XENSIV™ – sensing the world

Sensor solutions for automotive, industrial, consumer and IoT applications

Edition 2025/2026

www.infineon.com/xensiv

Dear valued customer,

Thomas Schafbauer,
Executive Vice President
Sensor Units & RF

Sensors are driving intelligence across industries, linking the real and the digital world. Our advanced sensor solutions are enabling new use cases and accelerating innovation across industries. By providing precise and reliable data for optimum performance and contextual awareness. Delivering unmatched safety and reliability in sensor-based solutions for our daily life – from vehicles to smart homes.

The world has been changing since the proliferation of AI. The need for high-quality data and advanced decision-making drives the adoption of sensors in basically all applications.

Let me list some examples:

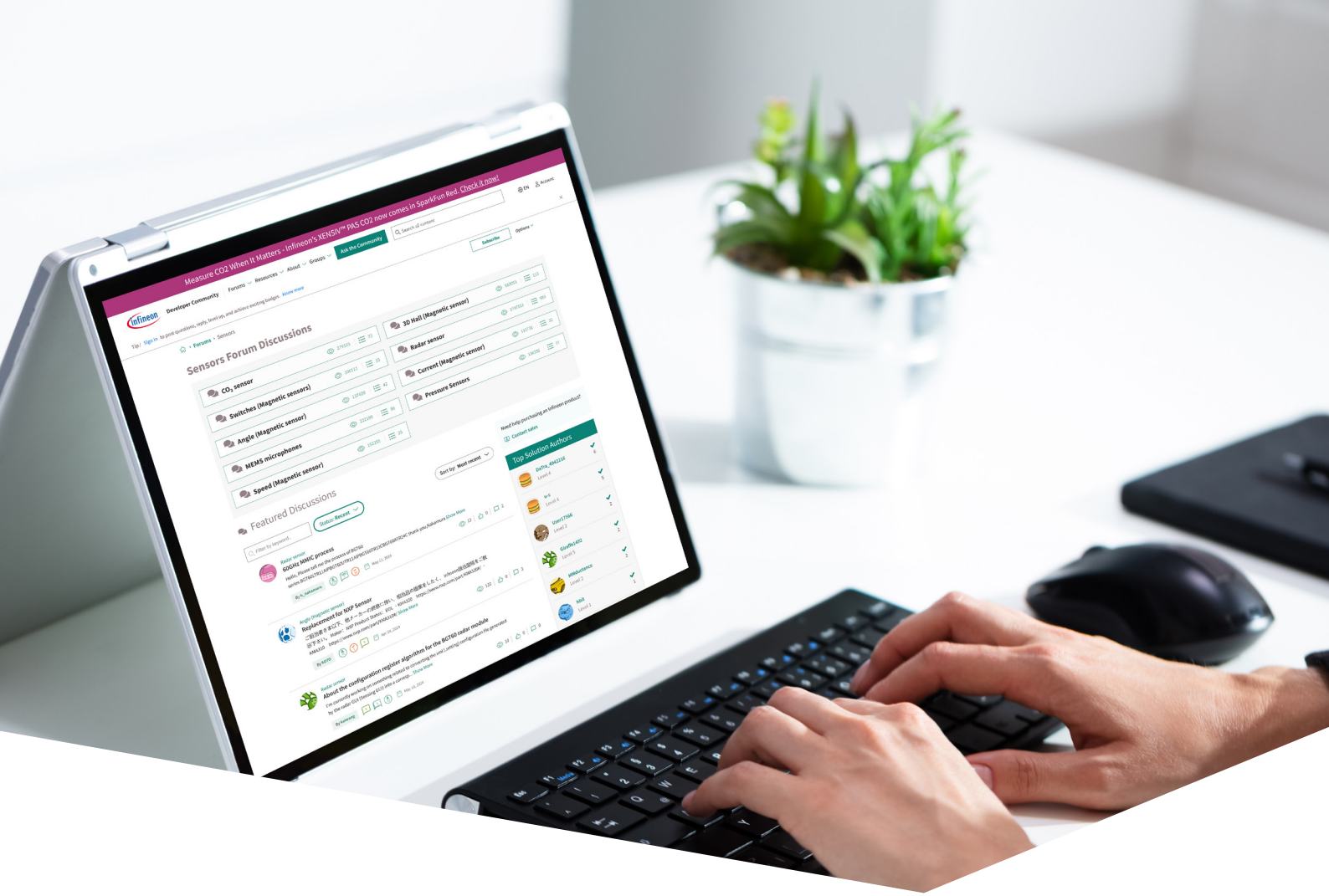
- Infineon's microphones based on high-end microelectromechanical systems (MEMS) are growing beyond smartphones and wearables in all objects
- Infineon radar solutions enable reliable object recognition e.g. in autonomous driving and cobots
- Infineon's magnetic sensors are already widely spread in cars and are now expanding rapidly into current sensing and consumer applications
- Human Machine Interfaces (HMI) and gas/pressure monitors allow for context-aware devices

That is why Infineon combined all of its Sensor and Radio Frequency portfolio into one business unit in January 2025. It represents Infineon's third key product pillar besides power and microcontroller, serving the automotive, industrial, and consumer markets.

The Infineon Sensing Guide 2025–2026 is a comprehensive reference of our vast sensing portfolio and technological advancements. I hope it can serve as a source of inspiration, how our sensors serve you in your journey of digitalization and decarbonization. Together.

Thomas Schafbauer,
Executive Vice President Sensor Units & RF

Contents



Ask the Infineon Developer Community

The Infineon Developer Community offers 24/7 self-service and lightning fast responses to customer demands. Any user, anywhere, anytime – any subject. The community is well-organized due to its multi-channel strategy. Unlike unmoderated forums, the developer community is based on high quality content that is professionally moderated and reviewed.

Check it out and be part of the Infineon Developer community.

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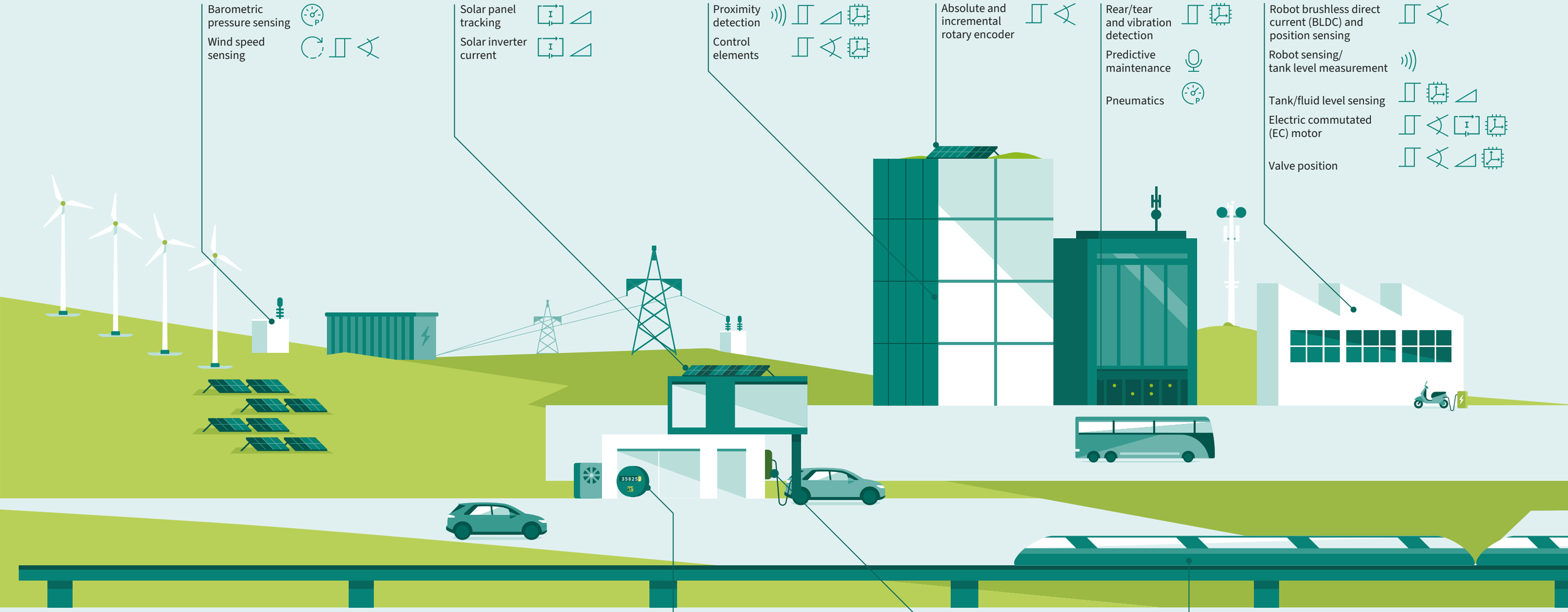
www.infineon.com/radar

XENSIV™ sensors in smart industry



Magnetic switches
Pressure sensors
Radar sensors
Linear sensors
3D magnetic sensors
MEMS microphones
Current sensors
Speed sensors
Angle sensors

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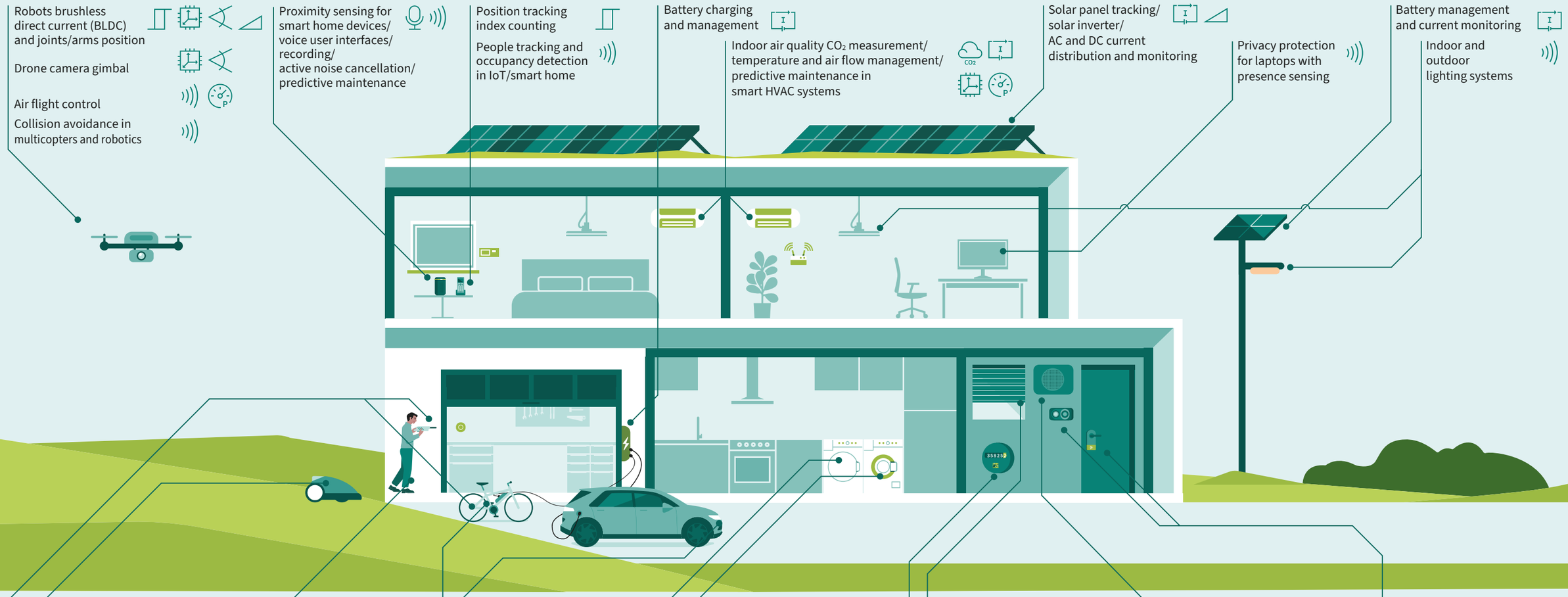
XENSIV™ sensors in smart homes



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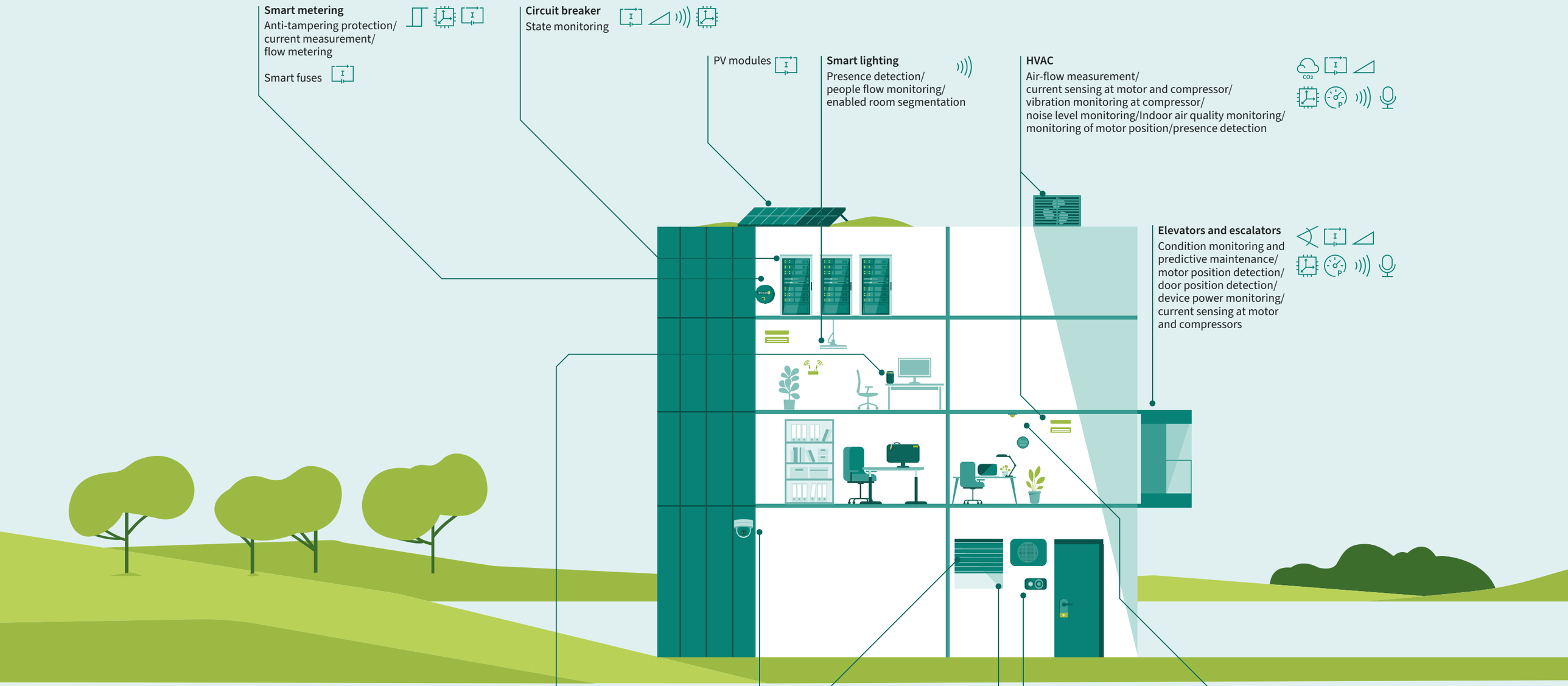
XENSIV™ sensors in smart buildings



Smart metering
Anti-tampering protection/
current measurement/
flow metering

Smart fuses

Circuit breaker
State monitoring

PV modules

Smart lighting
Presence detection/
people flow monitoring/
enabled room segmentation

HVAC
Air-flow measurement/
current sensing at motor and compressor/
vibration monitoring at compressor/
noise level monitoring/Indoor air quality monitoring/
monitoring of motor position/presence detection

Elevators and escalators
Condition monitoring and
predictive maintenance/
motor position detection/
door position detection/
device power monitoring/
current sensing at motor
and compressors

Voice control and VUI
Audio/presence

Shutters
Position detection

Surveillance cameras
Presence detection for
switching camera on & off/
perimeter monitoring
outside of the building

Access control
Security systems/
open/close detection

Intrusion detection
Glass break/
presence detection

Room automation
Presence detection/
indoor air quality monitoring/
noise level monitoring

Magnetic switches · Pressure sensors · Radar sensors · Linear sensors · 3D magnetic sensors · MEMS microphones · Current sensors · CO2 sensors · Angle sensors

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XENSIV™ sensors in body electronics

HVAC flaps

Wipers

Control element/ top column module

Gear stick

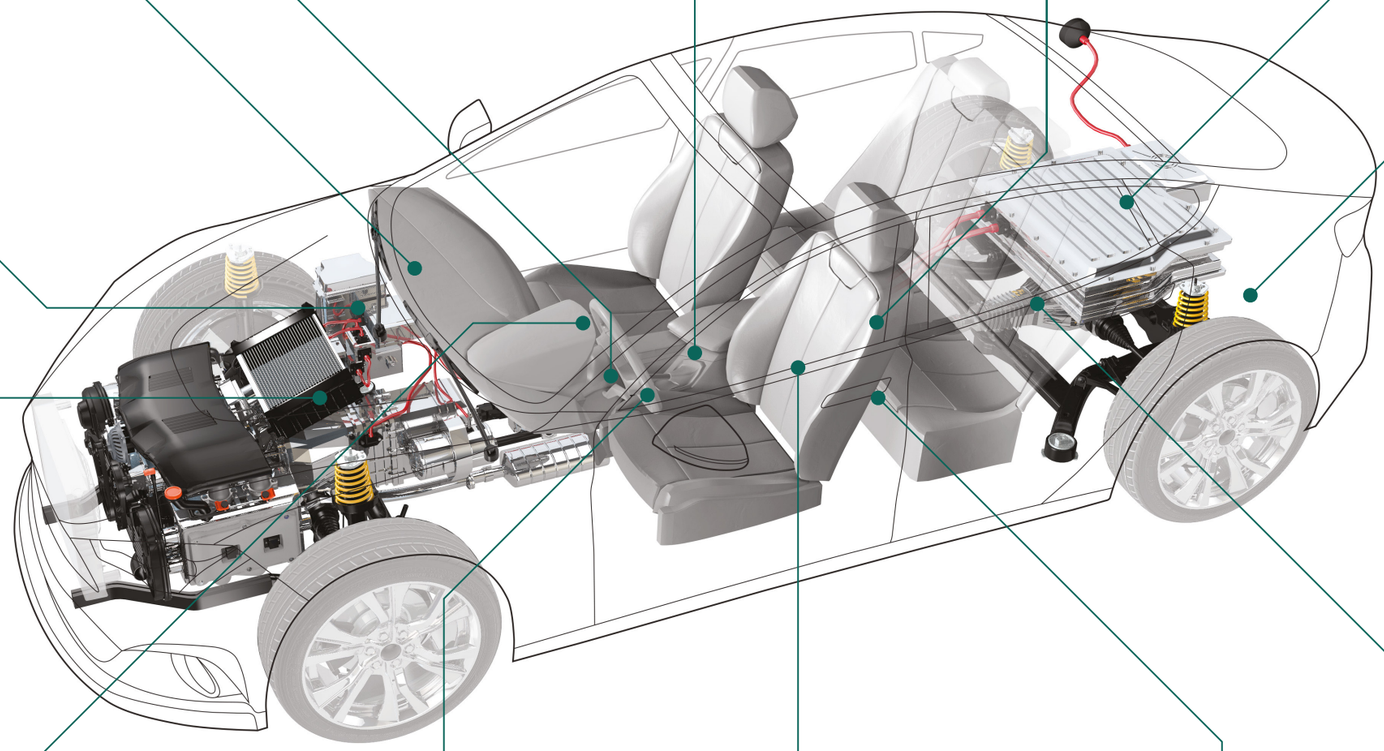
Direction indicator

Power seat

Battery monitoring

Road condition detection

Damage detection



Voice interaction

Emergency call (e-call)

In cabin communication (ICC)

Acoustic noise cancellation (ANC)

Hands free (HF)

HVAC compressor

Steering lock/ immobilization

Seat comfort

Door module

Window lifter/sun roof

Magnetic switches

Linear sensors

Angle sensors

Current sensors

Pressure sensors

3D magnetic sensors

MEMS microphones

www.infineon.com/body-electronics

XENSIV™ sensors in powertrain systems

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)

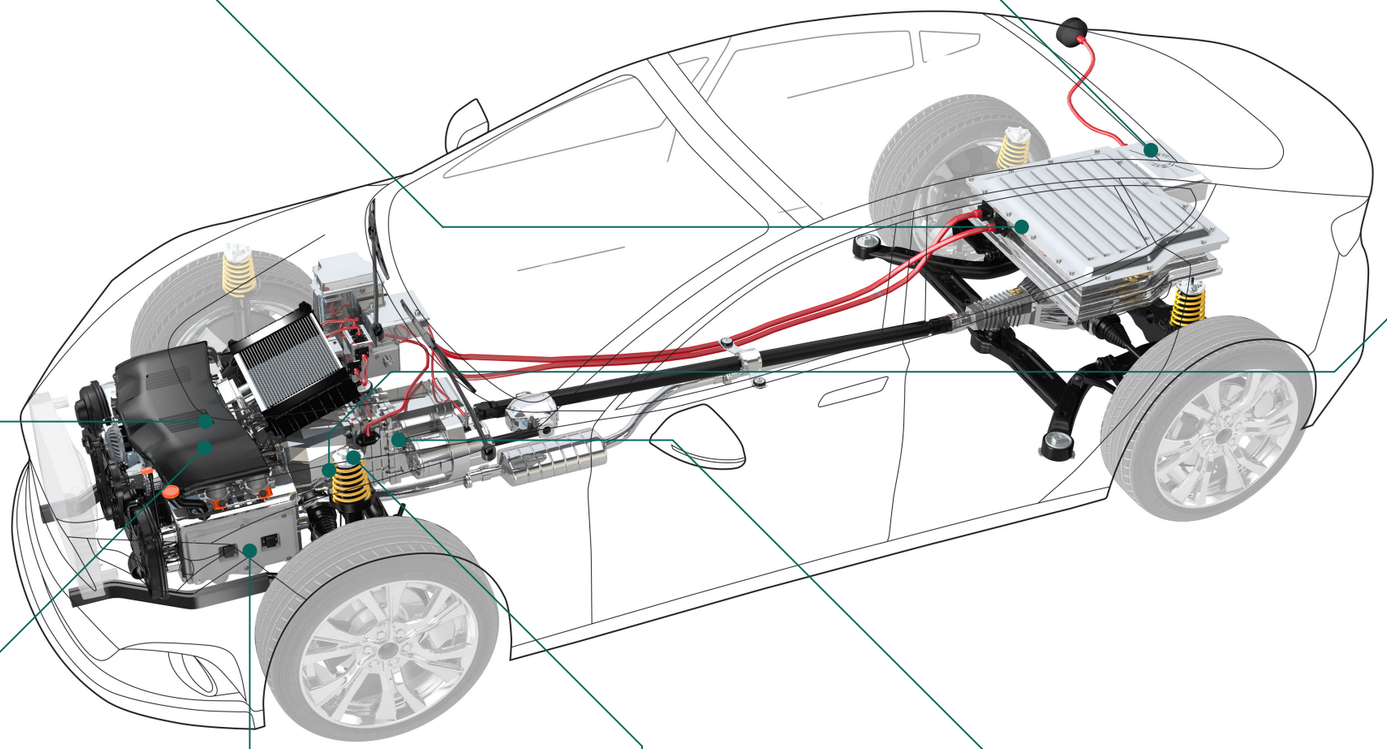
Transmission

- Clutch position
- Clutch actuator
- Transmission speed
- Transmission actuator
- Transmission gear position
- Oil pump
- Park lock
- Gear stick

Battery monitoring for EV

HV battery disconnect for xEV

On board charger (OBC)



DC-DC converter

Barometric air pressure

Starter generator

Transfercase

Magnetic switches · Linear sensors · Angle sensors · Current sensors · Pressure sensors · Speed sensors · 3D magnetic sensors

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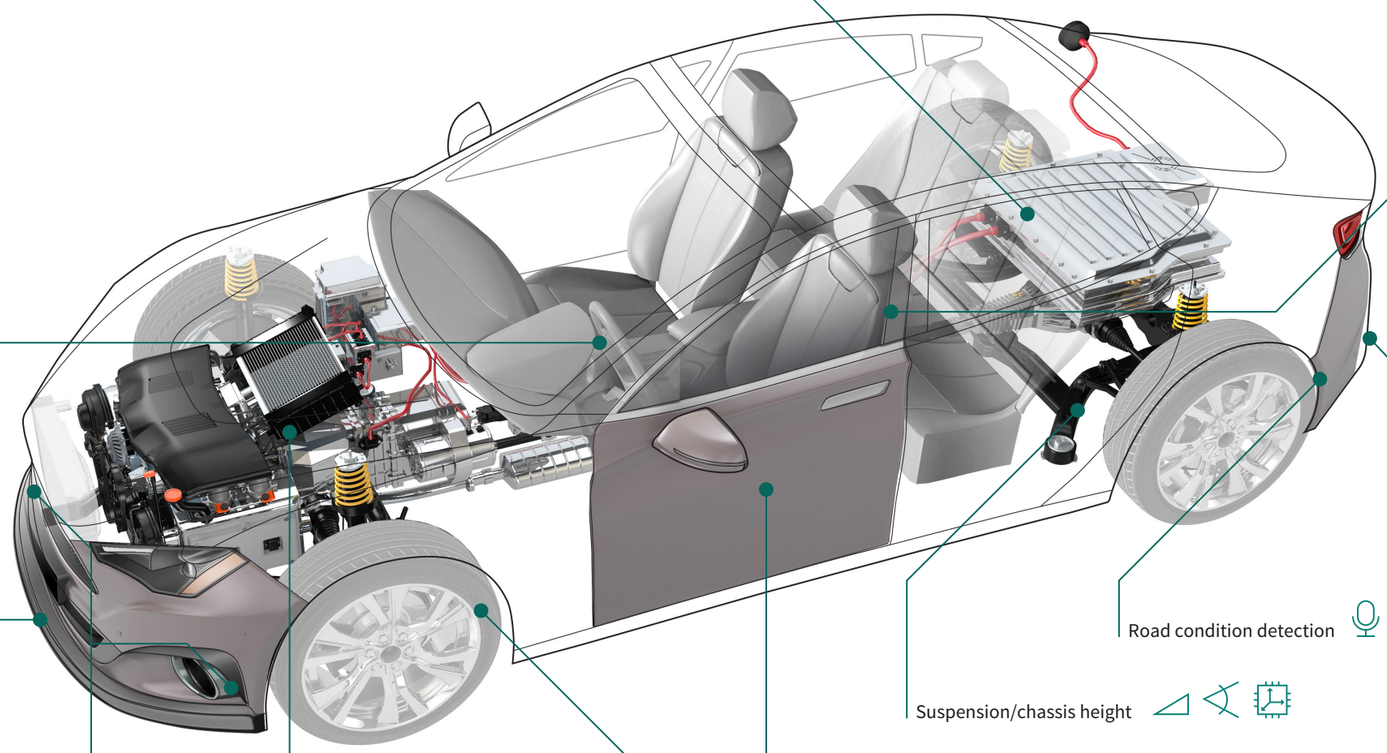
XENSIV™ sensors in chassis, safety and ADAS

Electric power steering (EPS)

- Steering torque
- Rotor position
- Steering angle

- Battery monitoring for EV
- Seatbelt buckle
- Seat position system
- Belt pretensioner



- Road condition detection
- Suspension/chassis height
- Side crash detection
- Wheel speed
- Tire pressure monitoring system (TPMS)
- Indirect TPMS system (iTPMS)
- Brake booster
- Brake pedal
- Brake light switch
- Pedestrian protection
- Radar
- Emergency vehicle detection/ autonomous parking (at the four vehicle corners)

Magnetic switches · Linear sensors · Angle sensors · Pressure sensors · Tire pressure sensor (TPMS) · 3D magnetic sensors · Radar sensors · Speed sensors · MEMS microphones

www.infineon.com/chassis-safety-adas

XENSIV™ current sensors

XENSIV™ high-precision coreless current sensors for automotive and industrial

Used to measure both AC and/or DC currents, Infineon's current sensors provide accurate and stable current measurement up to 160 A with integrated current rail packages (iCR) and magnetic fields up to 41 mT with external current rail packages (eCR), equivalent to 2000 A on external busbars. The products are intended for use in 48 V and high voltage and/or wide-bandgap applications such as traction inverters, industrial drives, photovoltaic inverters, or EV charging systems.

Infineon's XENSIV™ family of high-precision coreless open-loop current sensors is less bulky and costs less than core-based current sensors. Based on Infineon's precise and stable Hall effect current sensor IC technology, the current sensor analog output signal is highly linear over temperature and lifetime. Our newly released TMR sensors offer a high signal-to-noise ratio, low power consumption, and a high bandwidth of 1 MHz. Due to lacking an iron core or a flux concentrator, the sensor signal shows neither hysteresis nor does it suffer from saturation.

The differential current sensor measurement with two Hall cells ensures high accuracy even in a noisy environment like crosstalk from adjacent current lines or magnetic stray fields. System designers can program the sensitivity of the sensor as well as the threshold levels of up to two dedicated overcurrent signals and adapt them to individual requirements without any external components. The contactless current sensor IC also provides advanced diagnostic features for functional safety compliant with ISO 26262.

Product portfolio

On the one hand, we have the current sensors with an integrated current rail. The sensors in the TISON package allow accurate measurement with high frequencies and a small impact on the phase shift of the current signal. On the other hand, our current sensors for external current rails are non-invasive Hall effect current sensors and provide safe and reliable solutions for power electronics since there is no additional power dissipation. Our selection of isolated, non-contact current sensors can be used for current detection and monitoring in SiC and GaN applications, including motor control applications.

