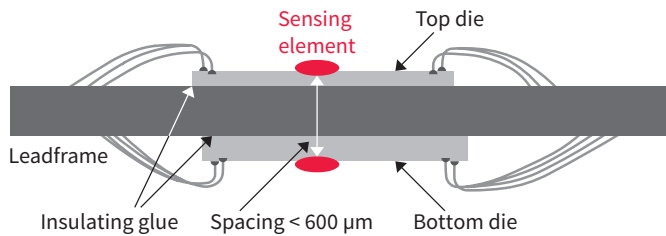
Switches

Position sensor applications in EPS are safety-related and typically rated with the highest ASIL D safety level. The ISO 26262 standard sets high requirements for the diagnostic coverage of random failures and the avoidance of systematic failures in order to reach the highest ASIL D safety level. These demanding specifications can typically be achieved by using redundant sensors as well as comparing their signals on a microcontroller.

Infineon offers dual-sensor solutions with two redundant sensors in the place of one for all position sensor applications in EPS. Our dual-sensor package integrates two magnetic position sensors with a separate power supply and separate signal outputs. They are electrically independent thanks to galvanic isolation. This means that the two sensors work independently, thereby increasing system reliability.

Magnetic position sensors for the ultimate in energy efficiency and functional safety in Electric Power Steering (EPS)

Side view of Innovative stack-mounted dual-sensor technology with bonding wires



Transparent 3D-graph of dual-sensor TDSO-16-2 package





Thanks to the use of innovative stack-mounting technology, the devices of the angle sensor family combine two independent sensors within standard and space-saving TDSO packages which are only about 1 mm thick. It has the same width and length as a conventional single-sensor package. Compared to the common approach of side-by-side sensor placement, the advantages of the top-bottom placement

include a more homogeneous magnetic field over the sensing elements and a significantly smaller footprint. This saves precious space and cuts down on expense in safety-critical applications, as a lower-cost ferrite magnet can provide a sufficient magnetic field for the sensors.

Steering torque sensors

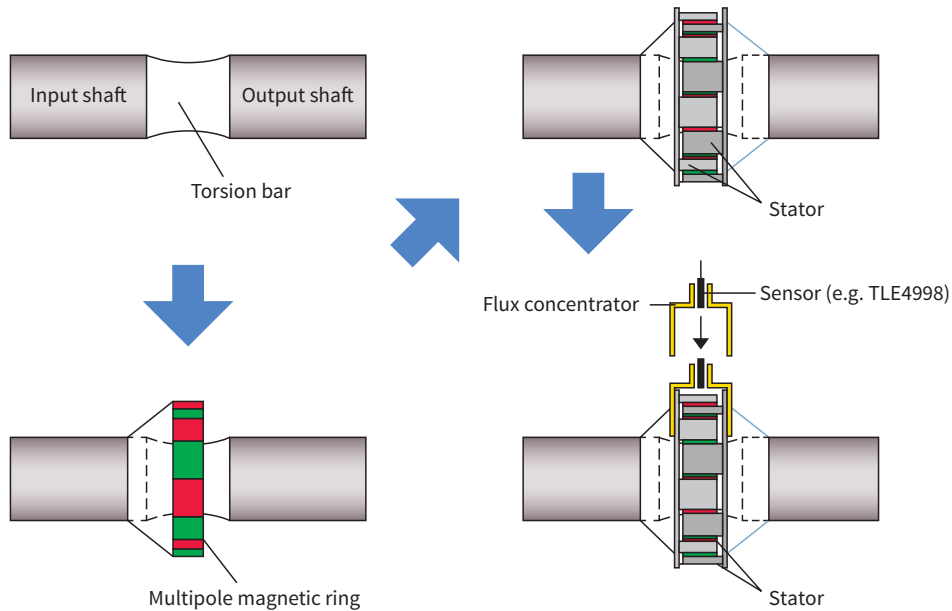
In the field of steering torque sensing, Infineon's TLE499x series offers highly accurate linear Hall sensors for magnetic torque sensing assembly. In order to support a maximum of compatibility with various Electronic Control Unit (ECU)

designs, the TLE499x sensors feature PWM, SENT, SPC or ratiometric analog output. They are available in leaded packages, as well as 1 mm-thick dual- or single-sensor SMD packages.

	TLE4997x	Programmable linear Hall sensor with temperature compensation and ratiometric analog output. Available in a 3- or 4-pin leaded package (with or without integrated capacitors) and an 8-pin dual- or single-sensor SMD package.
	TLE4998x	Programmable linear Hall sensor with digital stress and temperature compensation and PWM, SENT or Short-PWM-Code (SPC) output. Available in a 3- or 4-pin leaded package (with or without integrated capacitors) and an 8-pin dual- or single-sensor SMD package.

Magnetic position sensors for the ultimate in energy efficiency and functional safety in Electric Power Steering (EPS)

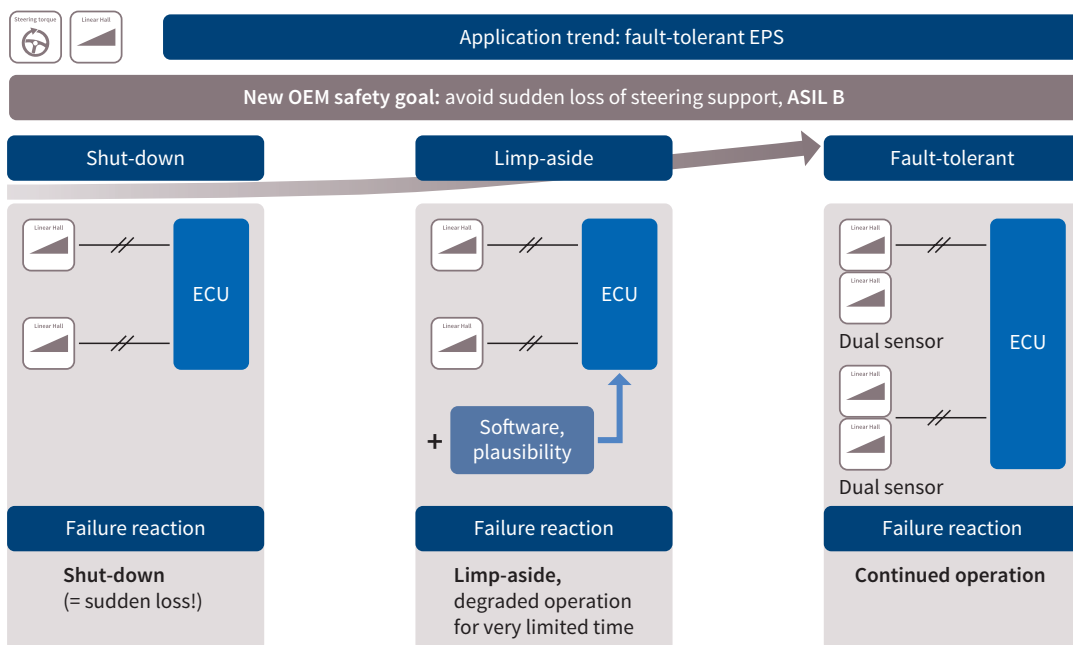
Magnetic torque sensing assembly



Conventional EPS systems use two linear Hall sensors for ASIL D compliance have to shut-down in the event of a loss of one sensor signal. Therefore, the trend in EPS systems is to increase availability by implementing additional sensor signals or plausibility mechanisms. To support this

trend towards high-availability EPS functionality, Infineon recommends the usage of two TLE4998 dual-sensors. In case of one TLE4998 signal loss, the remaining dual-sensor in the system provides continued operation of the EPS, avoiding an immediate system shut-down.

Application trend: high-availability

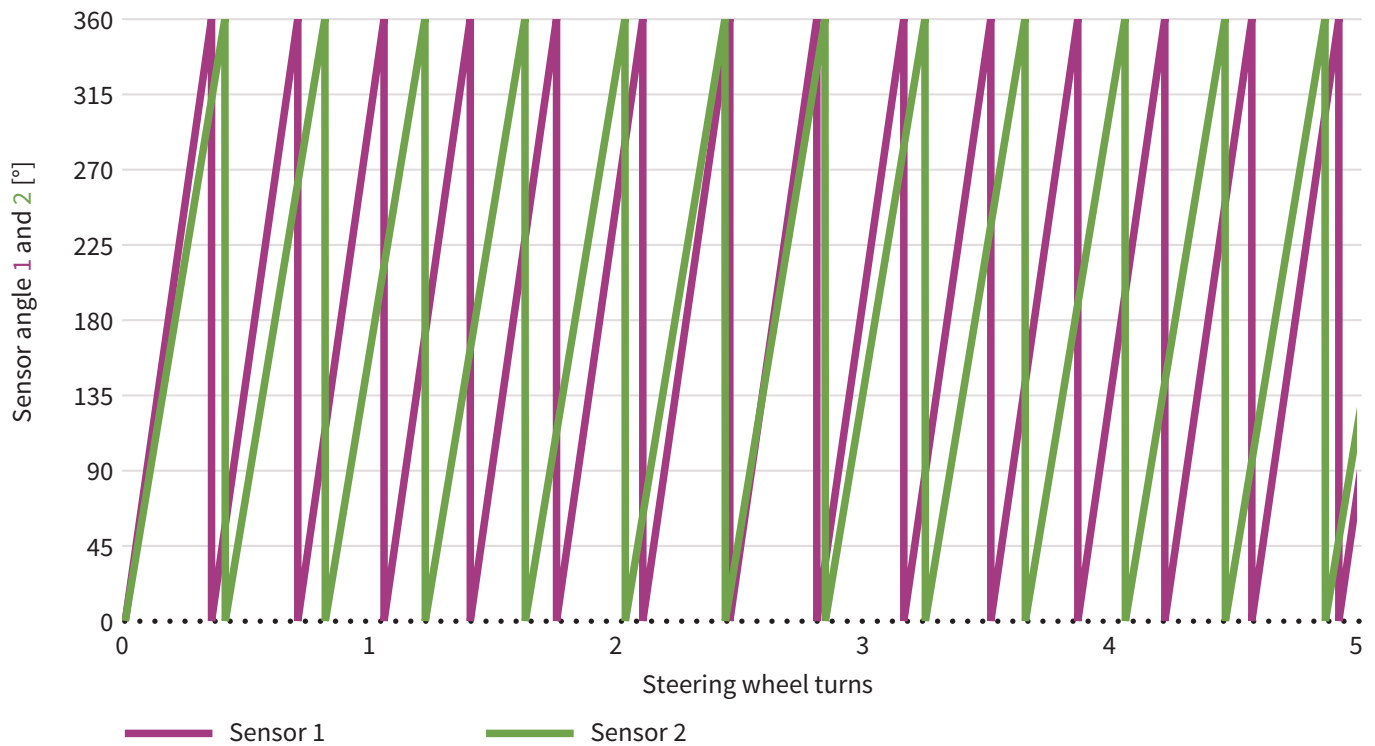


Steering angle sensors

The absolute steering angle position is an input for the Electronic Stability Program (ESP) and other driver assistance systems. A typical module design used for steering angle measurement is a design featuring gear

wheels with a slightly different number of gears. The angular positions of the gear wheels are measured by two angle sensors, where the absolute steering wheel position is calculated from those positions via the Vernier principle.





Schematic steering angle sensor module and illustration of the vernier principle



Steering angle sensors

The angle sensors for absolute steering angle measurement are available as a single-sensor SMD package for conventional designs, which achieve the ASIL D rating via a plausibility calculation of the two angle sensor signals as a result of a significant movement of the steering wheel.

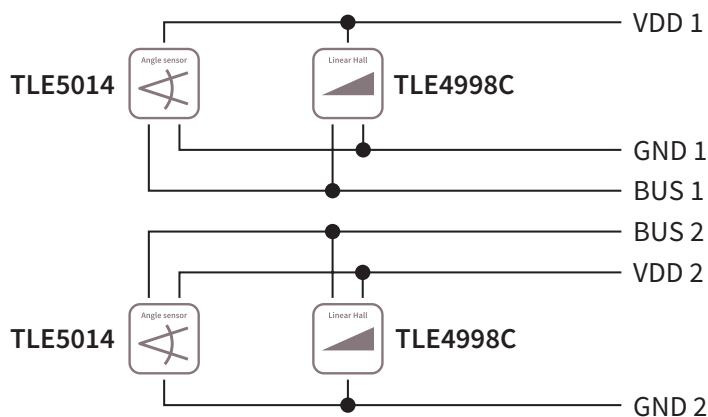
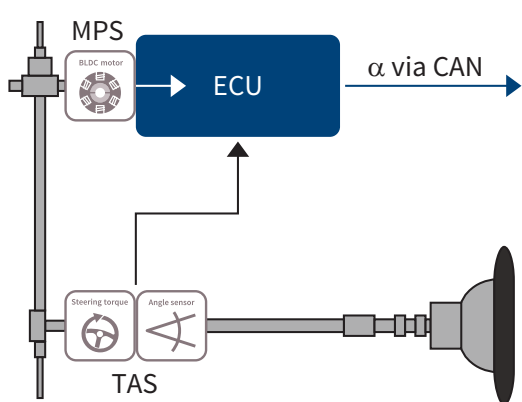
The sensors are also available in dual-sensor packages for module designs, that support an ASIL D-rated steering angle directly at power-on (ASIL D from start).

	TLE5009(D)	Fast Giant-Magneto Resistive (GMR) angle sensor with analog sin/cos output. Available in an 8-pin single, 16-pin single- and dual-sensor SMD package.
	TLE5109A16(D)	Fast Anisotropic Magneto Resistive (AMR) angle sensor with analog sin/cos output. Available in an 8-pin single, 16-pin single- and dual-sensor SMD package.
	TLE5014(D)	ISO 26262-compliant (ASIL C-metric), programmable GMR angle sensor with PWM, SENT or SPC output. Supports Torque-Angle-Sensor (TAS) module bus configuration with TLE4998C. Available in a 16-pin single- and dual-sensor SMD package.
	TLE5501	ISO 26262-compliant (ASIL D-metric) Tunneling Magneto Resistive (TMR) angle sensor with analog sin/cos output. Available in an 8-pin single SMD package. Decoupled bridges for redundant external angle calculation and highest diagnostic coverage.

Infinion angle sensors support steering angle sensor configurations with an on-board microcontroller, as well as satellite sensor designs, due to a broad variety of supported communication interfaces. In particular, the SPC interface allows the connection of angle sensor(s) and linear Hall

sensor(s) on a bus line in combined Torque-Angle-Sensor (TAS) modules. Compared to conventional designs with separate torque sensor and angle sensor modules, this configuration reduces the cost of wiring and saves module space.

Schematic TAS module set-up and SPC bus configuration of the TLE5014 and TLE4998C

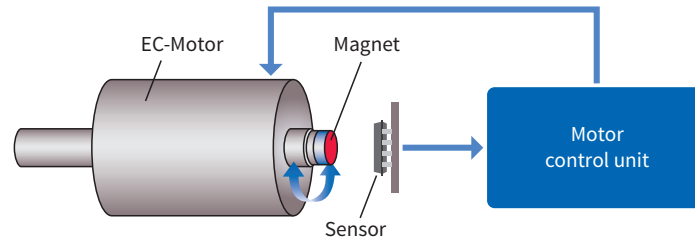


EPS motor position sensors

The motor, that drives the steering rack in an EPS system is usually a highly efficient brushless DC (BLDC) motor, which relies on a fast and accurate position sensor for commutation. In this application, short latency and high

accuracy are essential, as these sensor parameters have a significant impact on torque stability and the energy efficiency of the motor.

Schematic of BLDC motor with a magnetic position sensor for commutation







A correct commutation of the EPS motor has to be ensured, in order to avoid a blocked steering or the erratic steering support. This application is also classified in the category of ASIL D. To achieve this high level of functional safety, Infineon offers angle sensors in the dual-sensor package that allow the integration of two redundant sensors in the place of one.

The TLE5309D, in particular, meets the highest functional safety requirements by using a combination of AMR (Anisotropic-Magneto-Resistance) and GMR (Giant-Magneto-Resistance) technology, which not just offers redundan-

cy, but also integrated diversity in a single product. Depending on the overall EPS system architecture, the motor position sensor can be directly mounted on the steering ECU, or connected via a cable in a satellite configuration.

The very high level of sensor accuracy required for highest energy efficiency, comparable to the performance of costly resolver solutions, is typically achieved by implementing a continuous calibration algorithm on the steering ECU. By monitoring the sensors output signals and calculating the compensation parameters during operation, this algorithm compensates any drift errors that occur over temperature and lifetime.

	TLE5009A16(D)	Fast dual-GMR angle sensor with analog sin/cos output. Available in a 16-pin dual-sensor SMD package.
	TLE5109A16(D)	Fast dual-AMR angle sensor with analog sin/cos output. Available in a 16-pin dual-sensor SMD package.
	TLE5309D	Combined AMR and GMR sensor for integrated diversity, featuring fast analog sin/cos output. Available in a 16-pin dual-sensor SMD package.
	TLE5012BD	Digital GMR angle sensor with SPI + incremental encoder interface or Hall switch emulation output. Available in a 16-pin dual-sensor SMD package.

2-wheeler and all-terrain vehicles

Our broad portfolio of Hall- and GMR-based sensors is ideal for motorcycle, three-wheel and all terrain vehicle applications. These solutions cover the full spectrum from

switching through position measurement to engine and vehicle speed measurement, ABS sensing included.

www.infineon.com/sev



Commercial vehicles

We offer a broad portfolio of highly robust magnetic sensors tailored to the specific needs of commercial vehicles such as trucks or busses. Our Hall and xMR-based sensors were developed for switching functions as well as

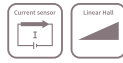
position and speed measurement. You are bound to find a dedicated solution for the individual body, powertrain and safety system of your commercial vehicle.