Click here to learn more:

www.infineon.com/magnetic-sensors
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TLx4971 in DSO-16 (300 mm) coreless magnetic current sensor

The TLx4971 current sensor, currently in mass production in the TISON-8 package, is also available in a DSO-16 (300 mm) package. This new package offers 8 mm clearance and creepage, isolation up to 1.7 kVpk (repetitive isolation voltage), and supports currents from 15 Apk to 50 Apk, with a continuous current rating of 45 Arms at 105°C. The DSO-16 version improves accuracy compared to the TISON-8 (1% vs. 2%) while maintaining the same bandwidth and overcurrent detection performance.

Potential applications

The TLI4971/TLE4971 is suitable for AC as well as DC measurement applications:

- Electrical drives
- Current monitoring
- On-board Charger
- Auxiliary drives
- Inverters
- Overcurrent detection (OCD) etc.

Product validation

The “TLE” variant is validated according to AEC-Q100, Grade 0.
The "TLI" variant is UL certified according to UL-1577.
Qualified for automotive applications

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [µA/√Hz]	Certification	Automotive	Industrial	Current rail	Package
TLI4971-A016W2-U-S0001	16	210 typ.	76	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A020W2-U-S0001	20	210 typ.	61	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A030W2-U-S0001	30	210 typ.	40	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A035W2-U-S0001	35	210 typ.	35	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A040W2-U-S0001	40	210 typ.	30	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A050W2-U-S0001	50	210 typ.	23	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLE4971-A016W2-S0001	16	210 typ.	76	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A020W2-S0001	20	210 typ.	61	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A030W2-S0001	30	210 typ.	40	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A035W2-S0001	35	210 typ.	35	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A040W2-S0001	40	210 typ.	30	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A050W2-S0001	50	210 typ.	23	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50

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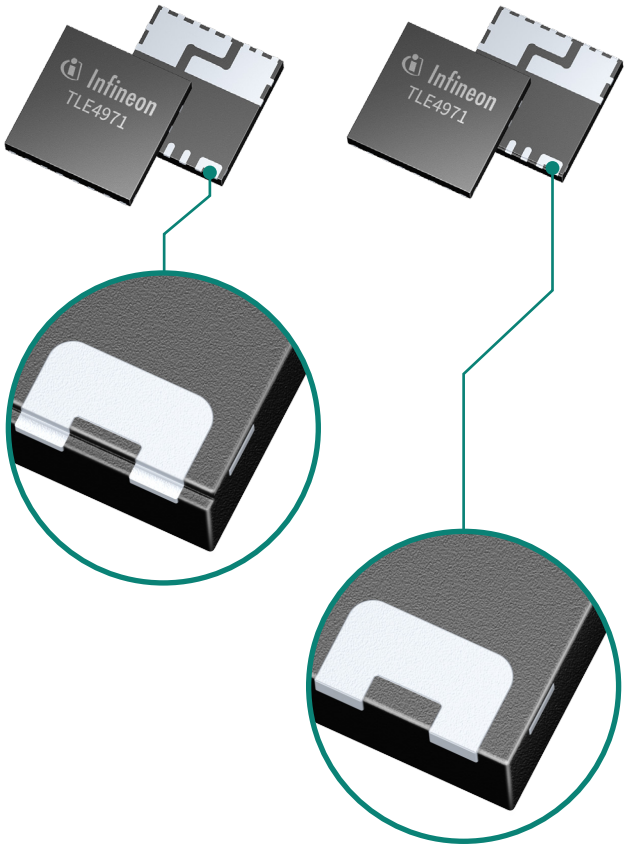
www.infineon.com/magnetic-sensors
www.infineon.com/current-sensors
www.infineon.com/inductive-position-sensing
www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

TLx4971 in PG-TISON-8-5 and PG-TISON-8-6
High-precision coreless current sensor for automotive and industrial applications

The Infineon TLE4971 is a precise current sensor for bidirectional AC and DC measurement up to 120A. A coreless, open-loop design based on Hall effect technology eliminates issues like saturation and hysteresis common in traditional core-based sensors, providing highly linear and accurate readings. Its unique double U-shaped current rail and differential signal sensing provide immunity to stray magnetic fields. The sensor features an analog interface, two fast overcurrent detection outputs for power circuit protection, and galvanic isolation. Delivered fully calibrated in a small 8x8 mm TISON-8 package suitable for SMD assembly, it requires no end-of-line calibration. Furthermore, it is reprogrammable for various parameters, allowing for application-specific optimization in areas like industrial drives, xEV auxiliary drives, PV inverters, DC fast chargers, and on-board chargers (OBCs).

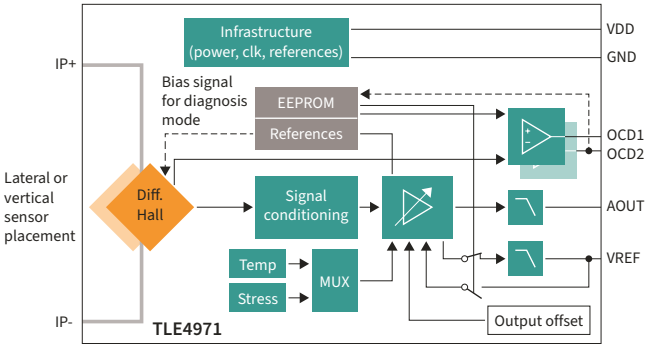
Difference between TISON-8-6 and TISON-8-5



Features and benefits

- Measurement up to 70 A_{RMS} at 690 V_{RMS}
- Typical error at 25°C <2%
- Current rail resistance at 220 µΩ and inductance <1 nH specified type
- Analog output signal (with typ. 210 kHz) bandwidth
- Fast (<0.7 µs) overcurrent detection up to 2 x IFSR
- 4 mm clearance and creepage, 975 Vpk Isolation
- AEC-Q100 Grade 1 qualified (125°C) for the TLE variant
- Ultralow power loss due to minimal resistance of current rail
- Reliable current measurement over lifetime (no re-calibration)
- Functional isolation for high-voltage application
- Easy and compact package allows high-power density design
- Pre-programmed variants for 25, 50, 75, and 120 A
- High accuracy, low noise analog output

Block diagram



Due to its low resistance and inductance, the TLE4971's integrated current rail minimizes power loss and allows for a compact sensing circuit. The analog output (AOUT) offers flexible configuration options, including single-ended, semi-differential, and fully-differential modes, in conjunction with the voltage reference pin (VREF). Two independent overcurrent outputs (OCD1 and OCD2) trigger rapid fault detection when the current surpasses a predefined threshold.

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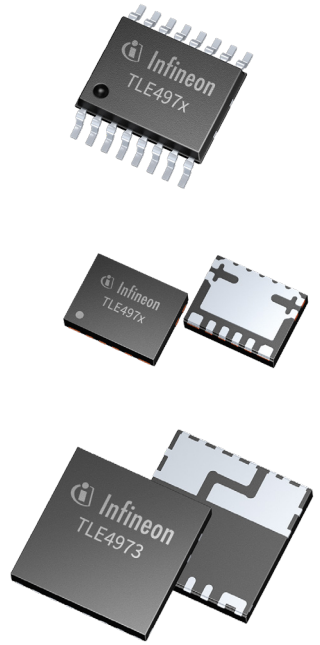
TLE4972/TLE4973
High-precision coreless current sensors for automotive and industrial applications

The Infineon TLE4972/3 product family of coreless magnetic current sensors specifically address requirements for current sensing in automotive applications. The well-established and robust Hall technology enables accurate and highly linear current measurements of the magnetic field induced by the current. With its compact design and ISO 26262 compliant ASIL rating with advanced diagnostic mode and easy low voltage programming, the TLE4973 in 5 V with ratiometric output and external current rail package is ideal for high current safety relevant xEV applications like traction inverters used in hybrid and battery-driven vehicles, as well as for battery main switches.

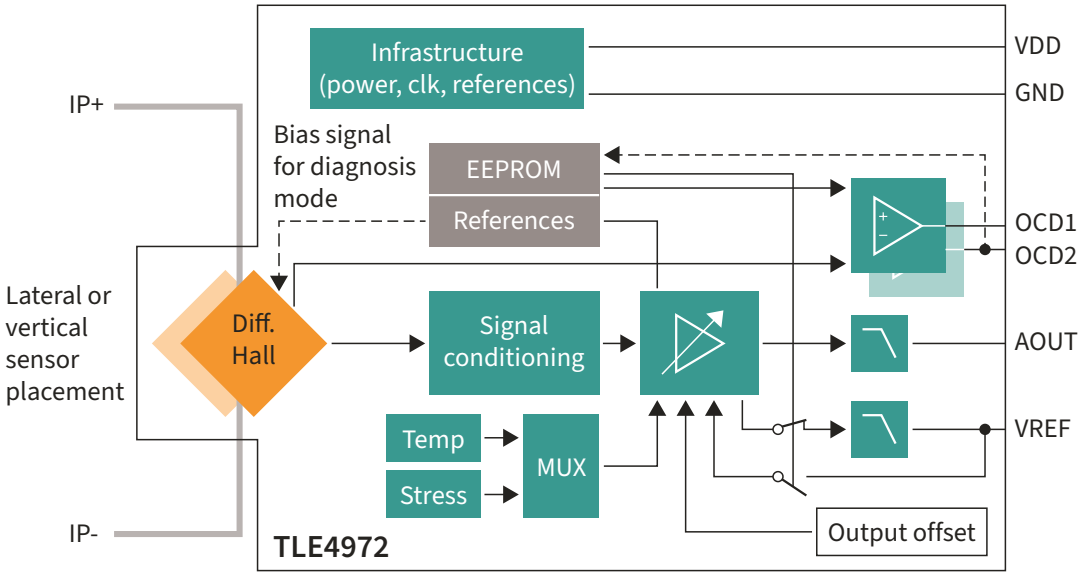
The TLE4973 in TISON package with internal current rail is capable of a low internal resistance and a high heat dissipation capability through its large soldering pads, making it suitable to handle high current up to 70 A continuous at high temperatures and measure up to 160 A peak on PCB in drives and PV inverters.

Features and benefits

- AC and DC Hall-based current sensor
- Differential measurement principle for coreless operation with no saturation or hysteresis effects
- High accuracy with very low error over temperature and lifetime
- Fast reaction time of analog sensor output with 210 kHz bandwidth
- Fast overcurrent detection to protect wide band gap SiC and GaN switching devices
- Up to two dedicated pins for overcurrent detection
- Scalable sensitivity ideal for platform designs
- One wire low voltage programming for up to 8 sensors
- ASIL B as SEooC, ISO 26262-compliant for simplified functional safety assessment



Block diagram



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www.infineon.com/mems
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www.infineon.com/radar

TLI5570 in SOT23-6 pin package

The XENSIV™ TLI5570-AE35E1-E0001 is a high-precision miniature coreless magnetic sensor for AC and DC measurement. Our revolutionary, robust, highly linear monolithic Tunnel Magnetoresistance (TMR) technology enables accurate current measurement. With a bandwidth of more than 1.1 MHz, this sensor provides a non-amplified high-speed differential analog output signal to be directly connected to replace shunts.

Utilizing Infineon's new and highly linear TMR technology, this coreless sensor can measure currents accurately from 0 to ±1000 A. In particular, the very high signal-to-noise ratio performance of the TMR technology enables precise measurements even in applications with lower currents. Suitable for both AC and DC currents, the sensor's bandwidth of over 1 MHz delivers a non-amplified, high-speed differential analog output signal for direct connection to amplification stages. Our new-generation TMR sensor provides superior temperature and lifetime stability thanks to Infineon's extensive experience in magnetoresistive sensor technologies. Its industrial-grade qualification enables operation in harsh environments up to 125°C.

Potential applications

The TLI5570, a cost-effective shunt-replacement, is suitable for AC as well as DC current measurement applications:

- Power tools
- Home appliances
- Drones and Robotics
- Auxiliary drives
- Inverters
- PV Optimizers

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [µA/√Hz]	Certification	Automotive	Industrial	Current rail	Package
TLI5570-AE35E1-E0001	35	>1100	4.8	5%	5 typ.			✓	External	PG-SOT23-6

Click here to learn more:

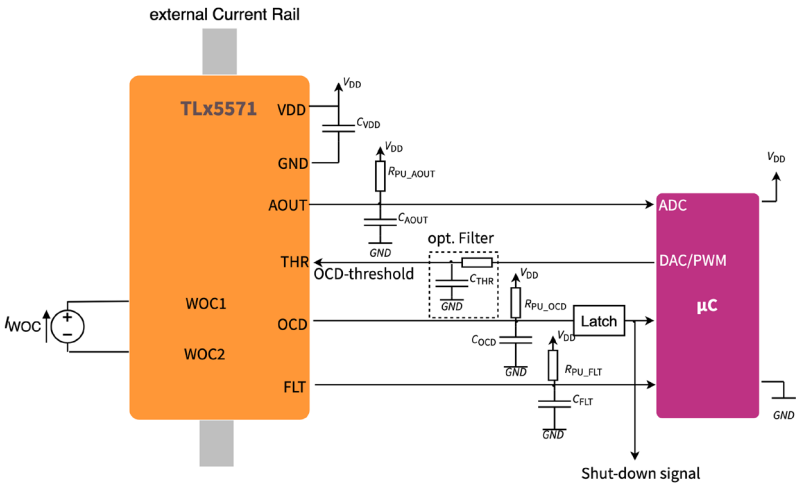
www.infineon.com/magnetic-sensors
www.infineon.com/current-sensors
www.infineon.com/inductive-position-sensing
www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

TLE5571*

Fast overcurrent detection sensor for protection applications

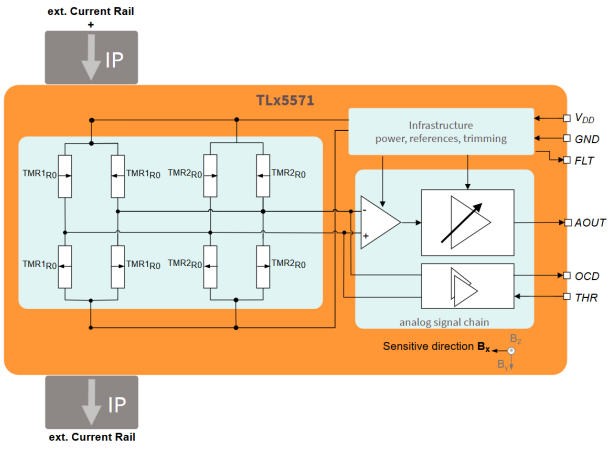
The XENSIV™ TLE5571 is a differential Tunnel Magnetoresistance (TMR) based coreless current sensor with ultrafast single-ended analog output and overcurrent detection (OCD) with a programmable threshold. With a dedicated fault pin to report internal failures and an ASIL C compliant with ISO 26262, the device is particularly suitable for fast protection in automotive and industrial applications such as HV efuse and solid-state circuit breakers (SSBC) that require current sensing with minimal input to output delay.

Application diagram



Features and benefits

Key features	Key benefits
– 2.5 MHz bandwidth with 200 ns analog output response time	– Fast protection in HV power distribution units from 100 A on PCB to kA on busbar
– Ultrafast 150 ns OCD with programmable threshold	– Compact solution, reduces footprint and component count on PCB
– Full scale from 5 to 35 mT differential field immune against external stray field	– Flexible sensor placement with possibility for sensing current on high side
– Contactless isolated magnetic sensor with external current rail	– Low resistance and no parasitic inductance effect for highest system efficiency
– ISO 26262 Safety Element out of Context for safety requirements up to ASIL C	– Prevents false OCD trigger due to internal fault and simplify functional safety



The TLE5571 measures a magnetic field via two differential TMR bridges. The signal is fed into a first stage of amplification (OTA) and then through a high-bandwidth and high slew rate differential amplifier, which provides a single-ended output signal on the AOUT pin.

The OCD pin latches whenever the input differential field exceeds the threshold programmed on the THR pin. In case of internal failures, the sensor provides fault information on the FLT pin without affecting the OCD.

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www.infineon.com/co2
www.infineon.com/current-sensors
www.infineon.com/mems
www.infineon.com/radar

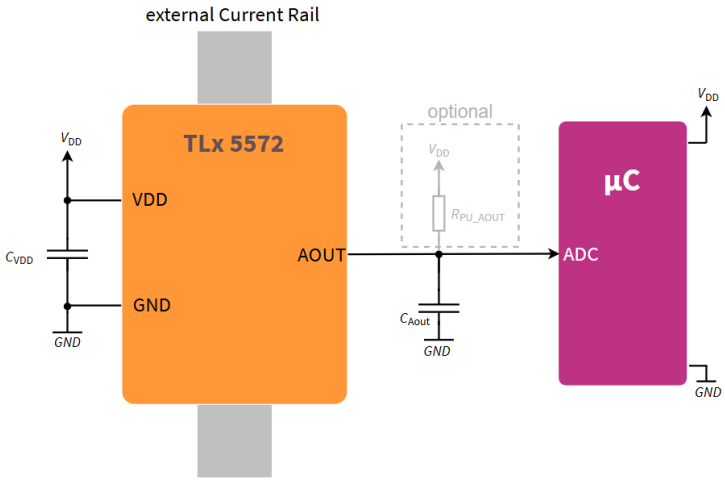
* Coming soon

TLx5572*

Cost competitive current sensor for Shunt and OpAmp replacement

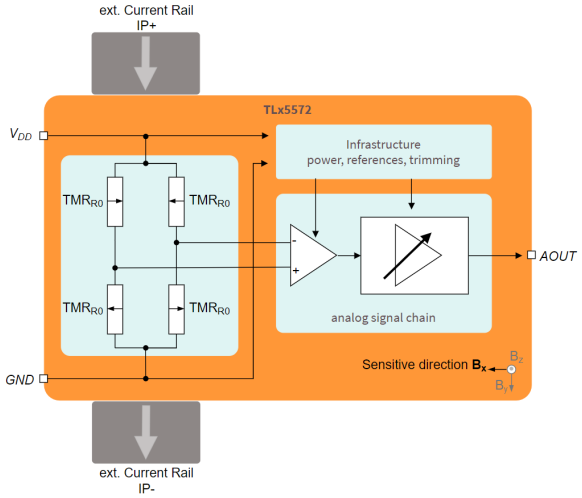
The XENSIV™ TLx5572 is a monocell TMR-based current sensor in a small and cost-competitive SOT23 package, which can replace a shunt and an OpAmp with a single component. The TLx5572 offers intrinsic isolation from the external current rail, with the benefit of reducing insertion resistance and allowing direct in-phase current measurement in automotive and industrial drives. And with its ultrafast response time, it also provides a suitable solution for fast protection.

Application diagram



Features and benefits

Key features	Key benefits
– Small 2.4 x2.9mm SOT23 package	– Cost competitive compact solution, reduces footprint and component count
– Isolated current measurement on external current rail	– Enable direct in-phase measurements in motor drives
– Wide full-scale measuring range from 4 mT to 39 mT	– Low resistance and no parasitic inductance effect for highest system efficiency
– High 1 MHz bandwidth with ultrafast 100 ns analog output	– Suitable to measure currents from 30 A on PCB to kA on busbar
– Available in 3.3 V and 5 V supply	– Fast protection for wide bandgap switching devices in automotive and industrial



The TLx5572 measures a magnetic field via a TMR bridge. The signal is fed into a first stage of amplification (OTA) and then through a high-bandwidth and high slew rate differential amplifier, which provides a single-ended output signal on the AOUT pin. The TLx5572 is compatible with 3.3 V and 5 V supplies.

USB PD charger | Adapter | Consumer | Smartphone charger

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www.infineon.com/mems
www.infineon.com/radar

* Coming soon

Current sensors – overview

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [µA/√Hz]	Classification	Indus-trial	Auto-motive	Supply [V]	Current rail	Package
TLI4971 family											
TLI4971-A025T5-E0001	25	240	48	<2	350	IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-E0001	50	240	24	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-E0001	75	240	16	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-E0001	120	240	10	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A025T5-U-E0001	25	240	48	<2	350	UL1577/ IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-U-E0001	50	240	24	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-U-E0001	75	240	16	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-U-E0001	120	240	10	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A016W2-U-S0001*	16	210 typ.	76	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A020W2-U-S0001*	20	210 typ.	61	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A030W2-U-S0001*	30	210 typ.	40	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A035W2-U-S0001*	35	210 typ.	35	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A040W2-U-S0001*	40	210 typ.	30	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A050W2-U-S0001*	50	210 typ.	23	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI5570 family											
TLI5570-AE35E1-E0001	35 [mT]	1100	4.8 [mV/V/mT]	5%	5 µVrms		✓	–	–	external	SOT23-6-4
TLE4971 family											
TLE4971-A025N5-E0001	25	210	48	<2	260	AEC-Q100	✓	✓	3.3	Internal	TISON-8-5
TLE4971-A050N5-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A075N5-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A120N5-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A025N5-U-E0001	25	210	48	<2	260	AEC-Q100/UL 1577	✓	✓	3.3	Internal	TISON-8-5
TLE4971-A050N5-U-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A075N5-U-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A120N5-U-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A025T5-E0001	25	210	48	<2	260	AEC-Q100/ ISO 26262-compliant	✓	✓	3.3	Internal	TISON-8-6
TLE4971-A050T5-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A075T5-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A120T5-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A025T5-U-E0001	25	210	48	<2	260	AEC-Q100/ ISO 26262-compliant/ UL 1577	✓	✓	3.3	Internal	TISON-8-6
TLE4971-A050T5-U-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A075T5-U-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A120T5-U-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLx4971 in DSO16*											
TLE4971-A016W2-S0001*	16	210 typ.	76	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A020W2-S0001*	20	210 typ.	61	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A030W2-S0001*	30	210 typ.	40	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A035W2-S0001*	35	210 typ.	35	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A040W2-S0001*	40	210 typ.	30	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A050W2-S0001*	50	210 typ.	23	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4972 family											
TLE4972-AE35D5	31 [mT]	210	39[1)] [mV/mT]	1	90 [nT/√Hz]	AEC-Q100/ ISO 26262-compliant	✓	✓	3.3	external	TDSO-16
TLE4972-AE35S5	31 [mT]	210	39[1)] [mV/mT]	1	90 [nT/√Hz]		✓	✓	3.3	external	VSON-6

1) Can be reprogrammed by customer
* Coming soon

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Current sensors – overview

Product	Current range [A]	Band-width typ. [kHz]	Sensitivity [mV/A]	Accu-racy [%]	Output noise density [µA/√Hz]	Classification	Indus-trial	Auto-motive	Supply [V]	Current rail	Package
TLE4973 family											
TLE4973-A025T5-S0001	27.5	210	65.5	<2	290	ISO 26262-compliant/ AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-A050T5-S0001	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-A075T5-S0001	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-A120T5-S0001	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0001	27.5	210	65.5	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0001	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0001	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0001	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0010	27.5	210	65.5	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0010	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0010	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0010	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-U-S0010	27.5	210	65.5	<2	290	ISO 26262-compliant/ AEC-Q100/ UL 1577	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-U-S0010	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-U-S0010	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-U-S0010	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-AE35D5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]	ISO 26262-compliant/ AEC-Q100	✓	✓	5.0	external	TDSO-16
TLE4973-RE35D5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	TDSO-16
TLE4973-RE35D5-S0010	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	TDSO-16
TLE4973-AE35S5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S0010	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S3510*	17 [mT]	210	105.8 [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLx5572 family*											
TLE5572-AE24E1-R-E0001*	24~39[2] [mT]	2500	56 [mV/mT]	4	8.1 µTrms	AEC-Q100	–	✓	–	external	SOT23-6-4
TLE5572-AE15E1-R-E0001*	15~24[2] [mT]	2500	90 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE12E1-R-E0001*	12~20[2] [mT]	2500	112.5 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE08E1-R-E0001*	8~12[2] [mT]	2500	180 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE06E1-R-E0001*	6~10[2] [mT]	2500	225 [mV/mT]	4	8.1µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE04E1-R-E0001*	4~6[2] [mT]	2500	360 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLI5572-AE24E1-R-E0001*	24~39[2] [mT]	2500	56 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE15E1-R-E0001*	15~24[2] [mT]	2500	90 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE12E1-R-E0001*	12~20[2] [mT]	2500	112.5 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE08E1-R-E0001*	8~12[2] [mT]	2500	180 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE06E1-R-E0001*	6~10[2] [mT]	2500	225 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE04E1-R-E0001*	4~6[2] [mT]	2500	360 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLE5571 family*											
TLE5571-AE36O5-I-S0001*	30 [mT]	2500	72 [mV/mT]	4	6.6µTrms	ISO 26262-compliant/AEC-Q100	–	✓	–	external	TDSO-16-10
TLE5571-AE24O5-I-S0001*	20 [mT]	2500	108 [mV/mT]	4	6.6µTrms		–	✓	–	external	TDSO-16-10
TLE5571-AE12O5-I-S0001*	10 [mT]	2500	216 [mV/mT]	4	6.6µTrms		–	✓	–	external	TDSO-16-10
TLE5571-AE06O5-I-S0001*	5 [mT]	2500	432 [mV/mT]	4	6.6µTrms		–	✓	–	external	TDSO-16-10

1) Can be reprogrammed by customer
2) X ~ Y [mT] : X is the full scale input magnetic range with 3.3V supply. Y is the full-scale range with 5V supply
* Coming soon

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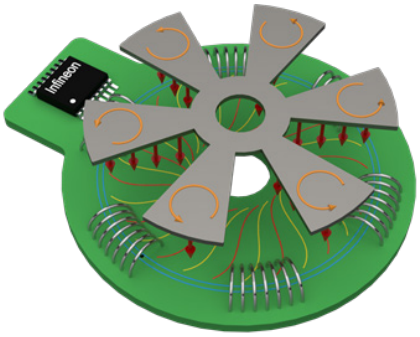
Inductive position sensing with TLE480x family

High accuracy with stray field robustness

Inductive sensing operates on the electromagnetic coupling principle between a printed circuit board coil and a metal target positioned above it. When the metal target enters the electromagnetic field generated by the sensor coil, a portion of the electromagnetic energy is transferred to the metal target, inducing eddy currents. These eddy currents, in turn, create a reverse electromagnetic field in the sensor coil that alters the effective inductance of the sensor coil. By measuring this change, the position of the target can be accurately determined.



The iTAS products generate an alternating current (AC) through the transmitter coils via TX outputs, creating an alternating magnetic field. This magnetic field induces voltages in the receiving coils. When a metallic rotor is placed above these coils, eddy currents are induced on the rotor surface, which generates a magnetic field that counteracts the flux density below. The amplitude of the voltages in the receiving coils changes according to the rotor's position. TLE480x products then demodulate these output voltages and compute the angle using the tangent inverse function.

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TLE480x – Inductive position sensing: Stray field robust with high accuracy

The increasing trend of car electrification, including both the conversion of internal combustion engine vehicles and the introduction of electric main drives in electric vehicles, is raising the potential for electromagnetic interference (EMI). This can have a detrimental impact on electronic subsystems. The TLE480x family has been developed to address this challenge, explicitly targeting electric power steering systems, including torque angle sensors, steering angle sensors, and pedal and suspension applications.. These devices employ the inductive measurement principle and inherently offer robustness against stray fields, eliminating the need for additional shielding against electromagnetic disturbances.

Furthermore, the TLE480x family meets the increasing demands of passengers for enhanced convenience, boasting an impressive angle error of 0.1 percent full scale (FS) and exceptional accuracy. The monolithic design of these devices enables system cost savings through reduced device count as they have been developed in accordance with ISO 26262 and fully support system design up to Automotive Safety Integrity Level (ASIL) D, ensuring a high level of safety and reliability.

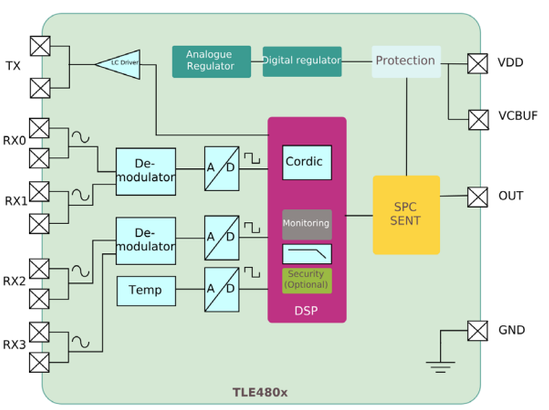
Inductive torque angle sensor (TLE4801/2)

Inductive steering angle sensor (TLE4803)

Features and benefits

Key features	Key benefits
– Stray field robust accordance with ISO 11452-8:2015	– Saves cost of shielding with intrinsic stray field robustness
– ISO 26262:2018 (SEooC) meets ASIL D	– Enables for cost efficient designs with high functional safety rating
– Cyber security (optional) accordance with ISO 21434	– Prevents threats of cyber attacks
– High accuracy angle error (electrical) 0.1% of full scale	– Easy to use high precision sensing

The TLE480x products include a coil system driver, signal conditioning circuits, and a DSP for torque and angle calculation within a single device.
The single-chip is designed according to ISO 26262 Safety Element out of Context (SEooC). It enables safety levels up to ASIL D, which is crucial for meeting future failed operational system safety requirements.



Inductive torque and angle sensors product portfolio

Product	Description	Package	ISO26262 (Functional safety)	ISO11452-8:2015 (Stray field robust)	Ordering code
TLE4801C16-S0000	16-pin SMD package, digital torque, and angle information	TDSO-16	ASIL D	Yes	SP006068554
TLE4801S16-S0000	16-pin SMD package, digital torque, and angle information	TDSO-16	ASIL D	Yes	SP006068552
TLE4802SC16-S0000	16-pin SMD package, digital torque, and angle information	TDSO-16	ASIL D	Yes	SP006068556
TLE4803C16-S0000	16-pin SMD package, digital angle 1, angle 2 information	TDSO-16	ASIL D	Yes	SP006068564
TLE4803S16-S0000	16-pin SMD package, digital angle 1, angle 2 information	TDSO-16	ASIL D	Yes	SP006068562

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XENSIV™ magnetic sensors

Exceptionally precise magnetic sensors comprising industry-leading switches, linear, angle, 3D, and speed sensors

Infineon XENSIV™ sensors are exceptionally precise thanks to an industry-leading magnetic technology portfolio. Our benchmark and innovative magnetic sensor portfolio perfectly fits numerous automotive, industrial, and consumer customer applications. We offer all magnetic sensor technologies in-house production; thus, our customers can choose between Hall sensors, anisotropic magnetoresistance (AMR), giant magnetoresistance (GMR), and tunnel magnetoresistance (TMR) sensors to find their best-fit solution for their application.