www.infineon.com/truck

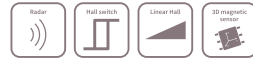


XENSIV™ sensors in industrial applications

Solar panel tracking



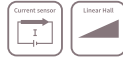
Proximity detection



Control elements



Solar inverter current



Robot sensing
Tank level measurement



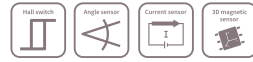
Gear wheel speed sensor



Barometric pressure sensing



Electric Commutated (EC) motor



Predictive maintenance



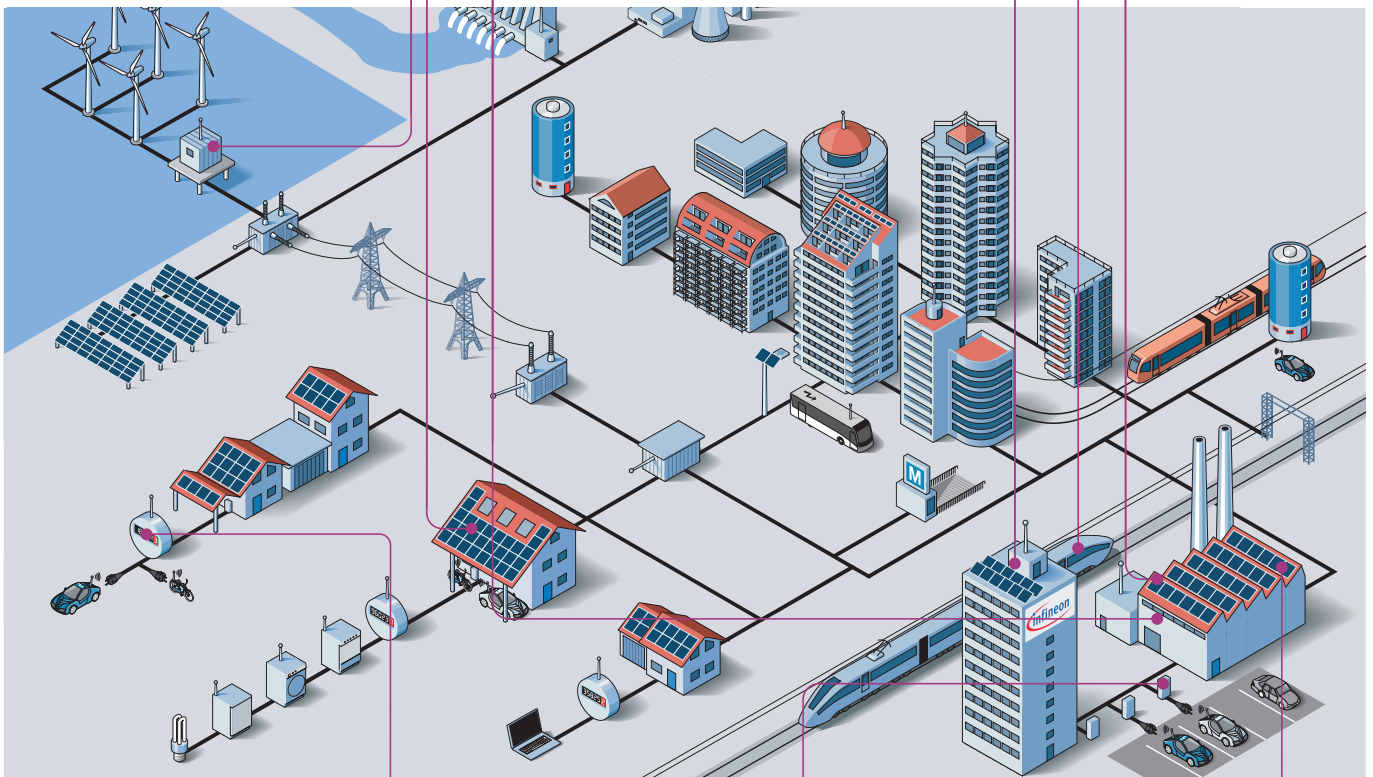
Wind speed sensing



Valve position



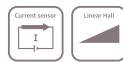
Pneumatics



Smart metering



Charger and battery management



Absolute and incremental rotary encoder



Switches



Linear Hall



Angle sensors



Current sensors



Speed sensors



Pressure



3D magnetic sensors



BAP

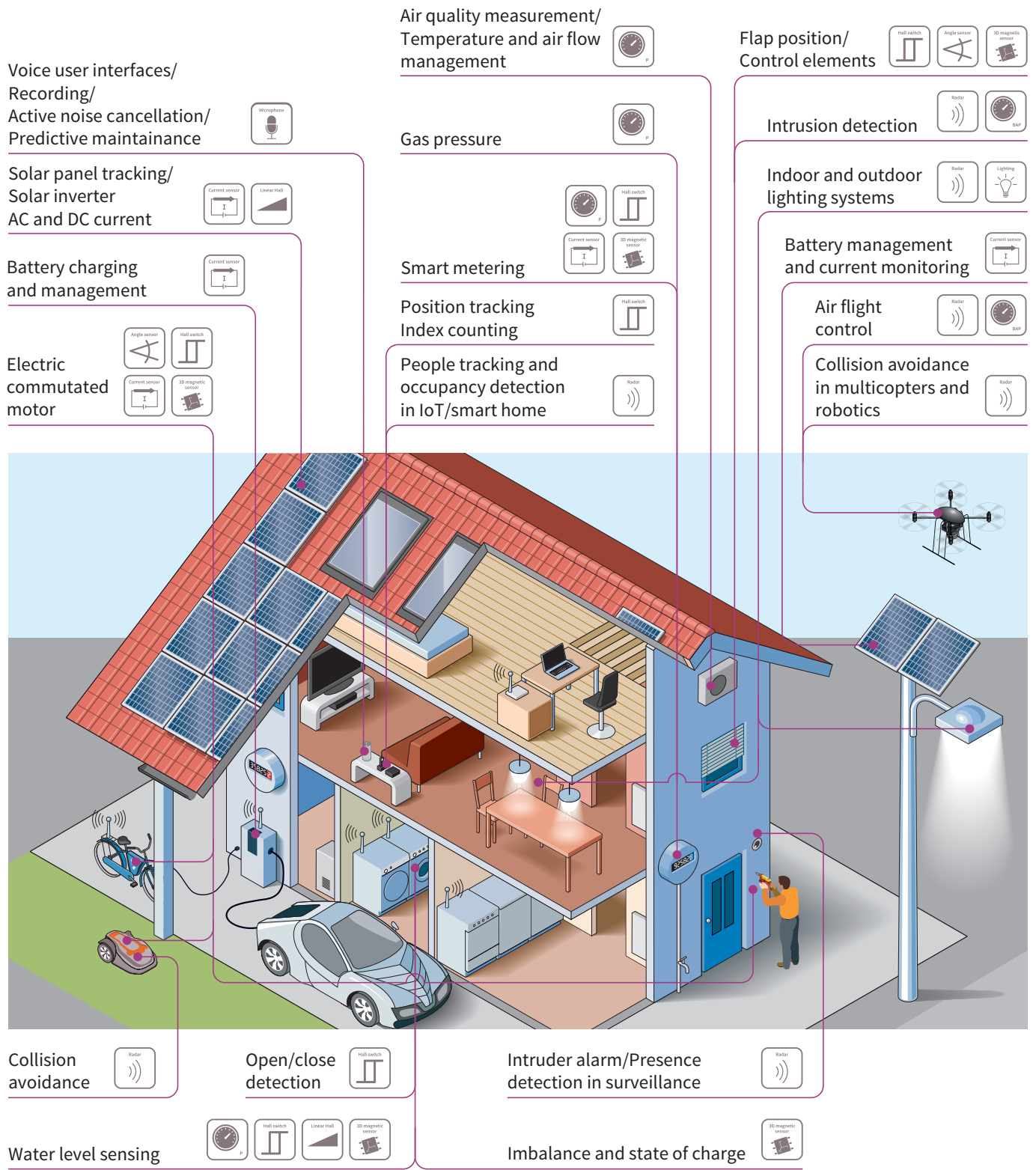


Radar



Microphone

XENSIV™ sensors for industrial/home applications



Switches	Linear Hall	Angle sensors	Current sensors	Pressure	3D magnetic sensors
BAP	Radar	Microphone	Lighting		



TLE/TLI/TLV4961/64/68

Energy-efficient Hall switch family for up to 32 V

The TLE/TLI/TLV496x-xM/L family of Hall switches saves energy and enables designers to create precise, compact systems. With an operational current consumption of just 1.6 mA, TLE/TLI/TLV496x-xM/L products can cut energy consumption by up to 50 percent compared with similar competitor products. Thanks to its small magnetic hysteresis, the family paves the way for precise switching points in systems. The integrated temperature profile compensates magnetic drifts and enables stable performance over temperature and lifetime.

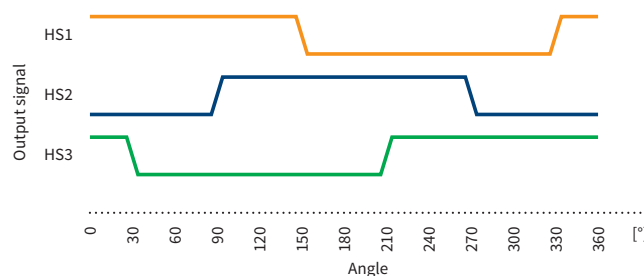
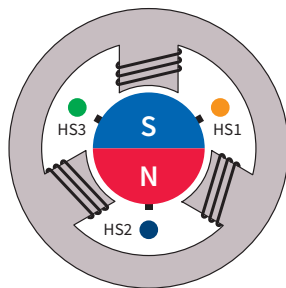
TLE/TLI/TLV496x-xM products come in the smallest SOT23 package, thus reducing height by 10 percent compared with predecessor products. The sensors also feature an integrated functionality test for better system control.

Features

- › Current consumption of just 1.6 mA
- › 3 to 32 V supply voltage range (over voltage up to 42 V)
- › 7 kV ESD protection (HBM)
- › Overtemperature and overcurrent protection
- › Temperature compensation
- › Smallest SOT23 package
- › Dedicated products for industrial applications (TLI496x)
- › AEC-Q100 qualified

Applications

- › Window lifter (index counting)
- › Power closing (index counting)
- › Gear stick (position detection)
- › Seat belt (position detection)
- › BLDC commutation
(e.g. wiper seat belt pretensioner, pump, seating)
- › Service robots
- › Power tools
- › White goods



Block commutation for BLDC motors

Product	Type	Operating point B_{OP}	Release point B_{RP}	Hysteresis ΔB_{HY}	Automotive	Industrial	Consumer	Package
TLE4961-1M/L	Latch	2.0	-2.0	4.0	●	●	●	SOT23/SSO-3-2
TLE4961-2M	Latch	5.0	-5.0	10.0	●	●	●	SOT23
TLE4961-3M/L	Latch	7.5	-7.5	15.0	●	●	●	SOT23/SSO-3-2
TLE4964-1M	Switch	18.0	12.5	5.5	●	●	●	SOT23
TLE4964-2M	Switch	28.0	22.5	5.5	●	●	●	SOT23
TLE4964-3M	Switch	12.5	9.5	3.0	●	●	●	SOT23
TLE4964-5M	Switch	7.5	5.0	2.5	●	●	●	SOT23
TLE4968-1M/L	Bipolar	1.0	-1.0	2.0	●	●	●	SOT23/SSO-3-2
TLE4961-5M	Latch	15.0	-15.0	30.0	●	●	●	SOT23
TLE4961-4M	Latch	10.0	-10.0	20.0	●	●	●	SOT23
TLE4964-4M	Switch	10.0	8.5	1.5	●	●	●	SOT23
TLE4964-6M	Switch	3.5	2.5	1.0	●	●	●	SOT23
TLV4964-1M	Switch	18.0	12.5	5.5	-	-	●	SOT23
TLV4964-2M	Switch	28.0	22.5	5.5	-	-	●	SOT23
TLI4961-1M/L	Latch	2.0	-2.0	4.0	-	●	●	SOT23/SSO-3-2
TLV4961-3M	Latch	7.5	-7.0	15.0	-	-	●	SOT23

TLE/TLI4963/65-xM

5 V high-precision automotive/industrial Hall-effect sensor

TLE/TLI496x-xM are integrated Hall-effect sensors specially designed for highly accurate applications. The sensors provide an easy-to-use and cost-effective solution for position sensing applications, requiring high temperature stability of the magnetic threshold.

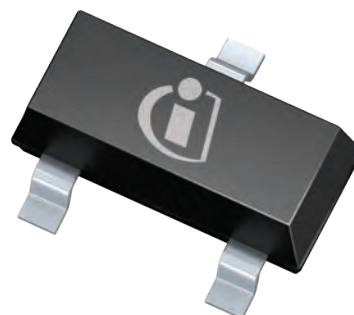
Target applications for TLE/TLI496x-xM are all low-power applications requesting a precision Hall latch or Hall switch with a broad operating temperature range.

By offering an excellent magnetic behavior Infineon's switches are ideally suited for:

- > Index counting application with a pole wheel
- > Rotor position detection (BLDC motors)
- > Open/close detection

Features

- > 3.0 to 5.5 V operating supply voltage
- > Low current consumption 1.4 mA
- > ESD protection 4 kV HBM
- > Active error compensation (chopped)
- > High stability of magnetic thresholds
- > Low jitter (typ. 0.35 μ s)
- > Operating temperature range:
 - from -40 to +170°C (TLE496x-xM)
 - from -40 to +125°C (TLI496x-xM)
- > Small SMD package SOT23
- > TLE: AEC-Q100 qualified
- > TLI: SDEC47 qualified



Product	Type	Operating point B_{OP}	Release point B_{RP}	Hysteresis ΔB_{HY}	Automotive	Industrial	Package
TLE4963-1M	Latch	2.0	-2.0	4.0	●	–	SOT23
TLE4963-2M	Latch	5.0	-5.0	10.0	●	–	SOT23
TLE4965-5M	Unipolar switch	7.5	5.0	2.5	●	–	SOT23
TLI4963-1M	Latch	2.0	-2.0	4.0	–	●	SOT23
TLI4963-2M	Latch	5.0	-5.0	10.0	–	●	SOT23
TLI4965-5M	Unipolar switch	7.5	5.0	2.5	–	●	SOT23

TLV496x-xTA/B

Precision Hall-effect sensor for consumer applications in leaded package

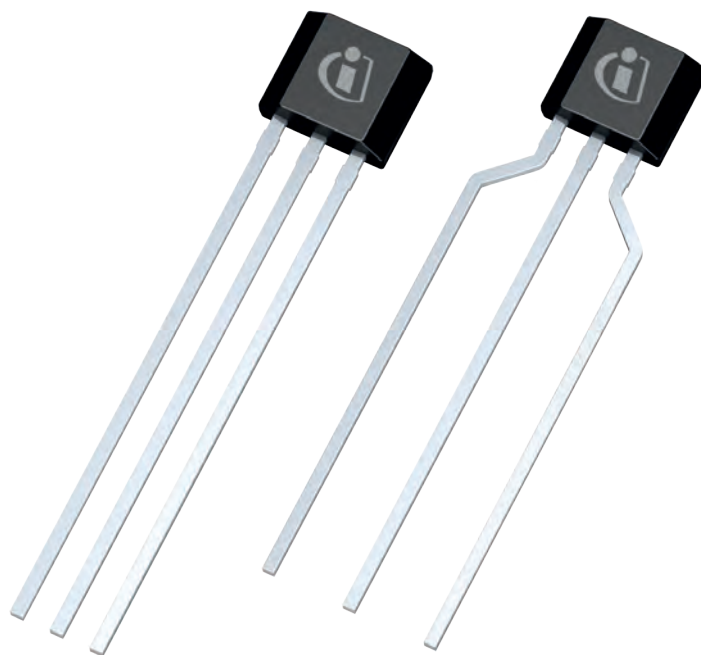
The TLV496x-xTA/B Hall sensor family comprises a line of Hall switches for contactless position sensing. The sensors are specially designed to provide an easy-to-use and cost-effective solution for position sensing applications.

Features

- › 3.0 to 26 V operating supply voltage
- › Low current consumption 1.6 mA
- › ESD protection 4 kV HBM
- › Operating temperature range from -40 to +125 °C
- › Leaded package TO92S

Applications

- › BLDC motor commutation for consumer devices (e.g. e-bikes, fans, aircons)
- › Position detection e.g. flaps and control buttons



Product	Type	Operating point B_{OP}	Release point B_{RP}	Hysteresis ΔB_{HY}	Consumer	Package
TLV4961-1TA	Latch	2.0	-2.0	4.0	•	TO92S-3-1
TLV4961-1TB	Latch	2.0	-2.0	4.0	•	TO92S-3-2
TLV4961-3TA	Latch	7.5	-7.5	15.0	•	TO92S-3-1
TLV4961-3TB	Latch	7.5	-7.5	15.0	•	TO92S-3-2
TLV4964-4TA	Unipolar switch	10.0	8.5	1.5	•	TO92S-3-1
TLV4964-4TB	Unipolar switch	10.0	8.5	1.5	•	TO92S-3-2
TLV4964-5TA	Unipolar switch	7.5	5.0	2.5	•	TO92S-3-1
TLV4964-5TB	Unipolar switch	7.5	5.0	2.5	•	TO92S-3-2
TLV4968-1TA	Latch	1.0	-1.0	2.0	•	TO92S-3-1
TLV4968-1TB	Latch	1.0	-1.0	2.0	•	TO92S-3-2

TLE4966

Two-in-one double Hall sensor

TLE4966 family features two integrated, calibrated sensor elements for detecting direction and counting indexes in one device. This two-in-one feature eliminates the need for a second sensor, which in turn cuts engineering and production costs. Using just one sensor ensures perfect alignment of the sensor elements raising system quality and reliability.

Features

- > Two Hall probes
- > Excellent matching between the two Hall probes
- > Hall plate distance of 1.45 mm
- > Industry standard
- > Outstanding quality
- > Information on direction and speed
- > TSOP6 package
- > AEC-Q100 qualified

Applications

- > Window lifter
- > Sunroof
- > Automatic tailgate
- > Automated doors
- > Sun blinds

TLE4966V

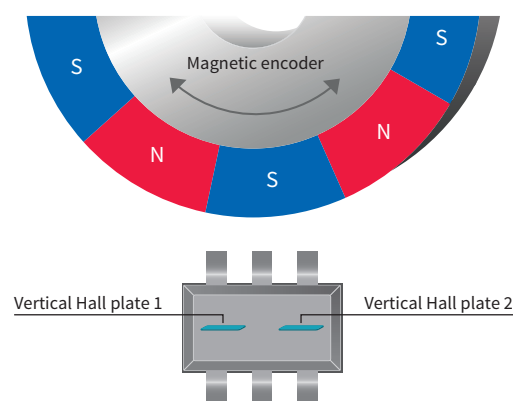
Vertical dual-Hall sensor

The Infineon vertical double Hall switch TLE4966V-1K is a further development of the TLE4966 family. Completely new is the vertical orientation of the Hall plates resulting in in-plane field sensitivity which enables entirely new application layouts. Designed in a new technology, this device offers high voltage capabilities with very small current consumption. The product can be operated from unregulated power supplies, which offers our customers unique freedom of design for their system. This product is AEC-Q100 certified and enables our customers to build systems for the highest automotive quality requirements.

Features

- > Saves space
- > Easy mounting of sensor and PCB board
- > Allows increased mounting flexibility
- > Enables new, compact system designs

Sensing direction parallel to target to wheel



Product	Type	Operating point B_{OP}	Release point B_{RP}	Hysteresis ΔB_{HY}	Automotive	Package
TLE4966K/L	Double Hall, speed and direction output	7.5	-7.5	15	●	TSOP6/SSO-4-1
TLE4966-2K	Double Hall, two independent outputs	7.5	-7.5	15	●	TSOP6
TLE4966-3K	Double Hall, speed and direction output	2.5	-2.5	5	●	TSOP6
TLE4966V-1K	Vertical double Hall, speed and direction output	2.5	-2.5	5	●	TSOP6

TLE/TLI/TLV49x6 family

High-precision Hall switches



The TLE49x6, TLI49x6, and the TLV49x6 family comprises high-precision, unipolar Hall-effect switches and latches for different magnetic sensitivities. TLE/TLI/TLV49x6 products have proven successful in many automotive, industrial and consumer applications. The family includes two-wire sensors with a current interface.

Features

- › Broad, successful family concept
- › Best in class quality
- › Chopped Hall system for high sensitivity
- › High jitter performance
- › SMD and leaded packages
- › Open collector or current interface
- › Temperature compensation
- › Up to 18 V supply
- › Dedicated products for industrial (TLI49x6) and consumer applications (TLV49x6)
- › AEC-Q100 qualified (option TLE)

Applications

- › Power closing (index counting)
- › Gear stick (position detection)
- › Seat belt (position detection)
- › HVAC flap (position detection)
- › BLDC commutation
- › Two-wheeler applications

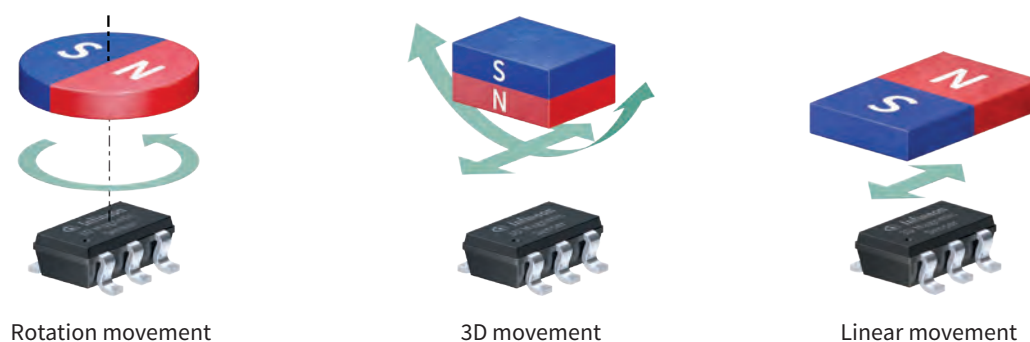
Product	Type	Operating point B_{OP}	Release point B_{RP}	Hysteresis ΔB_{HY}	Automotive	Industrial	Consumer	Package
TLE4906K/L	Unipolar switch	10.0	8.5	1.5	●	●	–	SC59/SSO-3-2
TLE4906-2K	Unipolar switch	18.0	12.5	5.5	●	●	–	SC59
TLE4906-3K	Unipolar switch	28.0	22.5	5.5	●	●	–	SC59
TLE4946K	Latch	14.0	-14.0	28.0	●	●	–	SC59
TLE4946-1L	Latch	15.0	-15.0	30.0	●	●	–	SSO-3-2
TLE4946-2K/L	Latch	2.0	-2.0	4.0	●	●	–	SC59/SSO-3-2
TLE4976L	Unipolar switch/ Current interface	6.0	4.0	2.0	●	●	–	SSO-3-2
TLE4976-1K	Unipolar switch/ Current interface	9.25	7.25	2.0	●	●	–	SC59
TLE4976-2K	Unipolar switch/ Current interface	4.5	2.7	1.8	●	●	–	SC59
TLV4946-2K	Unipolar switch	18.0	12.5	5.5	–	–	●	SC59
TLV4976-2K	Unipolar switch / Current interface	4.5	2.7	1.8	–	–	●	SC59



TLV493D-A1B6/TLI493D-A2B6

3D magnetic sensors for consumer and industrial market

The TLV493D-A1B6 sensor realizes an accurate three-dimensional sensing with extremely low power consumption in a small 6-pin package. Capable of detecting the magnetic field in the x, y, and z-direction, the sensor is ideally suited for the measurement of linear, rotation or 3 dimensional movements. Thanks to its small package and low power consumption, the TLx493D-AxB6 can be used in new applications, replacing potentiometer and optical solutions. Featuring contactless position sensing and high temperature stability of the magnetic threshold, the sensor allows systems getting smaller, more accurate and more robust.