Generally, magnetic sensors measure the strength and/or direction of an applied magnetic field generated by, e.g., ferromagnetic materials and magnets, inductive coils like in motors, etc. The information on the measured field is processed within the sensor and converted into strength, position, speed, angular, and/or direction information. The processed sensor information is transmitted to the application via specific analog or digital interfaces. A wide range of sensors is equipped with additional safety and diagnostic features, options with outstanding stray field robust performance, and ISO 26262-compliant developed.

Our portfolio includes a broad range of ISO 26262-compliant products meeting safety requirements as safety element out of context (SEooC) up to the highest safety level of ASIL D, as well as stray field robust sensors exceeding ISO 11452-1:20015, which are well perceived within the market and used in a wide range of automotive and industrial safety applications.

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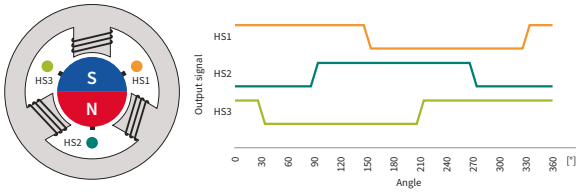
Magnetic switches

Broadest energy saving portfolio of high precision magnetic switches for automotive, industrial, and consumer applications
TLE/TLI/TLV4961, TLE/TLI/TLV4964, TLE/TLI/TLV4968
Energy-efficient magnetic switch family for up to 32 V

The TLE/TLI/TLV496x-xM/L family of magnetic switches saves energy and enables designers to create precise and 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. The family paves the way for precise system switching points thanks to its small magnetic hysteresis. The integrated temperature profile compensates for magnetic drifts and enables stable performance over temperature and lifetime.

TLE/TLI/TLV496x-xM products come in the smallest SOT23 package, reducing height by 10 percent compared with predecessor products on the market. 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 (overvoltage up to 42 V)
- 7 kV ESD protection (HBM)
- Overtemperature and overcurrent protection
- Temperature compensation
- Smallest SOT23 package on the market
- Dedicated products for industrial applications (TLI496x) and consumer (TLV496x)
- AEC-Q100 qualified

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

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	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	✓	✓	✓	SOT23
TLE4961-3M/L	Latch	7.5	-7.5	15	✓	✓	✓	SOT23/SSO-3-2
TLE4961-4M	Latch	10.0	-10.0	20	✓	✓	✓	SOT23
TLE4961-5M	Latch	15.0	-15.0	30	✓	✓	✓	SOT23
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
TLE4964-4M	Switch	10.0	8.5	1.5	✓	✓	✓	SOT23
TLE4964-6M	Switch	3.5	2.5	1.0	✓	✓	✓	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
TLI4961-1M	Latch	2.0	-2.0	4.0	–	✓	✓	SOT23/SSO-3-2
TLV4961-1M	Latch	2.0	-2.0	4.0	–	–	✓	SOT23
TLV4961-3M	Latch	7.5	-7.0	15.0	–	–	✓	SOT23
TLV4964-1M	Switch	18.0	12.5	5.5	–	–	✓	SOT23
TLV4964-2M	Switch	28.0	22.5	5.5	–	–	✓	SOT23

AEC Qualified

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TLE/TLI4963, TLE/TLI4965
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 magnetic latch or 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 µs)
- 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: JEDEC qualified

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	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

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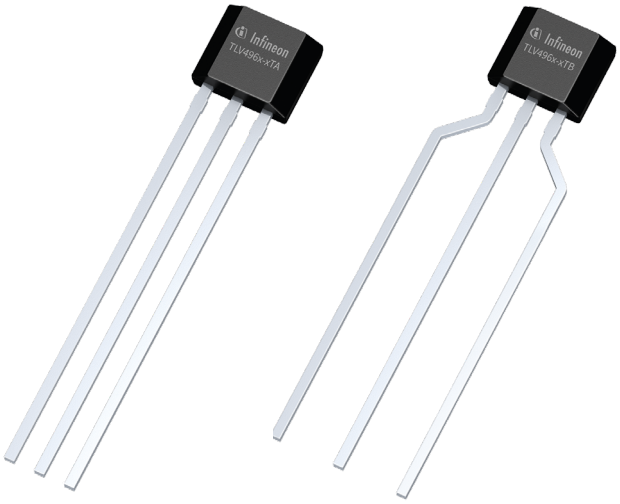
TLV496x-xTA/TLV496x-xTB
Precise Hall-effect sensor for consumer applications in leaded package

The TLV496x-xTA/B Hall-effect sensor family comprises a line of magnetic 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°C 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} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	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	Bipolar switch	1.0	-1.0	2.0	✓	TO92S-3-1
TLV4968-1TB	Bipolar switch	1.0	-1.0	2.0	✓	TO92S-3-2

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TLx4966 xG family
Two-in-one double Hall-effect sensor

Our XENSIV™ TLx4966 xG 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, cutting engineering and production costs. Using just one sensor ensures perfect alignment of the sensor elements, raising system quality and reliability.

Features

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

Applications

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

AEC Qualified

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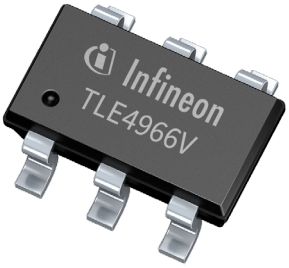
TLE4966V-1G
Vertical dual-Hall switch

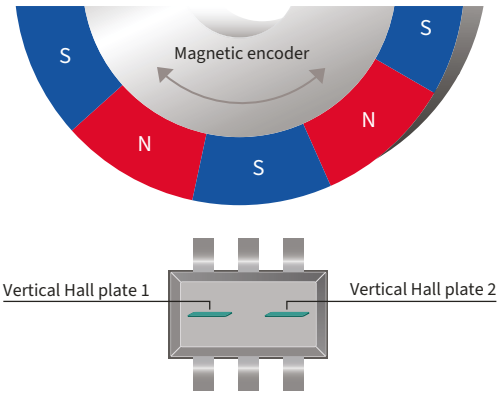
The Infineon vertical double Hall-effect switch TLE4966V-1G further develops the TLX4966-xG family. The vertical orientation of the Hall plates, resulting in in-plane field sensitivity, is completely new, enabling entirely new application layouts.

This device, which is designed using new technology, offers high voltage capabilities with very small current consumption. It can be operated from unregulated power supplies, which offers our customers unique freedom of design for their systems. 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





Product	Type	Output	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	✓	✓	✓	TSOP6/ SSO-4-1
TLE4966L	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	✓	✓	✓	TSOP6/ SSO-4-1
TLE4966-2G	Double Hall, two independent outputs	2 x speed	7.5	-7.5	15	✓	✓	✓	TSOP6
TLE4966-3G	Double Hall, speed and direction output	Speed and direction	2.5	-2.5	5.0	✓	✓	✓	TSOP6
TLE4966V-1G	Vertical double Hall, speed and direction output	Speed and direction	2.5	-2.5	5.0	✓	✓	✓	TSOP6
TLI4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	–	✓	✓	TSOP6

AEC Qualified

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TLE49x6/TLI49x6/TLV49x6 family
High-precision magnetic switches

The TLE49x6, TLI49x6, and the TLV49x6 families comprise high-precision, unipolar Hall-effect switches and latch for different magnetic sensitivities.

TLE/TLI/TLV49x6 products have succeeded 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 (TLE products)

Applications

- Power closing
- Gear stick
- Seat belt
- HVAC flap
- BLDC commutation
- Two-wheeler application

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4906K	Unipolar switch	10.0	8.5	1.5	✓	✓	✓	SC59/SSO-3-2
TLE4906L	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	28	✓	✓	✓	SC59
TLE4946-1L	Latch	15.0	-15	30	✓	✓	✓	SSO-3-2
TLE4946-2K	Latch	2.0	-2.0	4.0	✓	✓	✓	SC59/SSO-3-2
TLE4946-2L	Latch	2.0	-2.0	4.0	✓	✓	✓	SC59/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
TLV4976-2K	Unipolar switch/ Current interface	4.5	2.7	1.8	–	–	✓	SC59

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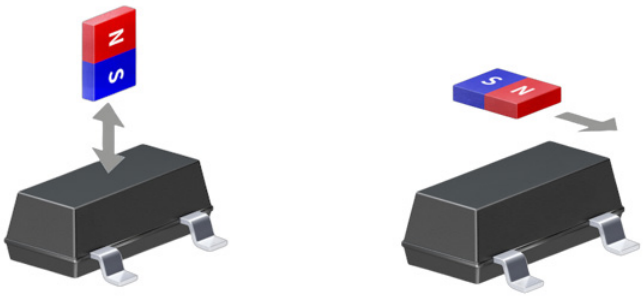
ASIL B compliant magnetic switches

ISO 26262-compliant switches with extended mounting flexibility enabling safety on application level up to ASIL B

The TLE496xx family of magnetic Hall switches is a range of high-precision magnetic sensors designed for use in demanding automotive applications with extended safety requirements. The different sensor variants, sensitive in planar and orthogonal directions, achieve extended mounting flexibility on PCBs, making them a perfect solution for a wide range of applications.



Large portfolio of Hall switches allows a maximum of mounting flexibility

The increasing electrification of vehicles, including safety-relevant areas such as steering and braking, has led to a growing concern about safety and redundancy in the automotive sector. The smallest errors in one magnetic sensor can lead to the failure of an entire system. The TLE496xx family sensors have been developed per ISO 26262 standard to address this issue, avert harm under all possible circumstances, and meet the ASIL B metric on chip level as a safety element that is out of context. Therefore, sensors are equipped with a fully ASIL B-compliant internal diagnosis and a periodically sent life-tick, which can be evaluated externally at the application level to detect faults. The evaluation of the sensor signals is particularly smart and cost-effective since both the magnetic switching signal and the safety diagnostic signals are transmitted via a single output, enabling drop-in replacements for conventional magnetic switches.

The TLE496xx family is designed for various automotive applications, including window lifters, gear sticks, steer-by-wire and motor commutation. Some derivatives can be operated in two-wire mode, requiring only a minimum of two wires between the controller unit and sensor, especially for remote peripheral devices inside automotive solutions.

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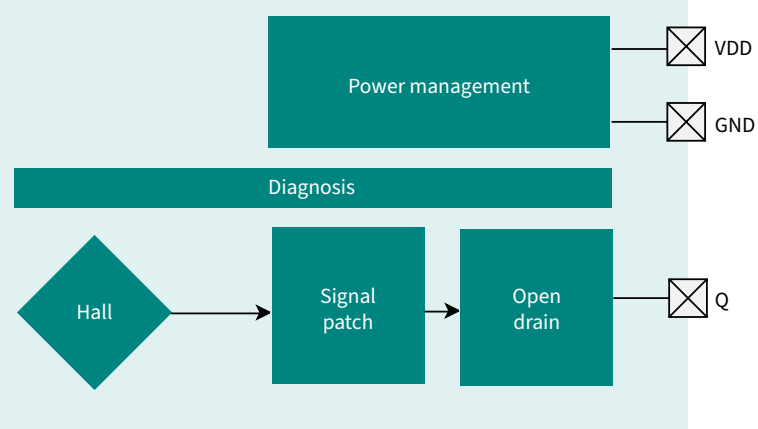
TLE4960x – ASIL B compliant magnetic switches with open drain interface

Upgrade your safety and flexibility in cars

Infineon has launched the pilot ASIL B magnetic switch family, which measures the magnetic field orthogonal to the PCB direction in the Z direction. This sensor family is developed according to ISO 26262 and provides built-in diagnosis functions to support functional safety applications with requirements up to ASIL B. It is also AEC-100 compliant and Grade 0 qualified.

The very small SOT23 package reduces overall system cost and ensures design flexibility. By using TLE4960x, safety and flexibility can be redefined in multiple car applications, such as window lifts, sunroofs, power closure actuators, seat positioning, and seat belt pre-tensioners.



Features and benefits

Key features	Key benefits
– Meets safety standard up to ASIL B	– Increased reliability means less fails at the end-customer within warranty time
– Smallest automotive-qualified SMD package on the market	– Reduces system cost, increases flexibility, and enables small designs
– Broad portfolio of specialized sensors for all kind of applications	– Ensures easy replacement and enables supplier flexibility
– Online simulation tool to ensure short design cycles	– Allows first time right designs and ensures fast time to market
– Lowest best-in-class effective noise	– Enables a very accurate time critical switching

Product portfolio

Product	Description	Package	ISO26262	Orientation	Ordering code
TLE49601-1M-S2	Latch with Bop/Brp (2/-2 mT)	SOT23-3	ASIL B	Z	SP005924303
TLE49601-3M-S2	Latch with Bop/Brp (7.5/-7.5 mT)	SOT23-3	ASIL B	Z	SP005924485
TLE49601-5M-S2	Latch with Bop/Brp (15/-15 mT)	SOT23-3	ASIL B	Z	SP005924491
TLE49604-1M-S2	Unipolar switch with Bop/Brp (18/12.5 mT)	SOT23-3	ASIL B	Z	SP005924627
TLE49604-2M-S2	Unipolar switch with Bop/Brp (28.0/22.5 mT)	SOT23-3	ASIL B	Z	SP005924552
TLE49604-4M-S2	Unipolar switch with Bop/Brp (10/8.5 mT)	SOT23-3	ASIL B	Z	SP005924634
TLE49604-6M-S2	Unipolar switch with Bop/Brp (3.5/2.5 mT)	SOT23-3	ASIL B	Z	SP005924642
TLE49604-7M-S2	Unipolar switch with Bop/Brp (9.5/7 mTG)	SOT23-3	ASIL B	Z	SP005924558
TLE49608-1M-S2	Bipolar switch with Bop/Brp 1/-1 mT	SOT23-3	ASIL B	Z	SP005924532

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3D magnetic sensors

Infineon's 3D magnetic sensors (TLx493D-xxxx) combine high-accuracy magnetic field measurements with an extremely compact footprint and exceptionally low power consumption (typ. 7 nA). Our sensors open up a lot of exciting new use cases, including innovative human-machine interfaces in the form of industrial joysticks, ergonomic pushbuttons on domestic appliances and highly precise position control in robotics.

XENSIV™ TLE493D-P3I8 /-P3B6 /-W3B6 is our latest magnetic 3D sensor, enabled by new and improved accuracy. With respect to pricing and package size, it is the best product for high-performance applications.

The TLE493D-P3I8 /-P3B6 /-W3B6 has an extremely low current consumption and a wake-up function in a small package. Also, the sensor provides configuration options to fit customer requirements best (e.g., data communication, definition of measurements, etc.). The ISO 26262 compliance includes the safety manual and supports functional safety applications. The configurability of the sensor is used in application platforms to adapt to end customer wishes. TLE493D-P3I8 /-P3B6 /-W3B6 is available in 4 different address variants. It is possible to connect up to 4 sensors to one I^2C bus.

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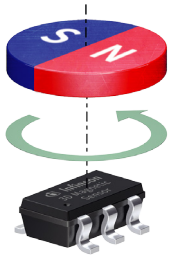
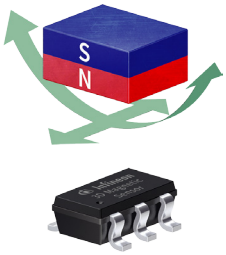
3D magnetic sensors

For consumer and industrial markets

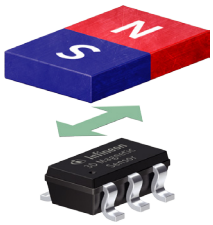
The TLV(I)493D-AxB6 sensor realizes accurate three-dimensional sensing with extremely low power consumption in a small package. Capable of detecting the magnetic field in the x, y, and z-directions, the sensor is ideally suited for the measurement of linear, rotational, or three-dimensional movements. Thanks to its small package and low power consumption, the TLV(I)493D-AxB6can be used in new applications, replacing potentiometer and optical solutions. Featuring contactless position sensing and high-temperature stability of the magnetic measurement, the sensor allows systems to get smaller, more accurate, and more robust.



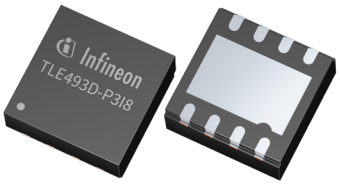
Rotation movement



3D movement



Linear movement



Features

- 3D magnetic sensing
- Integrated temperature sensing
- Low current consumption
  - 7 nA in power-down mode
- 2.8 to 3.5 V operating supply voltage
- Digital communication via a 2-wire standard I^2C 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 32 to 130 µT/LSB_{12}
- Operating temperature range from -40 to +125°C

Product	Temperature range	Qualification	Linear magnetic range	Resolution	I_{DD}	Update rate XYZ measurement	Package	Ordering code
TLI493D-A2B6	-40 … 105°C	JESD47	±100 mT ±160 mT	7.7 or 15.4 LSB_{12}/mT	7 nA – 3.4 mA	up to 8.4 kHz	TSOP6	SP001689844
TLV493D-A1B6	-40 … 125°C	JESD47	±130 mT (typ)	10.2 LSB_{12}/mT	7 nA – 3.7 mA	up to 3.3 kHz	TSOP6	SP001286056

New features

- Advanced operation modes to provide high flexibility
- Short mode range setting, focusing on the 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 measurement only)

Applications

- Anti-tampering protection in smart meters
- Joysticks
- CCTV-control, game consoles
- Control elements e.g., white goods multifunction knobs
- Ergonomic push- and control buttons on domestic appliances and power tools
- Position control in robotics
- Smart lock position detection

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3D magnetic sensors

For automotive applications

Infineon's TLE493D-xxxx enables automotive control element applications within the passenger compartment or under the hood with a temperature range of -40°C up to 150°C, with linear magnetic range requirements up to ±160 mT.

Features

- 3D magnetic sensing
- Integrated temperature sensing
- 2.8 to 5.5 V operating supply voltage
- Low current consumption
  - 7 nA in power-down mode
  - Up to 10 power modes
- Digital output via I^2C or SPI interface
- Bx, By, and Bz linear field measurement ±160 mT
- AEC-Q100 qualified
- Up to 14-bit data resolution for each measurement direction
- Various resolution options from 8.5 µT/LSB_{14} to 130 µT/LSB_{1}2
- Operating temperature range from -40°C up to 150°C
- ISO 26262 compliant for ASIL B

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
- Multi-function knobs
- Pedal/valve position sensing

Product	Supply voltage [V]	Inter-face	Qualification	Magnetic range (Se-lectable) [mT]	Sensitivity drift [%]	Matching drift X to Y [%]	Matching drift X/Y to Z [%]	Wake-up	Package	Ordering code
TLE493D-A2B6	2.8-3.5	I^2C	AEC-Q100	±160 ±100	±5	±3.5	±10	No	TSOP6	SP001689848
TLE493D-W286 A0 **TLE493D-W286 A1** **TLE493D-W286 A2** **TLE493D-W286 A3**	2.8-3.5	I^2C	AEC-Q100 ISO 26262-ready	±160 ±100	±5	±3.5	±10	Yes	TSOP6	SP001655334 SP001655340 SP001655344 SP001655348
TLE493D-W3B6 B0 **TLE493D-W3B6 B1** **TLE493D-W3B6 B2** **TLE493D-W3B6 B3**	2.8-3.5	I^2C	AEC-Q100 ISO 26262-compli-ant ASIL-B	±160 ±100 ±50	±5	±1	±10	Yes	TSOP6	SP005952965 SP005952969 SP005952973 SP005952977
TLE493D-P3B6 A0 **TLE493D-P3B6 A1** **TLE493D-P3B6 A2** **TLE493D-P3B6 A3**	2.8-3.5	I^2C	AEC-Q100 ISO 26262-ready ASIL-B	±160 ±100 ±50	±5	±1.7	±6.75	Yes	TSOP6	SP005427119 SP005427121 SP005427123 SP005427125
TLE493D-P3I8	2.8-3.5	I^2C	AEC-Q100 ISO 26262-ready ASIL-B	±160 ±100 ±50	±5	±1.7	±6.75	Yes	VSON-8	SP005633649

PRO SIL
ISO 26262 compliant

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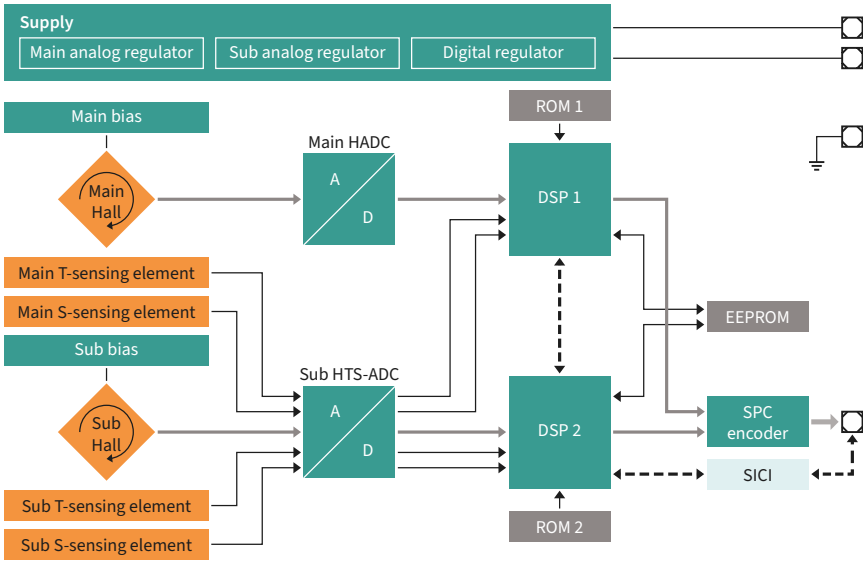
Linear sensors

Programmable dual channel linear Hall sensor with fast SPC interface for high precision applications

Infineon's TLE4999C8 is a programmable dual-channel linear Hall sensor designed to meet the requirements of safety-critical automotive and industrial applications. It is developed in full compliance with ISO 26262 using two sensor elements included within one monolithic silicon design. The sensor cells are designed to complement the state-of-the-art safety requirements at the system level and enable ASIL D system developments. Their signals follow two independent analog paths. Each signal path has a digital signal processing unit to ensure maximum independence (redundancy, respectively). The sensor offers a multi-point calibration with up to 9 selectable set points for enhanced linearization of the output signal. The chip provides five different calibration characteristics for an easy and flexible adaptation to the non-linearity of magnetic circuit design.

TLE4999C features a digital Short-PWM Code (SPC) interface with a bus capability for up to 4 sensor ICs on a single data output. The communication interface with minimum 0.5 µs unit time guarantees a fast transmission of a complete two-channel data signal in less than 500 µs. The additionally implemented frame holder circuit enables the synchronicity of multiple sensors (e.g., in combination with angle sensors) via an SPC bus. The chip offers a 12-, 14- and 16-bit output signal resolution, ensuring the highest flexibility and superior noise performance.

An integrated digital temperature and stress compensation achieves the highest accuracy over a wide temperature range and lifetime. The chip is available in a thin 8-pin SMD single-sensor package.



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Features

- Fully ISO 26262-compliant, supports ASIL D systems
- <2% sensitivity drift, <100 µT offset drift overtemperature and lifetime
- Integrated digital temperature- and stress-compensation
- Fast digital SPC interface (unit time 0.5–3.0 µs)
- Multi-point calibration with up to nine linearization set points

Key benefits

- High diagnostic coverage, ISO 26262-compliancy and dual sensor cell integration enable development of fail operational systems
- Multi-point calibration for better fit into various magnetic circuit designs
- Easy system integration due to programmability of several sensor parameters

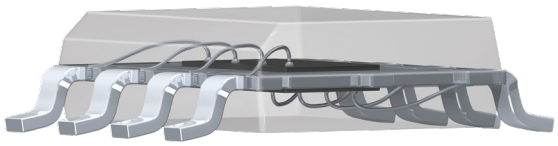
Applications

Automotive safety critical applications

- Electric power steering
- Linear movement position sensing
- Pedal position
- Electric throttle control
- Seat rail adjustment
- Headlight adjustment

Industrial applications

- Small home appliances
- Joystick applications



ISO 26262-ready/compliant dual channel linear sensors

Sales name	Interface	Magnetic linear range [mT]	Sensitivity	Sensitivity drift [%]	Gain	Magnetic offset drift [µT] 1)	Classification	Ordering code	Package
TLE4997A8D	Analog ratiometric	50, 100, 200	±60 mV/mT default for 100 mT range, with gain 1.5	±3	±4	<±400	ISO 26262-ready	SP000902760	TDSO-8
TLE4998P8D	Digital interface PWM	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	<±400	ISO 26262-ready	SP000902776	TDSO-8
TLE4998S8D	Digital interface SENT	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	<±400	ISO 26262-ready	SP000902784	TDSO-8
TLE4998C8D	Digital interface SPC	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	<±400	ISO 26262-ready	SP000902768	TDSO-8
TLE4999I3	Digital interface PSI5	12.5, 25	±147.5 LSB_{13}/mT default for 25 mT range, with gain 1.5	±2	±7.59	<±100/ <±200 2)	ISO 26262-compliant	SP001689862	SSO-3
TLE4999C8 (TLE4999C8-S0001)	Digital interface SPC	25, 50	±36.875 LSB_{12}/mT default for in 50 mT range, with gain 1.0	±2	±7.59	<±100/ <±2002 2)	ISO 26262-compliant ASIL D (ASIL C)	SP002662500 (SP005727371)	TDSO-8
TLE4999C4 (TLE4999C4-S0001)	Digital interface SPC	25, 50	±36.875 LSB_{12}/mT default for in 50 mT range, with gain 1.0	±2	±7.59	<±100/ <±200 2)	ISO 26262-compliant ASIL D (ASIL C)	SP003420076 (SP005727375)	SSO-4

1) Maximum drift overtemperature and lifetime
2) Main channel/sub channel

PRO SIL ISO 26262 compliant

PRO SIL ISO 26262 ready

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TLE499x family:
Programmable analog/digital single channel 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.

These sensors deliver outstanding temperature stability compared with similar compensation methods thanks to digital signal processing based on a 20-bit DSP architecture and digital temperature compensation. TLE4998 also includes stress compensation to withstand stress effects from the package, such as moisture, thus ensuring best-inclass 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
- TLE4997, TLE4998 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	Programm.	Number of pins	Sensitivity (programmable range)	Magnetic offset	Supply voltage (extended range)	Automotive	Classification	Interface	Package
TLE4997	EEPROM	3/Single die SMD 8	±12.5 to ±300 mV/mT	<±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)	✓	ISO 26262-ready	PWM	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO- 8
TLE4998S	EEPROM	3/4/Single die SMD 8	±8.2 to ±245 LSB_{12}/mT	<±400 µT	5 V ±10% (16 V)	✓	ISO 26262-ready	SENT	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8
TLE4998C	EEPROM	3/4/Single die SMD 8	±8.2 to ±245 LSB_{12}/mT	<±400 µT	5 V ±10% (16 V)	✓	ISO 26262-ready	SPC	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8

1) 147.44 LSB_{13} converts to 294.88 LSB_{12}

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ISO 26262 ready

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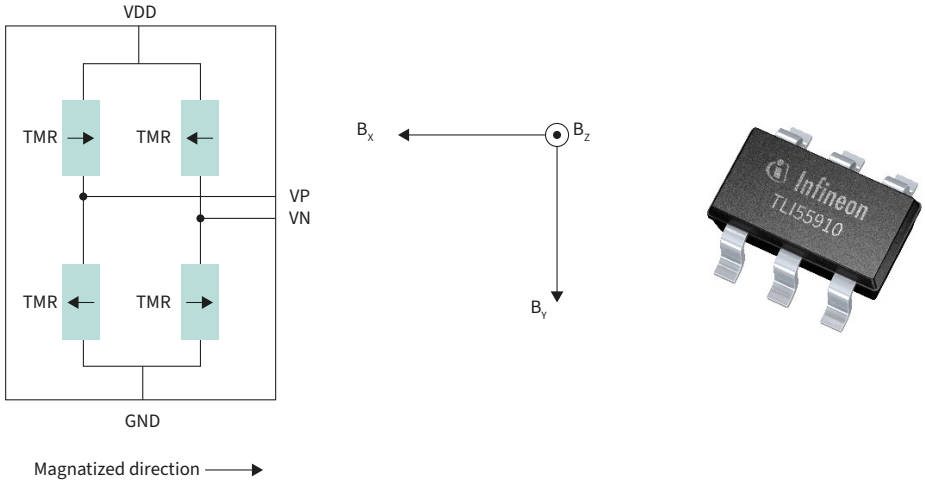
Linear TMR sensor

For consumer and industrial markets

The TLI55910 is a high-sensitivity and low-power linear position sensor that leverages tunnel magnetoresistance (TMR) technology to deliver precise linear measurements. This non-amplified analog sensor can measure magnetic fields within a range of ±35 mT and boasts a large ratiometric output sensitivity of 5 mV/V/mT. Additionally, the sensor has a low noise level of 5 µVRMS, which helps to minimize errors and ensure reliable measurements. The sensor's low power consumption of 0.25 mA at 1.8 Vdd makes it suitable for battery-powered devices or applications where power consumption is a concern. The TLI55910 sensor complies with JEDEC JESD47 and is available in a compact SOT23-6 package.

The TLI55910 is a versatile solution for various position-sensing applications, including industrial automation, consumer electronics, game controllers, home appliances and medical devices. The sensor is suitable for applications where low power consumption, high accuracy and reliability are beneficial. It can be used for linear, angle and rotary position sensing, displacement measurement, and motor control. It can enhance precision in machinery and robotic systems, improve user experiences in consumer electronics such as game controllers, provide precise feedback for efficient motor operation and ensure accurate and reliable measurements, even in harsh environments.



Features and benefits

Key features	Key benefits
– High signal-to-noise ratio	– Enables precise measurements
– Low power consumption (0.25 mA at 1.8 Vdd)	– Ideal for battery-powered devices
– Magnetic measurement range of ±35 mT	– Allows small and cost-effective magnet design
– Strong cross-field immunity	– Robustness against magnetic influences
– Very low temperature drift characteristic	– Stable measurements and operation even in harsh environments

Product	Interface	Magnetic linear range [mT]	Sensitivity [mV/V/mT]	Non-linearity [%]	Offset [mV/VDD]	Classification	Ordering code	Package
TLI55910*	Analog	±35	5	±1.8	10	JEDEC JESD47	SP006118939	PG-SOT23-6

Consumer · Game controller · Home appliance · Automation

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*Coming soon

Angle sensors

Compact designs in small outline packages – at highest functional safety

Highest variety – low end to high end, standardized and specialized in various technologies: GMR, AMR, TMR, and Hall
Angle sensors detect the orientation of an applied magnetic field by measuring sine and cosine angle components with monolithically integrated magnetoresistive elements. Infineon offers a large variety of high-precision angle sensors in all common technologies such as anistrophic magnetoresistance (AMR), giant magnetoresistance (GMR), tunnel magnetoresistance (TMR), and Hall.

General features of Infineon portfolio
- Wide product range, allowing for tailored solutions
- Analog and digital interface options
- Single and dual-chip variants available
- Products specifically designed for safety-relevant applications

Automotive applications
- Electric Power Steering
- Braking
- BLDC Motor Control
- Rotational Position Measurement (e.g., windscreen wiper, valves, flaps, pedals, etc.)

Industrial/consumer applications
- BLDC motor control
- Robotics
- Servo Drives
- Industrial Automation
- High End Drones

GMR, AMR, and TMR based angle sensors

Product	Technology	Die configuration	Sin/cos output	Angle output	Second interface	Accuracy	Classification	Package
TLE5009	GMR	Single die	Analog sin/cos	–	–	0.9°	ISO 26262-ready	DSO-8
TLE5009A16D	GMR	Dual die	Analog sin/cos	–	–	0.9°	ISO 26262-ready	TDSO-16
TLI5012B	GMR	Single die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.9°	JESD47	DSO-8
TLE5012BD	GMR	Single & dual die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.0°	ISO 26262-ready	DSO-8/ TDSO-16
TLE5014C16(D)	GMR	Single & dual die	–	SPC	–	1.0°	ISO 26262-compliant	TDSO-16
TLE5014P16(D)	GMR	Single & dual die	–	PWM	–	1.0°	ISO 26262-compliant	TDSO-16
TLE5014S16(D)	GMR	Single & dual die	–	SENT	–	1.0°	ISO 26262-compliant	TDSO-16
TLE5014SP16(D)	GMR	Single & dual die	–	SPI	–	1.0°	QM ISO 26262-compliant	TDSO-16
TLE5109A16D	AMR	Single	Analog sin/cos	–	–	0.5°	ISO 26262-ready	TDSO-16
TLE5309D	AMR + GMR	Dual die	Analog sin/cos	–	–	AMR 0.5°, GMR 0.9°	ISO 26262-ready	TDSO-16
TLE5501	TMR	Single die	Analog sin/cos	–	–	1.0°	QM ISO 26262-compliant	DSO-8
TLE5502(D)	TMR	Single & dual die	Analog sin/cos	–	–	0.8°	ISO 26262-compliant	QFN-16

SPI = Serial peripheral interface
IIF = Incremental interface
PWM = Pulse width modulation
HSM = Hall switch mode
SENT = Single edge nibble transmission
SPC = Short PWM code
SSC = Synchronous serial communication

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TMR based angle sensors

Tunneling magnetoresistance (TMR) technology offers high sensing sensitivity with a high output voltage, reducing the need for an internal amplifier. Thus, the sensor can be connected directly to the microcontroller without any further amplification.

In addition, TMR technology shows a very low temperature drift, reducing external calibration and compensation efforts. The TMR technology is also well known for its low current consumption.

TLE5501

Infineon's TMR sensor TLE5501 is available in two versions.

TLE5501 – product versions with different pin out:
- TLE5501 E0001: pin-compatible to TLE5009 automotive qualified acc. AEC-Q100
- TLE5001 E0002: decoupled bridges for redundant external angle calculation and highest diagnostic coverage, realizing ISO 26262-compliant development ASIL D

Features
- Large output signals of up to 0.37 V/V for direct microcontroller connection
- Discrete bridge with differential sine and cosine output
- Very low supply current: ~2 mA
- Magnetic field range (20–100 mT)
- Typ. angle error ~ 1.0° (overtemperature and lifetime)
- DSO-8 package
- AEC-Q100, grade 0: T_A = -40 … +150°C (ambient temperature)
- For TLE5501 E0002:
  - Reaching ASIL D with just one single sensor chip
  - ISO 26262-compliant development ASIL D

TLE5502D

Infineon's latest and improved TMR sensor generation

TLE5502 – product versions with different pin out:
- TLE5502D S0002: de-coupled P/N-bridges for redundant external angle calculation and highest diagnostic coverage
- TLE5502D S0003: SIN/COS bridge design

Features
- Up to 4x ASIL-D (ISO 26262) sensors in one package enabling fail operational designs
- Improved accuracy (0.8° over lifetime and temperature)
- Compact QFN-16 package (3x3 mm)

Applications
- Steering angle sensor
- BLDC motor commutation (e.g., wipers, pumps and actuators)
- Angular position sensing for e.g., robotics or gimbal
- Electric motors
- Industrial automation
- Safety applications

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GMR based angle sensors

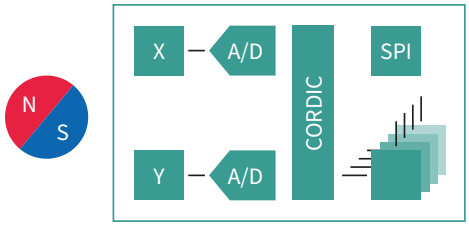
TLE5014(D)
Digital GMR sensor with an easy-to-use plug-and-play concept for highest functional safety applications

All XENSIV™ TLE5014 angle sensors are available as single- and dual-die products. They are easy to use and come pre-configured and pre-calibrated as plug-and-play sensors. Customers can choose between SENT, PWM, SPC, and SPI interfaces. On top of those protocol options, the sensors can be adapted to any application setup via their programmable E²PROM interfaces. TLE5014 magnetic angle sensors meet ISO 26262 ASIL C for the single die and ISO 26262 ASIL D for the dual die versions.

All products are ready for applications with the highest functional safety requirements. The sensors show an extremely small angle error of less than 1° across the entire temperature profile and lifetime. This is particularly helpful in applications requiring very accurate position sensing, such as steering angle sensing or motor commutation. Further application areas range from rotor position measurement to electric power steering (EPS), pedal position, and any other kind of position measurement.

Features

- Easy-to-use, plug-and-play sensors, pre-configured and pre-calibrated
- Offering high flexibility:
  - Available as single- and dual-die products
  - 12-bit digital interface with protocol options PWM, SENT, SPC, and SPI
  - E² PROM and look-up table for customer configuration and calibration
- High angle accuracy: max. 1.0° overtemperature and lifetime
- High voltage capability up to 26 V
- Development fully compliant with ISO 26262
  - Developed according to ASIL D level
  - Dual die sensors reaching ASIL D, single die sensors ASIL C metrics
- Safety manual and safety analysis summary report available on request



Applications

- Steering angle sensing (SAS)
- Motor commutation
- Rotor position measurement
- Pedal position
- Safety applications
- Any other kind of high-accuracy position measurement

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GMR based angle sensors

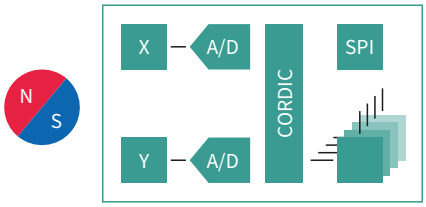
TLE5012B(D), TLI5012B
GMR sensor with integrated angle calculation and multiple interfaces

Features

- Integrated angle calculation with CORDIC algorithm
- 15-bit representation of calculated angle value
- High update rate up to 43 µs (23 kHz)
- Range of selectable interfaces
- SPI compatible Synchronous Serial Communication (SSC)
- Bidirectional 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
- Industrial version TLI5012B in line with JEDEC JESD47

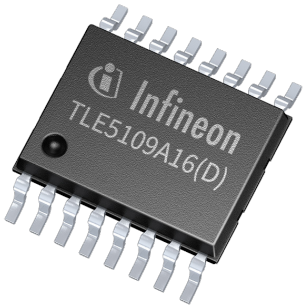
Applications

- Steering angle
- Brushless DC motor commutation, i.e., electric power steering (EPS)
- Rotary switches
- General angular sensing
- Incremental or absolute magnetic encoders
- Gimbals, drones, robots



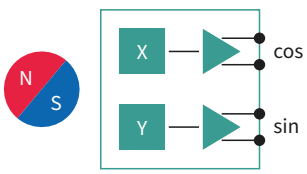
AMR based angle sensors

TLE5109A16(D)
Analog AMR sensor with temperature compensation



Features

- Features a differential or single-ended analog interface for sine and cosine values
- Internal temperature drift compensation for gain and offset
- ISO 26262-ready



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Combined AMR and GMR based angle sensors

TLE5309D
Dual angle sensor combining AMR and GMR technology

The TLE5309D is a diverse redundant angle sensor with analog outputs. It combines a giant magnetoresistance (GMR) sensor for a full 360° angle range with an anisotropic magnetoresistance (AMR) sensor for high precision in a flipped configuration in one package. Magnetoresistive (MR) elements measure a rotating magnetic field's sine and cosine angle components. The sensors provide analog sine and cosine output voltages that describe the magnetic angle from 0 to 180° (AMR sensor) and 0 to 360° (GMR sensor), respectively.

The differential MR bridge signals are independent of the magnetic field strength, and the analog output is designed for differential or single-ended applications.

The output voltages are designed to use the dynamic range of an A/D-converter using the same supply as the sensor as a voltage reference. Both sensor ICs are supplied independently by separate supply and ground pins.

Summary of features

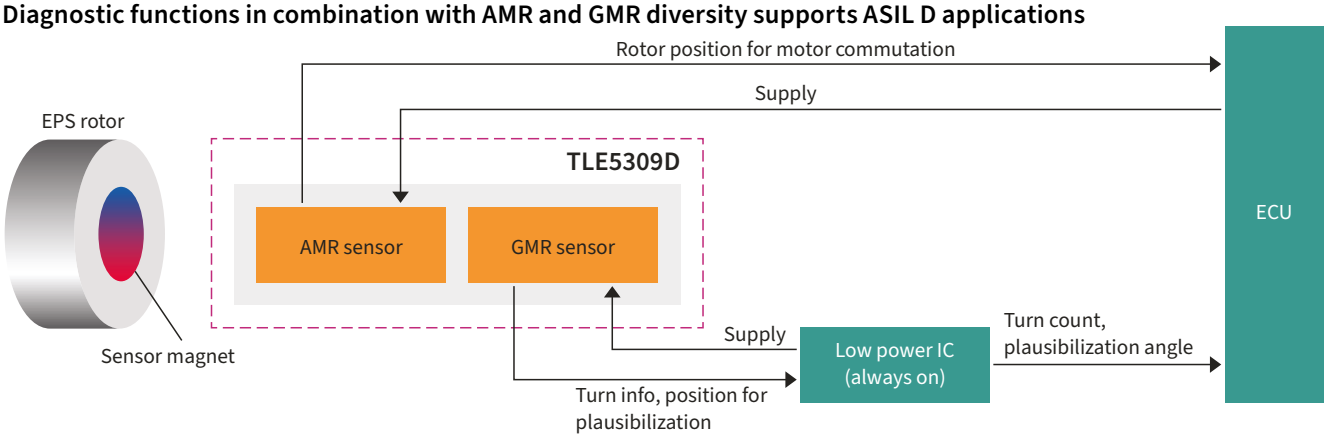
- Separate supply pins for AMR and GMR sensors
- Diverse redundant design with one GMR sensor (top die) and one AMR sensor (bottom die) in one package
- Low current consumption and very fast start up
- 360° contactless angle measurement
- Immune to air gap variations due to MR-based sensing principle
- Operating ambient temperature:
  -40 … +125°C/-40 … +150°C (TLE5309DHT)

Potential applications

The TLE5309D angle sensor is designed for angular position sensing in safety-critical automotive applications.
Its high accuracy, 360° measurement range, and short propagation delay make it suitable for systems with high speeds and high accuracy demands, such as brushless DC (BLDC) motors for actuators and electric power steering systems (EPS). At the same time, its fast start-up time and low overall power consumption enable the device to be employed for low-power turn counting. Extremely low power consumption can be achieved with power cycling, where the advantage of fast power-on time reduces the average power consumption.

- BLDC motors for electric power steering (EPS)
- Low-power turn counter

Diagnostic functions in combination with AMR and GMR diversity supports ASIL D applications



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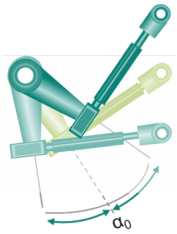
Stray field robust angle sensors

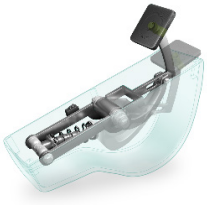
Outstanding stray field robustness, high accuracy, and flexibility

The TLE49SRx family of angle sensors is a range of high-performance, stray field-robust sensors designed for use in demanding automotive applications. With their advanced measurement capabilities and compliance with key safety and electromagnetic compatibility standards, these sensors offer a reliable and versatile solution for a wide range of applications.

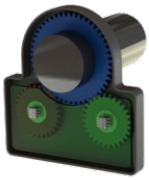
The increasing electrification of vehicles, including integrating electric main drives, has led to a growing concern about electromagnetic interference (EMI) caused by stray fields. These stray fields can potentially disrupt the functioning of electronic subsystems. The TLE49SRx family of angle sensors has been developed to address this issue. It features spatially separated Hall cells that enable robust magnetic field measurement, even in the presence of inhomogeneous stray fields, exceeding the requirements of EMC standards ISO 11452-1:2015.



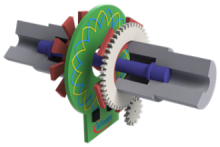
Chassis height leveling
e.g., TLE49SRI3



Chassis pedal
e.g.TLE49SRS3



Steering angle sensor (SAS)
e.g., 2 x TLE49SRC8(D)



Steering torque angle sensor(TAS)
e.g., (TLE4801-iTAS)+ TLE49SRC8(D)

The TLE49SRx family is designed for various automotive applications, including chassis height, pedal position, and steering angle sensors. Several derivatives of the TLE49SR sensor are available, offering a range of package options, including a package with long leads and integrated capacitors for easy use in remote sensor applications and surface-mounted packages, as well as various communication interfaces.

These sensors have been developed in accordance with the ISO 26262 standard, meeting the ASIL C (D) metric on chip level as a safety element out of context.

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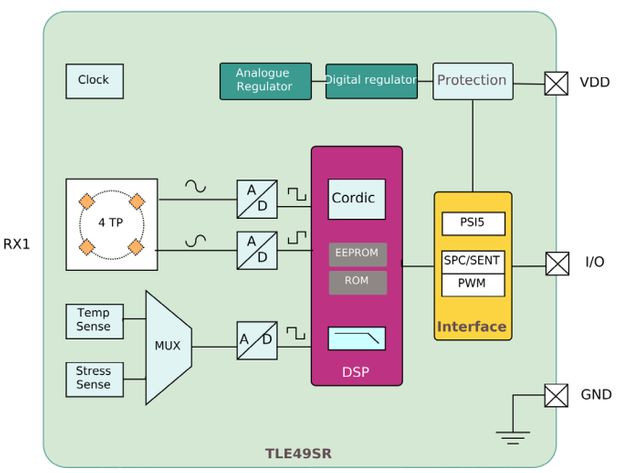
TLE49SR – Stray field robust angle sensors

Outstanding stray field robustness, high accuracy, and flexibility

The XENSIV™ TLE49SR magnetic angle sensor family is designed to meet the demands of high-performance applications. It offers excellent stray field robustness up to 8 mT in homogeneous stray fields and is compliant with EMC standards ISO 11452-1:2015.

The TLE49SR sensors are available in various configurations to suit different application needs. For on-PCB usage, the 8-pin surface-mounted device (SMD) package is available with PWM (TLE49SRP8), SENT (TLE49SRS8), or SPC (TLE49SRC8) communication interfaces. A dual-channel version is also available to support redundancy requirements. For remote sensor applications, derivatives are available in a 3-pin package with long leads, offering PWM (TLE49SRP3), SENT (TLE49SRS3), or SPC (TLE49SRC3) options.

All members of the XENSIV™ TLE49SR magnetic sensor family are developed in compliance with ISO26262 and support the ASIL C metric on the device level, enabling the development of fail-safe systems.



The TLE49SR integrated circuit (IC) features a comprehensive set of on-chip components, including spatially separated Hall-, temperature-, stress sensors, a signal conditioning circuit, analog-to-digital converters, and a digital signal processor. The IC also includes a clock, voltage regulators and internal protection circuitry to ensure safe and reliable operations.
The TLE49SR family offers a range of digital output interfaces, providing flexibility and compatibility with various systems. These interfaces include PSI5, SENT, SPC, and PWM, allowing for seamless integration into a variety of applications.

Features and benefits

Key features	Key benefits
– Stray field Immunity, exceeding ISO 11452-1:2015	– High system reliability eliminates the need for external shielding
– Excellent angle performance with very low jitter and fast response time	– Look-up table for correction of systematic angle errors, angle error <0.5°
– Very low jitter delay ±1 µs and very fast response time 9.8 µs ~ 26 ms	– Enables for highly responsive and fast systems
– EEPROM for customized configuration and customer specific ID	– Easy design with high product flexibility
– PSI5 protocol V1.3 and V2.3, PWM, SENT, and SPC Interface	– Synchronization pulse for PSI5- , frame holder mechanism for SPC-sensors
– ISO 26262-compliant, ASIL C(D), and ASIL D rating	– Dual die version for redundant, ASIL D compliant systems

Product portfolio

Product	Description	Package	ISO26262 (Functional safety)	ISO 11452-8:2015 (Stray field robust)	Ordering code
TLE49SRI3	Leaded 3-pin package, with 2 internal capacitors, PSI5 Interface	SSO-3	ASIL C	Yes	SP005398935
TLE49SRC3	Leaded 3-pin package, with 3 internal capacitors, SPC Interface	SSO-3	ASIL C	Yes	SP005398941
TLE49SRS3	Leaded 3-pin package, with 3 internal capacitors, SENT Interface	SSO-3	ASIL C	Yes	SP005398939
TLE49SRP3	Leaded 3-pin package, with 3 internal capacitors, PWM Interface	SSO-3	ASIL C	Yes	SP005398937
TLE49SRC8	8-pin SMD package, SPC Interface	TDSO-8	ASIL C	Yes	SP005398933
TLE49SRS8	8-pin SMD package, SENT Interface	TDSO-8	ASIL C	Yes	SP005398931
TLE49SRP8	8-pin SMD package, PWM Interface	TDSO-8	ASIL C	Yes	SP005398929
TLE49SRC8D	8-pin SMD package, dual die, SPC Interface	TDSO-8	ASIL D	Yes	SP005859106
TLE49SRS8D	8-pin SMD package, dual die, SENT Interface	TDSO-8	ASIL D	Yes	SP005948428

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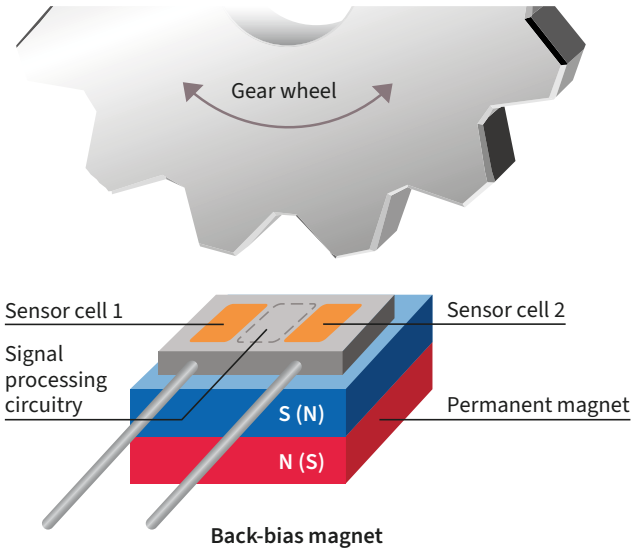
Magnetic speed sensors

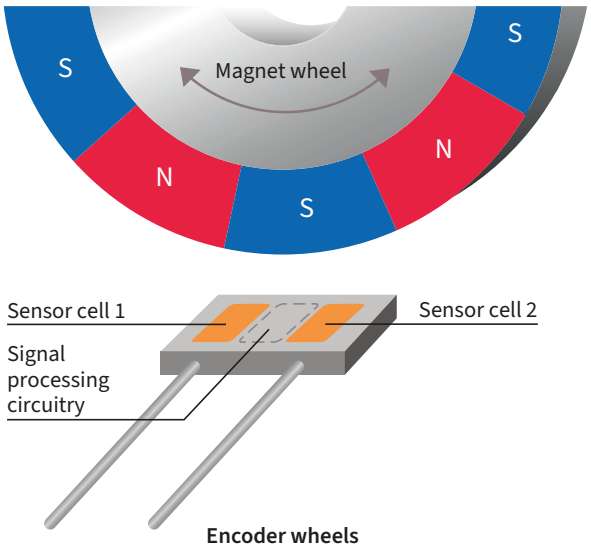
Easy to use, robust, and cost-effective sensors for speed measurement

Infineon's Hall-, GMR- and TMR-based magnetic speed sensors are designed to measure speed in safety and powertrain applications such as speedometers, ABS, camshafts/crankshafts, and automatic transmissions. They are also used in similar applications in the industrial sector. The sensors use a ferromagnetic gear tooth or encoder structure to measure linear or rotational speed and position. Hall sensor measuring rotational speed with a gear tooth and a magnetic encoder wheel. The majority of sensors also feature additional benefits, such as integrated capacitors for high EMC robustness and the highest levels of ESD protection.

Typical application of a magnetic differential sensor



Back-bias magnet



Encoder wheels

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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 enable good accuracy over air gap jumps and immunity to vibration and run-out events.

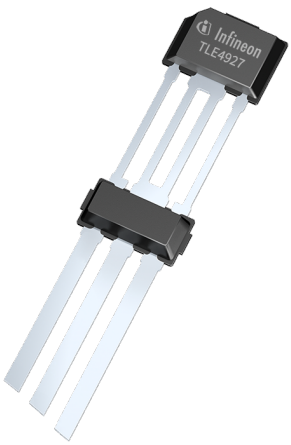
Features
- Large operating air gap capability
- Flexible mounting (also known as twist-independent mounting)
- Hidden adaptive hysteresis
- Low current consumption
- Reverse magnetic polarity capability
- Advanced protection technology
  - Reverse voltage protection at VS-pin
  - Short-circuit protection
  - Overtemperature protection
- Wide operating temperature ranges of -40°C ≤ T_j ≤ ±150°C
- High ESD robustness up to ±4 kV HBM
- Three-wire PWM voltage interface

Applications
- Industrial applications
- Two-wheeler and automotive vehicle speed

TLE4927C E6547
Differential Hall effect crankshaft sensor with hidden adaptive hysteresis

Infineon's TLE4927C detects the motion and position of ferromagnetic and permanent magnet structures by measuring the differential flux density of the magnetic field. A self-calibration mode ensures optimum accuracy in running mode in just a few transitions after start-up. The sensor combines a fast power-up time with high accuracy and sensitivity for large operating air gaps. Qualified for automotive temperature ranges and meets the requirements of harsh environmental conditions prevalent in automotive applications.
The TLE4927C comes with the SSO package with two integrated capacitors.

Features
- Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- Easy to use single chip solution in SSO-3-92
- Symmetrical switching point in the middle of the tooth/magnetic pole
- South and north pole pre-induction possible
- Digital output signal (voltage interface)
- Fast start-up time
- Reverse voltage protection at V_S-pin
- Short-circuit and overtemperature protection of output
- Automotive operating temperature range



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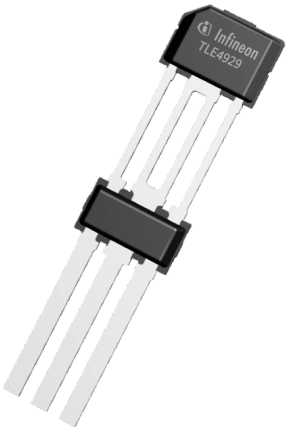
TLE4929
Fully programmable crankshaft sensor with direction detection

The TLE4929 is an active differential Hall sensor ideally suited for crankshaft applications and similar industrial applications, such as a speedometer or any speed sensor with excellent accuracy and low jitter capabilities. It as well addresses new requirements for crankshaft speed sensing from hybrid powertrains. An advanced vibration detection algorithm ensures valid sensor data for any hybrid powertrain traction. This improves efficiency of the engine start and helps to avoid misfiring or ECU error messages caused by wrongly calibrated sensor data. Also, the compatible 3-pin-package allows a one-to-one-replacement of the former generation of crankshaft sensors without direction detection, TLE4924/25/26/27/28, widely backward compatible functionality through flexible EEPROM configuration of parameters, meaning the former TLE492x-family can be mimicked.

Features

- Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- Ease of use single chip solution in SSO-3-52
- Switching point in the middle of the tooth enables backward compatibility
- Robustness over magnetic stray-field due to the differential sensing principle
- Precise miss fire detection through excellent jitter performance
- Dedicated hybrid engine algorithm keeps combustion engine calibrated during an electric drive cycle
- Digital output signal with programmable output-protocol including diagnosis interface
- Direction detection and stop-start-algorithm
- High accuracy and low jitter
- High sensitivity enables large air gap
- End-of-line programmable to adapt engine parameters
- Can be used as a differential camshaft sensor
- Pre-programmed version TLE4929C-XAN available, TLE4929C-X2A for wheels with 32 teeth
- Automotive operating temperature range



Product	Sensor technology	Classification	Direction detection	Automotive	Industrial	Protocol	RoHS
TLE4922	Mono-Hall	AEC-Q100	–	✓	✓	Single pulse	✓
TLE4927	Differential Hall	AEC-Q100	–	✓	✓	Single pulse	✓
TLE4929	Differential Hall	AEC-Q100	✓	✓	✓	PWM, Single pulse	✓

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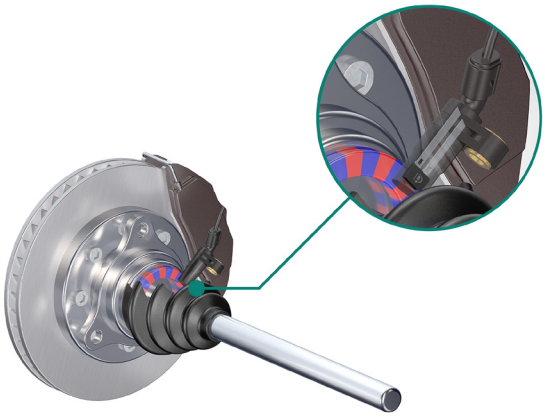
Safety first – wheel speed sensors

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 car modules have considered the wheel speed for their intelligent functions. The electrical parking brake, for example, needs to know about every inch a car moves when it is supposed to be stationary. iTPMS uses sophisticated algorithms to determine if a wheel lacks air pressure. Even the central locking locks the doors after a couple of meters, and the radio turns up the volume at an increasing speed. All of the above rely on accurate information from the wheel speed sensor.

Applications

- Wheel speed sensing in automotive applications
- Antilock braking systems (ABS)
- Electronic stability programs (ESP)
- Automatic transmissions
- iTPMS TLE5045IC and TLE5046SIC
- Support of automated driving and parking, TLE55493IC(D)



TLE4941PLUSC/TLE4942-1C/TLE4943C
My car, how fast and far does it drive?

The TLE4941PLUSC is a widely used wheel speed sensor. 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 car's wheel speed with its differential Hall technology. The ideal all-purpose sensor is equally suitable for pole and steel wheel applications. Because of their differential principle, these sensors are immune to any kind of undesired magnetic stray fields, ferromagnetic particles or other disturbances.

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

Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	iTPMS
TLE4941plusC	Hall differential	✓	✓	ISO 26262-compliant	–	Standard	–
TLE4942-1C	Hall differential	✓	✓	ISO 26262-compliant	✓	PWM	–
TLE4943C	Hall differential	✓	✓	–	✓	AK	–

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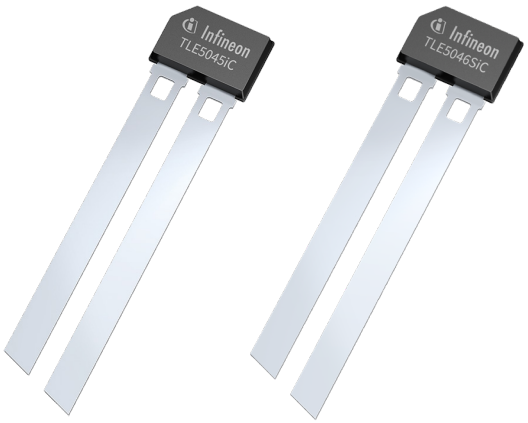
TLE5045IC/TLE5046SIC
GMR wheel speed sensors

The TLE5045IC/TLE5046SIC is our state-of-the-art wheel speed sensor family based on GMR technology. The family consists of a designed-to-cost speed-only TLE5045IC and a high-end TLE5046SIC that provides not only direction detection but also true “zero-speed” capability and the possibility of self-diagnostics.