Features

- › 3D magnetic sensing
- › Integrated temperature sensing
- › Low current consumption
 - 7 nA in power-down mode
 - 10 μ A in ultra-low power mode
- › 2.8 to 3.5 V operating supply voltage
- › Digital output via a 2-wire standard I²C interface
- › Bx, By and Bz linear field measurement up to ± 160 mT
- › JESD47 qualified
- › 12-bit data resolution for each measurement direction
- › Various resolution options from 65 μ T/LSB to 130 μ T
- › Operating temperature range up to -40 to +125°C

Product	Temperature range	Qualification	Linear magnetic range	Resolution	I _{DD}	Update rate	Package	Ordering code
TLV493D-A1B6	-40 ... 125°C	JESD47	± 130 mT (typ)	98 μ T/LSB	7 nA – 3.7 mA	10 Hz – 3.3 kHz	TSOP6	SP001286056
TLI493D-A2B6	-40 ... 105°C	JESD47	± 160 mT (min) ± 100 mT (min)	130 μ T/LSB (65 μ T/LSB) ¹⁾	7 nA – 3.3 mA	10 Hz – 8.4 kHz	TSOP6	SP001689844

1) Half range mode

While the TLV493D-A1B6 just supports a typical value for the linear magnetic range of ± 130 mT, the TLI493D-A2B6 specification includes also a minimum value with ± 160 mT.

With the TLI493D-A2B6 a broader microcontroller compatibility as well an enhanced feature set is included.

New features

- › Sensor address read back
- › Half mode range setting, focusing to half of the magnetic range ensuring higher accuracy
- › Higher update frequency allows for an application field that requires faster update speed
- › Angular mode (for x and y read out only)

Applications

- › Anti tempering protection in smart meters
- › Joysticks e.g. for medical equipment, cranes, CCTV-control, game consoles
- › Control elements e.g. white goods multifunction knobs

TLE493D-A2B6/W2B6

3D magnetic sensors for automotive low-power applications

The TLE493D-x2B6 enables for all kind of automotive control element applications within the passenger compartment or under the hood with a temperature range of -40 to +125°C with linear magnetic range requirements up to ± 160 mT.



Features

- › 3D magnetic sensing
- › Integrated temperature sensing
- › 2.8 to 3.5 V operating supply voltage
- › Low current consumption
 - 0.007 μ A in power-down mode
 - 10 μ A in ultra-low power mode
 - Up to 10 power modes
- › Digital output via a 2-wire standard I²C interface
- › Bx, By and Bz linear field measurement ± 160 mT
- › AEC-Q100 qualified
- › 12-bit data resolution for each measurement direction
- › Various resolution options from 67 μ T/LSB to 134 μ T
- › Operating temperature range up to -40 to +125°C

Product	Temperature range	Qualification	Linear magnetic range	Resolution	I _{DD}	Update rate	Wake-up	Package	Ordering code
TLE493D-A2B6	-40 ... 125°C	AEC-Q100	± 160 mT (min)	130 μ T/LSB (65 μ T/LSB) ¹⁾	7 nA – 3.3 mA	10 Hz – 8.4 kHz	No	TSOP6	SP001689848
TLE493D-W2B6 A0 TLE493D-W2B6 A1 TLE493D-W2B6 A2 TLE493D-W2B6 A3	-40 ... 125°C	AEC-Q100	± 160 mT (min) ± 100 mT (min)	130 μ T/LSB (65 μ T/LSB) ¹⁾	7 nA – 3.3 mA	0.05 Hz – 8.4 kHz	Yes	TSOP6	SP001655334 SP001655340 SP001655344 SP001655348

1) Half range mode

The TLE493D-A2B6 features include a sensor address read back feature for additional communication verification, a half range mode focusing to half of the magnetic range ensuring higher accuracy and an angular mode (for x and y read out only).

With the TLE493D-W2B6 A0-A3, a 3D sensor has been developed, which includes an enhanced dynamic wake up feature. Four pre-programmed address options (A0-A3) will be available, enabling for a fast start up initialization, when used in I²C bus configurations. It also includes enhanced test options and a safety documentation is available to enable the usage of this sensor in the context of ASIL B systems.

Applications

- › Control elements for infotainment/navigation systems, air conditions, multifunctional steering wheels, seat controls
- › Top column modules e.g. direction indicator, wiper control
- › Gear stick position sensing

TLE499x family

Programmable analog/digital linear Hall sensor family



Infineon's family of TLE499x linear Hall ICs is tailored to the needs of highly accurate angular and linear position detection and current measurement applications. Each product measures the vertical component of a magnetic field and outputs a signal that is directly proportional to the magnetic field. These programmable linear Hall sensors come with different interface options: TLE4997 features ratiometric analog output while TLE4998P comes with Pulse Width Modulation (PWM), TLE4998S with Single Edge Nibble Transmission (SENT) and TLE4998C with Short PWM Codes (SPC). These high-precision 12-bit resolution linear Hall sensors feature EEPROM memory for flexible programming across a wide range of parameters.

Thanks to digital signal processing based on a 20-bit DSP architecture plus digital temperature compensation, these sensors deliver outstanding temperature stability compared with similar compensation methods. TLE4998 also includes stress compensation to withstand stress effects from the package, such as moisture, thus ensuring best-in-class accuracy over the device's lifetime.

Features

- › Best-in-class accuracy with low drift of output signal temperature range lifetime (including stress compensation in TLE4998)
- › Programmable transfer function (gain, offset), clamping, bandwidth and temperature characteristics
- › AEC-Q100 qualified
- › Available in various packages including SSO-3-9 with two integrated capacitors to improve ESD and ESC behavior
- › Dual-die SMD package
- › ISO 26262 ready

Applications

- › Detecting linear and angular position
- › Detecting pedal and throttle position
- › Steering torque measurement
- › Headlight leveling
- › High-current sensing
- › Seat position and occupant detection
- › Suspension control
- › Detecting gear stick/lever positions
- › Detecting liquid levels in fuel tanks
- › Current sensing e.g. for battery management

Product	Programmable	Number of pins	Sensitivity	Magnetic offset	Supply voltage (extended range)	Automotive	Interface	Package
TLE4997	EEPROM	3/ Single die SMD 8	±12.5 to ±300	< ±400 μT	5 V ±10% (7 V)	●	Analog	SSO-3-10 TDSO-8
TLE4998P	EEPROM	3/4/ Single die SMD 8	±0.2 to ±6%/mT	< ±400 μT	5 V ±10% (16 V)	●	PWM	SSO-3-10 SSO-4-1 SSO-3-9 (2 capacitors) TDSO-8
TLE4998S	EEPROM	3/4/ Single die SMD 8	±8.2 to ±245 LSB/mT	< ±400 μT	5 V ±10% (16 V)	●	SENT	SSO-3-10 SSO-4-1 SSO-3-9 (2 capacitors) TDSO-8
TLE4998C	EEPROM	3/4/ Single die SMD 8	±8.2 to ±245 LSB/mT	< ±400 μT	5 V ±10% (16 V)	●	SPC	SSO-3-10 SSO-4-1 SSO-3-9 (2 capacitors) TDSO-8

1) More information on PRO-SIL™, see page 64

Two sensors in one SMD package



The new SMD package (TDSO) includes two independent sensors with separate power supply and separate signal outputs. Due to special mounting technology, Infineon is able to keep dual-sensor package size very small to enable compact PCB layouts and small magnet sizes.

Infineon offers a wide range of Hall sensors in the TDSO package. The two sensors in one package offer sensor redundancy in one package. Sensor redundancy is especially interesting for new generation EPS steering systems with increased ISO 26262 requirements and other safety critical applications. All sensors are automotive qualified.

Most products are also available as single-sensor solution with only one sensor.

Features

- > Two sensors in one package
- > Separate power supply and signal output
- > AEC-Q100 qualified
- > Temperature range from -40 to +125°C
- > Outstanding quality
- > Single-sensor versions available
- > 16-pin and 8-pin versions available
- > ISO 26262 ready

Automotive applications

- > Steering torque systems
- > Pedal position
- > Any other safety critical application

Linear Halls

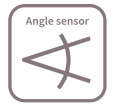
Product	Interface	Dual-/single-sensor available	Package
TLE4997A8D	Analog	yes/yes	TDSO-8
TLE4998P8D	PWM	yes/yes	TDSO-8
TLE4998S8D	SENT	yes/yes	TDSO-8
TLE4998C8D	SPC	yes/yes	TDSO-8



1) More information on PRO-SIL™, see page 64

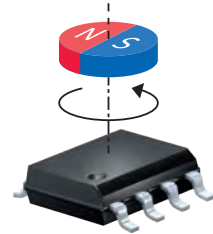


Angle sensors

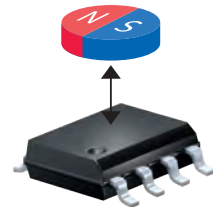


Infineon offers a variety of angle sensors based on integrated Magneto Resistive (ixMR) technologies. In addition to the already well-established portfolio in iGMR and iAMR technologies, Infineon is currently launching the first angle sensors based on iTMR technology.

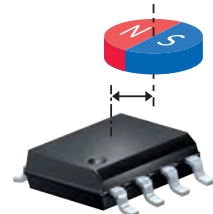
Infineon's angle sensors detect the orientation of an applied magnetic field by measuring sine and cosine angle components with monolithically integrated magneto resistive elements. ixMR technology is now widely used in automotive and industrial applications and provides a wide range of benefits.



Low sensitivity to air gap variations: The ixMR element senses a field's direction, not its intensity. Variations in field intensity within the sensor's range therefore have a minimal impact on angle accuracy.



Improved tolerance to misalignment: The area sensitive to ixMR is very small. It is therefore easier to keep it within the homogeneous zone of the magnetic field, in case of a small mechanical failure.



High speed: ixMR technology is extremely fast. Its speed is not limited by the reaction time of the MR element but by delays in the amplifier circuit.



High degree of integration: The data processing and communication interfaces are integrated in the same silicon chip as the sensing elements. This enables compact designs using small outline packages. The angle sensors are available with a wide variety of communication interfaces as well as different levels of data processing and self-testing capabilities, making them ideal for safety-relevant applications in the automotive sector.

iGMR based angle sensors

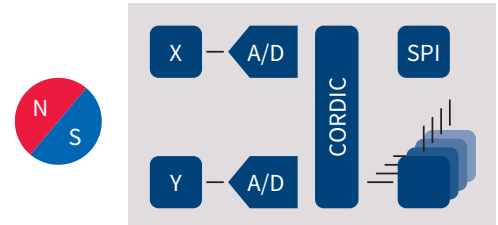
TLE5012B(D)

iGMR sensor with integrated angle calculation and multiple interfaces



Features

- > Integrated angle calculation with CORDIC algorithm
- > 15-bit representation of calculated angle value
- > High update rate up to 43 μ s (23 kHz)
- > Range of selectable interfaces
- > SPI-compatible synchronous serial communication (SSC)
- > Bi-directional communication up to 8 Mbit/s
- > Pulse Width Modulation (PWM)
- > Hall Switch Mode (HSM) for motor commutation
- > Incremental Interface (IIF)
- > Temperature compensation and **auto-calibration** algorithm
- > Diagnostic function for sensor elements and circuitry with PRO-SIL™ support
- > Dual-die SMD package (redundancy)
- > ISO 26262 ready
- > Available as single and dual die product



Applications

- > Steering angle
- > Brushless DC motor commutation (for example Electric Power Steering (EPS))
- > Rotary switches
- > General angular sensing
- > Incremental or absolute magnetic encoders

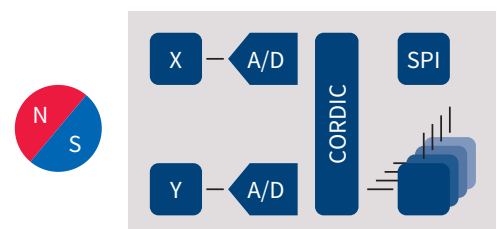
TLE5014(D)

Digital iGMR sensor for functional safety applications
ASIL C(D) with PWM, SENT and SPC interfaces



Features

- > Giant Magneto Resistance (GMR)-based principle
- > Integrated magnetic field sensing for angle measurement
- > High voltage and reverse polarity capability
- > EEPROM for storage of configuration (e.g. zero angle) and customer-specific ID
- > 12-bit representation of absolute angle value on the output
- > **Max. 1° angle error** over lifetime and temperature range
- > **Developed according to ISO 26262 with process complying to ASIL D**
- > Single Point Fault Metrics (SPFM) and Latent Fault Metrics (LFM) meeting ASIL C requirements
- > Interfaces: PWM, SPC, SENT (based on SAE J2716-2010)
- > 32-point **look-up table** for correcting systematic angle errors (e.g. magnetic circuit)
- > Safety manual and safety analysis summary report available on request
- > Available as single and dual die product
- > ISO 26262 **compliant**



Applications

- > Steering angle sensor
- > Pedal
- > Safety applications

1) More information on PRO-SIL™, see page 64

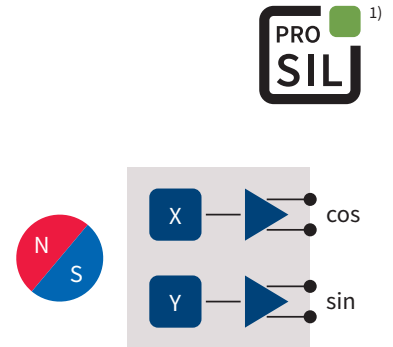
iAMR sensors

Our iAMR sensors are ideal for applications with the highest accuracy requirements. Our iAMR technology offers best performance over temperature, lifetime and magnetic field range. All products are pre-calibrated and ready to use.

TLE5109A16(D)

Analog iAMR sensor with temperature compensation

- › Features a differential or single-ended analog interface for sine and cosine values
- › Internal temperature drift compensation for gain and offset
- › Also available as a dual-sensor package
- › ISO 26262 ready
- › Typical 0.1° angle error over lifetime and temperature range after compensation (max 0.5°)
- › Available as single and dual die product

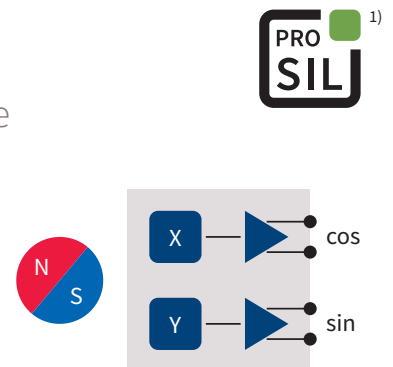


TLE5309D

Diverse redundant iAMR and iGMR sensor with analog interface

Features

- › Differential or single-ended analog interface for sine and cosine values
- › Internal temperature drift compensation for gain and offset
- › Dual-die sensor with technology diversity one iAMR and one iGMR sensor in one package
- › ISO 26262 ready



Applications

- › Contactless angle measurement
- › Steering angle
- › Motor commutation
- › Wiper position
- › Rotational position measurement
- › Safety applications

Product	Technology	Die configuration	ISO 26262	Sin/cos output	Angle output	Second interface	Accuracy	Package
TLE5009	GMR	Single die	Ready	Analog sin/cos	–	–	0.9°	DSO-8
TLE5009A16(D)	GMR	Dual die	Ready	Analog sin/cos	–	–	1.0°	TDSO-16
TLE5011	GMR	Single die	Ready	SSC (SPI)	–	–	1.6°	DSO-8
TLI5012B	GMR	Single die	Ready	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.9°	DSO-8
TLE5012B(D)	GMR	Single & dual die	Ready	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.0°	DSO-8/ TDSO-16
TLE5014C16(D)	GMR	Single & dual die	Compliant	–	SPC	–	1.0°	TDSO-16
TLE5014P16(D)	GMR	Single & dual die	Compliant	–	PWM	–	1.0°	TDSO-16
TLE5014S16(D)	GMR	Single & dual die	Compliant	–	SENT	–	1.0°	TDSO-16
TLE5109A16(D)	AMR	Single & dual die	Ready	Analog sin/cos	–	–	0.5°	TDSO-16
TLE5309D	AMR + GMR	Dual die	Ready	Analog sin/cos	SSC (SPI)	–	AMR 0.5°, GMR 1.0°	TDSO-16
TLE5501	TMR	Single die	Compliant	Analog sin/cos	–	–	1.0°	DSO-8

1) More information on PRO-SIL™, see page 64

iTMR based angle sensors



Tunneling Magneto Resistive (iTMR) technology is offering high sensing sensitivity with a high output voltage so that no internal amplifier – thus the sensor can be connected directly to the microcontroller without any further amplification. In addition, iTMR technology shows a very low temperature drift reducing external calibration and compensation efforts. The iTMR technology is also well known for its low current consumption.

TLE5501

With the TLE5501 products, Infineon is currently launching the first angle sensor products based on iTMR technology. TLE5501 is available in two versions.