TLE5045IC and TLE5046SIC are developed according to ISO 26262 to fulfill ASIL B and support ASIL D systems. The TLE5046SIC 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 ASIL D systems
- 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)

Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	iTPMS
TLE5045IC-R050	iGMR differential	✓	–	ISO 26262-compliant	–	Standard	✓
TLE5046SIC-PWM2-R050	iGMR differential	✓	–	ISO 26262-compliant	✓	PWM	✓
TLE5046SIC-AK-LR	iGMR differential	✓	–	ISO 26262-compliant	✓	AK	✓

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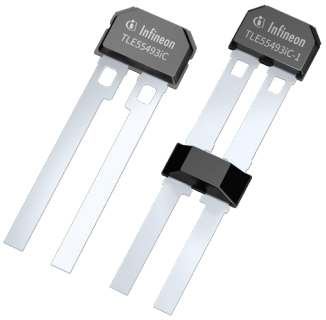
TLE55493IC - High end TMR wheel speed sensor

TLE555493IC is our next-generation wheel speed sensor family based on TMR technology. Linearized TMR brings together the benefits of GMR and Hall worlds: very good sensitivity, excellent jitter performance, a very big linear range, and excellent linearity for high-resolution algorithms. It perfectly addresses the customer requirements for autonomous parking and low-speed driving. Electric vehicles with fast torque can be perfectly served with valid direction detection with the first pulse. The complete TLE55493 family is compliant according to ISO 26262 ASIL D process.



TLE55493IC will be offered in two different packages:
PG-SSO-2-51 and PG-SSO-2-53

Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	Resolution
TLE55493IC-LR	iTMR differential	X		ISO 26262-compliant	X	AK	Standard
TLE55493IC-PW2-50	iTMR differential	X		ISO 26262-compliant	X	PWM	Standard
TLE55493IC-LR-4H	iTMR differential	X		ISO 26262-compliant	X	AK-4H	High
TLE55493IC-LR-6M	iTMR differential	X		ISO 26262-compliant	X	AK-6M	High
TLE55493IC-LR-8H	iTMR differential	X		ISO 26262-compliant	X	AK-8H	High
TLE55493IC-1-LR	iTMR differential	X		ISO 26262-compliant	X	AK	Standard
TLE55493IC-1-PW2-50	iTMR differential	X		ISO 26262-compliant	X	PWM	Standard
TLE55493IC-1-LR-4H	iTMR differential	X		ISO 26262-compliant	X	AK-4H	High

Features and benefits

Key features	Key benefits
– Immediate valid direction with first pulse	– Blind spot detection at automated parking
– Improved spatial resolution	– High protocol variants enable accurate, faster, and smoother control of the car movement
– Improved duty cycle	– Smoother control of car movement at low speed movement

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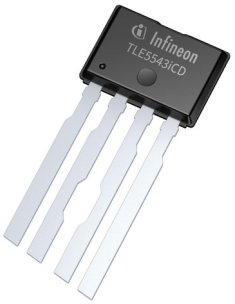
TLE55493ICD – High-end TMR dual die wheel speed sensor

TLE555493ICD is our next-generation wheel speed sensor family based on TMR technology. Linearized TMR brings together the benefits of GMR and Hall worlds: very good sensitivity, excellent jitter performance, very big linear range and excellent linearity for high-resolution algorithms. It perfectly addresses the customer requirements for autonomous parking and low-speed driving. Electric vehicles with fast torque can be perfectly served with valid direction detection with the first pulse. The complete TLE55493 family is developed as ASIL C (D) according to ISO 26262. The dual die sensor has two fully galvanic insulated sensors in one slim package that perfectly serve L3+ cars in case redundancy is required.



TLE55493ICD will be offered with two galvanic isolated dies in one package:
PG-SSO-4-52

Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	Resolution
TLE55493ICD-LR	iTMR differential	X		ISO 26262-compliant	X	AK	Standard
TLE55493ICD-PW2-50	iTMR differential	X		ISO 26262-compliant	X	PWM	Standard
TLE55493ICD-LR-4H	iTMR differential	X		ISO 26262-compliant	X	AK-4H	High
TLE55493ICD-LR-6M	iTMR differential	X		ISO 26262-compliant	X	AK-6M	High
TLE55493ICD-LR-8H	iTMR differential	X		ISO 26262-compliant	X	AK-8H	High

Features and benefits

Key features	Key benefits
– Immediate valid direction with first pulse	– Blind spot detection at automated parking
– Improved spatial resolution	– High protocol variants enable accurate, faster, and smoother control of the car movement
– Improved duty cycle	– Smoother control of car movement at low speed movement
– Redundancy for L3+ cars	– Same TMR chip will be re-used in galvanic isolated dual die package

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TLE4953C
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 enable designers to create high-accuracy systems with excellent vibration suppression. Adaptive hysteresis and the dynamic self-calibration algorithm ensure outstanding measurement results with 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 over molded capacitor for improved EMC.

Features
- Detection of rotation direction
- Highly accurate speed measurements from 0 to 12 kHz over large operating air gaps
- Excellent vibration suppression
- Broad operating temperature range
- AEC-Q100 qualified

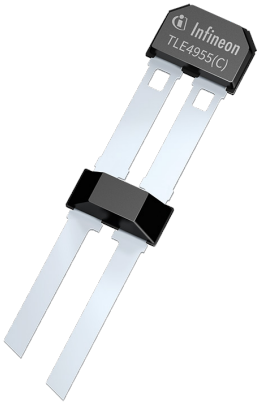
Applications
- Automatic transmission systems
- Industrial speed sensing using current interface

TLE4955C
Leading the way in vibration robustness

TLE4955 family of differential Hall sensors specially 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 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 interface



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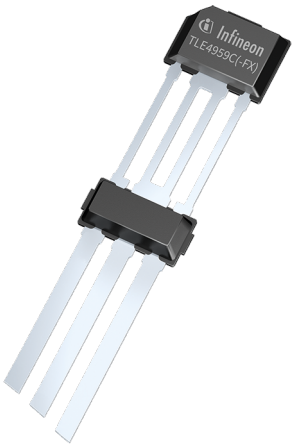
TLE4959C, TLE4959C-FX
State-of-the-art three-wire transmission speed sensor with direction detection

With our TLE4959, you can now address your three-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 three-wire sensor with direction detection and active vibration suppression. In addition to its outstanding air gap and best-in-class Hall jitter performance, its high immunity against stray fields makes it 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 20 k 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

TLE4959-5U, TLE4959-5U-FX
State-of-the-art four-wire transmission speed sensor with direction detection

XENSIV™ TLE4959-5U and TLE4959-5U-FX are four-wire voltage interface differential Hall speed sensors for transmission speed applications with vibration suppression and direction detection output. The FX version is flexible regarding protocol; it offers customer-programmable EEPROM.

State-of-the-art 4-wire transmission speed sensor with direction detection. The TLE4959-5U (FX) is an integrated differential Hall speed sensor ideally suited for transmission applications. Its basic function is to provide information on rotational speed and direction of rotation to the transmission control unit.
Sophisticated vibration suppression with excellent air gap performance. TLE4959-5U (FX) includes a sophisticated algorithm that actively suppresses vibration while keeping excellent air gap performance.

Features
- Voltage interface
- Active vibration suppression
- Direction detection output
- Dynamic self-calibration
- 0 Hz capability
- FX: flexible - protocol is customer programmable

Target applications
- Automatic transmission applications
- Transmission applications with speed with direction detection

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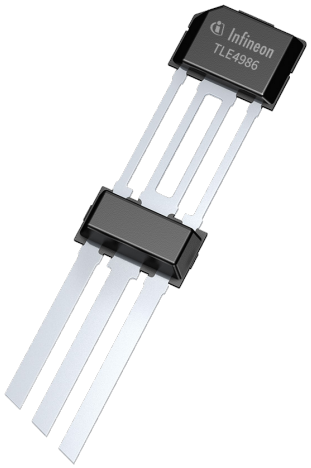
TLE4986
Mono-Hall based camshaft speed and position sensor

The TLE4986C is an active Hall sensor ideally suited for camshaft applications and similar industrial applications such as speedometers. Its basic function is to map a tooth or a notch into a unique electrical output state. It has an electrical trimming option for post-fabrication trimming to achieve true power on (TPO) capability even in the case of production spreads such as different magnetic configurations or misalignment. A self-calibration algorithm has also been implemented to achieve optimum accuracy during normal running operations. The EEPROM is adaptable to various performance-affecting parameters. It comes in a three-pin SSO-3-52 package for the supply voltage and an open drain output.

Features

- Hall switching sensor to measure speed or phase of pole/tooth wheels
- Digital output signal (voltage interface)
- Monocell chopped Hall system
- TPO true power on functionality
- TIM twist independent mounting
- Dynamic self-calibrating algorithm
- IST individual switching threshold
- End-of-line programmable switching points
- EEPROM for various algorithm options
- TC of back-bias magnet pre-programmed
- High resistance to mechanical stress
- Enhanced immunity against ESD and EMC
- Improved µ-cut capability
- Enhanced operating temperature range
- Module package SSO-3-52



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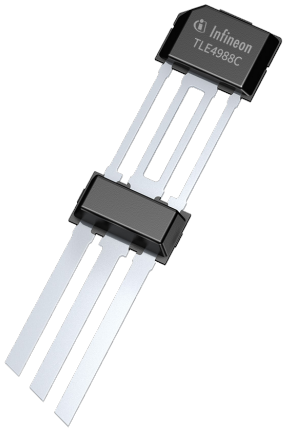
TLE4988C
Mono-Hall based camshaft speed and position sensor with reduced dependence on rare-earth backbias magnets

The Infineon XENSIV™ TLE4988C products feature advanced camshaft sensing performance and improved application adaption. One major benefit of advanced sensor performance for module manufacturers is the reduced dependence on rare-earth backbias magnets. The TLE4988C has proven the right performance with a ferrite backbias magnet for all relevant parameters such as phase jitter, phase accuracy or speed effect across key temperature, air gap, and rpm ranges. With automatic in-car TPO calibration, the most accurate start-up sensing in a real application environment is ensured by addressing tolerances of ferromagnetic wheels and magnetic encoders and mounting tolerances of the sensor. Infineon's TLE4988C products are optimized with three different backbias magnet materials: Fe, SmCo, and NdFeB. All products come inside the well-established camshaft sensor package SSO-3-52, allowing low design switch effort in terms of package and performance compatibility with predecessor products.

Features

- Digital output signal (voltage interface)
- True power on functionality (TPO)
- Auto TPO – automatic in car calibration
- Improved switching level/phase accuracy
- TC range including ferrite
- High speed digital interface for diagnosis/test
- Twist independent mounting (TIM)
- EEPROM for algorithm options and ID
- Increased ESD and EMC immunity, improved µCut feature
- Digital magnet temperature compensation
- Mechanical stress compensation
- Module package SSO-3-52



Product	Sensor technology	Magnet TC	Automotive	Industrial	Protocol	RoHS
TLE4986	Mono-Hall	SmCo	✓	✓	Single pulse	✓
TLE4988	Mono-Hall	SmCo, NdFeB, Fe	✓	✓	Single pulse	✓

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TLE5555IC(B)
State-of-the-art TMR transmission speed sensor for pole/toothed wheel in top/ side read configuration with/without back-bias magnet

The TLE5555IC is a differential magnetic speed sensor based on tunnel magnetoresistive (TMR) sensing technology. This technology enables best-in-class jitter and air gap performance and allows sensing flexibility in top and side read configuration. Its basic function is to provide information about the rotational speed and the direction of the rotation to the transmission control unit. Therefore, the sensor family includes a sophisticated algorithm that actively suppresses vibration. The output has been designed as a two-wire current interface based on a PWM (pulse width modulation) principle. The TLE5555IC operates without external components and is fully EMC-compliant thanks to its capacitor integrated on silicon level.

Features

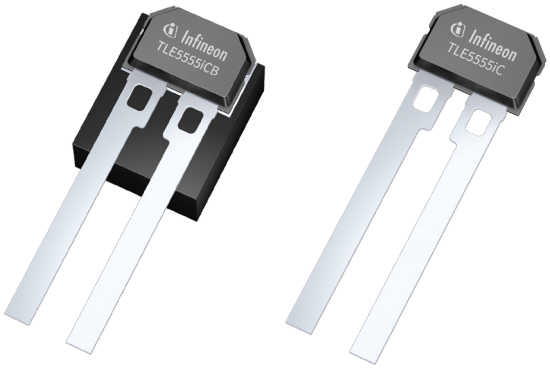
- High magnetic field sensitivity enables ultralow jitter over high operating air gap range
- Two wire PWM current interface
- Direction detection
- Vibration suppression (active via protocol suppression; passive via adaptive hysteresis)
- Differential sensing principle enables magnetic stray field robustness
- Equipped with sintered ferrite back-bias magnets and algorithm-optimized for toothed wheel applications
- Package options for top and side read mounting make bending of sensor leads obsolete
- EMC robust without the need of capacitors on sensor leads
- Comprehensive digital diagnostic interface, enabling readout of internal signals and electronic chip ID
- Customer configurable EEPROM in FX version

Potential applications

- Ideal for the use in harsh environments, particularly automotive transmissions
- Suitable for all kinds of transmission systems including dedicated hybrid transmission (DHT) and electric vehicle (EV) concepts

The "ICB-top" family members are designed for toothed wheel applications and have a ferrite back-bias magnet attached. They come in a RoHS-compliant two-pin package and are qualified for automotive usage. It is recommended that the ICB-top be used within an over molded module. For magnetic encoder (ME) applications, other sensors –called ME family – are available.

The FX version, which provides a programmable EEPROM, offers high flexibility. This sensor offers many protocol options that have been established in transmission applications over the last decades. Additionally, it offers the option to configure the sensor algorithm (e.g., magnetic threshold, vibration robustness) to optimize the sensor performance for the target wheel fully.



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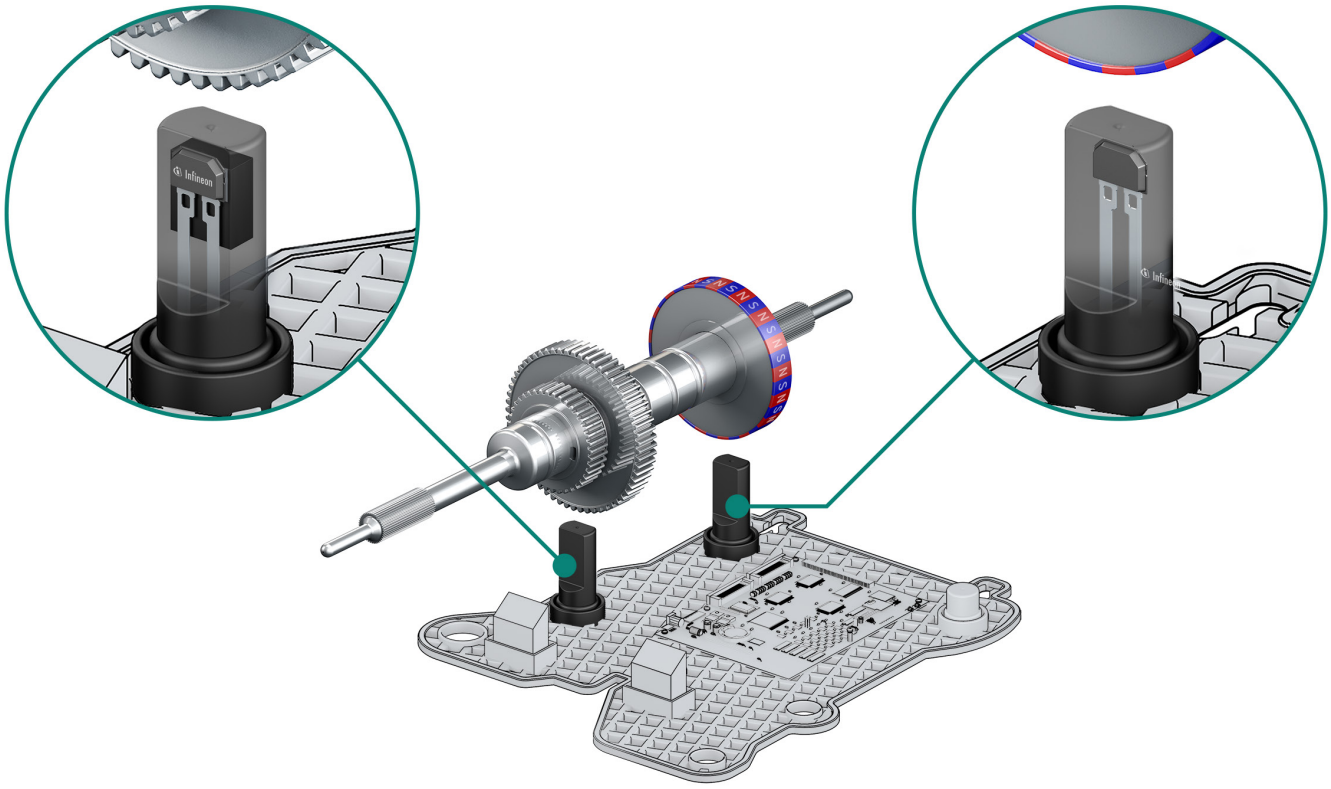

Available variants

Product	Description	Classification	Ordering code	Package
TLE5555IC ME E0	For polewheel (top + side-read), E0 protocol	ISO 26262-compliant	SP003883456	SSO-2-51
TLE5555IC ME E1	For polewheel (top + side-read), E1 protocol		SP005832719	SSO-2-51
TLE5555IC ME E4B	For polewheel (top + side-read), E4B protocol		SP005829763	SSO-2-51
TLE5555ICB E0-TOP	For steelwheel (top-read), E0 protocol, incl. backbias magnet		SP003883500	SSOA22-2-51
TLE5555ICB E1-TOP	For steelwheel (top-read), E1 protocol, incl. backbias magnet		SP005401486	SSOA22-2-51
TLE5555ICB E4B-TOP	For steelwheel (top-read), E4B protocol, incl. backbias magnet		SP005832705	SSOA22-2-51

PRO SIL

ISO 26262 compliant

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XENSIV™ pressure sensors

For automotive, industrial, and consumer applications – ensure the perfect fit for all performance and integrity needs

Infineon XENSIV™ pressure sensors measure the pressure of air and gases across various industries and applications. As pressure transducer sensors, they convert physical pressure into an electric signal. Infineon XENSIV™ pressure sensors combine sensing functions (via a pressure sensor element) and conversion into an electrical signal (via an absolute pressure transducer and signal processing) in one integrated silicon device.

The sensor element and its integrated circuits (ICs) are the heart of pressure sensor technology. Infineon's small pressure sensor IC chips support various applications with best-in-class performance. Infineon is one of the world's largest semiconductor pressure sensor and transducer manufacturers, thanks to a varied portfolio of absolute air pressure sensor ICs. Our comprehensive family of XENSIV™ sensors includes a wide selection of pressure-sensitive sensors tailored specifically to the automotive, consumer, and industrial sectors. XENSIV™ sensors are compact, designed to save energy, and offer a rapid time-to-market – a perfect fit for any performance and integrity needs.

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Infineon XENSIV™ BAP sensors are calibrated for specific automotive applications, especially for BMS thermal runaway detection, pneumatic seats, and electronic engine control. The BMS sensors are ISO 26262-compliant and support the highest ASIL requirements on the system level.

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 analog or digital interfaces enable engines to meet these requirements.

Typical safety-related automotive pressure sensing applications, such as side impact and pedestrian protection, call for the highest quality and accuracy standards with full ISO 26262 compliance. Every year, thousands of pedestrians are severely injured in traffic due to slow or failing sensing elements.
Our Infineon XENSIV™ safety pressure sensor family includes integrated pressure sensors that tick all these boxes with PSI5 peripheral sensor interfaces for safety-critical use cases. Our sensors support new safety systems, increasing the protection of pedestrians and car occupants in the event of a collision.

Infineon's tire pressure sensors perform all of the functions necessary to implement a state-of-the-art module for a tire pressure monitoring system (TPMS). As part of our XENSIV™ pressure sensors portfolio, our SP49 TPMS sensor ICs are easy to integrate and feature a microcontroller, sensors, wireless communication, and convenient peripherals. They only need a few passive components and a battery to complete a full automotive TPMS sensor assembly.

Our family of digital barometric pressure sensors also gives designers the best choice when it comes to mobile and wearable devices. Highlights include small form factors to facilitate system integration, highest precision and relative accuracy over a wide temperature range, fast read-out speeds via the serial I^2C/SPI interface, and low power consumption to ensure longer battery lifetimes.

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Absolute pressure sensors (MAP and BAP)

Highest accuracy and precision on the smallest footprint and energy bill

Infineon's pressure sensors offer the highest quality and accuracy for safety-relevant automotive, industrial, or consumer lifestyle applications. Typical safety-related automotive pressure sensing applications such as side-impact and pedestrian protection call for the highest quality and accuracy standards with full ISO 26262 compliance. Our XENSIV™ family includes integrated pressure sensors that tick all these boxes with PSI5 peripheral sensor interfaces for a safety-critical use case.

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KP21x/KP22x – Analog manifold air pressure sensor family (MAP + turbo MAP)

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

KP23x – Analog barometric air pressure (BAP) sensor family

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 15 to 165 kPa
- Temperature range from -40 to +125°C
- Serial service interface
- Open bond detection (OBD) for supply and GND
- Reverse polarity protection
- Green SMD package

KP276 – Media robust MAP sensor with digital interface

Features

- Media robustness for current automotive requirements
- Digital single edge nibble transmission (SENT) interface (282 clock ticks)
- Excellent accuracy of ±0.77% FSS
- Temperature range -40 to +170°C (170°C for 20 min. max., 150°C operating)
- Integrated NTC temperature sensor functionality with fast start up time (typ. 10 ms)
- Green SMD package

Integrated pressure sensor ICs for manifold and barometric air pressure

Product	Max. accuracy [kPa]	Max. operating temperature [°C]	Automotive	Industrial	Classification	Pressure range [kPa]
KP21x	1.0	140	✓	✓	–	10 … 150
KP22x	2.5	140	✓	✓	–	10 … 400
KP23x	1.0	125	✓	✓	–	15 … 115
KP236N6165	1.0	125	✓	✓	–	60 … 165
KP276	3.0	150 (170 time limited)	✓	✓	–	10 … 400

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KP46x – Digital barometric air pressure family in new DFN-8 package

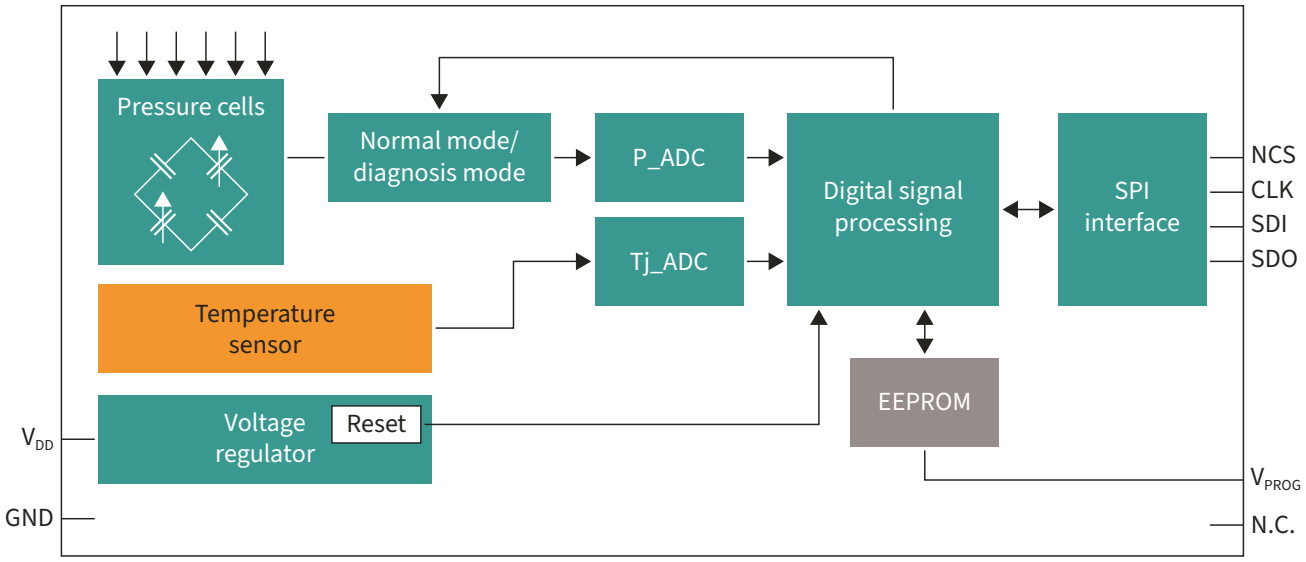
Features

- High accuracy pressure sensing
- Pressure range according to different application needs:
  - ECU/MAF (40–115 kPa)
  - Pneumatic seats (60–165 kPa)
  - BMS thermal runaway (45–200 kPa)
- ISO 26262 compliance for KP467 (ASIL B)
- Operating ambient temperature range -40 … +125°C, KP467 up to 105°C
- Best-in-class low power consumption with dedicated power-down mode for energy saving
- 10-, 12- or 14-bit resolution pressure and temperature values via SPI interface and backwards compatibility to legacy devices KP25x and KP264
- KP467 with autonomous low-power monitoring (LPM) feature for pressure event detection and host wake-up
- Integrated signal path diagnosis features
- Green, small 4.5×5.1 mm 8-pin DFN package for all KP46x

Applications

- KP464/KP464E for ECU and mass airflow sensing to control fuel supply and injection, for air management and ignition
- KP465 for higher pressure levels e.g., within compressed air in fuel-cell applications
- KP466 for pneumatic seat comfort application
- KP466P for pneumatic seat comfort application and thermal runaway detection in battery management system for xEVs
- KP467 for thermal runaway detection in battery management system for xEVs

Block diagram KP46x



Product	Operating pressure range [kPa]	P-accuracy -40°C [kPa]	P-accuracy 0 … +85°C [kPa]	P-accuracy +125°C [kPa]	T-accuracy +25 … +85 [°C]	Supply current I_{VDD} [mA]	Supply current power down I_{VDD_PD} [µA]	Classification
KP464	40 … 115	±1.5	±1.0	±1.5	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP464E	40 … 115	±1.5	±1.0	±1.5	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP465	60 … 320	±5.0	±3.0	±5.0	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP466	60 … 165	±4.0	±1.0	±2.0	±3	5 (without SPI comm.)	10	AEC-Q103
KP466P	60 … 165	±1.5	±1.0	±1.5	±3	5 (without SPI comm.)	10	AEC-Q103
KP467	45 … 200	±3.0 kPa (lifetime) ±1.5 kPa (0h) ±4% of LPM threshold (±2 kPa max.)			±3	– 3.5 mA (on mode without SPI comm.) – typ. 50 µA (in LPM)	10	AEC-Q103 ISO 26262-compliant

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KP497 – Advanced digital barometric air pressure and acceleration sensor

Features

- Pressure range for thermal runaway detection: 20–250 kPa
- Integrated acceleration sensor for battery shock monitoring
- ISO 26262-compliant (ASIL A)
- 2kB flash memory available for storage of customer specific data, e.g., battery passport relevant data
- High accuracy pressure sensing
- Operating ambient temperature range -40 … +105°C
- Ultralow power consumption with dedicated power-down mode for energy saving
- Autonomous low-power monitoring (LPM) feature for event detection and host wake-up

Applications

- KP497 calibrated for thermal-runaway-detection in battery management systems for xEVs by sensing critical air pressure
- Determination of the economic value of the battery over the course of its life cycle in relation to mechanical influences and shocks; with that essential part of the information for battery passport for xEVs and for reprocessing and reuse of batteries

Product	Operating pressure range [kPa]	P-accuracy [kPa]	T-accuracy [°C]	Typ. supply current power down at 25°C I_{VDD_PD} [µA]	Classification
KP497 [1)]	20 … 250	±2	±3	0.24	AEC-Q100 ISO 26262-compliant

1) Coming Q2/2025

PRO SIL

ISO 26262 compliant

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Pressure sensors for side crash detection (SAB)

PSI5 PRO-SIL™-ready pressure sensors for side impact detection and pedestrian protection

Passive safety vehicle systems have improved significantly over the last few years, especially in terms of front impact, side impact, and pedestrian impact detection. Legal regulations and consumer tests have been the main drivers (e.g., FMVSS 214, UN ECE R135, NCAP) for increased penetration. Infineon Technologies' next-generation PSI5 safety pressure sensor family enables very fast reaction times and will help you to fulfill existing and future tests.

The pressure sensor is assembled in a module within the car's side doors in the side airbag application. When the door is compressed due to a side impact, the KPx0x provides a signal pulse proportional to the pressure change inside the door. In the pedestrian protection application, the pressure sensing system based on KP201/KP305/KP405 is mounted within the car's front bumper. In case of an impact, a pedestrian protection device is triggered. The KP201/KP305/KP405 extended pressure range allows common pedestrian protection systems to support front impact detection scenarios and also supports side crash systems.

Features and benefits

Key features	Key benefits
– PSI5 peripheral interfaces	– Fully compliant to PSI5 and AK-LV29/38 and extended pressure range addendum
– Easy customization with end of line programming via PSI5 interface in the final customer module	– ISO 26262-compliant development to be used in ASIL B(D) systems
– Low design-in effort due to drop-in compatibility to previous safety pressure sensor family	– Patented built-in diagnosis for pressure cells and circuitry
– Best-in-class cost performance	– SMD package: DFN-8-1

Product summary

Type	Application	Classification	Package
KP200	Side crash detection	ISO 26262-compliant	DSOF-8-16
KP201	Side crash detection Pedestrian impact detection Front crash detection	ISO 26262-compliant	DSOF-8-16
KP204	Side crash detection	ISO 26262-compliant	DSOF-8-164
KP300	Side crash detection	ISO 26262-compliant	DSOF-8-164
KP305	Side crash detection Pedestrian impact detection Front crash detection	ISO 26262-compliant	DSOF-8-164
KP400	Side crash detection	ISO 26262-compliant	DFN-8-1
KP405	Side crash detection Pedestrian impact detection Front crash detection	ISO 26262-compliant	DFN-8-1

PRO SIL

ISO 26262 compliant

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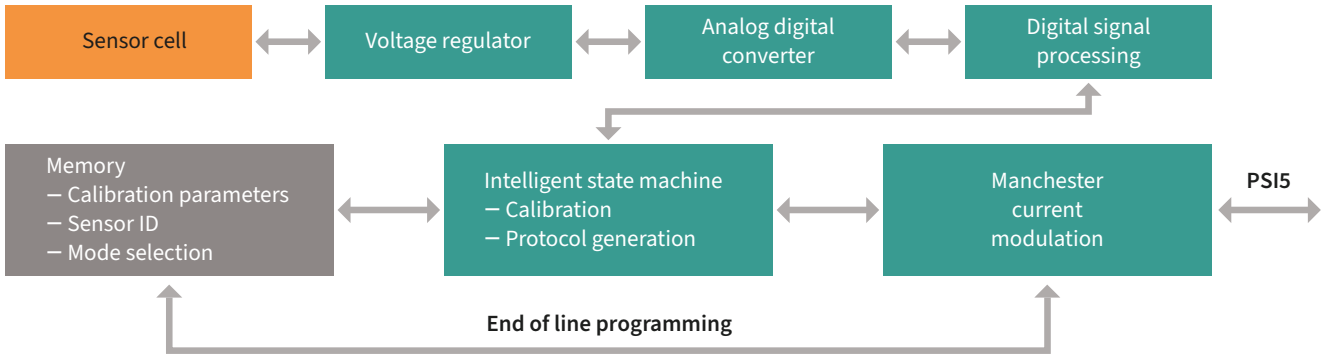
Pressure sensors KP300 and KP305

ISO 26262-compliant pressure sensor for side crash, pedestrian impact, and front crash detection

Infineon's KP30x is a monolithically integrated pressure sensor featuring a programmable PSI5 interface and compliance with AK-LV29/38. An intelligent state machine provides a pressure signal output enabling simple threshold detection algorithms. The amplitude of the signal pulse is independent of the ambient pressure but dependent on the relative pressure change. Several output formats are selectable to provide more design flexibility to the system. The KP30x family forms the next generation of safety pressure sensors and is application-compatible with Infineon's previous generation. ISO 26262-compliant development and corresponding functional safety documentation support the use of the KP30x in ASIL B(D) systems.

Block diagram



Features and benefits

Key features	Key benefits
– Fully compliant to PSI5 and AK-LV29/38 and extended pressure range addendum	– Easy customization with end of line programming via PSI5 interface in the final customer module
– ISO 26262 compliant development to be used in ASIL B(D) systems	– Low design-in effort due to drop-in compatibility to previous safety pressure sensor family
– Patented built-in diagnosis for pressure cells and circuitry	– Best-in-class cost performance
– SMD package: DSOF-8-164	

Product summary

Type	Application	Classification	Package
KP300	Integrated pressure sensors	Side crash detection	DSOF-8-164
KP305	Integrated pressure sensors	Side crash detection Pedestrian impact and front crash detection	DSOF-8-164

PRO SIL

Pedestrian protection

Side airbag

ISO 26262 compliant

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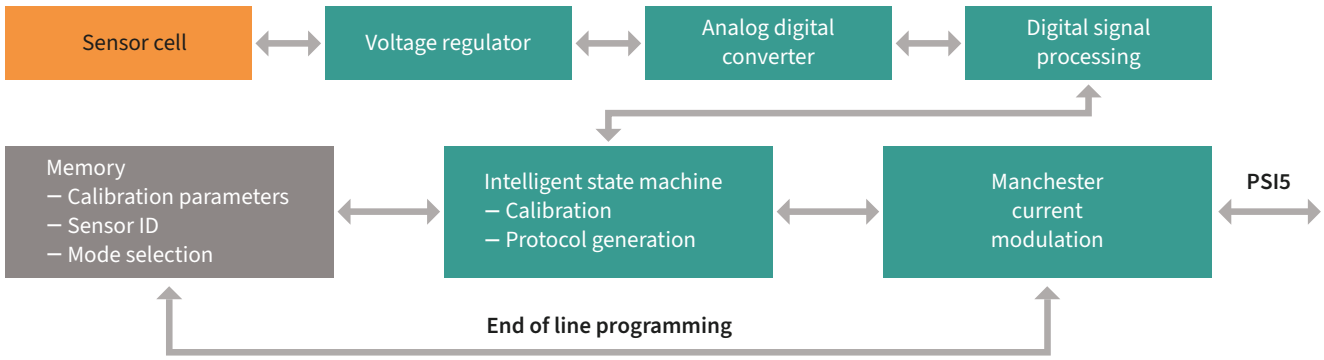
Pressure sensors KP400 and KP405

ISO 26262-compliant pressure sensor for side crash, pedestrian impact, and front crash detection in small DFN package

Infineon's KP40x is a monolithically integrated pressure sensor featuring a programmable PSI5 interface and compliance with AK-LV29/38. An intelligent state machine provides a pressure signal output, enabling simple threshold detection algorithms. The amplitude of the signal pulse is independent of the ambient pressure but dependent on the relative pressure change. Several output formats are selectable to provide more design flexibility to the system. The KP40x family forms the next generation of safety pressure sensors and is fully compatible with Infineon's previous generation. ISO 26262-compliant development and corresponding functional safety documentation support the use of the KP40x in ASIL B(D) systems. Based on the proven chip technology, the KP40x offers best-in-class cost performance and is delivered fully calibrated.

Block diagram



Features and benefits

Key features	Key benefits
– Small holes for intrusion protection	– Fully compliant to PSI5 and AK-LV29/38 and extended pressure range addendum
– Safe operation even with two blocked holes	– ISO 26262-compliant development to be used in ASIL B(D) systems
– Easy customization with end of line programming via PSI5 interface in the final customer module	– Patented built-in diagnosis for pressure cells and circuitry
– Low design-in effort due to drop-in compatibility to previous safety pressure sensor family	– SMD package: DFN-8-1
– Best-in-class cost performance	

Product summary

Type	Application	Classification	Package
KP400	Integrated pressure sensors	Side crash detection	DFN-8-1
KP405	Integrated pressure sensors	Side crash detection Pedestrian impact and front crash detection	DFN-8-1

PRO SIL

Pedestrian protection

Side airbag

RoHS

ISO 26262 compliant

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Tire pressure sensors (TPMS)

SP49 – Tire pressure monitoring sensors

The Infineon SP49 product family provides highly integrated devices that perform all functions for a tire pressure monitoring system (TPMS) wheel module suited for high-volume applications. The devices measure pressure in the range from 100 kPa up to 920 kPa and acceleration between -600 g and 600 g, as well as temperature and supply voltage. Furthermore, they feature efficient power management and an integrated microcontroller. An integrated LF receiver and RF transmitter allows wireless communication.

For wired data transfer, the hardware master/slave I2C interface can be used. Further wired interfaces, such as UART, SPI, or PWM, can be realized in software. Infineon's technical leadership in MEMS technology and patented Glass-Silicon-Glass MEMS pressure sensors with best-in-class media compatibility ensure industry-leading performance in TPMS.

Customer benefits

Optimized for battery-powered applications, the system controller's flexible wake-up and power management, ultralow power down current, and wide range of supply voltages ensure a long battery lifetime (for typical TPMS applications, 10 years with a CR2032 battery).
With the possibility of generating a wake-up from the integrated Interval timer, SP49 products are perfectly suited for standalone remote pressure sensing solutions demanding low charge consumption. For such applications, the LF receiver with wake-up capability and best-in-class sensitivity provides the possibility of on-demand measurements.
SP49 has a tailored ASIC, which is optimized for the following new intelligent tire features.

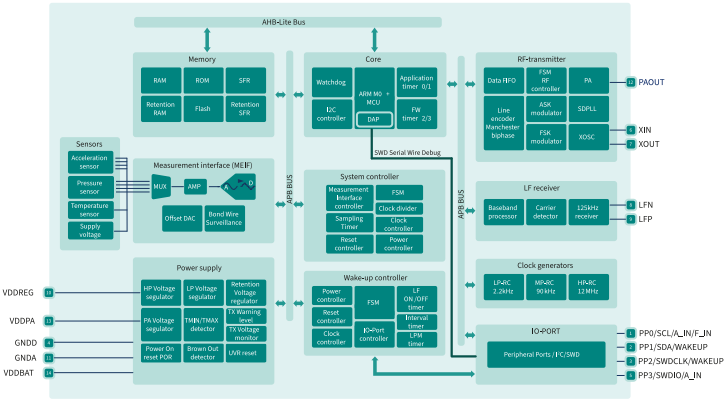
- On-tire auto-position-sensing (APS)
- Tire filling assist
- Tire burst detection
- Load detection

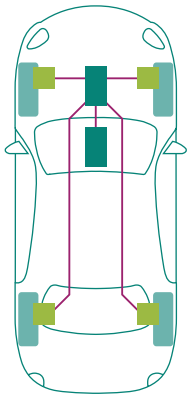
Features

Patented Glass-Silicon-Glass MEMS pressure sensor with Best-in-class media compatibility

- Industry-standard power efficient 32-bit Arm® Cortex® [1)]
- 19 kB of flash memory for the application code and/or user data storage; also usable for a bootloader
- 1 kB RAM plus 192 bytes of retention RAM
- Best-in-class lifetime charge consumption

1) Arm® and Cortex® are trademarks of ARM limited, UK





SP49 fully supports all necessary requirements for a tire pressure monitoring system (TPMS)

Product table

Product variant	Product name	Pressure range [kPa]	Flash size for code [kB]	Package	Ordering code
SP490-01-11	SP49	920	19	DSOSP-14-84	SP005878909
SP490-01-12	SP49i	920	19	DSOSP-14-84	SP005825051
SP49T-05-12	SP49iTruck	1600	19	DSOSP-14-84	SP005957469

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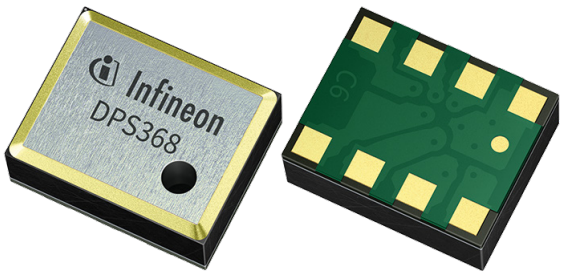
Pressure sensors for consumer and IoT

DPS368 – Digital barometric pressure sensor for mobile and wearable devices

Infineon's digital barometric pressure sensor DPS368 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 ultrahigh precision (±2 cm) and excellent relative accuracy (±0.06 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 application uses the coefficients to convert the measurement results to true pressure and temperature values. The sensor has a FIFO that can store the last 32 measurements. Since the host processor can remain in sleep mode for longer between readouts, a FIFO can reduce the system's power consumption. Sensor measurements and calibration coefficients are available via the serial I²C/SPI interface.

DPS368 offers the best-in-class resolution (±2 cm), a very fast readout speed, and low current consumption. The sensor can be used in harsh environments, as it is robust against water (IPx8 - 50 m underwater for 1 hour), dust and humidity. The small package size saves up to 80 percent of the space and makes the DPS368 ideal for mobile applications and wearable devices.



Typical applications

- Drones: altitude detection and height stability
- Health and fitness: accurate elevation gain and step counting (e.g., for smartwatches)
- 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
- Airflow control: Smart filter replacement alarm (e.g., in home appliances); predictive maintenance
- Health care: fall detection; respiratory devices; smart inhalers

Key product features

Package size	2.0 x 2.5 x 1.1 mm
Operating pressure range	300 … 1200 hPa
Operating temperature range	-40 … 85°C
Pressure level precision	± 0.002 hPa (or ±0.02 m)
Relative accuracy	± 0.06 hPa (or ±0.5 m)
Absolute accuracy	± 1 hPa (or ±8 m)
Temperature accuracy	0.5°C
Pressure temperature sensitivity	0.5 Pa/K
Measurement time	3.6 ms (low precision); 27.6 ms (standard mode)
Average current consumption at 1 Hz sampling rate	1.7 µA pressure measurement, 1.5 µA temp. measurement, standby 0.5 µA
Supply voltage	V_{DDIO}: 1.2–3.6 V; V_{DD}: 1.7–3.6 V
Operating modes	Command (manual), background (automatic), standby
Interface	I²C and SPI, both with optional interrupt

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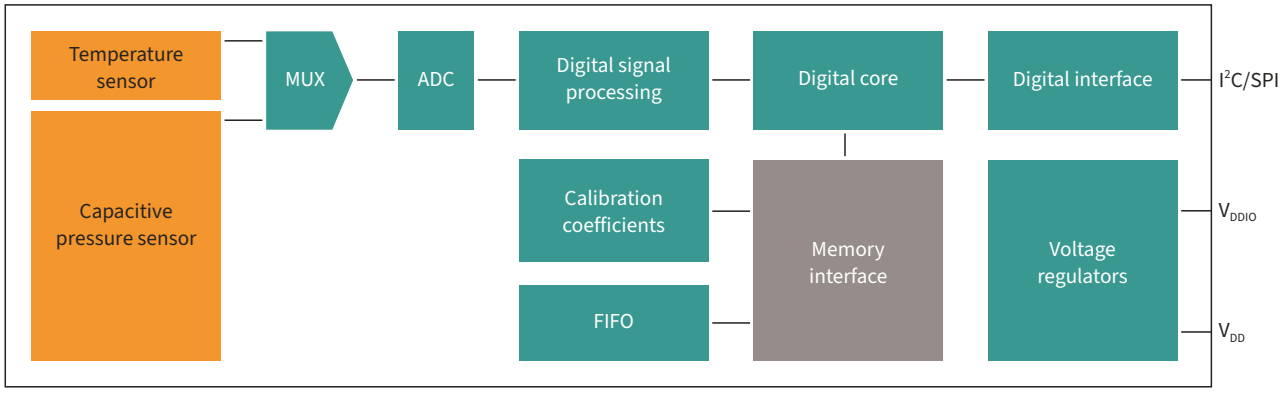
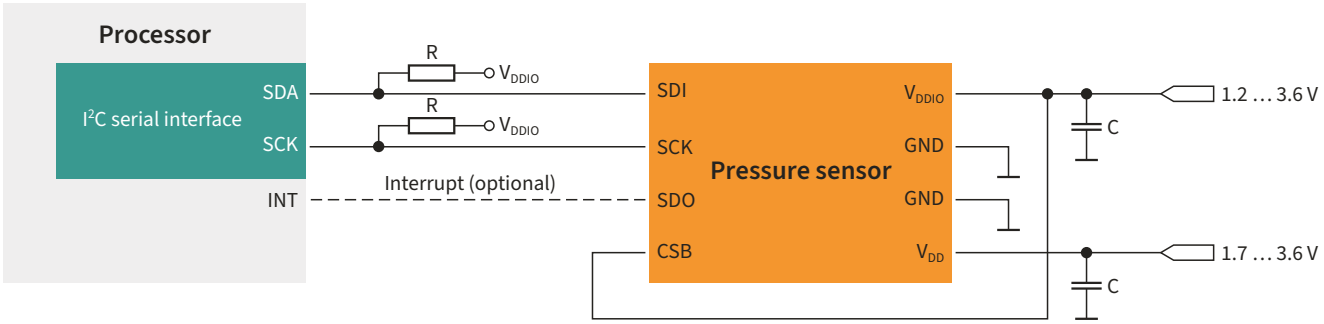
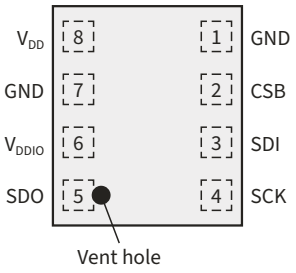
Functional block diagram



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	VDDIO	Digital interface supply
7	GND	Ground
8	VDD	Analog supply

Infineon inside pressure sensor partners

Building upon its best-in-class technology, Infineon offers a full range of barometric pressure sensors as chipsets. Infineon's network of global partners offers customers a comprehensive portfolio of Infineon inside pressure sensors that will propel performance to the next level even for the most demanding applications.

Infineon Partner Program

Learn more about our partner program and purchase our partner solutions here.

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XENSIV™ MEMS microphones for consumer, industrial, and automotive applications

Infineon XENSIV™ MEMS microphones redefine a growing number of use cases

XENSIV™ MEMS microphones are setting new performance benchmarks across a growing number of industries. These innovative silicon microphones are designed to provide the benefits of the lowest possible self-noise (high SNR) and minimal distortion for an ever-expanding range of applications.

Dedicated digital and analog MEMS mics
Our digital and analog MEMS microphones for consumer applications deliver a studio-quality audio experience in compact form factors such as smartphones or earbuds. Our automotive-qualified solutions, on the other hand, enable the best audio performance in harsh automotive environments improving the in-cabin user experience and passenger comfort. Additionally, they enhance autonomous driving features and contribute to road safety.

MEMS for consumer and industrial applications
Infineon's XENSIV™ MEMS microphones are designed to capture unprecedented precision and quality audio signals. The microphones comprise Infineon's MEMS microphone chips and ASICs, the world's best-selling microphone components. Due to advanced technical characteristics, high-quality standards, and robustness at the chip level, XENSIV™ MEMS microphones add 'hearing' to many consumer applications (earbuds, headphones, wearables, smart speakers, laptops, tables, etc.) and industrial and medical applications (predictive and preventive maintenance, security, patient monitoring systems, etc.).

MEMS microphones for automotive applications
We also offer high-performance MEMS microphones qualified to the AEC-Q103-003 automotive quality standard. They are suited for all applications inside and outside the car where the best audio performance in harsh automotive environments is required. The extended availability of these silicon devices matches the typical long lifecycle of a vehicle.

Typical applications include speech (hands-free/e-call/ICC), voice commands with microphone arrays and beamforming, active and road noise cancellation, and detecting event sounds, sirens, contact, and road conditions.

The extended availability of these silicon devices matches the typical long lifecycle of a vehicle, revolutionizing the use of ATV microphones for a wide range of applications.

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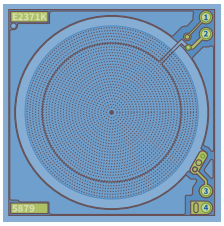
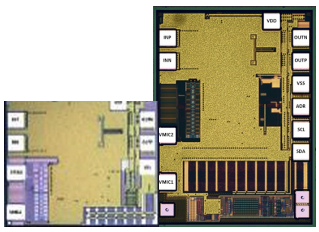
MEMS microphones technology

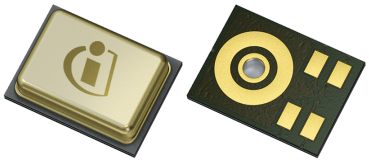
Infineon's XENSIV™ MEMS microphones are designed for capturing audio signals with unprecedented precision and quality. The microphones are comprised of Infineon's MEMS microphone chips and ASICs which are not without reason the world's best-selling microphone components.

Infineon microphone system

MEMS	ASIC	Package







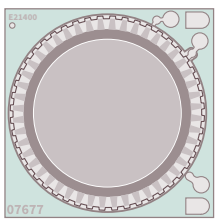
Infineon owns all building blocks of MEMS microphones allowing to develop MEMS, ASIC, and package combinations which achieve the best possible performance and are optimized to each application.

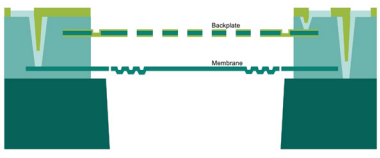
Infineon XENSIV™ MEMS microphones shape the industry on the technology level

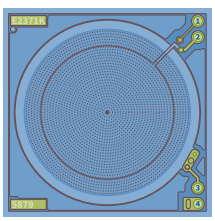
MEMS microphones use an electrically charged backplate and a membrane to form a capacitive sound transducer. The flexible membrane moves proportional to the amplitude and frequency of incoming sound waves. The resulting change in voltage is measured, processed and output by an integrated analog or digital ASIC. Infineon distinguishes two main MEMS technologies:

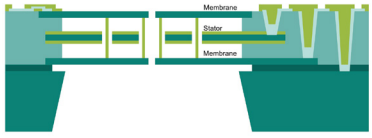
Single backplate technology (SBP)
Single backplate technology (SBP) represents an industry standard for mid-end microphones with its simplicity and robustness. The SBP technology offers the best performance-to-cost ratio, especially for small package sizes and SNR values up to 69 dB SNR.

Sealed Dual Membrane (SDM)
Sealed dual membrane (SDM) is Infineon's revolutionary MEMS microphone technology that utilizes two membranes and a charged stator to create a sealed low-pressure cavity and a differential output signal. The architecture enables ultrahigh SNR (up to 75 dBSNR) and very low distortions and delivers high ingress protection (IP57) at a microphone level. Select SDM technology for best-in-class acoustic performance in medium and larger packages.









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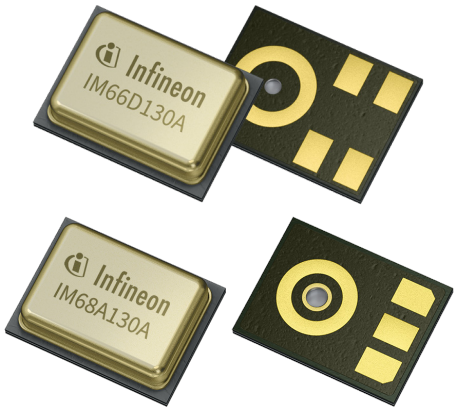
MEMS microphones for automotive applications

Qualified according to automotive standard, AEC-Q103-003

As part of our comprehensive XENSIV™ microphone family, we also offer automotive microphones, especially tested and qualified to the stringent needs of automotive use cases. These microphones close the gap in the automotive industry, providing the best possible fit for automotive applications.



Special features and benefits of automotive qualified microphones

- Full automotive qualification according to AEC-Q103-003
- Increased operating temperature range up to +105°C [1)]
- Environmental robust up to IP57 [1)]
- Narrow sensitivity matching for enhanced performance of beam-forming arrays
- Flat frequency and stable phase response down to 7 Hz for optimal performance in acoustic noise cancellation (ANC) applications [1)]
- Very high AOP for high wind-noise robustness ensures stable performance in extremely loud environments of exterior use cases [1)]
- Best-in-class audio performance (SNR, AOP, THD) for optimum speech quality and capture of distortion-free audio signals in loud environments such as inside a car

1) Depending on selected product. See parameter table below for details.

Customer benefits of automotive qualified microphones

Cost saving	– Reduced re-qualification cost for Tier 1 due to minimized risk of qualification failure – Longer available parts enable platform concepts at Tier1/OEM
Quality	– Quality assured for the whole vehicle life by running qualification tests at three different temperatures over the full operating temperature range (-40°C … +105°C) – Compliance with AEC-Q103 and automotive style documentation (PPAP, Qual report, ...) simplifies OEM discussions (no waivers needed)
Performance	– Characterization data over full temperature range provides full transparency of acoustic behavior and avoids late discrepancies – Best-in-class audio performance leads to increased speech intelligibility and improved satisfaction of the end user
Flexibility	– Extended temperature range allow flexible use in different operational areas (internal and external) and various applications – High acoustic-overload-point (AOP) allows flexible placement inside/outside the vehicle
Service and knowledge	– Good reputation of Infineon-Automotive simplifies product selection procedures with OEMs – Premium services with our worldwide support teams shorten the learning curve and design-in cycles – Fast FAR handling, including high traceability, facilitates efficient incident management

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Parameter table: Digital microphones

Key parameters	IM67D130A IM67D120A Optimized for speech	IM66D130A IM66D120A Optimized for ANC and speech	IM64D130A IM64D121A Optimized for mid performance use cases	IM63D135A Optimized for external application
Signal-to-noise ratio (SNR)	67 dB(A)	66 dB(A)	64 dB(A)	63 dB(A)
Sensitivity	-36/-26 dB FS	-36/-26 dB FS	-36/-26 dB FS	-41 dB FS
Acoustic overload point AOP (THD = 10%)	130/120 dB SPL	130/120 dB SPL	130 dB SPL	135 dB SPL
Frequency range	28 Hz … 20 kHz	7 Hz … >20 kHz	7 Hz … >20 kHz	7 Hz … >20 kHz
Package	4.0 x 3.0 mm2	3.50 x 2.65 mm2	3.50 x 2.65 mm2	3.50 x 2.65 mm2
Operating temp.	-40°C ... +105°C	-40°C ... +105°C	-40°C ... +85°C	-40°C ... +105°C
AEC-Q103-003 qualification	Yes	Yes	Yes	Yes
Environmental robustness	–	IP57	IP57	IP57
Status	Mass production	Mass production	Mass production	Mass production

Parameter table: Analog microphones

Key parameters	Optimized for ANC	Optimized for mid performance use cases
Signal-to-noise ratio (SNR)	68 dB(A)	64 dB(A)
Sensitivity	-38 dB V	-38 dB V
Acoustic overload point AOP (THD = 10%)	130 dB SPL	130 dB SPL
Frequency range	10 Hz … 18 kHz	10 Hz … 18 kHz
Package	3.35 x 2.50 mm2	3.35 x 2.50 mm2
Operating temp.	-40°C ... +105°C	-40°C ... +85°C
AEC-Q103-003 qualification	Yes	Yes
Environmental robustness	IP57	IP57
Status	Mass production	Mass production

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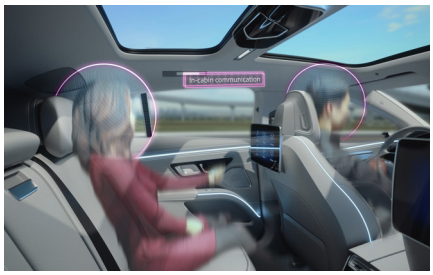
Typical applications for automotive MEMS microphones in-cabin and outside of the vehicle

Speech: Hands free/e-call/ICC
Enabling distortion-free audio capturing for all speech-related applications thanks to the high SNR and low distortions.
Recommended products:
IM66D1x0A, IM68A130A, IM64D1xxA, IM64A130A

Interior

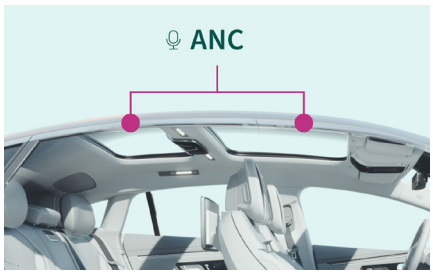
Speech: Microphone arrays/beamforming
Improved beam forming and noise suppression capabilities of microphone arrays, due to the narrow sensitivity and phase matching.
Recommended products:
IM67D1x0A, IM66D1x0A

Interior



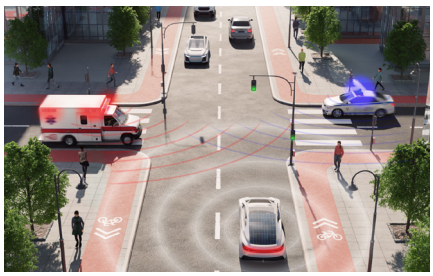
Speech recognition/voice commands
Best speech intelligibility for speech recognition due to high SNR and low distortions.
Recommended products:
IM67D1x0A, IM66D1x0A, IM68A130A

Interior



Active and road noise cancellation (ANC/RNC)
Enabling a quite environment for comfortable travels with best ANC performance, thanks to the flat and stable frequency and phase response at lowest frequencies.
Recommended products:
IM66D1x0A, IM68A130A

Interior



Event sound detection/siren detection
Contributing to road safety, by detecting sounds like sirens from emergency vehicles or even dangerous road conditions even thanks the large dynamic range and high acoustic overload point.
Recommended products:
IM63D135A, IM66D130A, IM68A130A

Exterior

Voice recognition/external interaction
Allowing external interaction via voice commands and good speech intelligibility due to high SNR and low distortions (THD)
Recommended products:
IM66D130A, IM63D135A

Exterior

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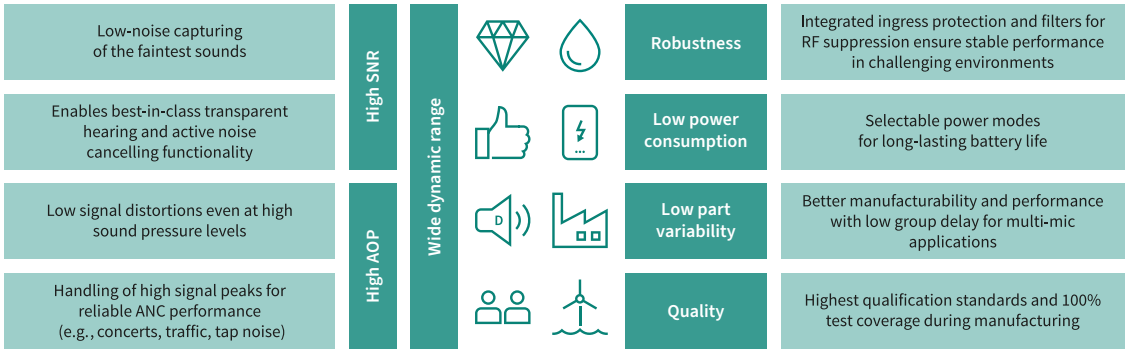
MEMS microphones for consumer applications

XENSIV™ MEMS microphones feature ultralow self-noise (high SNR), extremely low distortions (THD) even at high sound pressure levels (SPL), very tight part-to-part phase and sensitivity matching, a flat frequency response with a low LFRO (low frequency roll-off), and an ultralow group delay. Combined with selectable power modes and their very small package size, Infineon XENSIV™ MEMS microphones, combined with selectable power modes and their tiny package size, perfectly match consumer electronics with excellent audio-capturing functionalities and selected industrial applications such as predictive maintenance and security.