TLE5501 - product versions with different pin out:

- > TLE5501 E0001: pin-compatible to TLE5009
- > TLE5001 E0002: decoupled bridges for redundant external angle calculation and highest diagnostic coverage, realizing ISO 26262-compliant development ASIL D(D)

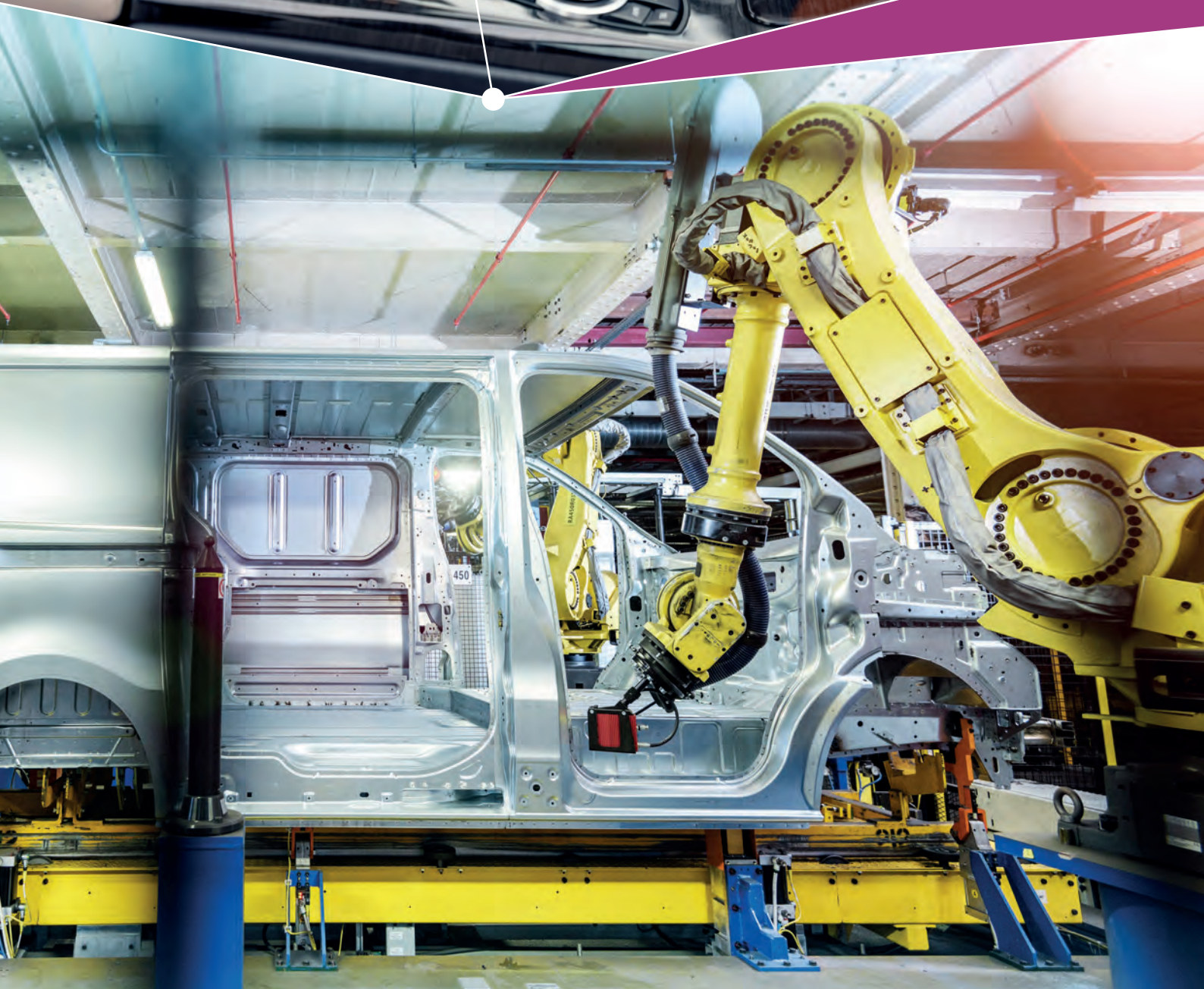


Features

- > Large output signals of up to 0.37 V/V for direct micro controller connection
- > Discrete bridge with differential sine and cosine output
- > Supply current: ~2 mA
- > Magnetic field range (20 to 100 mT)
- > Typ. angle error ~ 1.0 ° (overtemperature and lifetime)
- > Designed for Safety: 2 independent dual channel sensors
- > DSO-8 package
- > Automotive qualified Q100, Grade 0: $T_A = -40$ to 150°C (ambient temperature)
- > Functional safety: safety manual and safety analysis summary report available on request

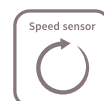
Applications

- > Steering angle sensor
- > BLDC motor commutation
- > Angular position sensing
- > Safety applications





Magnetic speed sensors



Our Hall- and GMR-based magnetic speed sensors are designed to measure speed in safety and powertrain applications such as ESP, ABS, camshafts/crankshafts and automatic transmissions. They may be also used in comparable applications in the industrial sector. The sensors use a ferromagnetic toothed wheel or a magnetic encoder structure to measure rotational speed.

We offer a broad range of options to ensure the perfect fit for individual customer applications, including voltage and current interfaces with a variety of different protocols and algorithms, such as e.g. vibration suppression. By integrating the magnetic Hall or GMR sensing cell and the signal processing unit on a single chip, we deliver optimum performance and cost savings.

The majority of sensors also feature additional benefits such as integrated capacitors (C- types) for high EMC robustness and the highest levels of ESD protection.

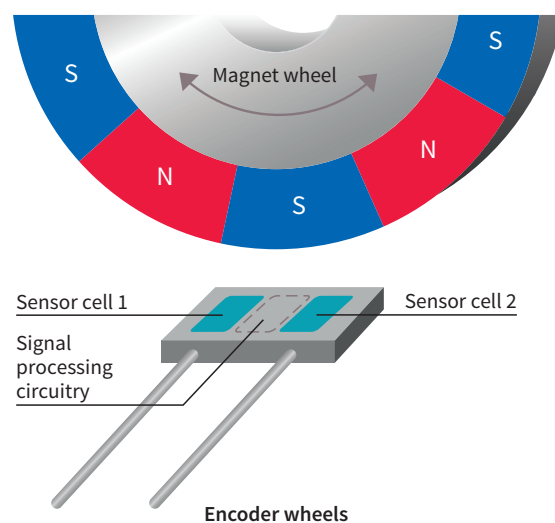
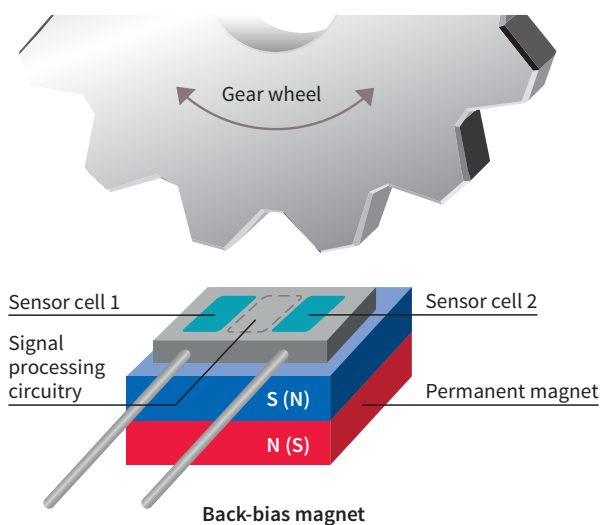
We have an outstanding record of excellence in the automotive sector. Over two billion of our integrated magnetic sensors are installed in cars all over the world, delivering extremely reliable results in safety-relevant applications such as ESP and ABS, and in extremely harsh environments such as engines and transmissions.

The speed sensing family



Product	Automotive	Industrial	Sensor technology	AEC-Q100 qualified	RoHS	HAL free	Product status
TLE4921	●	●	Differential Hall	●	●	–	In production
TLE4922	●	●	Mono-Hall	●	●	●	In production
TLE4924	●	●	Differential Hall	●	●	–	In production
TLE4926	●	–	Differential Hall	●	●	–	In production
TLE4927	●	●	Differential Hall	●	●	–	In production
TLE4928	●	–	Differential Hall	●	●	–	In production
TLE4941	●	–	Differential Hall	●	●	–	In production
TLE4941plusC	●	–	Differential Hall	●	●	●	In production
TLE4942	●	–	Differential Hall	●	●	–	In production
TLE4943	●	–	Differential Hall	●	●	●	In production
TLE4953	●	–	Differential Hall	●	●	–	In production
TLE4955	●	–	Differential Hall	●	●	●	In production
TLE4957	●	–	Differential Hall	●	●	–	In production
TLE4959	●	–	Differential Hall	●	●	●	In production
TLE4983	●	–	Mono-Hall	●	●	–	In production
TLE4984	●	–	Mono-Hall	●	●	–	In production
TLE4986	●	–	Mono-Hall	●	●	–	In production
TLE5025	●	–	iGMR differential	●	●	●	In production
TLE5027	●	–	iGMR differential	●	●	–	In production
TLE5028	●	–	iGMR differential	●	●	●	In production
TLE5041plusC	●	–	iGMR differential	●	●	●	In production
TLE5045	●	–	iGMR differential	●	●	–	In production
TLE5046	●	–	iGMR differential	●	●	–	In production

Typical application of a magnetic differential sensor



Overview of magnetic speed sensors

	Icon/ Description	TLE4921	TLE4922	TLE4924	TLE4926	TLE4927	TLE4928	TLE4929	TLE4941	TLE4941plusC	TLE4942	TLE4943
Automotive	Wheel speed	-	•	-	-	-	-	-	•	•	•	•
	Camshaft	-	•	•	-	•	-	-	-	-	-	-
	Crankshaft	•	•	•	•	•	•	•	-	-	-	-
	Transmission	•	•	-	-	-	-	-	•	•	•	-
Industrial		•	•	•	-	•	•	•	-	•	-	-
Sensor technology		Diff. Hall	Mono-Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall
Improved air gap/jitter performance		-	-	-	-	-	-	•	-	-	-	-
Direction information available		-	-	-	-	-	-	•	-	-	•	•
True Power On (TPO)		-	-	-	-	-	-	-	-	-	-	-
Twist-Independent Mounting (TIM)		-	•	-	-	-	-	-	-	-	-	-
Vibration suppression algorithm included		-	-	-	-	-	-	•	-	-	-	-
Type of hysteresis ¹⁾		V	H	V	H	H	H	H	H	H	H	H
		F	A	A/F	F	A	F	A	F	F	F	A
Interface ²⁾	# of pins	4	4	3	3	3	3	3	2	2	2	2
	Interface	V	V	V	V	V	V	V	C	C	C	C
	Protocol	S	P	S	S	S	S		S	S	P	AK
Electrostatic Discharge (ESD)	Human Body Model (HBM)	2 kV	4 kV	6 kV	6 kV	6 kV	6 kV	6 kV	12 kV	12 kV	12 kV	12 kV
Package without integrated capacitor		•	•	-	-	-	•	-	•	-	-	-
Package with integrated capacitor		-	-	•	•	•	•	•	-	•	•	•

1) H = Hidden; V = Visible; F = Fixed; A = Adaptive; P = Programmable

2) AK = AK protocol; C = Current; V = Voltage interface; S = Single pulse; P = PWM protocol

TLE4953	TLE4955	TLE4957	TLE4959	TLE4983	TLE4984	TLE4986	TLE5025	TLE5027	TLE5028	TLE5041plusC	TLE5045	TLE5046
-	-	-	-	-	-	-	-	-	-	•	•	•
-	-	-	-	•	•	•	•	-	-	-	-	-
-	-	•	-	-	-	-	•	•	•	-	-	-
•	•	•	•	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Mono-Hall	Mono-Hall	Mono-Hall	iGMR	iGMR	iGMR	iGMR	iGMR	iGMR
-	-	-	•	-	-	-	•	•	•	•	•	•
•	•	-	•	-	-	-	-	•	•	-	-	•
-	-	-	-	•	•	•	-	-	-	-	-	-
-	-	-	-	•	•	•	-	-	-	-	-	-
•	•	•	•	-	-	-	-	-	-	-	-	-
V	V	V/H	V	H	H	V/H	H	H	H	H	H	H
A	A	A	A	F	F	P/A	A	A	A	F	A	A
2	2	3	3	3	3	3	3	3	3	2	2	2
C	C	V	V	V	V	V	V	V	V	C	C	C
P	P	S	P	S	S	S	S	P	P	S	S	P/AK
12 kV	12 kV	6 kV	6 kV	4 kV	4 kV	6 kV	8 kV	8 kV	8 kV	12 kV	12 kV	12 kV
•	•	-	-	-	-	-	-	-	-	-	•	•
•	•	•	•	•	•	•	•	•	•	•	-	-

TLE4921-5U

Highly robust and cost-effective speed sensor



TLE4921-5U is a highly robust and cost-effective solution for measuring speed in a wide range of automotive and industrial applications. This differential Hall sensor delivers outstanding performance while enabling simple, low-cost magnetic circuit designs, making it ideal for all entry-level speed sensing applications.

Features

- > Good sensing performance and high sensitivity
- > Well suited to harsh environments thanks to dynamic offset cancellation, EMI robustness, reverse polarity and overvoltage protection
- > Suitable for a broad temperature range
- > Flexible sensor module interface that can be configured for two-wire and three-wire interfaces
- > AEC-Q100 qualified

Applications

- > Engine speed and position (e.g. crankshaft)
- > Transmission speed
- > Speedometer
- > Industrial speed and position sensing

TLE4922

Highly robust, easy-to-use mono-Hall speed sensor with twist-independent mounting

This sensor is specially designed to provide an easy-to-use, robust and cost-effective solution for vehicle or industrial speed sensing applications. The TLE4922 can therefore be back-biased using a simple, low-cost bulk magnet, while providing a good air gap performance and switching accuracy. Its hidden adaptive hysteresis and calibration algorithm enables good accuracy over air gap jumps and immunity to vibration and run-out events. Thanks to its mono-cell design, the TLE4922 is the perfect choice for applications requiring twist-independent mounting. As a result, the TLE4922 is well suited for replacing passive sensors, such as Variable Reluctance Sensors (VRS), in automotive and 2-wheeler applications by providing the user with higher accuracy and a better jitter performance. The improved EMC, ESD and temperature robustness are perfectly suited for use in the harsh environmental conditions prevalent in automotive or dedicated industrial applications. The TLE4922 comes in a thin 4-pin SSO-4-1 package using a standard 3-wire voltage interface.

Features

- > Large operating air gap capability
- > Twist-independent mounting
- > Hidden adaptive hysteresis
- > Low current consumption



- > Reverse magnetic polarity capability
- > Advanced protection technology
 - Reverse voltage protection at V_S -pin
 - Short-circuit protection
 - Overtemperature protection
- > Wide operating temperature ranges of $-40^{\circ}\text{C} \leq T_J \leq \pm 150^{\circ}\text{C}$
- > High ESD robustness up to ± 4 kV HBM
- > 3-wire PWM voltage interface

Applications

- > 2-wheeler
- > Automotive vehicle speed

TLE4924/26/27/28C

High-performance speed sensor family

Our proven family of TLE492x differential Hall speed sensors is designed for a broad range of speed sensing applications. Each sensor provides the highest levels of quality, robustness and cost efficiency. Thanks to the hysteresis and dynamic self-calibration algorithm, they are ideally suited to high-performance speed sensing applications in harsh environments, such as automotive engine or transmission applications.

All sensors have a three-wire voltage interface, fast start-up time, symmetrical switching thresholds and optional south or north pole pre-induction.

Features

- › High sensitivity and large operating air gaps
- › Excellent switching performance down to a 1 Hz cut-off frequency

- › Broad operating temperature range
- › High protection against reverse voltage, short circuit and overtemperature
- › Strong EMC robustness and micro-cut performance thanks to module-style package with integrated 47 nF/4.7 nF capacitors
- › Option to use innovative iBB package solution
- › AEC-Q100 qualified

Applications

- › Engine speed and position (i.e. crankshaft)
- › Transmission speed
- › Speedometer
- › Industrial speed and position sensing

Product	Hysteresis	Comment	Standard
TLE4924C-1	Visible fixed	-	SSO-3-9
TLE4924C(B)-2	Visible adaptive	-	SSO-3-9
TLE4926C	Hidden fixed	-	SSO-3-9
TLE4926C-HT	Hidden fixed	High temperature profile	SSO-3-9
TLE4927C(B)	Hidden adaptive	-	SSO-3-9
TLE4928C	Hidden fixed	200 ms watchdog reset	SSO-3-9

TLE4929

Fully programmable crankshaft sensor

The TLE4929 is an active Hall sensor ideally suited for crankshaft applications and similar industrial applications, such as speedometer or any speed-sensor with high accuracy and low jitter capabilities.

Features

- › Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- › Switching point in middle of the tooth enables backward compatibility
- › Robustness over magnetic stray-field due to differential sensing principle
- › Digital output signal with programmable output-protocol including diagnosis interface
- › Direction detection and Stop-Start-Algorithm
- › High accuracy and low jitter
- › High sensitivity enable large air gap
- › End-of-line programmable to adapt engine parameters
- › Can be used as a differential Camshaft sensor
- › Automotive operating temperature range



Safety first: Infineon wheel speed sensors

Nowadays, wheel speed sensors have to support an ever-growing list of applications. Years ago, ABS systems simply needed to know if a wheel was blocked, and then ESC used the accurate speed of all four wheels for its corrections. Since then, an increasing number of modules in the car take the wheel speed into account for their intelligent functions. The electrical parking brake, for example, needs to know about every inch a car moves when it's supposed to be stationary, and iTPMS uses sophisticated algorithms to determine if a wheel lacks air pressure, and even the central locking locks the doors after a couple of meters and the radio turns up the volume in line with increasing speed. All of the above rely on accurate information from the wheel speed sensor.

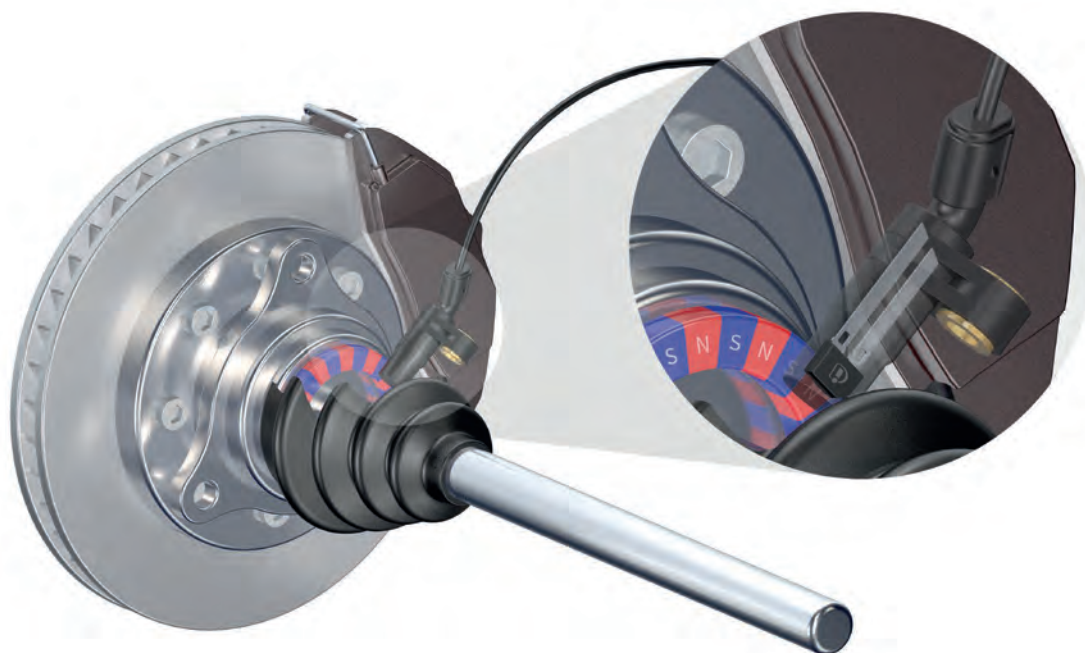
Currently, every second car in the world, uses our wheel speed sensors for these vital, safety-relevant tasks – over 1 billion Infineon wheel speed sensors have been sold over the past decade and contributed every day to make people's lives safer.

Features

- > High sensitivity for large air gap applications
- > Differential principle against stray fields and other disturbances
- > Single-chip solution for outstanding reliability
- > Best-in-class slim package sets a global benchmark for the smallest-possible size of the sensor module
- > High resistance against temperature change: No unwanted pulses at thermal drift

Applications

- > Wheel speed sensing in automotive applications
- > Antilock Braking Systems (ABS)
- > Electronic Stability Programs (ESP)
- > Automatic transmissions
- > iTPMS TLE5041plusC, TLE5045iC and TLE5046iC



TLE4941plusC/TLE4942-1C/TLE4943C

My car, how fast and how far does it drive?

The TLE4941plusC, our best selling sensor, has become an industry standard for wheel speed sensing. TLE4942-1C and TLE4943C are complementing this sensor with additional direction information using PWM or AK protocol, respectively.

As a single chip sensor it magnetically measures the cars wheel speed with its differential Hall technology, making it the ideal all-purpose sensor, equally suitable for pole wheel and steel wheel applications. These sensors are immune towards any kind of undesired magnetic stray fields, ferromagnetic particles or other disturbances, because of their differential principle.

Features

- > Family of hall sensors available with and without direction detection
- > Excellent stray field robustness

Applications

- > Pole wheel applications
- > Steel/tooth wheel applications by using back bias magnet

TLE5045iC, TLE5046iC

Ready for autonomous driving

The TLE5045/46iC is Infineon's next generation wheel speed sensor family based on GMR technology. The family consists of a designed-to-cost **speed-only** TLE5045iC, and a high-end TLE5046iC providing not only **direction detection** but also offering true "zero-speed" capability as well as possibilities of self-diagnostics.

TLE5045iC and TLE5046iC are developed according **ISO 26262** to fulfill ASIL B, supporting ASIL D systems. The TLE5046iC with direction detection is available with PWM or AK protocol.