XENSIV™ MEMS microphones product portfolio

	Infineon model	Main features	Interface	Package size	SNR	AOP (1/10%THD)	Current	Sensitivity	LFRO [Hz]
Digital	**IM69D130**	High SNR and high AOP	PDM	4 x 3 x 1.2 mm	69 dB(A)	128/130 dBSPL	980 µA at 3.072 MHz	-36 dBFS	28 Hz
	IM69D120	High SNR and sensitivity	PDM	4 x 3 x 1.2 mm	69 dB(A)	118/120 dBSPL	980 µA at 3.072 MHz	-26 dBFS	28 Hz
	IM69D127	High performance in small size	PDM	3.60 x 2.50 x 1 mm	69 dB(A)	123/127 dBSPL	980 µA at 3.072 MHz	-34 dBFS	40 Hz
	IM69D128S	Ultralow current consumption	PDM	3.5 x 2.65 x 1 mm	69 dB(A)	125/128 dBSPL	520 µA at3.072 MHz	-37 dBFS	30 Hz
	IM70D122	High SNR and sensitivity	PDM	3.5 x 2.65 x 1 mm	70 dB(A)	120/122 dBSPL	980 µA at 3.072 MHz	-26 dBFS	30 Hz
	IM72D128	Ultrahigh SNR	PDM	4 x 3 x 1.2 mm	72 dB(A)	126/128 dBSPL	980 µA at 3.072 MHz	-36 dBFS	20 Hz
	IM73D122	Ultrahigh SNR and sensitivity	PDM	4 x 3 x 1.2 mm	73 dB(A)	120/122 dBSPL	980 µA at 3.072 MHz	-26 dBFS	20 Hz
	IM72D128V NEW	Ultralow current consumption	PDM	4 x 3 x 1.2 mm	71.5 dB(A)	125/128 dBSPL	430 µA at 3.072 MHz	-36 dBFS	11Hz
	IM68D121J NEW	High SNR, high sensitivity & low IDD	PDM	3.5 x 2.65 x 0.98 mm	68 dB(A)	118/121 dBSPL	580 µA at 3.072 MHz	-26 dBFS	20 Hz
	IM68D128B NEW	High SNR & low IDD	PDM	3.5 x 2.65 x 0.98 mm	67.5 dB(A)	122/128 dBSPL	580 µA at 3.072 MHz	-37 dBFS	20 Hz
	IM66D132H NEW	High 1%/10% THD & low IDD	PDM	3.5 x 2.65 x 0.98 mm	66 dB(A)	128/132 dBSPL	580 µA at 3.072 MHz	-37 dBFS	20 Hz
	IM69D129F NEW	Ultralow power	PDM	3.50 x 2.65 x 0.98 mm	69 dB(A)	127/129 dBSPL	450 µA at 3.072 MHz	-36 dBFS	11 Hz
	IM66D130M NEW	Small package & low IDD	PDM	3 x 2 x 0.98 mm	66 dB(A)	124/130 dBSPL	550 µA at 3.072 MHz	-37 dBFS	35 Hz
Analog	**IM68A130**	Small package and low LFRO	Single Ended	3.35 x 2.5 x 0.98 mm	68 dB(A)	118/130 dBSPL	110 µA at 2.75 V	-38 dBV	10 Hz
	IM70A135	High SNR and high AOP	Differential	3.5 x 2.65 x 1 mm	70 dB(A)	132/135 dBSPL	170 µA at 2.75 V	-38 dBV	37 Hz
	IM73A135	Ultra-high SNR and high AOP	Differential	4 x 3 x 1.2 mm	73 dB(A)	132/135 dBSPL	170 µA at 2.75 V	-38 dBV	20 Hz

All XENSIV™ consumer microphones have bottom port. All SDM (Sealed Dual Membrane) XENSIV™ microphone deliver IP57 ingress protection on the component level for better manufacturability and robustness against water and dust.

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XENSIV™ MEMS microphone boards

The Infineon Audiohub Nano

The Infineon Audiohub Nano enables better evaluation of Infineon XENSIV™ microphones. The kit includes an Infineon Audiohub Nano and four microphones on flex board. Up to two additional Infineon XENSIV™ MEMS microphones can be connected to the mono or stereo output evaluation board. The evaluation board provides a USB audio interface to stream audio data from the microphone to any audio recording and editing software. The board has two different interfaces: analog and digital.

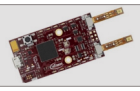
Summary of Features

- Audio interface for analog XENSIV™ MEMS microphones
- Audio streaming over USB interface
- 48 kHz sampling rate
- 24-bit audio data (stereo)
- Dynamic range 120 dB
- LED indication for the configured gain level in normal mode and low power mode
- Volume unit meter display with onboard LEDs
- Powered through Micro-USB

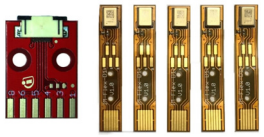
Summary of Features

- Audio streaming over USB interface
- 48 kHz sampling rate
- 24-bit audio data (stereo)
- Mode switch for toggling between normal mode and low power mode with four pre-defined gain configurations
- LEDs indication for the configured gain level in normal mode and low power mode
- Volume unit meter display with on board LEDs
- Powered through Micro-USB

XENSIV™ MEMS microphone boards

Product	Description	SP	OPN	Board
EVAL AHNB DIGITALV01	Digital XENSIV™ MEMS microphones evaluation board	SP005955184	EVALAHNBDIGITALV01TOBO1	
EVAL AHNB ANALOGV01	Analog XENSIV™ MEMS microphones evaluation board	SP005568087	EVALAHNBANALOGV01TOBO1	

XENSIV™ MEMS microphones flex boards

Product	Description	SP	OPN	Flexkit
EVAL_IM69D130_FLEXKIT	– Quick and easy connection to evaluation system – Small size: 25 mm x 4.5 mm – Pre-soldered MEMS microphone – Configurable select pin configuration for digital microphones	SP002153022	EVALIM69D130FLEXKITTOBO1	
EVAL_IM69D120_FLEXKIT		SP002153026	EVALIM69D120FLEXKITTOBO1	
KIT_IM69D127V11_FLEX		SP005403891	KITIM69D127V11FLEXTOBO1	
KIT_IM73A135V01_FLEX		SP005415695	KITIM73A135V01FLEXTOBO1	
KIT_IM72D128V01_FLEX		SP005429924	KITIM72D128V01FLEXTOBO1	
KIT_IM70A135V10_FLEX		SP005728204	KITIM70A135V01FLEXTOBO1	
KIT_IM68A130V01_FLEX		SP005728206	KITIM68A130V01FLEXTOBO1	
KIT_IM69D128SV01_FLEX		SP005744505	KITIM69D128SV01FLEXTOBO1	
KIT_IM70D122V01_FLEX		SP005826638	KITIM70D122V01FLEXTOBO1	
KIT_IM72D128VV01_FLEX		SP006038668	KITIM72D128VV01FLEXTOBO1	
KIT_IM66D130MV01_FLEX		SP006038060	KITIM66D130MV01_FLEXTOBO1	
KIT_IM66D132HV01_FLEX		SP006038061	KITIM66D132HV01_FLEX TOBO1	
KIT_IM68A130V01_FLEX		SP005728206	KITIM68A130V01_FLEX TOBO1	
KIT_IM68D128BV01_FLEX		SP006114517	KITIM68D128BV01_FLEX TOBO1	
KIT_IM68D121JV01_FLEX		SP006155584	KITIM68D121JV01FLEXTOBO1	
KIT_IM69D129FV01_FLEX		SP006038667	KITIM69D129FV01FLEXTOBO1	

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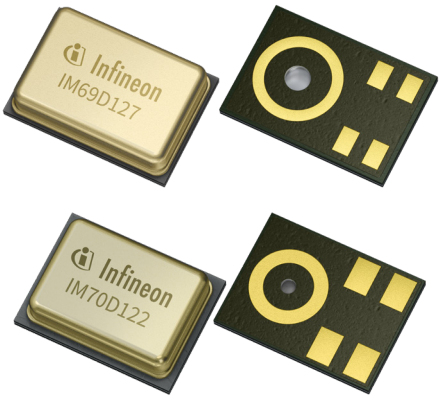
Features, applications, and use cases for MEMS microphones for consumer

Features

- Ultralow self-noise/ultrahigh SNR
- Selectable power modes for longer battery life
- Sealed dual membrane (SDM) technology with ingress protection at microphone level
- Extremely low distortions (THD) even at high sound pressure levels
- High dynamic range and very high acoustic overload points (AOP)
- Very tight part-to-part phase and sensitivity matching
- Flat frequency response with a low LFRO (low frequency roll-off)
- Ultralow group delay for multi-mic applications
- Very small package sizes for various applications



Typical use cases

- Studio quality audio capturing for communication devices
- Low-latency wide-band audio signal capturing for active noise cancellation (ANC) and transparent hearing functionality
- Small form factor and current consumption for battery and size-constrained devices
- Multi-microphone (array) based beamforming and source separation for audio zoom features and multiuser audio capturing
- High range, far field voice pickup for multi room applications
- Capturing of audio signals in loud environments, such as outdoor
- Audio pattern detection for predictive and preventive maintenance and security

Applications

- TWS earbuds
- ANC headphones
- Smart speakers
- Conference speakers
- Laptops/tablets
- Wearables
- AR/VR devices
- Cameras
- Video doorbells
- Smart home
- Smart infrastructure
- Home appliances
- Industrial applications
- Medical applications

Visit the Infineon Developer Community to get the support on your design with our audio experts. Furthermore, you can delve into Knowledge Based Articles, learn about MEMS mics specifications, foundational differences between ECM and MEMS technologies, get electrical implementation hints, and so much more!

Learn more about our partner program and purchase our partner solutions here.

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XENSIV™ radar sensors for consumer, industrial, and automotive applications

Giving technology the ability to “see”

Radar offers a host of advantages over passive infrared (PIR) technology in motion detection applications. These include greater accuracy and more precise measurement of detected objects, paving the way for new speed detection and motion sensing capabilities. These advanced capabilities enable all sorts of “things,” such as robots, cars, smart home devices and even lights, to “see” their surroundings and respond dynamically.

As a leading provider of radar chip technology, we offer a comprehensive range of mmWave radar sensors within our XENSIV™ family, which operates at 24 GHz and 60 GHz frequencies. These sensors cater to diverse industrial, consumer, and automotive applications. In addition, our RASIC™ family of radar front-end MMICs supports 77/79 GHz frequencies and is designed for automotive radar applications, offering a complete solution for a wide range of use cases, from basic warning functions such as lane change assist (LCA) and blind spot detection (BSD) to advanced active safety systems like automatic emergency braking (AEB) and dynamic driving features like adaptive cruise control (ACC).

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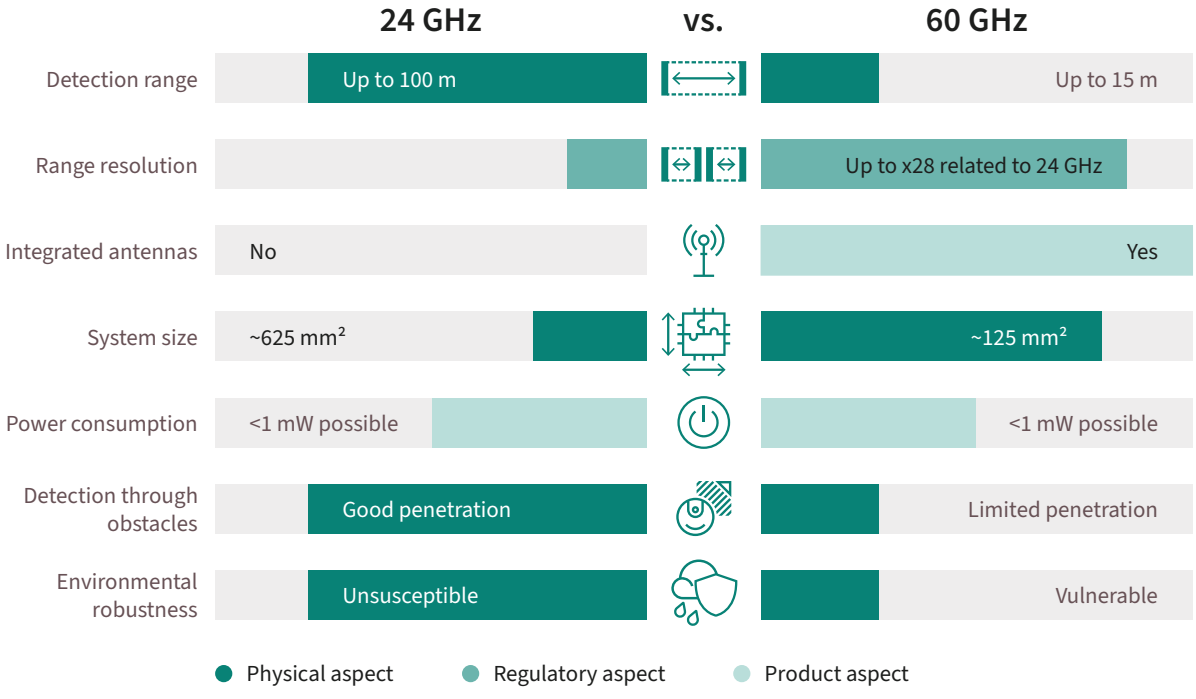
As the market leader in radar chips, we offer a wide portfolio of mmWave radar sensors as part of our XENSIV™ sensor family – including Doppler radar as well as FMCW radar systems. This portfolio includes the smallest 24 GHz MMIC in the market as well as the most integrated and largest 24 GHz radar transceiver family currently available. These radar chips are designed to support different industrial, smart home, and consumer applications. In addition, we also offer radar sensors in the 60 GHz range, which are used in consumer products such as the Google Pixel 4 smartphone.

Motion detection with radar offers significant advantages over PIR and other motion-sensing technologies

Our 24- and 60-GHz radar sensors cover a wide range of applications. Many of them are based on motion detection triggering systems, such as lighting solutions, automatic doors, camera and security systems, or smart home devices. In contrast to other motion detection technologies like PIR, radar technology offers significant advantages. These include smaller system sizes, greater accuracy, and more precise measurements of detected objects. In addition, radar can also determine the direction of a moving object, the speed of an object, distance, and, depending on the antenna configuration, even the position of a moving object.

When to use 24 GHz or 60 GHz radar technology

In the 24 GHz range, the bandwidth for FMCW radar operations covers 250 MHz within the regulated ISM band. In the 60 GHz regime, an unlicensed ultrawideband of up to 7 GHz can be used for short-range applications. Consequently, 60 GHz FMCW radar systems can offer a better resolution, allowing additional use cases such as human tracking and segmentation. Due to micromotion detection, radar technology makes gesture control, material classification, and monitoring of various vital functions (respiration, heartbeat, or blood pressure) possible.



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Radar implementation can bring several benefits to different applications:

Smart TV

Safe energy and OLED lifetime by turning off

HVAC

Track people to move the airflow away from them

Security

Security camera and doorbells

Lighting

Indoor and outdoor. Resistant to harsh weather

Monitors and laptops

Small, hidden, sensitive

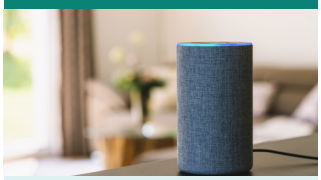
Home appliances

Activate displays and control it with gestures

Door opening

Direction of travel to remove false opening

Smart speaker



Eliminate keyword based activation

Smart Home

Robust, discreet, small

Gaming and VR

Enhance gaming experience

Smart toilet

Presence sensing and water level detection

Service robots

Robust, small footprint, accurate

Robotics

Safety, accuracy and efficiency

Sleep monitoring systems

Breathing and heart rate measurement

Summary of key benefits

- Direction, proximity, and speed detection
- Segmentation and tracking functionalities
- Target positioning
- Detection through non-conductive materials
  - Product design flexibility
  - Anonymous sensing
- Maintains operation through harsh environmental conditions such as rain, snow, fog, dust, etc.
- Sensitive enough to capture breathing and heart-beat
  - Radar can feel presence and vital functions
- Radar performance parameters can be adjusted
  - Adaptable to different application requirements

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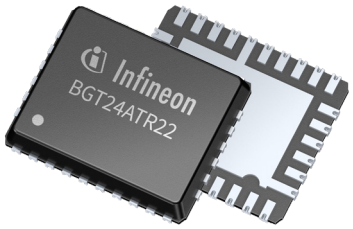
XENSIV™ 24 GHz radar for automotive

XENSIV™ BGT24ATR22 24 GHz pulsed Doppler radar transceiver

The BGT24ATR22 is a monolithic microwave integrated circuit (MMIC) for 24 GHz radar applications. It provides building blocks for analog signal generation and reception, operating in the frequency range from 24 GHz up to 24.25 GHz.

Key features

- 24 GHz radar transceiver
- Two Tx channels
- Two Rx channels
- Low-phase noise VCO
- Automatic frequency control
- Automatic DC offset compensation
- State machine with ultralow power modes
- 12-bit ADC
- Digital radar data processing unit
- Temperature range: -40°C to +105°C
- VQFN-32 RoHS compliant, leadless package



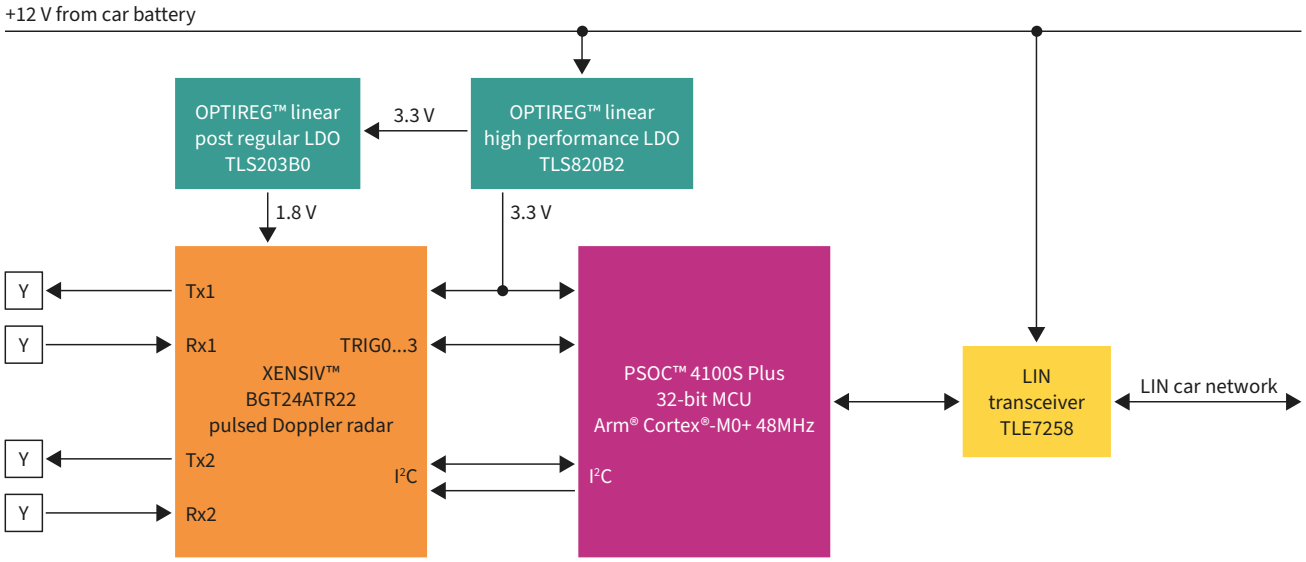
Applications

- Automotive short-range radar
- Hands-free trunk and door opening
- Motion detection
- Touchless switches

Benefits

- Compact PCB design due to high level of integration
- Ultralow power consumption modes for 24/7 use cases
- Low system costs due entry-level only microcontrollers
- Autonomous motion sensing
- Globally approved 24 GHz radar with excellent characteristics for robust and reliable performance in harsh environmental conditions

Smart trunk opener system diagram



24 GHz – Product overview

Product	OPN	Qualification	Frequency min Frequency max	NF	Packages
BGT24ATR22	BGT24ATR22E6433XUMA1	AEC-Q100	24–24.25	NFSSB: 13 dB at 1 kHz	VQFN-32-9

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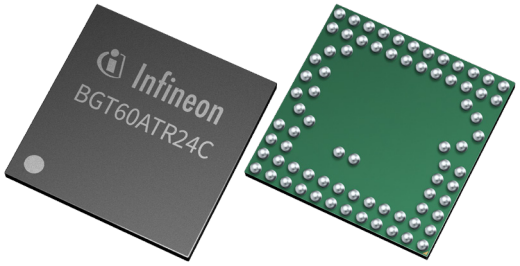
XENSIV™ 60 GHz radar for automotive

XENSIV™ BGT60ATR24C 60 GHz radar sensor for automotive enables highly reliable in-cabin monitoring systems

XENSIV™ BGT60ATR24C, an automotive 60 GHz radar sensor, enables ultrawide bandwidth FMCW operation in a small package. Sensor configuration and data acquisition are enabled with a digital interface, and the integrated state machine enables independent data acquisition with power mode optimization for lowest power consumption.

Summary of features

- 60 GHz radar sensor for FMCW operation
- 4 GHz bandwidth
- 2Tx/4Rx channels
- Digital interface for chip configuration and radar data acquisition
- Optimized power modes for low-power operation
- Integrated state machine for independent operation
- AEC-Q100/101 qualified

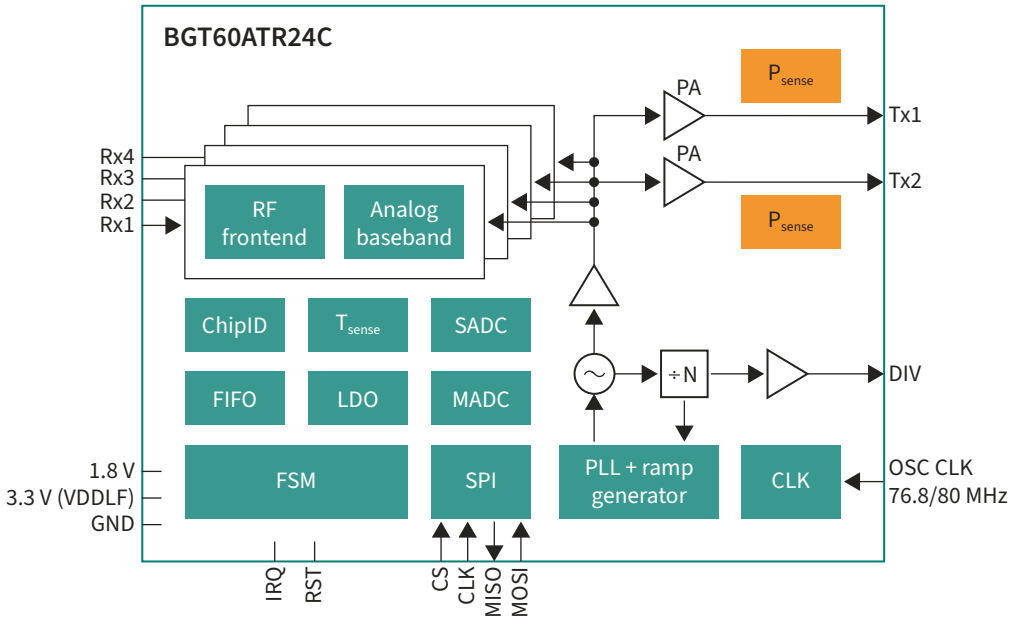


Benefits

- Low power consumption
- Accurate and robust performance
- Excellent thermal management
- Size and space optimized solution

Potential applications

- Radar frontend for gesture sensing
- High resolution FMCW radars
- Short range sensing operations
- Hidden sensing applications behind radome



60 GHz – Product overview

Product	Frequency [GHz]	Ordering code	Packages
BGT60ATR24C	58–62	SP005350514	VFWLB-76-1
SHIELD_60ATR24ES_01	58–62	SP005448216	-

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RASIC™ 77/79 GHz radar for automotive

RASIC™ front-end radar tranceivers ICs

Infineon has been delivering automotive 77 GHz radar products for over a decade. Infineon's RASIC™ family of radar transceiver MMICs 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 precise distance measurement and simultaneous transmitter operation for MIMO.

RXS81xxx and CTRX8191F are highly integrated devices that perform all functions of a radar front-end in a single device—from FMCW signal conditioning to generation of digital receive data output. On-chip temperature and output power sensors and multiple monitoring circuits allow calibration and monitoring. Controlling the MMIC is done via SPI. CTRX8191F additionally offers cascading functionality, thus enabling up to 24T24R radar systems.

Infineon offers a complete suite of 77/79 GHz radar chipsets consisting of

- Radar 77 GHz transceiver MMIC (RASIC™) with RXS81xxx and CTRX8191F
- Radar MCU family featuring radar signal processing
- units (AURIX™ TC3xx and TC4xx)
- Radar system power supply with numerous safety functions (TLF3068x)

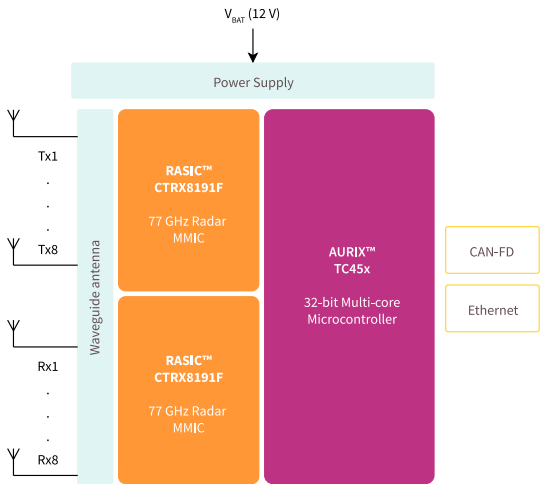
Customer benefits:

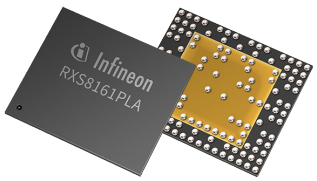
- One 77/79 GHz radar platform supporting all types of automotive radar applications
- Scalability by cascading multiple MMICs and MCUs enabling most advanced sensors
- Flexibility through numerous configuration parameters
- ASIL C support reducing customer R&D efforts

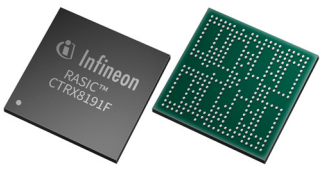
77 GHz – Product overview

Product	Config.	Key benefits	Features
RXS816xPL	3Tx4Rx	RXS8161PLx: Standalone transceiver MMIC	– Transmit channels (2Tx - 4Tx, up to 4 GHz BW within 76–81 GHz) – Receive channels: 4Rx – Integrated PLL (Phase Locked Loop) – Sequencer enabling the execution of a user-defined ramp configuration – Integrated Analog-to-Digital Converter (ADC) – Integrated calibration functionality – Build-in monitoring functionality – Compliant to IS0 26262; capable for up to ASIL C
RXS8156PLA	2Tx4Rx	RXS8156PLA: Cost-optimized transceiver MMIC	
CTRX8191F	4Tx4Rx	Transceiver MMIC with cascading	
CTRX8191FS	4Tx4Rx	Standalone transceiver MMIC	

Please be aware that 77/79 GHz radar products are not available via Infineon's distribution partners.







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ISO 26262 compliant

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XENSIV™ 60 GHz radar for consumer and IoT

Infineon's innovative XENSIV™ 60 GHz radar chip enables things to see and revolutionizes the human-machine interface.

XENSIV™ Radars product portfolio

Product	SP	OPN	Description	Packages
BGT60TR13C	SP002262606	BGT60TR13CE6327XUMA1	XENSIV™ 60 GHz FMCW radar sensor for advanced sensing	VF2BGA-40
BGT60UTR11AIP	SP005407929	BGT60UTR11AIPXUMA1	XENSIV™ 60 GHz highly integrated FMCW radar sensor	VF2BGA-28-1
BGT60LTR11AIP	SP005537624	BGT60LTR11SAIPXUMA1	XENSIV™ 60 GHz completely autonomous pulsed-Doppler radar sensor, operating in the frequency band from 61 GHz to 61.5 GHz.	UF2BGA-421
BGT60LTR11SAIP	SP005832449	BGT60LTR11SAIPXUMA1	Japanese version of XENSIV™ BGT60LTR11AIP, operating in the frequency band from 60.5 GHz to 61 GHz (Japanese ISM band)	
BGT60LTR11BAIP	SP005547020	BGT60LTR11BAIPXUMA1	Down-specified version of XENSIV™ BGT60LTR11AIP with reduced detection range (autonomous mode) and operating temperature from -10 to +70°C	

XENSIV™ Radars boards

Product	SP	OPN	Description
DEMO BGT60TR13C	SP005728718	DEMOBGT60TR13CTOBO1	Demonstration kit, consisting of a Radar Baseboard MCU7 and a XENSIV™ BGT60TR13C sensor shield.
DEMO BGT60UTR11AIP	SP005745304	DEMOBGT60UTR11AIPTOBO1	Demonstration kit, consisting of a Radar Baseboard MCU7 Plus and a XENSIV™ BGT60UTR11AIP sensor shield.
DEMO BGT60LTR11AIP	SP005422969	DEMOBGT60LTR11AIPTOBO1	Demonstration kit, consisting of a Radar Baseboard MCU7 and a XENSIV™ BGT60LTR11AIP sensor shield.
SHIELD_AUTONOM_BGT60	SP005630363	SHIELDAUTONOMBGT60TOBO1	Shield for fully autonomous operation of XENSIV™ BGT60LTR11AIP; directly fits on Arduino MKR board
S2GO RADAR BGT60LTR11	SP005594890	S2GORADARBGT60LTR11TOBO1	Shield2Go version of XENSIV™ BGT60LTR11AIP, that can be used in both autonomous/SPI modes.
REF_BGT60LTR11AIP_M0	SP005894766	REFBGT60LTR11AIPM0TOBO1	Reference design with XENSIV™ BGT60LTR11AIP (SPI mode) and XMC™ Cortex®-M0 Microcontroller for data processing.
REF_BGT60LTR11AIP_AUT	SP005636053	REFBGT60LTR11AIPAUTTOBO1	Reference design with XENSIV™ BGT60LTR11AIP (autonomous mode), FCC, CE certified.
KIT_CSK_BGT60TR13C	SP005635357	KITCSKBGT60TR13CTOBO1	Connected Sensor Kit (CSK), consisting of a Rapid IoT Connect Developer Kit Feather board and a XENSIV™ BGT60TR13C Wing board.
KIT_CSK_BGT60UTR11AIP	SP006089336	KITCSKBGT60UTR11AIPTOBO1	Connected Sensor Kit (CSK), consisting of a Rapid IoT Connect Developer Kit Feather board and a XENSIV™ BGT60UTR11AIP Wing board.