Features

- > **One family** of speed sensors for all wheel speed sensing applications in same package
- > **Best in class** in sensitivity, jitter and duty cycle, independent from magnetic target wheel
- > **"Zero speed"** capability
- > **ISO 26262** compliant ASIL B development, supporting system ASIL D
- > Multiple **protocol** variants with and without self-diagnosis functionality
- > Integrated circuitry for improved EMC and ESD robustness even without external capacitor

Applications

- > Pole wheel applications
- > Autonomous driving (e.g. park assist)

Wheel speed sensor selection guide for high selling product portfolio

Product	Sensor technology	Pole wheel	Steel wheel	ISO 26262	Direction detection	Protocol	iTPMS
TLE4941plusC	Hall differential	●	●	-	-	Standard	-
TLE4942-1C	Hall differential	●	●	-	●	PWM	-
TLE4943C	Hall differential	●	●	-	●	AK	-
TLE5045iC	iGMR differential	●	-	ASIL B(D)	-	Standard	●
TLE5046iC-PWM	iGMR differential	●	-	ASIL B(D)	●	PWM	●
TLE5046iC-AK	iGMR differential	●	-	ASIL B(D)	●	AK	●

TLE4953C

The two-wire transmission speed sensor

The differential Hall sensor TLE4953C can detect direction and was developed specifically to meet the needs of high-end transmission applications. Its jitter performance and high sensitivity enables designers to create high-accuracy systems with excellent vibration suppression. Adaptive hysteresis and the dynamic self-calibration algorithm ensure outstanding measurement results with both fine and coarse target wheels. As with other Infineon speed sensors, the south and north poles can be pre-inducted. TLE4953 features a current interface and comes in a two-wire package with an integrated 1.8 nF overmolded capacitor for improved EMC.

Features

- › Detection of rotation direction
- › Highly accurate speed measurements from zero to 12 kHz over large operating air gaps
- › Excellent vibration suppression
- › Broad operating temperature range
- › AEC-Q100 qualified

Applications

- › Automatic transmission systems
- › Industrial speed sensing using current sensor interfaces

TLE4955(C)

Leading the way in vibration robustness

TLE4955 is a new family of differential Hall sensors specifically designed to meet the latest requirements in transmission vibration suppression. It provides best-in-class vibration suppression for applications, that require a two-wire current interface. The TLE4955 family provides a similar algorithm plus dynamic self-calibration, jitter and sensitivity levels as our proven TLE4953, thus ensuring accurate speed measurements in the harshest of environments for both fine and coarse target wheels.

Designers can choose different interface protocol versions.

Features

- › Detection of rotation direction
- › Best-in-class vibration suppression
- › Highly accurate speed measurements from zero to 12 kHz over large operating air gaps
- › Broad operating temperature range
 - Four different interface protocols
- › AEC-Q100 qualified

Applications

- › Automatic transmission systems
- › Industrial speed sensing using current sensor interfaces

TLE4957C

Three-wire transmission speed sensor

Differential Hall sensor TLE4957 is the ideal choice for designers, who prefer using a three-wire voltage interface rather than a two-wire current interface in applications such as transmission speed sensing. TLE4957 outperforms other devices thanks to its higher Digital Noise Constant (DNC) at start-up and its switching algorithm's increased hysteresis level. It is also available with adaptive hidden or adaptive visible hysteresis. The dynamic self-calibration principle together with the option of south or north pole pre-induction, sophisticated protection technology make TLE4957 ideal for automotive and industrial speed sensing applications.

Features

- > Greater robustness against vibration
- > Highly accurate speed measurements from 1 Hz to 8 kHz over large operating air gaps
- > Common three-wire voltage interface
- > Broad operating temperature range
- > AEC-Q100 qualified

Applications

- > Automatic transmission systems
- > Engine speed (crankshaft)
- > Industrial speed sensing

TLE4959C(-FX)

State-of-the-art three-wire transmission speed sensor with direction detection

With our TLE4959 you now can also address your 3-wire applications with the latest state-of-the-art technology of IFX transmission sensors. Differential Hall sensor TLE4959 is your choice when you need a 3-wire-sensor with direction detection and active vibration suppression. Beside its outstanding airgap and best of class Hall jitter performance, with its high immunity against strayfields it is the ideal match not only for traditional transmissions but also particularly for hybrid applications.

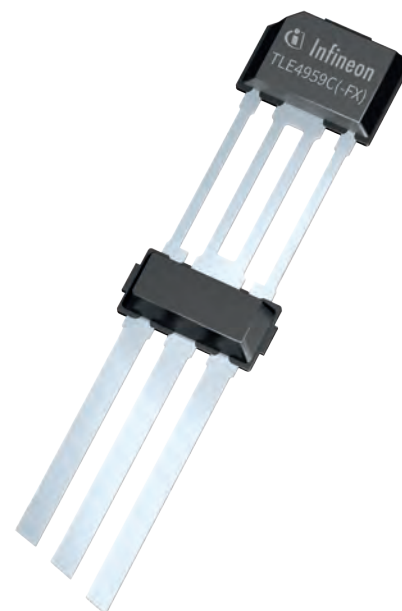
While TLE4959C is provided with the standard protocol, the FX version gives access to different protocols (e.g. speed only) as it is to be programmed at the customer's premises.

Features

- > Active vibration suppression
- > Highly accurate speed measurements from 0 Hz to 10 kHz over large operating air gaps (up to 20k for -FX)
- > Common three-wire voltage interface
- > Broad operating temperature range
- > AEC-Q100 qualified
- > FX version customer programmable (protocol, hysteresis level)

Applications

- > Automatic (hybrid) transmission systems



TLE4983/84C

Outstanding camshaft sensing

Our TLE4983/84 chopped mono-Hall sensor family comprises an excellent dedicated feature set. It is highly robust and is equipped with a module-style package with integrated capacitors. Due combining all these features, its the ideal opportunity for automotive camshaft applications. The product family meets all key camshaft sensor requirements including true power-on, Twist-Independent Mounting (TIM) and high phase accuracy for optimum fuel-injection timing. Both sensors deploy a dynamic self-calibration algorithm with programmable power-on and a dynamic switching point. TLE4984, for example, uses an algorithm, that enables fast threshold adjustments with small step sizes during the pre-calibration phase. This, in turn, allows thresholds to be adjusted very accurately. In contrast, the step sizes used by TLE4983 in the pre-calibration phase are approximately 10 times larger. TLE4983 therefore requires only half of the switching events used by TLE4984 to reach calibration mode. These flexible options give designers the freedom to choose the best start-up concept for individual system requirements.

Features

- › True power-on and high phase accuracy for optimal fuel injection timing
- › Self-calibration algorithm for fast start-up and precise calibration
- › Twist-Independent Mounting (TIM)
- › High temperature operating range and EMC robustness
- › Three-wire digital voltage interface (PWM)
- › AEC-Q100 qualified

Applications

- › Camshaft speed and position sensing

TLE4986C

Leading performance

TLE4986C is the latest chopped mono-Hall sensor for automotive camshaft applications. It meets the most stringent requirements for phase accuracy, true power-on, EMC and temperature robustness. TLE4986C can be programmed to achieve the highest system performance with the widest range of target wheels, thus enabling designers to optimize the costs of a mechanical system, while obtaining the highest phase accuracy and greatest robustness against effects such as run-out. The temperature coefficient of the magnet can also be configured to ensure, that the sensor is adapted to the magnetic back-bias design. As with the TLE4983/84 family, TLE4986C also comes with proven features such as a dynamic self-calibration algorithm and module-style package plus integrated capacitors for optimal micro-break and EMC behavior.

Features

- › True power-on and highest phase accuracy for optimum fuel injection timing
- › Extensive programming options for flexible design of magnetic circuits and optimized performance
- › Self-calibration algorithm for fast start-up and precise calibration
- › Highest temperature operating range and EMC robustness
- › Best-in-class micro-break performance
- › Twist-Independent Mounting (TIM) capability
- › Three-wire digital voltage interface (PWM)
- › AEC-Q100 qualified

Applications

- › Camshaft speed and position sensing

TLE5027C/28C

iGMR-based speed sensor

TLE5027C is the world's first speed sensor solution based on Giant Magneto Resistive (iGMR) technology. It provides a higher air gap and greatly reduced jitter over frequency and temperature performance. All of which puts it ahead of other magnetic sensing technologies and makes it the preferred solution for high-accuracy powertrain speed sensor systems – both today and in the future. TLE5027C can detect the rotation direction of a wheel and transmit this information during the first output pulse, making it the perfect fit for the latest engine systems that use a start-stop feature as well as for automatic transmission applications in the automotive sector. The TLE5028C adds an improved immunity towards ESD and EMC to address the problems, caused by harsh high power environments like from hybrid systems. TLE5027C and TLE5028C are available in our well-established, module-style package with integrated capacitors. It uses a three-wire digital voltage interface (PWM).

Features

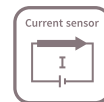
- › Outstanding jitter performance thanks to giant magneto resistive technology
- › High sensitivity ($B_{\min} < 1 \text{ mT}$) and large air gap capability
- › Detection and transmission of rotation direction during the first output pulse
- › Three-wire digital voltage interface (PWM)
- › Large frequency range
- › Broad operating temperature range
- › AEC-Q100 qualified
- › Improved EMC and ESD immunity from TLE5028C

Applications

- › Automatic transmission systems
- › Engine speed (crankshaft)

TLI/TLE4970

High-precision current sensor

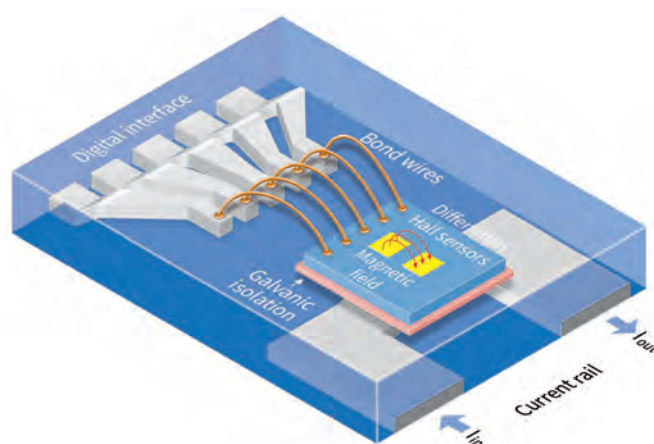


TLI4970 is a high-precision current sensor for industrial applications, based on our proven Hall technology. The coreless concept significantly reduces footprint compared with existing solutions. TLI4970 is an easy-to-use, fully digital solution, that does not require external calibration or additional parts such as A/D converters, 0 pAmps or reference voltage. It thus significantly reduces overall implementation effort as well as PCB space and cost.

The differential measurement principle integrated in the TLI4970 sensor suppresses interference caused by external magnetic fields. Accordingly, the sensor achieves an extremely low offset of just 25 mA. With conventional current measurement principles, the measuring accuracy is always governed by the ambient conditions (e.g. the temperature).

TLI4970 is more accurate than existing open-loop and comparable to closed-loop systems. It also provides additional functions such as fast overcurrent detection and programmable filter, yet it has a significantly smaller footprint and lower power consumption.

TLI4970 is extremely robust against external magnetic fields thanks to implemented stray field suppression and is also suitable for fast overcurrent detection at a pre-configurable level. This allows the control unit to switch off independently of the main measurement path and protect power consumers from damage.



Features

- > Fully calibrated digital output
- > High accuracy over life time due to on-chip temperature and stress compensation
- > Programmable low-pass filter for measuring current (0 to 18 kHz)
- > Fast, configurable overcurrent detector (< 1.8 μ s typ.)
- > Inherent magnetic stray field suppression
- > Small package size and weight for SMD mounting

Applications (AC and DC current measurement)

- > Photovoltaic and general purpose inverters
- > Power supplies (SMPS)
- > Battery chargers
- > Lighting applications
- > Electrical drives
- > and many more

Product	Accuracy ¹⁾	Current range [A]	Bandwidth [kHz]	Resolution [mA/LSB]	Automotive	Industrial	Package
TLI4970-D050T4	±1.6	±50	18	12.5	–	●	TISON-8
TLI4970-D050T5	±3.5	±50	18	12.5	–	●	TISON-8
TLI4970-D025T4	±1.6	±25	18	6.25	–	●	TISON-8
TLI4970-D025T5	±3.5	±25	18	6.25	–	●	TISON-8
TLE4970-D050T4	±1.6	±50	18	12.5	On request	–	TISON-8
TLE4970-D025T4	±1.6	±25	18	6.25	On request	–	TISON-8

1) Total error over lifetime and temperature

Integrated pressure sensor ICs

For automotive and industrial applications



Our pressure sensors are ideal for a wide range of applications in the automotive and industrial sectors. Typical applications in automotive include side airbag, engine control and seat comfort with high quality, highly accurate and ISO 26262 conform products. We offer the ideal portfolio for these systems.

The analog and digital interfaces of our pressure sensors provide customers with a high degree of design flexibility and enable manufacturers to meet evolving market demands.

Our digital interface portfolio ranges from PSI5 for safety products (for example side crash detection and pedestrian protection systems) through SPI for automotive powertrain and body applications (for example Barometric Air Pressure (BAP), fuel vapor and seat comfort systems) to SENT with SPC functionality for upcoming engine management products (for example MAP, turbo MAP (with NTC) and secondary air valves).



Powertrain systems have to fulfill the constantly increasing stringent media requirements. Environmental legislation aims to deliver cleaner air by ensuring a steady global decrease in CO₂ emissions. Thanks to their accurate measurement capability, Infineon MAP and turbo MAP product with analog or digital interface enable engines to meet these requirements.



Cars have to act and perform in the same way whether driving along a coast or through mountains. As a result of different locations, the composition and the quality of the air around changes. It is important that the engine react immediately to these changes. Infineon offers various pressure sensors for barometric measurements with analog and digital interface and various pressure ranges.

Automotive applications

- > Barometric absolute pressure
- > Seat comfort systems
- > Manifold absolute pressure
- > Exhaust gas recirculation
- > Secondary air valve
- > Fuel vapor
- > Natural gas vehicle
- > Side crash detection
- > Pedestrian impact detection

Industrial applications

- > Industrial and process controls
- > Gas flow
- > Level meter
- > Barometric pressure
- > Altitude compensation systems
- > Weather stations
- > Engine management systems
- > Medical equipment

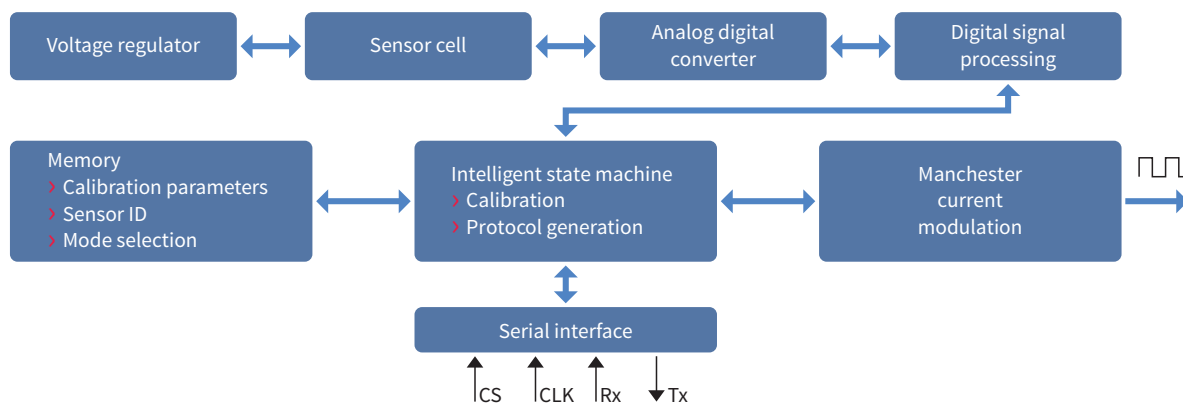
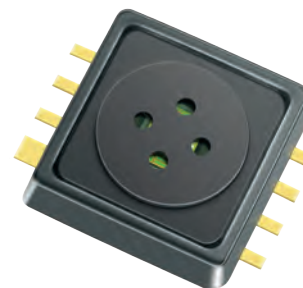
KP200/KP201/KP204



PSI5 PRO-SIL™ ready pressure sensor ICs for side crash detection and pedestrian protection

Features

- > Two-wire interface with on-chip current modulator for PSI5 communication
- > Fully PSI5 compliant with support for multiple modes
- > Synchronous or asynchronous data transmission
- > EEPROM for unique ID number, calibration and mode selection
- > Serial service interface for EEPROM programming
- > On-chip voltage regulator
- > Reverse polarity protection
- > Fully AK-LV29 and AK-LV38 compliant
- > Patented online diagnosis for pressure cells and circuitry
- > PRO-SIL™ support in line with IEC 61508 and ISO 26262
- > Green SMD package
- > KP201 qualified for higher operating temperatures up to 125°C
- > KP204 with 4-hole lid supporting insect intrusion protection



KP23x



Analog Barometric Air Pressure (BAP) sensor IC family

Everybody expects a car, that always acts and performs in the same way- whether driving along a coast or through mountains. As a result of different locations, the composition and the quality of the air around changes. Due to these changes its thus of fundamental importance, that the engine react immediately. Infineon offers various pressure sensors for barometric measurement with different interfaces (analog and digital) and various pressure ranges.

Features

- > Absolute air pressure measurement
- > Excellent accuracy of 1.0 kPa over a large temperature range
- > Ratiometric analog voltage output proportional to the applied pressure
- > Output signal fully compensated across pressure and temperature range
- > Pressure range from 40 to 115 kPa
- > Temperature range from -40 to +125°C
- > Serial service interface
- > Open Bond Detection for supply and GND (OBD)
- > Inverse polarity protection
- > Green SMD package

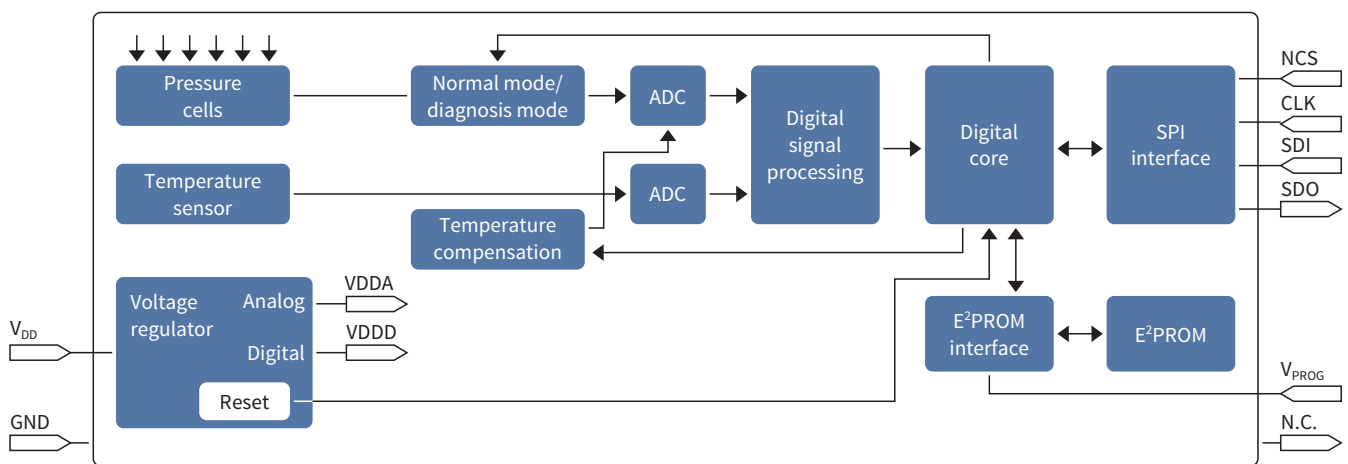
1) More information on PRO-SIL™, see page 64

KP25x

SPI digital barometric air pressure sensor IC family

Features

- › SPI – digital interface
- › Absolute air pressure measurement
- › Excellent accuracy of 1.0 kPa over a large temperature range
- › Output signal fully compensated across pressure and temperature range
- › Pressure range from 40 to 165 kPa
- › Temperature range from -40 to +125°C
- › Self-diagnosis routines and diagnosis codes
- › Reverse polarity protection
- › Diagnosis checks during operation
- › Green SMD package



Overview of integrated pressure sensor ICs for manifold and barometric air pressure

Product	Pressure range [kPa]	Max. accuracy [kPa]	Max. operating temperature [°C]	Automotive	Industrial
KP21x	10 ... 115	1.0	140	●	●
KP22x	10 ... 400	2.5	140	●	●
KP23x	40 ... 115	1.0	125	●	●
KP236N6165	60 ... 165	1.0	125	●	●
KP253	60 ... 165	1.0	125	●	●
KP254	40 ... 115	1.5	125	●	●
KP255	10 ... 125	1.4	140	●	●
KP256	60 ... 165	1.0	125	●	●
KP275	10 ... 400	3.0	170	●	●

KP21x/KP22x



Analog manifold air pressure sensor IC family (MAP + turbo MAP)

Powertrain systems have to fulfill the constantly increasing stringent media requirements. Environmental legislation aims to deliver cleaner air by ensuring a steady global decrease in CO₂ emissions. Thanks to their accurate measurement capability, Infineon MAP and turbo MAP products with an analog interface enable engines to meet these requirements.

Features

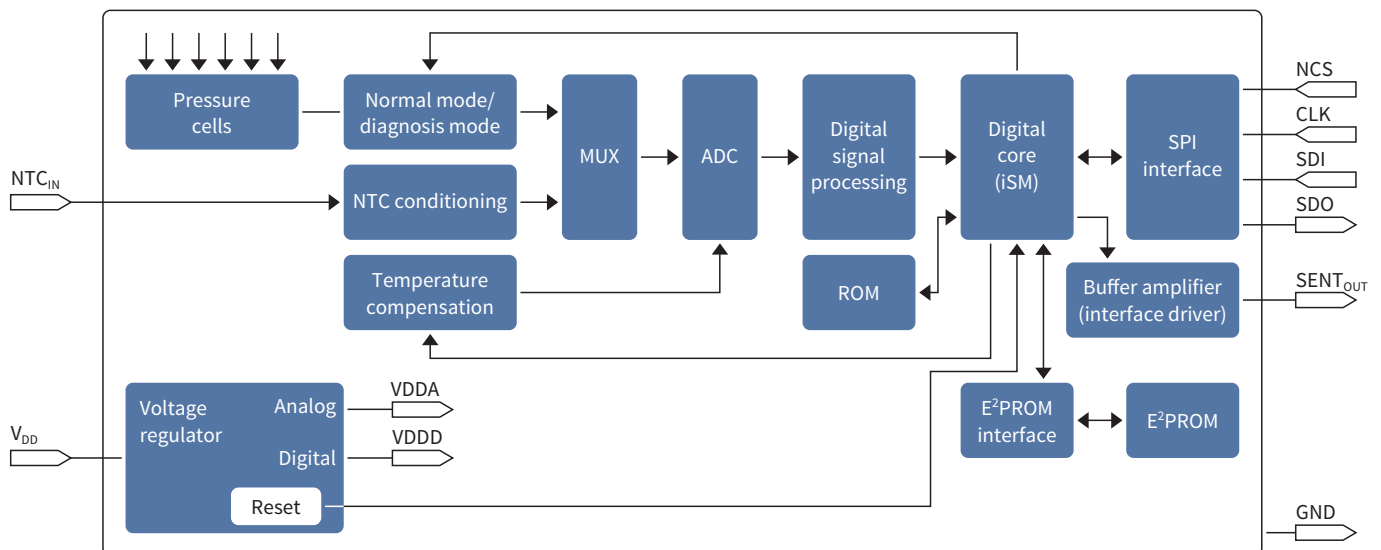
- > Manifold air pressure measurement – MAP and turbo MAP
- > Excellent accuracy of up to 1.0 kPa over a large temperature range
- > Ratiometric analog voltage output proportional to the applied pressure
- > Output signal fully compensated over pressure and temperature
- > Pressure range from 10 to 400 kPa
- > Temperature range from -40 to +140°C
- > Output clamping (optional)
- > Complete product family available with multiple transfer function
- > Reverse polarity protection
- > Green SMD package

KP275

Media robust MAP sensor with digital interface

Features

- > Media robustness for current automotive requirements
- > Digital interface SENT
- > Excellent accuracy of ±0.77 percent FFS
- > Green SMD package
- > Temperature range -40 to +170°C
- > Integrated NTC temperature sensor functionality



SP27

Pressure sensor for industrial and automotive applications

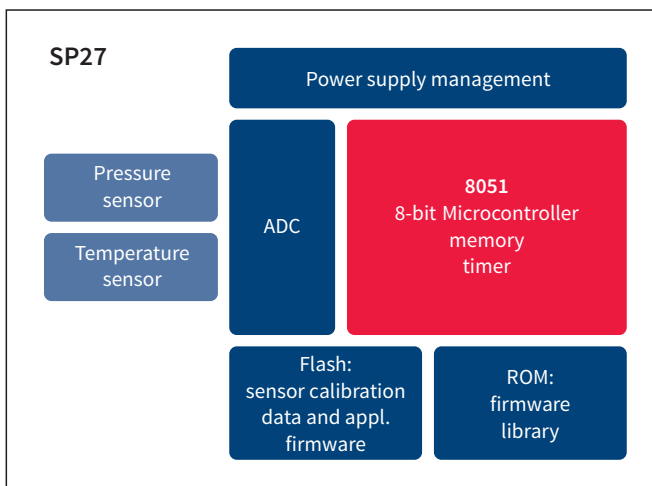
The SP27 is a pressure sensor designed for the harshest automotive and industrial environments. Among its unique selling points, the device offers a wide pressure range up to 1300 kPa and a proven sensor technology, which is robust against various media.

It can be used in both wired and battery-supplied applications.

The SP27 is a complete system on package since it integrates a microcontroller with 6 kB flash and several peripherals (such as temperature and voltage sensors on top of the pressure sensor); it requires very few external components.

Its data interface is I²C; nevertheless, the integrated microcontroller allows the implementation of specific communication protocols such as SPI, SPC, SENT or PWM. The integrated microcontroller is instruction-set compatible with a standard 8051 processor. Integrated on-chip flash memory can be used to store a customer-specific application code, along with its unique ID number and the calibration data for the sensors. Additional on-chip ROM memory is available and includes functions (developed by Infineon) that cover standard tasks used by the application.

The device can be programmed to wake-up at regular intervals via its low-power interval-timer or per an external wake-up source connected to a General Purpose Input/Output (GPIO), thus allowing the application to save energy by spending most of the time in powerdown state.



Features

- > Pressure sensor (100 to 1300 kPa)
- > Temperature sensor
- > Embedded 8051 compatible 8-bit microcontroller
- > 6 KB on-chip flash memory
- > 256 Byte RAM
- > Advanced power control/wake-up system to minimize power consumption
- > Ultra-low powerdown current of < 0.7 μ A
- > Supply voltage range of 1.9 to 3.6 V
- > Operating temperature range of -40 to +125°C
- > DSOSP-14-6 package
- > RoHS compliant, green package

Parameter	Values		Unit	Note/test condition
	Min.	Max.		
Input pressure range	100	500	kPa	T = -40 ... 125°C
Measurement error 100 ... 500 kPa	-21	+21	kPa	T = 25 ... 80°C
	-46	+46	kPa	T = -40 ... 125°C
Input pressure range	500	1300	kPa	T = -40 ... 125°C
Measurement error 500 ... 1300 kPa	-31	+31	kPa	T = 25 ... 80°C
	-60	+60	kPa	T = -40 ... 125°C
Temperature measurement error	-3	+3	°C	T = -20 ... 70°C
	-5	+5	°C	T = -40 ... -20°C T = 70 ... 125°C

XENSIV™ digital barometric air pressure sensors

For mobile and wearable devices

Infineon's digital barometric pressure sensor family is the best choice for mobile and wearable devices due to its small form factor, high precision and low power consumption. Pressure sensing is based on capacitive technology which guarantees ultra-high precision (± 5 cm) and relative accuracy (± 0.6 hPa) over a wide temperature range. The sensor's internal signal processor converts the output from the pressure and temperature sensor elements to 24-bit results. Each pressure sensor has been calibrated individually and contains calibration coefficients. The coefficients are used in the application to convert the measurement results to true pressure and temperature values. All sensors have a FIFO that can store the latest 32 measurements. Since the host processor can remain in a sleep mode for a longer period between readouts, a FIFO can reduce the system power consumption. Sensor measurements and calibration coefficients are available via the serial I²C/SPI interface.

DPS310

Barometric pressure sensor with very low power consumption, recommended for applications where power consumption is critical and highest precision in pressure metering is required.

DPS368¹⁾

Environmentally protected pressure sensor which is robust against water, dust & humidity. Same footprint and performance as DPS310.

DPS422²⁾

Monolithic chip solution having an ultra-small critical area and a very thin package (0.73 mm typ.). Beneath high precision pressure metering, DPS422 offers also highly accurate absolute temperature sensing ($\pm 0.4^\circ\text{C}$), which is required in applications like weather stations, thermostats, etc.

Typical applications:

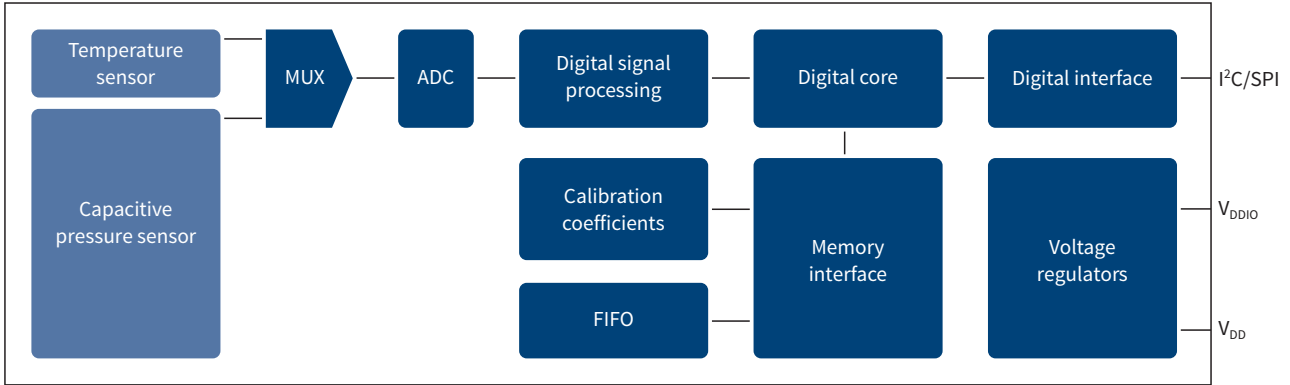
- › Drones: Altitude detection and height stability
- › Health and fitness: Accurate elevation gain and step counting (e.g. for smart watches)
- › Outdoor navigation: GPS start-up time / accuracy improvement; dead-reckoning (e.g. in tunnels)
- › Indoor navigation: Floor detection e.g. in shopping malls and parking garages
- › Smart home: Micro weather forecasting; room temperature control; intruder detection
- › Air flow control: Smart filter replacement alarm (e.g. in home appliances); predictive maintenance
- › Health care: Fall detection; respiratory devices; smart inhalers

Key product features	DPS310/DPS368 ¹⁾	DPS422 ²⁾
Operating pressure range	300 ... 1200 hPa	
Operating temperature range	-40 ... 85°C	
Pressure level precision	± 0.005 hPa (or ± 0.05 m)	
Relative accuracy/Absolute accuracy	± 0.06 hPa (or ± 0.5 m) / ± 1 hPa (or ± 8 m)	
Temperature accuracy	0.5°C	< 0.4°C
Pressure temperature sensitivity	0.5 Pa/K	
Measurement time	3.6 ms (low precision); 27.6 ms (standard mode)	
Average current consumption @ 1 Hz sampling rate	1.7 μA for pressure measurement/1.5 μA for temperature measurement (0.5 μA standby)	1.7 μA for pressure measurement/2.0 μA for temperature measurement (1.0 μA standby)
Supply voltage	V_{DDIO} : 1.2–3.6 V; V_{DD} : 1.7–3.6 V	
Operating modes	Command (manual), background (automatic), standby	
Interface	I ² C and SPI, both with optional interrupt	
Package	8 pins LGA: 2.0 x 2.5 x 1.0 mm (DPS310) 8 pins LGA: 2.0 x 2.5 x 1.1 mm (DPS368)	8 pins LGA: 2.0 x 2.5 x 0.73 mm

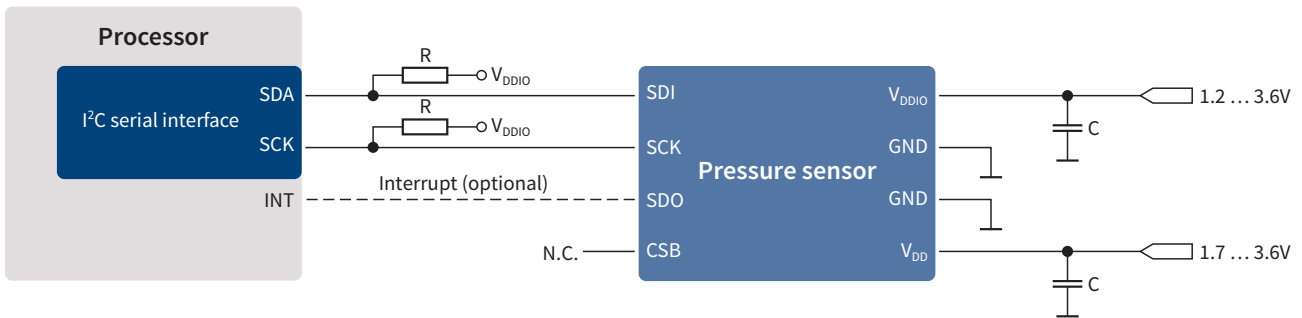
1) Available Q1 2019

2) Available Q3 2018

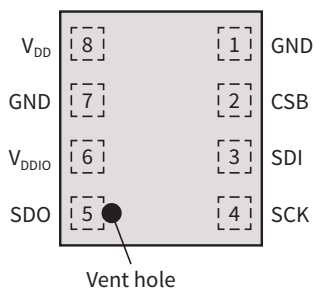
Functional block diagram



Application circuit example (in I²C configuration)

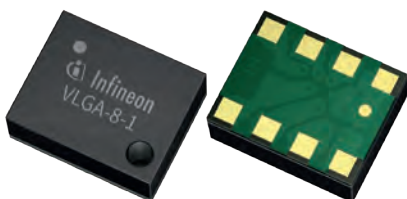


Pin configuration (Top view)

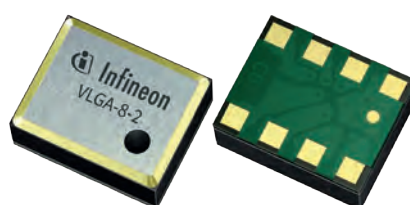


Pin	Name	Function
1	GND	Ground
2	CSB	Chip select
3	SDI	Serial data in/out
4	SCK	Serial clock
5	SDO	Serial data out
6	V _{DDIO}	Digital interface supply
7	GND	Ground
8	V _{DD}	Analog supply

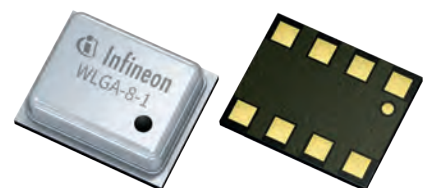
DPS310 package drawing



DPS368 package drawing



DPS422 package drawing



SP40

Tire pressure sensor for Tire Pressure Monitoring Systems (TPMS)



SP40 provides a very high level of integration and is optimized to perform all of the functions necessary to implement a state-of-the-art Tire Pressure Monitoring System (TPMS) sensor module. With its integrated micro controller, sensors and convenient peripherals, the SP40 needs the addition of only a few passive components and a battery to form a complete TPMS sensor assembly.

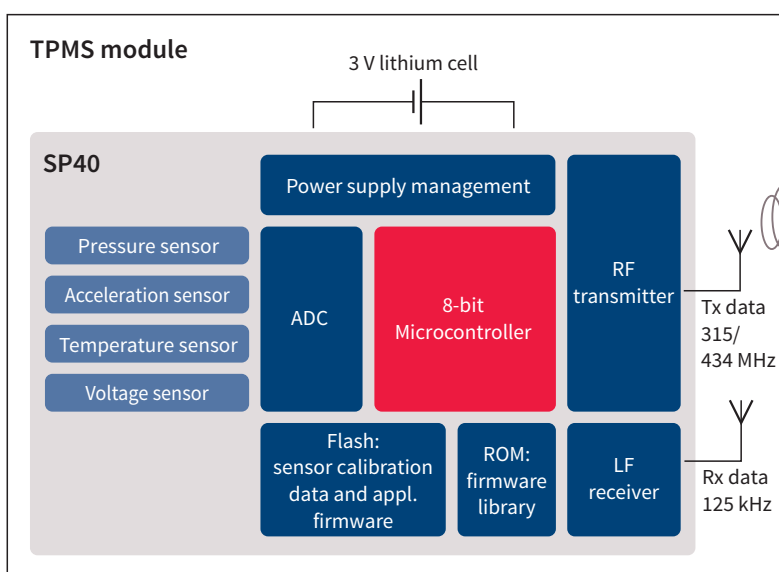
SP40 measures pressure, radial acceleration, temperature and supply voltage and is certified as a green package compliant with RoHS. SP40 comes with a pressure-auto-ranging feature, providing best-in-class pressure-accuracy in the range from 100 to 900 kPa, making it the ideal choice for passenger vehicle and lights truck applications.

Compared to the previous generation SP37, the SP40 family offers even lower current consumption and more features like larger flash and better sensor accuracy.

Features

- > Pressure sensor
- > Radial acceleration sensor
- > Temperature sensor
- > Supply voltage sensor
- > Embedded 8051 compatible 8-bit microcontroller
- > 12 kB on-chip flash memory, plus optional additional 2 kB (for example for LF-bootloader)
- > 160 Byte retention RAM hinzufügen
- > 315 and 434 MHz FSK/GFSK/OOK/ASK RF transmitter
- > Output power of 5 dBm
- > 125 kHz ASK high-sensitivity LF receiver
- > Advanced power control/wake-up system to minimize battery consumption
- > Ultra-low powerdown current of < 540 nA
- > Supply voltage range from 1.6 to 3.6 V
- > Operating temperature range from -40 to +125°C
- > DSOSP-14-82 package
- > RoHS compliant, green package

Product	Pressure range [kPa]	On-chip flash memory [kB]	Key features
SP400-11-01	100-900	12	<ul style="list-style-type: none"> > Highest integration > Very low energy consumption
SP400-11-11	100-900	12 + 2	<ul style="list-style-type: none"> > Robust g- and p- sensor > High LF sensitivity



SP40 fully supports all necessary requirements for a Tire Pressure Monitoring System (TPMS)



RASIC™ – automotive radar sensor ICs



Front-end ICs for automotive radars

RXS8160PL – Single-chip front-end MMICs for 77/79 GHz automotive RADAR

Infineon has been delivering automotive 77GHz radar products for over 10 years. Infineon's new radar transceiver IC (RASIC™) addresses the needs of 77/79 GHz radar for all safety-critical applications from automatic emergency braking (AEB) to high-resolution radars in automated driving. It supports high modulation bandwidth up to 2 GHz using fast ramps for precise distance measurement and simultaneous transmitter operation for MIMO.

RXS8160PL is a highly integrated device that performs all functions of a radar front-end in a single device - from FMCW signal conditioning to generation of digital receive data output. On-chip sensors for temperature, output power and multiple monitors/supervisory circuits allow for calibration and monitoring. Programming and Status are communicated via SPI.

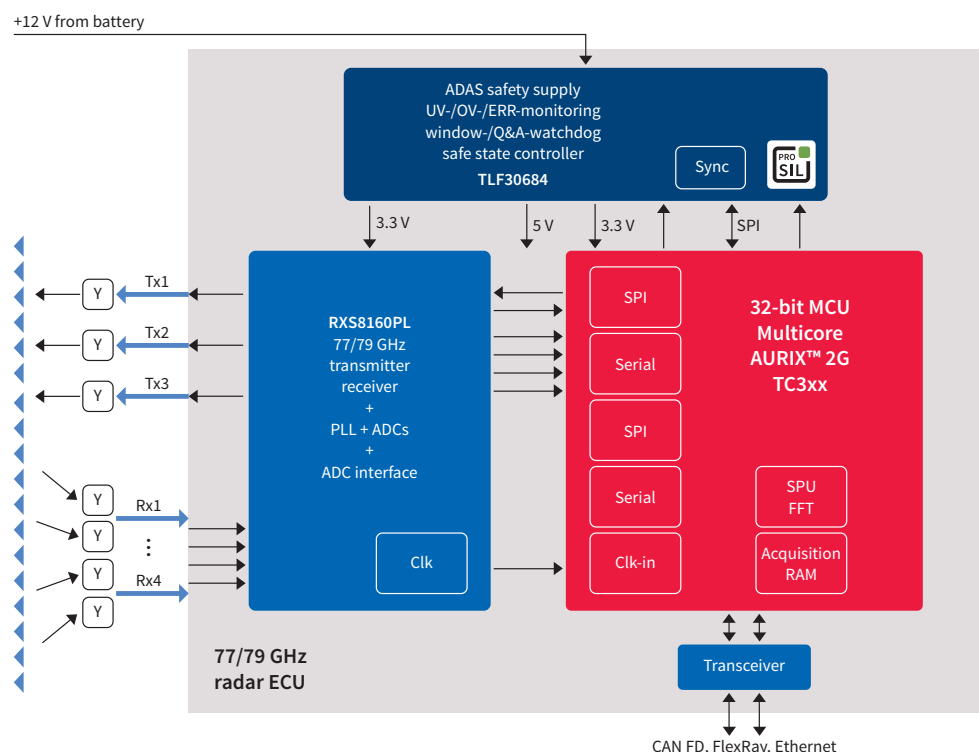
Infineon offers a complete 77/79 GHz radar chipset consisting of

- › Radar 77/79 GHz RF Millimeter Wave IC (RASIC™ RXS8160PL)
- › Radar MCU family featuring radar signal processing units (2nd generation AURIX™ TC3xx)
- › Radar system power supply with numerous safety functions (TLF3068x)
- › Very compact 3-chip configuration (RXS8160PL+ AURIX™ TC357 + TLF30681) for AEB sensor

Customer benefits:

- › One 77/79 GHz radar platform supporting all types of automotive radar applications
- › Scalability by cascading multiple RF MMICs and MCUs enabling most advanced sensors
- › Flexibility through numerous configuration parameters and on-chip monitoring functions
- › ASIL C support reducing customer R&D efforts

Product	Configuration	Key benefits	Features
RXS8160PL	3Tx4Rx	Cascadable from single- to multi-chip	<ul style="list-style-type: none"> › Flexible FMCW waveform generation › 2 GHz modulation bandwidth › Four receive channels featuring integrated filters + AD converters › 4 channel LVDS data interface › Robust eWLB package (7 x 8.5 mm)
RXS8150PL	2Tx4Rx	Cost efficient solution for corner radars	



24 GHz radar sensor ICs

Infiniteon offers a wide portfolio of mmWave radar sensors to address different customer requirements. The BGT24M/L family is the largest and highest integrated 24 GHz radar transceiver family currently on the market, saving ~30 percent board space compared to discrete line ups. Infineon provides a total of four 24 GHz industrial radar chips, providing a range of different transmitter and receiver channel configurations, supporting different application requirements.

Applications

- > Building and smart home (IoT)
- > Indoor/outdoor lighting
- > Smart street lighting
- > UAV/multicopters
- > Security
- > Robotics

Key benefits

- > Direction, proximity and speed detection
- > Hidden mounting capability
- > Maintains operation through harsh weather conditions
- > Motion tracking
- > Ghost target suppression
- > Target positioning
- > Adaptable to different application requirements

In addition to the Infineon BGT24M/L family of MMIC chips, Infineon provides a continuously expanding range of evaluation and demo boards to support the testing and development of radar in multiple applications. All boards are provided with base level software to support ease-of-use and faster to market integration.

Utilizing our strong network of partners, the radar portfolio is extended to include a range of easy-to-integrate modules which each contain an Infineon 24 GHz MMIC.

Infiniteon's radar offerings

Infiniteon MMIC	Evaluation and demo boards	Radar modules
BGT24M/L family	Supporting testing and development	Turnkey modules and design support

Infinion BGT24M/L family of MMIC chips

The Infineon range of 24 GHz industrial radar chips provide four configurations of transmit and receiver channels ensuring there is a chip to support your specific application. From basic applications such as motion detection in security systems which only require one transmit and one receive channel, through to more complex applications like 3D positioning which require two or more receive channels, our range of radar chips support all of your requirements.

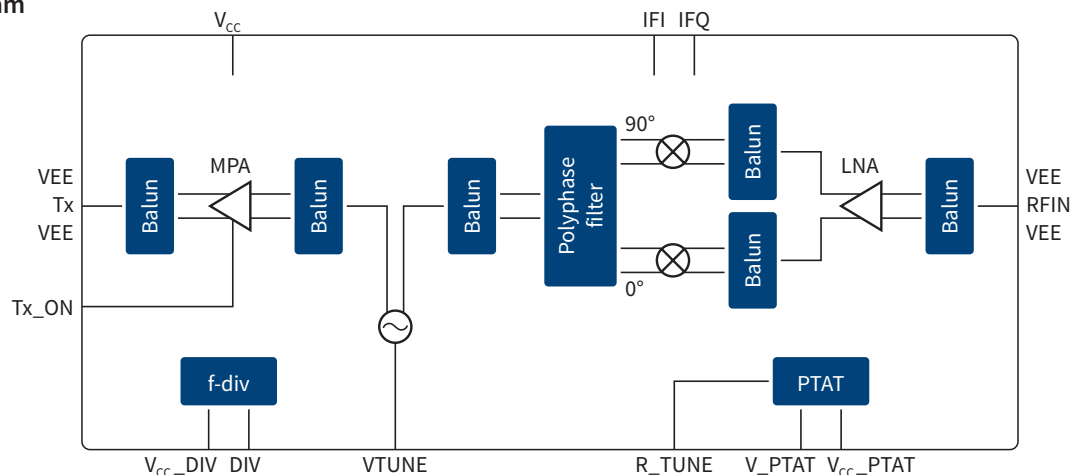
Features	Infineon MMIC	Benefits
<ul style="list-style-type: none"> > 24 GHz ISM band operation for motion, speed, direction movement and distance measurements > 4 MMIC chips available 		<ul style="list-style-type: none"> > Long range distance detection of moving objects up to 30 m > Wide range speed detection up to ± 100 km/h

Product	Configuration	Key benefits	Features
BGT24MTR11	1Tx + 1Rx	32 pin leadless RoHS compliant VQFN package	<ul style="list-style-type: none"> > Measures not just motion, but also speed, direction, and distance > Small form factor > Resistance to moisture, dirt and temperature > Increased area coverage > Discrete design > Energy savings > Privacy protection > Adaptable to different application requirements > Highly integrated chips eliminating costly external components
BGT24MR2	2Rx	Twin receiver	
BGT24MTR12	1Tx + 2Rx	On chip power and temperature sensors	
BGT24LTR11	1Tx + 1Rx	Low power consumption	

The BGT24LTR11N16 key features

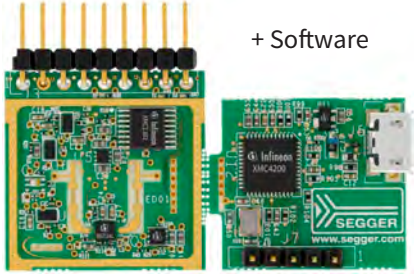
- > 24 GHz transceiver MMIC
- > Fully integrated low phase noise V_{CO}
- > Built in temperature compensation circuit for VCO stabilization
- > Low power consumption
- > Fully ESD protected device
- > Single ended RF and IF terminals
- > 200 GHz bipolar SiGe:C technology B7HF200
- > Single supply voltage 3.3 V

Block diagram



24 GHz evaluation and demo boards

Our range of 24 GHz evaluation and demo boards continues to expand to support the needs of our customers and the increasing number of innovative ways radar is being incorporated into new applications.

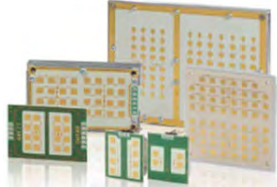
Features	Infineon development kit	Benefits
<ul style="list-style-type: none"> > Three system boards available > All include 24 GHz radar and XMC™ microcontroller > Kit contains user manual, GUI, MATLAB compiler and Gerber files > Requires software 	 <p>Demokit with SW, reference design</p>	<ul style="list-style-type: none"> > Capability to detect motion, speed and direction of movement (approaching or retreating) distance and angle of arrival based on hardware > FW/SW available for each radar mode

Sense2GOL (BGT24LTR11 + XMC1300)	Distance2Go (BGT24MTR11 + XMC4200)	Position2Go (BGT24MTR12 + XMC4700)
<ul style="list-style-type: none"> > Capability to detect motion, speed and direction of movement (approaching or retreating) Precise measurement of object detection compared to PIR > Operates in harsh environments and detects through non-metallic materials > Low power mode for enhanced battery life > One of the world's smallest complete radar + MCU development kit > BGT24LTR11 – 24 GHz highly integrated RF MMIC > XMC1300 ARM® Cortex®-M0 –32-bit industrial microcontroller > Debug over cortex 10 pin debug connector > Integrated multiple element patch antennas 	<ul style="list-style-type: none"> > Capability to detect distance of multiple targets > Capability to detect motion, speed and direction of movement (approaching or retreating) > Operates in harsh environments and detects through non-metallic materials > BGT24MTR11 – 24 GHz highly integrated RF MMIC > XMC4200 ARM® Cortex®-M4 –32-bit industrial microcontroller > Debug over cortex 10 pin debug connector > Integrated multiple element patch antennas 	<ul style="list-style-type: none"> > Capability to detect position of multiple targets > Capability to detect distance of multiple targets > Capability to detect motion, speed and direction of movement (approaching or retreating) > Operates in harsh environments and detects through non-metallic materials > BGT24MTR12 – 24 GHz highly integrated RF MMIC > XMC4700 ARM® Cortex®-M4 –32-bit industrial microcontroller > Debug over cortex 10 pin debug connector > Integrated multiple element patch antennas
<p>Main applications</p> <ul style="list-style-type: none"> > Security > Lighting control > Automatic door opener > Vital sensing 	<p>Main applications</p> <ul style="list-style-type: none"> > Drone: soft landing/obstacle avoidance > Smart toilets > Tank level sensing > Intelligent switches 	<p>Main applications</p> <ul style="list-style-type: none"> > Drone/robots: obstacle avoidance > Security > People tracking (IoT, smart home) > Vital sensing
<p>Board dimensions</p> <ul style="list-style-type: none"> > 25 mm x 25 mm (pictured with the Segger Debugger break-off board for reprogramming) 	<p>Board dimensions</p> <ul style="list-style-type: none"> > Board 36 mm x 45 mm 	<p>Board dimensions</p> <ul style="list-style-type: none"> > Board 50 mm x 45 mm
<p>Kit contents</p> <ul style="list-style-type: none"> > User's manual > SW GUI to operate kit > Schematic and bill-of-materials of module 	<p>Kit contents</p> <ul style="list-style-type: none"> > User's manual > SW GUI to operate kit > FMCW FW and SW¹⁾ > Doppler FW and SW¹⁾ > Schematic and bill-of-materials of module 	<p>Kit contents</p> <ul style="list-style-type: none"> > User's manual > SW GUI to operate kit > FMCW FW and SW > Doppler FW and SW > Schematic and bill-of-materials of module

1) Usage of the FMCW and/or Doppler FW and SW requires agreeing to Infineon's user's agreement and licensing terms.

24 GHz modules

Partnering with the leading radar solution providers enables Infineon to connect our customers looking for turnkey solutions and design support for a complete range of applications.

Features	Partner modules using Infineon chips	Benefits
<ul style="list-style-type: none"> Complete module, including radar MMIC, antenna options, MCU signal processing options, and SW options (Doppler, FSK and FMCW versions available) 	 <p>Module (RF module; RF module + MCU including SW)</p>	<ul style="list-style-type: none"> Ease-of-design Turn-key solution for customers with limited radar/RF/SW know-how

By integrating the Infineon 24 GHz MMIC chip into their own easy-to-use, and simple to integrate modules we have reduced the complexity and time to market for a range of applications from home automation, multicopters, robotics and street lighting.



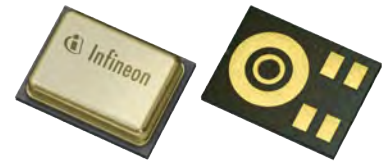
New application or simple PIR replacement? Radar has it covered.

Radar used in motion detection applications increases accuracy when compared to passive infrared (PIR) technology allowing a more precise measurement of object detection and providing new capabilities such as the detection of speed and direction of moving objects. Radar is also superior to camera-based systems by allowing detection of the objects while keeping identities anonymous.

Visit the link below to view our network of partners who provide modules and design support for all 24 GHz industrial applications: www.infineon.com/24GHzpartners

MEMS microphones

Time to debottleneck your audio chain



The popularity of voice user interfaces and the usage of audio recording to share information and experiences are increasing dramatically. However, the performance of microphones often limits the potential of today's cutting-edge devices. Not anymore!

Infineon XENSIV™ MEMS microphones introduce a new performance class for digital MEMS microphones that overcomes existing audio chain limitations. IM69D130 is designed for applications where low self-noise (high SNR), wide dynamic range, low distortions and a high acoustic overload point are required.



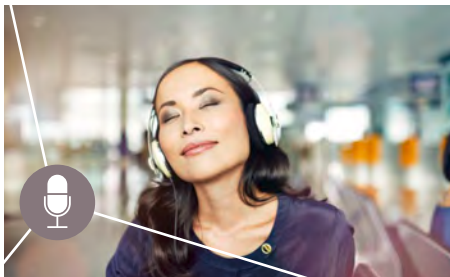
Don't miss a single thing!

With XENSIV™ MEMS microphones, you can create a new user experience benchmark in audio recording.



Talk to tomorrow and be heard!

With XENSIV™ MEMS microphones, you can define the benchmark in speech recognition for a new user experience.



Hear nothing but your favorite beats!

With XENSIV™ MEMS microphones, you can create headsets offering users a benchmark noise cancellation experience.

Features

- > 69 dB(A) signal-to-noise ratio
- > Below 1 percent distortions at 128 dB SPL (130 dB SPL AOP)
- > Digital (PDM) interface with 6 μ s group delay at 1 kHz
- > Tight sensitivity (-36 ± 1 dB) and phase (± 2 deg) tolerances
- > 28 Hz low frequency roll-off

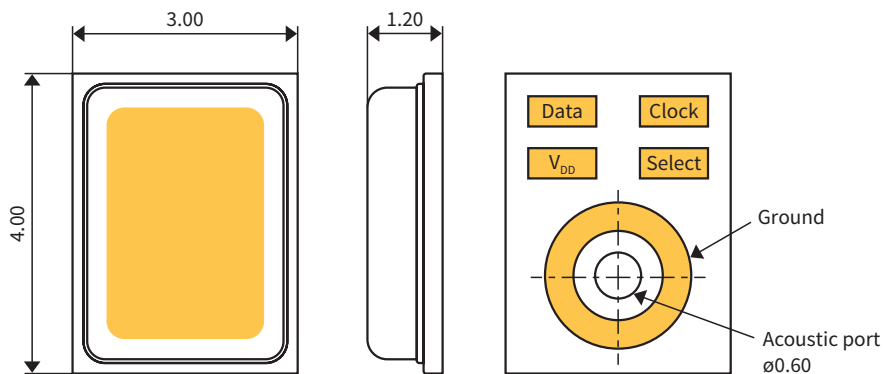
Benefits

- > High fidelity and far field audio recording
- > Matched, noise and distortion free audio signals for advanced audio processing
- > Ultra-low group delay for latency-critical applications
- > No analog components required

MEMS microphones

Time to debottleneck your audio chain

Infinion's dual backplate MEMS technology is based on a miniaturized symmetrical microphone design, similar as utilized in studio condenser microphones, and results in high linearity of the output signal within a dynamic range of 105 dB. The microphone noise floor is at 25 dB[A] (69 dB[A] SNR) and distortion does not exceed 1 percent even at sound pressure levels of 128 dB SPL (AOP 130 dB SPL). The flat frequency response (28 Hz low-frequency roll-off) and tight manufacturing tolerance result in close phase matching of the microphones, which is important for multi-microphone (array) applications.

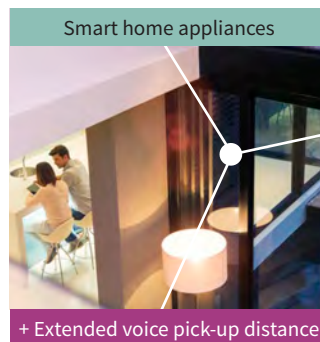


All dimensions in mm

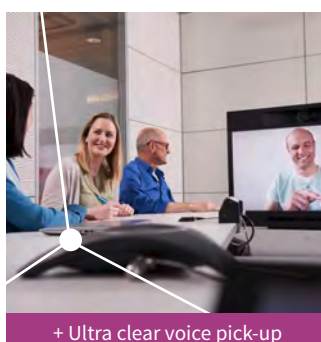
Typical applications

- > High quality audio capturing: e.g. cameras, camcorders, conference systems
- > Voice user interface: e.g. smart speaker, home automation and IoT devices
- > Active noise cancellation: headphones and earphones
- > Audio pattern detection: predictive maintenance, security or safety applications

Devices with voice user interface



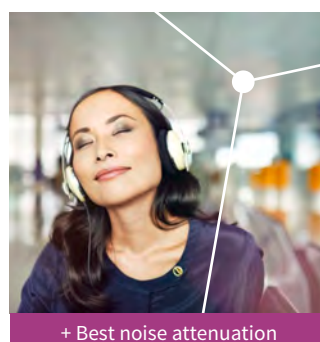
Conference



Security



Headsets



Industry 4.0



Functional safety – ISO 26262



ISO 26262 defines the development of electric and electronic automotive systems with regard to their functional safety. The aim of this standard is to reduce possible hazards caused by the failure and malfunction of such systems. The safety requirements for the development process depend on the ASIL rating of the target application and can range from ASIL A to ASIL D. Applications such as steering or braking systems are rated with the highest ASIL D level. A failure in such a system can lead to an out-of-control vehicle, possibly resulting in fatal injuries.

All newly developed parts, which are addressing a certain safety goal will be based on an ISO 26262-compliant development flow, thereby allowing direct use in all safety-rel-

evant applications. Devices which are developed prior to the ISO 26262 as a QM part can nevertheless be used in ISO-compliant systems as outlined in part 8 clause 13 of the standard. In such cases, it is mandatory “to provide evidence of the suitability of hardware components and parts” for use in ISO-compliant systems and also to provide failure modes, their distribution and diagnostic capability.

To support our customers as they strive to achieve the highest ASIL on system level, Infineon provides PRO-SIL™ ISO 26262-ready products the necessary support for qualification of existing pre-ISO 26262 products, , and fully PRO-SIL™ ISO 26262-compliant products the future:

What does ISO 26262 compliant mean?



Infineon PRO-SIL™ ISO 26262-compliant safety sensors fulfil the properties required by the ISO 26262 (Automotive Safety) Standard. PRO-SIL™ ISO 26262-compliant product development follows a product specific safety plan defined by Infineon. The product development follows the Infineon V-model based development lifecycle which encompasses all ISO 26262 required activities and work products related to the product scope. Product relevant safety requirements and required metrics are captured and verified through the development of the product, this includes the product safety concept and ultimately a product safety case which provides the argumentation and evidence showing achievement of the defined safety requirements and process compliance, including all essential supporting processes.

An independent functional safety management organization supports the ISO 26262 conform safety lifecycle.

For ISO 26262-compliant products a Safety Manual and a Safety Analysis Summary Report can be delivered to our customers* in addition to Infineon standard documentation:

Moreover Infineon offers expert support for system integrators to achieve the required ASIL on system level. Infineon’s activities result in a simplified integration in safety-related applications.

What does ISO 26262 ready mean?



ISO 26262 ready

Infineon PRO-SIL™ ISO 26262-ready sensors are developed according to Infineon's sophisticated Automotive Development and Quality Standards. For ISO 26262-ready products additional functional safety analysis will be provided. ISO 26262-ready enables our customers to use Infineon's (QM) products in safety related applications.

For ISO 26262-ready products Safety Manual and a Safety Analysis Summary Report can be delivered to our customers* in addition to Infineon standard documentation. These reports are provided to customers to serve as building block for their system level safety concept. Moreover Infineon offers expert support for system integrators to achieve the required ASIL on system level. Infineon's activities result in a simplified integration in safety-related applications.

Infineon PRO-SIL™



The functional complexity and levels of integration of real-time, safety-critical applications continue to increase.

Norms such as IEC 61508 and ISO 26262 mandate more robust products and functional safety concepts in automotive and industrial applications.

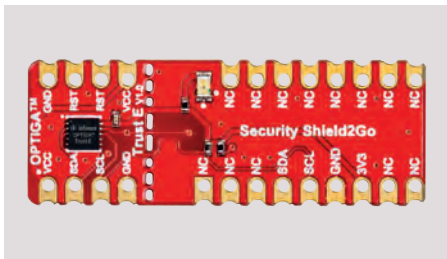
Infineon's PRO-SIL™ trademark designates Infineon products, which contain SIL-supporting (Safety Integrity Level) features. The SIL-supporting features are intended to assist the overall system design in attaining the desired SIL (according to IEC 61508) or A-SIL (according to ISO 26262) level for safety systems with high efficiency. Products with the PRO-SIL™ label will help you to select Infineon products for safety-relevant (automotive) systems.

More information on PRO-SIL™ can be found at www.infineon.com/prosil

Shields 2GO

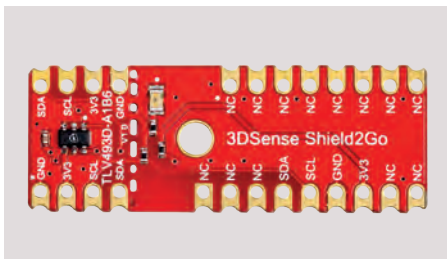
Infineon's 2GO boards offer a unique customer and evaluation experience – the boards are equipped with one Infineon IC and come with a ready to use Arduino library. Customers can now develop their own system solutions by combining 2GO boards together with Infineon MyIoT adapters. MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of IoT system.

Security

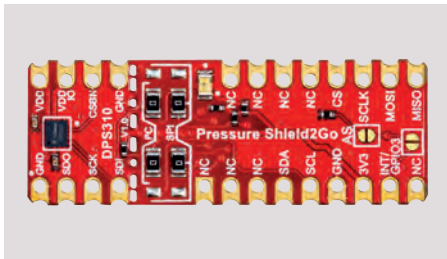


Product name: OPTIGA™ Trust E Security Shield2Go
Sales name: S2Go_Security_OPTIGA_E
SP: SP001820138
More at: <https://www.infineon.com/cms/en/product/evaluation-boards/s2go-security-optiga-e>

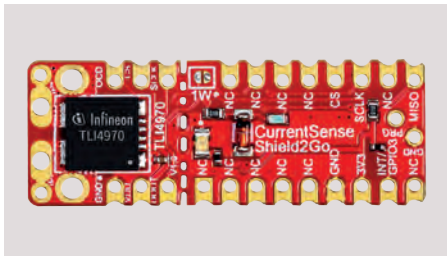
Sensors



Product name: TLV493D 3DSense Shield2Go
Sales name: S2GO_3D-SENSE_TLV493D
SP: SP001823678
More at: https://www.infineon.com/cms/en/product/evaluation-boards/s2go_3d-sense_tlv493d



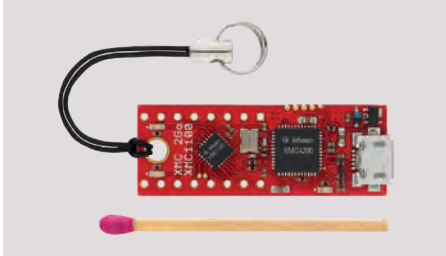
Product name: S2GO Pressure DPS310
Sales name: S2GO_PRESSURE_DPS310
SP: SP001777630
More at: <https://www.infineon.com/cms/en/product/evaluation-boards/s2go-pressure-dps310>



Product name: TLI4970 Current Sense Shield2Go
Sales name: S2GO_CUR-SENSE_TLI4970
SP: SP001823682
More at: https://www.infineon.com/cms/en/product/evaluation-boards/s2go_cur-sense_tli4970

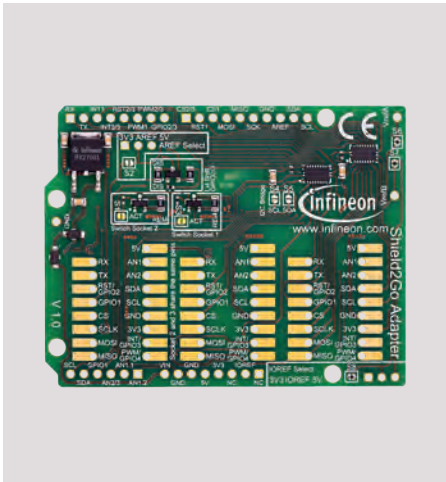
Shields 2GO

Microcontroller



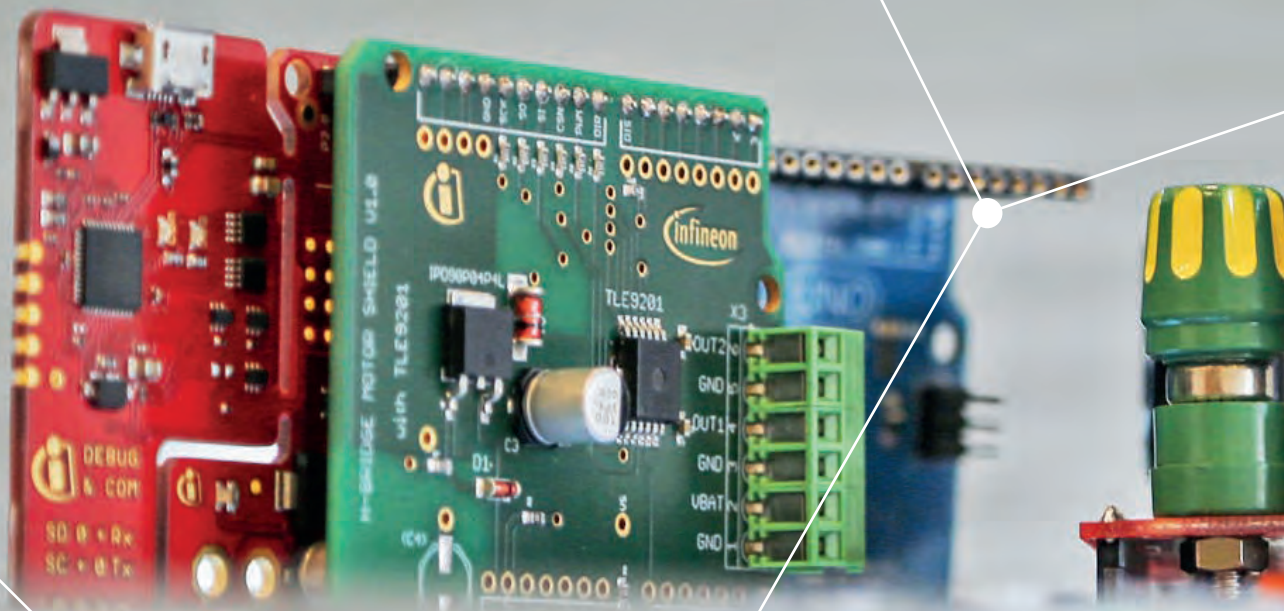
Product name: XMC 2Go Kit
Sales name: KIT_XMC_2GO_XMC1100_V1
SP: SP001199544
More at: https://www.infineon.com/cms/en/product/evaluation-boards/kit_xmc_2go_xmc1100_v1

MyIoT – Adapter



Product name: MyIoT Adapter
Sales name: MYIOTADAPTERTOBO1
SP: SP002434972

Infineon's 2Go boards offer a unique customer and evaluation experience – the boards are equipped with one Infineon IC and come with a ready to use Arduino library. Customers can now develop their own system solutions by combining 2Go boards together with Infineon MyIoT adapters. MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry Pi, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of IoT system.

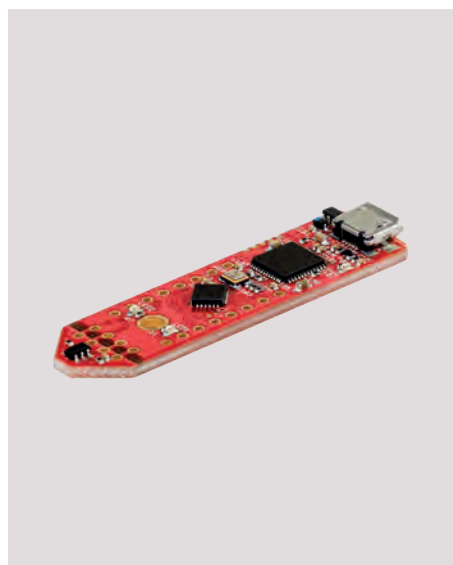


2GO evaluation kits

Smallest, fully featured sensor 2GO evaluation kits for current, low-cost rotational speed, 3D magnetic sensors with optional joystick adapter, rotation knob and linear slider as well as digital barometric air pressure sensor and MEMS microphone.

- > Plug-and-measure evaluation board
- > First measurements possible within minutes
- > Mechanical adapter for 3D magnetic sensor (joystick/rotation knob/linear slider) available for quick evaluation.

Infineon's sensor 2GO kits are new budget-priced evaluation boards that are already equipped with a sensor combined with an ARM® Cortex®-M0 CPU. The sensor 2GO kits provide a complete set of on-board devices, including an on-board debugger. Build your own application and gadget with the sensor 2GO kits. Our 2GO kits are ready-to-use plug-and-play boards.



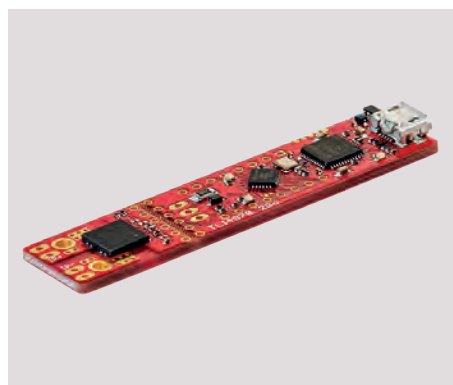
3D magnetic sensor 2GO kit

Product name: TLE493D-A2B6 MS2GO/TLE493D-W2B6 MS2GO/
TLV493D-A1B6 MS2GO

SP: SP001707582/SP001707578/
SP001707574

Features

- > We offer three different derivatives
 - TLE493D-A2B6 (three dimensional magnetic sensor)
 - TLE493D-W2B6 (three dimensional magnetic sensor)
 - TLV493D-A1B6 (three dimensional magnetic sensor)
- > XMC1100 (ARM® Cortex™-M0 based)
- > On-board J-Link Lite Debugger (Realized with XMC4200 Microcontroller)
- > Power over USB (Micro USB), ESD and reverse current protection
- > GUI for free download



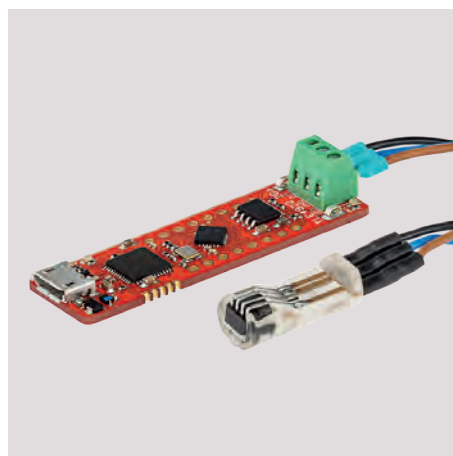
Current sensor 2GO kit

Product name: TLI4970050 MS2GO

SP: SP003119148

Features

- > TLI4970-D050T4 (current sensor with digital interface)
- > XMC1100 (ARM® Cortex®-M0 based)
- > On-board J-link lite debugger (realized with XMC4200 microcontroller)
- > Power over USB (micro USB), ESD and reverse current protection
- > GUI for free download



Speed sensor 2GO kit

Product name: TLE4922 Speed-2-Go-Kit

SP: SP001624692

Features

- > Budget-priced evaluation board for speed sensing
- > Complete speed sensor incl. back-bias magnet, fixing and cable
- > TLE4922 (active mono cell Hall sensor)
- > XMC1100 (ARM® Cortex™-M0 based)
- > On-board J-Link Lite Debugger (realized with XMC4200 microcontroller)
- > Power over USB (Micro USB), ESD and reverse current protection
- > GUI based tool for real in-application evaluation for free download

2GO evaluation kits



Joystick adapter for the 3D magnetic sensor 2GO

Product name: JOYSTICK FOR 3D 2 GO KIT

SP: SP001491834

Features

- > In addition to the 3D magnetic sensor 2GO evaluation kit, Infineon also offers the new joystick adapter, which can be easily mounted on the evaluation board
 - First magnetic joystick measurements within minutes
- > The user manual in the download area precisely explains usage, mounting and functionality

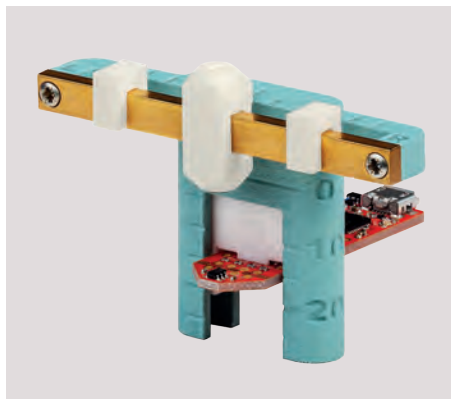
Rotation knob for the 3D magnetic sensor 2GO

Product name: ROTATE KNOB 3D 2 GO KIT

SP: SP001504602

Features

- > Rotate and push button control element
- > Simulates rotational and angle sensing movements
- > The user manual in the download area precisely explains usage, mounting and functionality



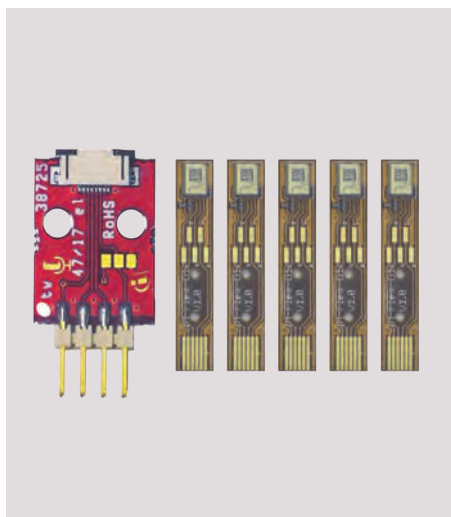
Linear slider for the 3D magnetic sensor 2GO

Product name: LINEAR-SLIDER 2GO

SP: SP002043034

Features

- > Easy mounting on 3D Magnetic Sensor 2GO
- > First magnetic Linear evaluations within minutes
- > Flexible setup: adaptable airgaps, two different magnetic strengths/ materials and distance limiters



MEMS 2Go

Product name: EVAL_IM69D130_FLECKIT

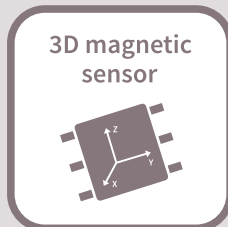
SP: SP002153022

The flex evaluation kit allows simple and easy evaluation of XENSIV™ MEMS microphone IM69D130. The flex board can be easily connected to audio testing setup. The evaluation kit includes five IM69D130 mounted on flex board and one adapter board.

Features

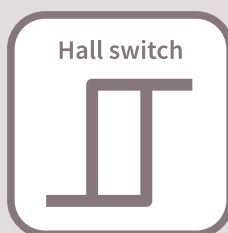
- > Quick and easy evaluation of XENSIV™ MEMS microphones
- > Flex dimensions: 25 x 4.5 mm
- > Adapter dimensions: 20 x 15 mm

Our simulation tools will guide you in identifying the most suitable Infineon sensor IC combined with the best-fit magnet



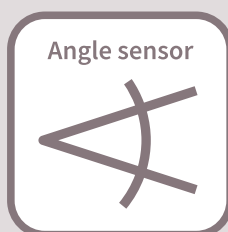
The magnetic design tool for 3D magnetic sensors

- › Covers some typical applications which can be addressed with 3D magnetic sensors:
 - Angle measurement (rotational movement of the magnet)
 - Linear position measurement (linear movement of the magnet)
 - Joystick (3D movement of the magnet)
- › The tool provides pre-defined or user-customized magnets for each of the three applications
- › The tool automatically calculates the three magnetic field components at the sensor location. Calculation is based on the sensor arrangement defined by the user.
- › Direct link to the 3D magnetic sensors simulation tool: <https://design.infineon.com/3dsim/>



The simulation tool for Hall switches

- › A highly efficient and easy-to-use way of simulating Hall switch applications
- › This results in an accurate simulation of the magnetic field and the switching behavior of the Hall switch in the application
- › Position detection with Hall switches can be optimized on magnet parameters, magnet-to-sensor distance and Hall switch parameters
- › Capable of downloading the simulation results, simulation parameters and datasheets
- › Direct link to the Hall switches simulation tool: <https://infineon.transim.com/Halldesk/pages/appfinder.aspx>



The magnetic design tool for angle sensors

- › Designed to support xMR-based angular sensors and diametrically magnetized disk magnets
- › Calculates the valid distance from the magnet surface to the sensor and the assembly error, given certain parameters:
 - Magnetic properties
 - Sensor specification
 - Assembly tolerances
- › Direct link to the angle sensors simulation tool: <http://sensors.your-infineon.com/index.html>

All simulation tools can be easily accessed via this link: <https://www.infineon.com/cms/en/product/sensor/#!simulation>

Packages

DSO-8/TDSO-8



TDSO-16



DSOF-8



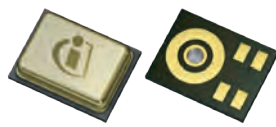
DSOSP-14-6



DSOSP-14-82



LLGA-5



SC59



SOT23



TSOP6



TISON-8



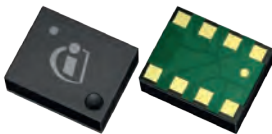
TQFP-48 PGN



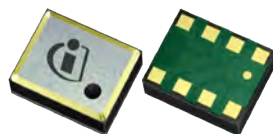
TSNP-16



VLGA-8-1



VLGA-8-2



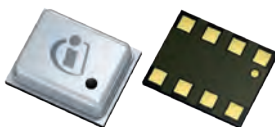
VQFN-32



WFWLB-112 (eWLB)



WLGA-8



For further information on Infineon packages, please visit our website at www.infineon.com/packages

SSO-2-1



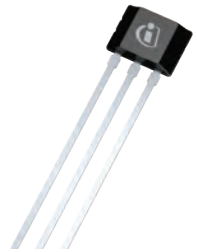
SSO-2-4



SSO-2-53



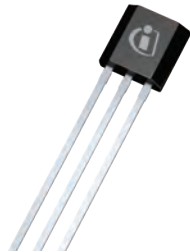
SSO-3-2



SSO-3-9/SSO-3-52



SSO-3-10



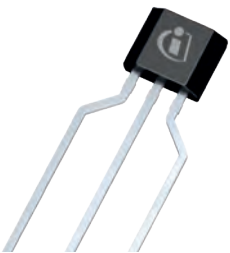
SSO-4-1



T092S-3-1



T092S-3-2



Where to buy

Infiniteon distribution partners and sales offices:

www.infineon.com/WhereToBuy

Service hotline

Infiniteon offers its toll-free 0800/4001 service hotline as one central number, available 24/7 in English, Mandarin and German.

- > Germany 0800 951 951 951 (German/English)
- > China, mainland 4001 200 951 (Mandarin/English)
- > India 000 800 4402 951 (English)
- > USA 1-866 951 9519 (English/German)
- > Other countries 00* 800 951 951 951 (English/German)
- > Direct access +49 89 234-0 (interconnection fee, German/English)

* Please note: Some countries may require you to dial a code other than "00" to access this international number.
Please visit www.infineon.com/service for your country!



Mobile product catalog

Mobile app for iOS and Android.

www.infineon.com

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Additional information

For further information on technologies, our products, the application of our products, delivery terms and conditions and/or prices, please contact your nearest Infineon Technologies office (www.infineon.com).

Warnings

Due to technical requirements, our products may contain dangerous substances. For information on the types in question, please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by us in a written document signed by authorized representatives of Infineon Technologies, our products may not be used in any life-endangering applications, including but not limited to medical, nuclear, military, life-critical or any other applications where a failure of the product or any consequences of the use thereof can result in personal injury.