BGT60LTR11AIP – XENSIV™ 60 GHz first completely autonomous radar sensor for motion sensing

The BGT60LTR11AIP is a fully integrated microwave motion sensor that includes antennas in package (AIP) and built-in detectors for motion and direction of motion. A state machine enables the device to operate without any external microcontroller. This autonomous mode detects a human target up to 7 m with a low power consumption of less than 2 mW. The BGT60LTR11AIP enables radar technology for everyone since it does not require know-how in RF, antenna design, or radar signal processing. These features make the small-sized radar solution a compelling, smart, and cost-effective replacement for conventional PIR sensors in low-power or battery-powered applications. Also, with its small form factor, Infineon's highly integrated radar sensor solutions bring innovative, intuitive sensing capabilities to many applications.

Radar has been demonstrated to be a powerful sensor for short-range motion detection. Through reliable presence and absence detection, smart devices with radar sensors become more energy-efficient, smart, and sustainable. Users can also benefit from vacancy detection in applications such as televisions. This function not only saves energy but also displays lifetime. BGT60LTR11AIP has a high sensitivity and can detect if a person is present and if the device needs to be ready – similar to a screensaver that deactivates the PC monitor after a certain time without mouse or keyboard input and reactivates it as soon as new input is noticed.

Through this reliable presence and absence detection, Infineon's 60 GHz radar powers the design of truly smart, energy-saving devices. Find out more on our website.

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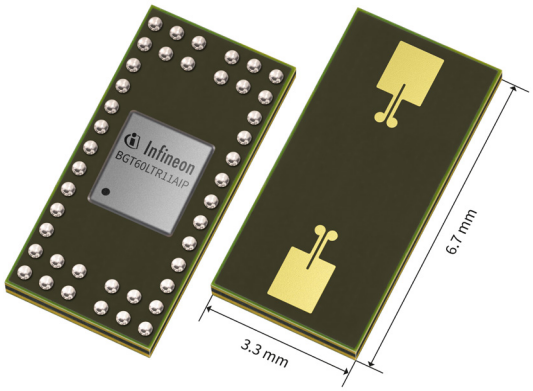
Key features

- 3.3 x 6.7 x 0.56 mm package size
- 1Tx 1Rx Antennas in Package (AIP) with 80° field of view
- Built-in motion detector
- Built-in direction of motion detector
- Multiple modes of operation including a completely autonomous mode
- Adjustable performance parameters: detection sensitivity, hold time, and frequency of operation
- FR4 material for PCB design is sufficient



Target application

- Smart building and smart home
- Home appliances
- Smart home security
- Room air conditioners
- Automated door openers
- Smart entrance counter solution
- Displays such as TVs, monitors, laptops, or tablets
- Lighting systems and lighting control

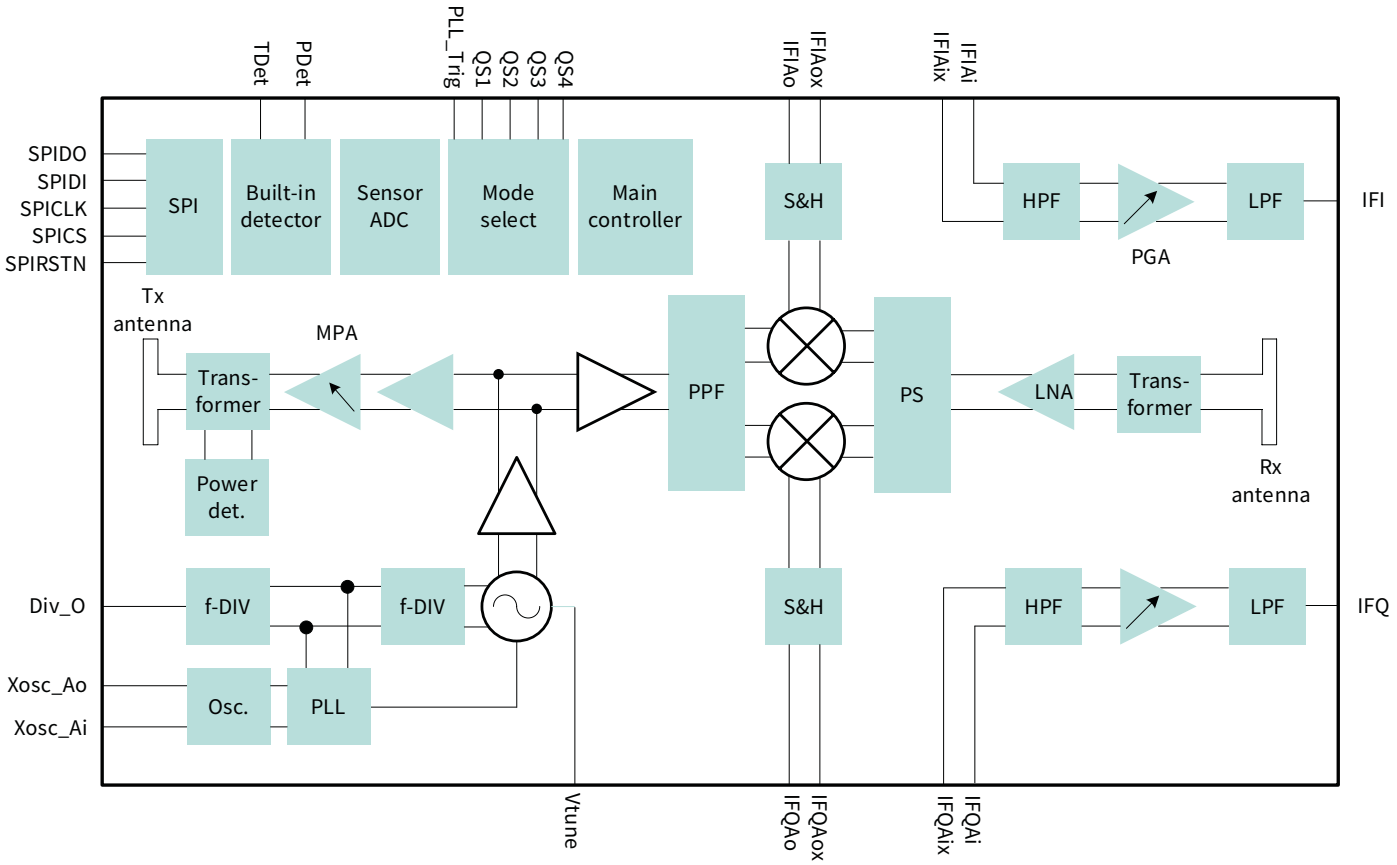
Key benefits

- Autonomous mode
  - Up to 7 m detection range
  - Less than 2 mW power consumption
  - Requires minimal external circuitry including crystal, LDO, and some resistors capacitors

Adding a M0 MCU extends flexibility

- Up to 14 m detection range (SPI mode)
- Less than 2 mW power consumption possible

Block diagram of the BGT60LTR11AIP



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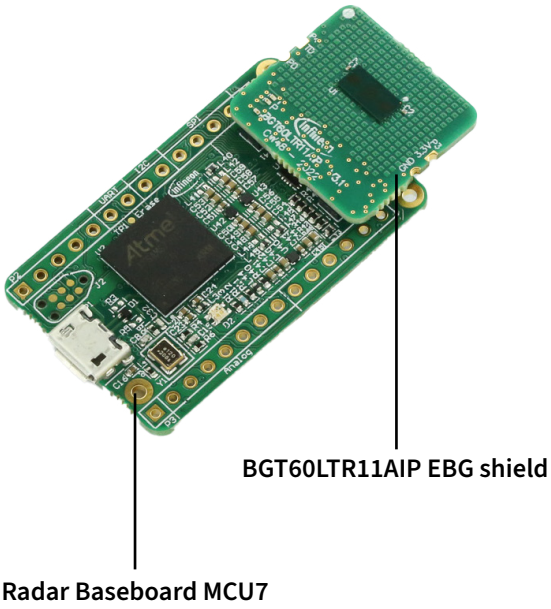
DEMO BGT60LTR11AIP
XENSIV™ 60 GHz demo board for motion sensing

This demo features Infineon's first completely autonomous radar sensor, the BGT60LTR11AIP. The 60 GHz radar MMIC is a fully integrated microwave motion sensor that includes antennas in package (AIP) as well as integrated detectors for motion and direction of motion. A state machine enables the device to operate without any external microcontroller. This autonomous mode detects a human target up to 7 m with a low-power consumption of less than 2 mW. These features make the small-sized radar solution a compelling, smart, and cost-effective replacement for conventional PIR sensors in low-power or battery-powered applications.

For evaluation of the BGT60LTR11AIP MMIC, this demo includes the BGT60LTR11AIP shield as well as the Infineon Radar Baseboard MCU7.

The BGT60LTR11AIP shield can be attached to an Arduino MKR board or the included Infineon Radar Baseboard MCU7. For first evaluation of the radar sensor, we offer the DEMO BGT60LTR11AIP and the Radar Development Kit (RDK), which can be downloaded via the Infineon Developer Center (IDC).



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BGT60TR13C – XENSIV™ 60 GHz radar sensor for advanced sensing

Enablement of horizontal and vertical angular measurement

The BGT60TR13C MMIC is a 60 GHz radar sensor with integrated antennas and comes with one transmitting and three receiving antennas. Thanks to the antennas in package (AIP) concept, the antenna design complexity at the user end can be eliminated and the PCB-designed with standard FR4 materials.

BGT60TR13C offers innovative and intuitive sensing capabilities

With its small form factor and low power consumption, BGT60TR13C MMIC brings innovative, intuitive sensing capabilities to many applications.

Key features

- Integrated finite-state-machine (FSM)
- Very fast chirp speed: 400 MHz/µs
- High signal-to-noise ratio (SNR)
- Ultrawide bandwidth >5 GHz
- FMCW operation
- Integrated L-shaped antennas and small package size (6.5 x 5.0 x 0.9 mm^3)
- <5 mW (duty cycling according to released FCC waiver)

Key benefits

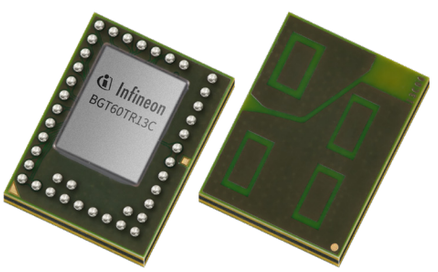
- Allows semi-autonomous operation
- Highly configurable modulation and power modes
- MCU only needs to configure sensor and fetch data
- High velocity resolution
- People can be detected up to 15 m
- High sensitivity allows submillimeter level motion detection
- Allows simultaneous measurement of target range and velocity
- High accuracy of range measurements
- Reduced interference with other sensors
- L-shape enables horizontal and vertical angular measurements
- Thanks to small package size, PCB area can be saved and design-in process simplified
- Reduces average power consumption
- Optimized power modes for low power consumption

Based on the developed algorithm, the MMIC can serve established and new applications and use cases without intruding on privacy. Thanks to its feature set, the MMIC can measure velocity, angle, horizontal, and vertical.

BGT60TR13C demonstrates to be a powerful sensor for:

- Presence detection/segmentation/tracking: BGT60TR13C enables human presence detection, tracking, and segmentation while providing extremely high accuracy in detecting micro and macro motions
- Gesture sensing: BGT60TR13C ensures detection of submillimeter motions
- Vital sensing: BGT60TR13C is able to track vital signs in consumer electronics, healthcare as well as industrial applications

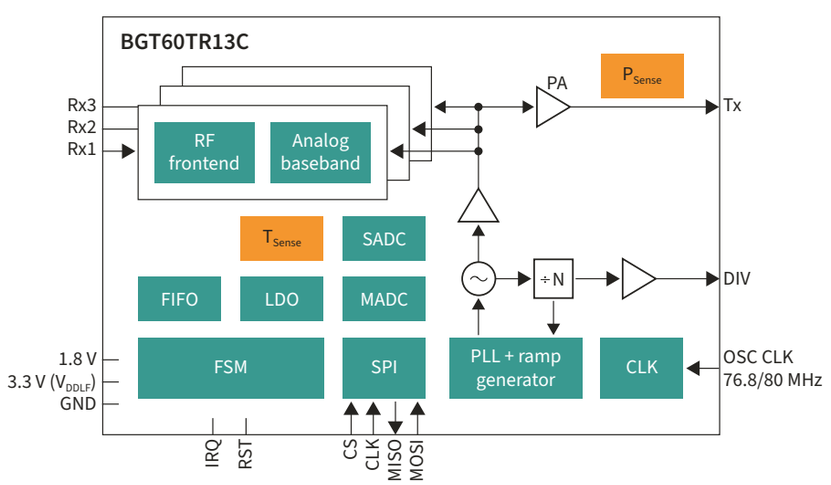
For first evaluation of the radar sensor, we offer the DEMO BGT60TR13C and the Radar Development Kit (RDK), which can be downloaded via the Infineon Developer Center (IDC).



Target application

- Smart TVs
- Smart speaker
- Smart home
- Smart building
- Elderly monitoring
- Vital sensing
- Home appliances

Block diagram of the BGT60TR13C



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DEMO BGT60TR13C
XENSIV™ 60 GHz demo board for advanced sensing

BGT60TR13C offers innovative and intuitive sensing capabilities

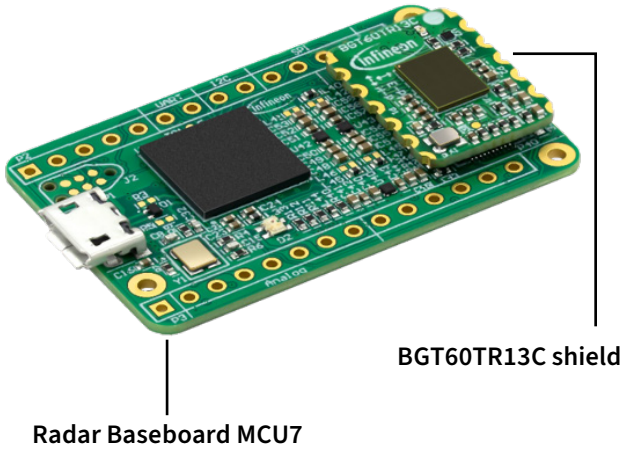
This demo board features Infineon's XENSIV™ 60 GHz radar sensor BGT60TR13C, consisting of a Radar Baseboard MCU7 and a BGT60TR13C shield.

The radar baseboard is a 40.64 x 25.4 mm^2 printed circuit board (PCB). Its main purpose is to provide a generic sensor interface for BGT60TR13C MMIC. The central microcontroller unit (MCU) can process radar data or forward the sensor data to a USB interface or an Arduino MKR interface.

Several benefits come along with the BGT60TR13C demo board:

- Flexible platform selection
- Variable connector options, and option to solder onto other PCBs
- Highly flexible configuration on FMCW modulation
- Power consumption can be optimized according to use case

The BGT60TR13C shield presents a minimized form factor of 17 x 12.7 mm2 and comes with an integrated BGT60TR13C Antenna-in-Package (AIP) radar chip of 6.5 x 5.0 x 0.85 mm3. Moreover, the shield contains a digital interface for configuring and transferring the acquired radar data to a microcontroller board. The shield is optimized for fast prototyping designs, system integrations, and initial product feature evaluations. In addition, it offers developers the flexibility to choose their platform depending on their preferred use cases.



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BGT60UTR11AIP – Highly integrated 60 GHz radar sensor for consumer electronics and IoT applications

The BGT60UTR11AIP is optimized for low power consumption and system cost optimization. Its compact size of only 16 mm^2 makes it suitable for integration into the smallest devices. The MMIC is manufactured using Infineon's B11 SiGe BiCMOS technology, ensuring excellent RF performance.

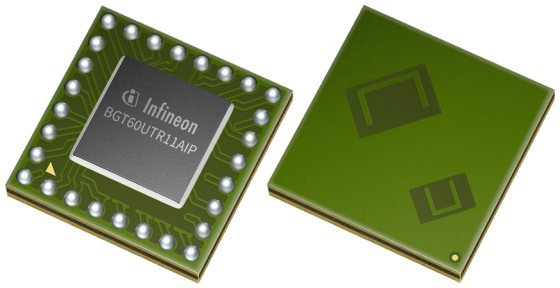
Its 5.6 GHz ultrawide bandwidth allows FMCW operations with extremely high resolution. The detection of sub-mm movements ensures not only extremely sensitive presence and motion detection up to a range of 15 m but also enables mm precise range measurements, 1D gestures, and the measurement of vital signs such as breathing rate and heart rate.

The sensor features a 50 MHz digital SPI interface for configuration and data transfer, while an integrated state machine enables real-time data acquisition without requiring constant interaction with the processor. With three different power modes, users can optimize between performance and power consumption. The BGT60UTR11AIP's sub-mA average current consumption makes it suitable for battery-powered devices.

For first evaluation of the radar sensor, we offer the DEMO BGT60UTR11AIP and the Radar Development Kit (RDK), which can be downloaded via the Infineon Developer Center (IDC).

Features

- 60 GHz radar operating with 6 GHz bandwidth and ramp speed of up to 400 MHz/µs
- Antenna in package (AIP) with ±60° field of view (FoV)
- Integrated finite state machine (FSM) for low power consumption and real-time operation
- 4 MSps ADC sampling rate
- Single 50 MHz SPI for chip configuration and data transfer
- Broadcast mode to trigger and configure multiple devices



Benefits

- High sensitivity to detect sub-mm movements for human presence detection and vital sensing applications
- High bandwidth for precise distance measurements with mm accuracy
- Small size for integration into space-constrained environments
- Low power consumption for battery-driven applications

Applications

- Smart building devices such as door locks, smart doorbells, and air conditioners
- Smart home devices such as smart speakers and thermostats
- Smart appliances such as refrigerators and kitchen machines
- Healthcare devices such as baby monitors and sleep tracker
- Service robots such as vacuum cleaners and lawn mowers
- Security devices such as motion detectors and IP cameras
- Wearables such as headphones and smartwatches
- TVs and notebooks

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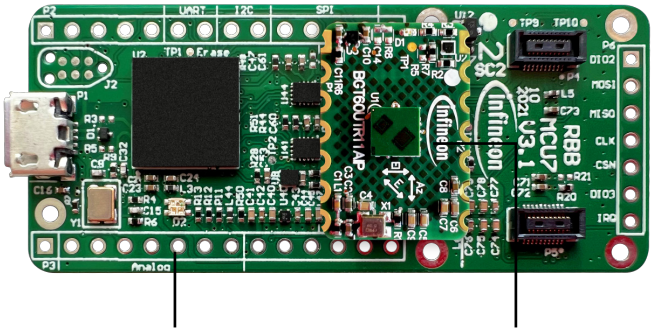
DEMO BGT60UTR11AIP
XENSIV™ BGT60UTR11AIP 60 GHz radar sensor FMCW demo board

This demo board features Infineon's 60 GHz XENSIV™ radar sensor BGT60UTR11AIP. It consists of a Radar Baseboard MCU7 Plus and a BGT60UTR11AIP sensor shield. The board can be used for product feature evaluations, fast prototyping, and radar algorithm development with the BGT60UTR11AIP.
The BGT60UTR11AIP MMIC has integrated antennas with one transmit and one receive antenna. With its compact size of only 16 mm² and extremely high FMCW performance (5.6 GHz bandwidth), this radar sensor is suitable for a wide range of applications.

The DEMO BGT60UTR11AIP board is supported by our Radar Development Kit (RDK), which can be downloaded from the Infineon Developer Center (IDC).



It contains the Radar Fusion GUI for an instant display of the radar signals as well as predefined applications such as presence detection or distance measurement. For further development of application-specific radar algorithms, C, C++, Python and MATLAB interfaces are provided.

Features of BGT60UTR11AIP shield
- 19 mm x 12.7 mm small form factor
- Digital SPI interface for configuration and data transfer to an MCU
- Standard FR4 laminate
- Castellated holes on the PCB edges for additional signal access
- MCU-controllable LED on board indicating radar sensor status

Features of Radar Baseboard MCU7 Plus
- 59 mm x 25.4 mm size
- Can perform radar data processing Arm® Cortex®-M7 processor or forward the sensor data to an USB interface or an Arduino MKR interface
- Hi-Speed USB 2.0 interface
- Operates with Radar Development Kit and Radar Fusion GUI

Benefits
- Flexible platform selection
- Variable connector options, and option to solder onto other PCBs
- Highly flexible configuration on the FMCW modulation
- Advanced functionalities by SPI configuration or further signal processing
- Power consumption can be optimized according to the radar use case

Applications
- Smart building devices such as door locks, smart doorbells, and air conditioners
- Smart home devices such as smart speakers and thermostats
- Smart appliances such as refrigerators and kitchen machines
- Healthcare devices such as baby monitors and sleep tracker
- Service robots such as vacuum cleaners and lawn mowers
- Security devices such as motion detectors and IP cameras
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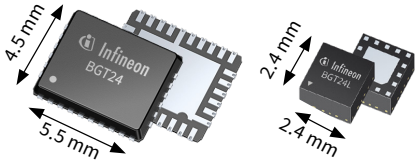
XENSIV™ 24 GHz radar for consumer and IoT

Infineon's range of 24 GHz industrial radar chips provides five configurations of the transmit and receiver channels, ensuring that there is a chip to support your specific application. From basic applications such as motion detection in security systems, which only requires one transmit and one receive channel, to more complex applications like 3D positioning, which requires two or more receive channels, our range of radar chips supports all of your requirements.

Features	Infineon MMIC	Benefits
– 24 GHz ISM band operation for motion, speed, direction movement and distance measurements – Five 24 GHz chips available – Highly integrated MMICs		– Long-range distance detection of moving objects up to 50 m – Wide range speed detection up to ±100 km/h – Low BOM costs

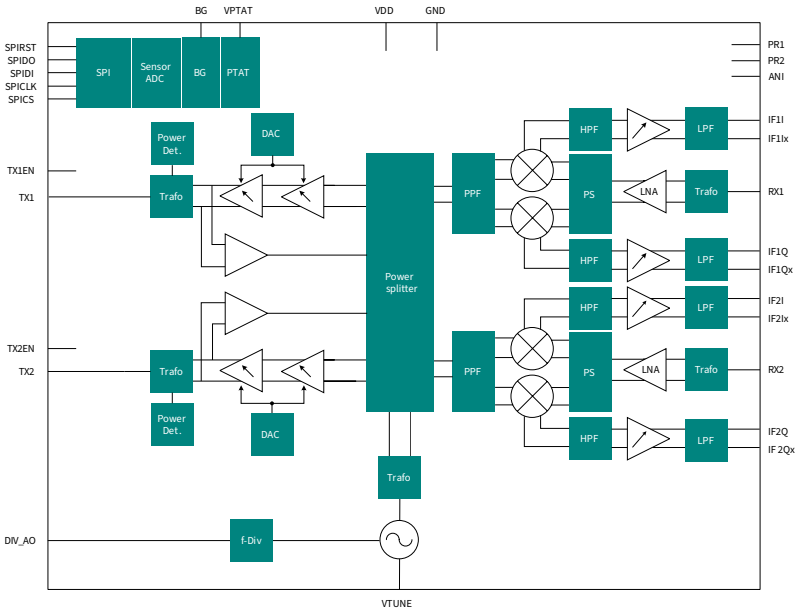
Product	Configuration	Features	
BGT24LTR11	1Tx + 1Rx	– Measures, not just motion, but also speed, direction, and distance – Small form factor – Resistance to moisture, dirt, and temperature – Increased area coverage – Discrete design	– Low power MMICs for energy saving – Privacy protection – Adaptable to different application requirements – Highly integrated chips eliminating costly external components
BGT24LTR22	2Tx + 2Rx		

BGT24LTR22 – XENSIV™ 24 GHz radar sensor

The BGT24LTR22 key features

- 24 GHz transceiver MMIC
- Fully integrated low phase noise VCO
- Integrated analog base band stage with programmable gain and filter settings
- Bidirectional pin for synchronization
- Built-in temperature compensation circuit for VCO stabilization, no PLL needed
- Low power consumption
- Fully ESD protected device
- Single ended RF and IF terminals
- Single supply voltage 1.5 V

Block diagram of the BGT24LTR22



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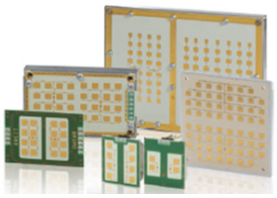
Radar partner modules

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

Utilizing our strong network of partners, the radar portfolio is extended to include a range of easy-to-integrate modules, each containing Infineon's Radar MMICs.

Features	Partner modules using Infineon chips	Benefits
– Complete module, including radar MMIC, antenna options, MCU signal processing options, and SW options (Doppler, FSK and FMCW versions available)	 Module (RF module; RF module + MCU including SW)	– Ease of design – Turnkey solution, no need for test and certification

By integrating Infineon's Radar MMICs chip into the partners' easy-to-use and simple-to-integrate modules, the complexity and time-to-market for a range of applications such as smart home automation, camera and security systems, air conditioners, UAVs, robotics, and smart lighting are reduced.

XENSIV™ radar sensor partners

Learn more about our partner program and purchase our partner solutions here.

Infineon Partner Program

Do you have a question?

Learn more and ask questions in our Infineon Developer Community.

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XENSIV™ gas sensors

High-accuracy CO_2 and H_2 gas sensors for automotive, industrial, and consumer applications

XENSIV™ gas sensors: Precision and reliability for superior gas sensing

Infineon's XENSIV™ sensor portfolio offers high-precision sensors that deliver accurate and reliable measurements, ideal for automotive, industrial, and consumer applications. XENSIV™ gas sensors excel in detecting and measuring gases like CO2 and H2 by utilizing advanced technologies.

XENSIV™ CO_2 sensors

Infineon's CO_2 sensors use Photoacoustic Spectroscopy (PAS) for precise carbon dioxide detection. PAS absorbs specific light wavelengths, causing CO_2 molecules to vibrate and producing detectable sound waves. This method ensures high accuracy and is less affected by environmental factors like humidity and temperature. Accurate CO_2 monitoring is vital for maintaining indoor air quality in spaces such as offices, schools, and homes. CO_2 sensors also enhance energy efficiency in HVAC systems through Demand Controlled Ventilation (DCV), regulating ventilation based on CO_2 levels.

XENSIV™ H_2 sensors

Infineon's H_2 sensors utilize the thermal conductivity (TC) principle to detect hydrogen gas. By measuring heat conduction changes, these sensors provide precise hydrogen concentration readings. Monitoring hydrogen is crucial due to its flammable nature. Infineon's H_2 sensors ensure safety in automotive applications like fuel-cell electric vehicles (FCEVs) and hydrogen-based internal combustion engines (ICEs). They also detect potential thermal runaways in battery electric vehicles (BEVs) and are vital in industrial settings for monitoring hydrogen electrolyzers, storage, dispensers, fuel stations, and energy storage systems.

Infineon's XENSIV™ gas sensors combine energy efficiency, compact design, and high sensitivity, making them perfect for integration into modern smart systems.

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PAS CO2 gas sensors

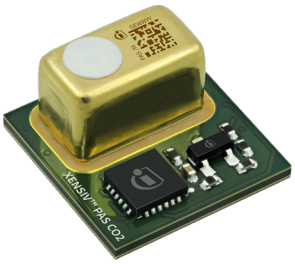
High performance in a small size – disruptive CO_2 gas sensors based on photoacoustic spectroscopy (PAS)

CO_2 measurement contributes to improvements in health, comfort, productivity, and energy efficiency. Even at moderate levels, CO_2 can have a negative impact on health and productivity, causing drowsiness and headaches. Fortunately, smart indoor air quality sensors can "smell" rising levels of CO_2 and either alert the user or trigger a system response. Awareness of indoor air quality is further increasing as a result of the COVID-19 pandemic, making accurate, affordable monitoring solutions like the XENSIV™ PAS CO2 more important than ever. Given the correlation between CO2 and aerosol concentration, CO2 sensors can mitigate the transmission of airborne illnesses such as COVID-19, cold, or influenza. Furthermore, CO2 sensors can facilitate demand-controlled ventilation, improving energy efficiency and significant savings on energy bills.

Accurate, real-time CO_2 measurement thanks to superior MEMS technology

Widespread adoption of real CO_2 sensors has so far been hampered by size, performance, and cost constraints. Infineon's PAS CO2 sensors leverage photoacoustic spectroscopy (PAS) technology to provide an exceptionally small, highly accurate, and cost-effective sensing solution. Infineon's leading position in MEMS technology is the foundation for this unique and accurate CO_2 detection approach.

PASCO2V01 (12 V)



PASCO2V15 (5 V)

Reliable CO2 measurements enable smart indoor air quality monitoring, facilitating improvements in health, productivity and overall well-being. These features make the PAS CO2 sensors ideal for heating, ventilation, and air conditioning applications as well as for integration into consumer IoT devices such as air purifiers, thermostats, baby monitoring devices, wake-up alarms, and smart speakers.

Disruptive gas sensor technology from Infineon

PAS CO2 integrates on the PCB a photoacoustic transducer, including an acoustic detector, infrared source, and optical filter; a microcontroller for signal processing; and a MOSFET chip to drive the infrared source. The exceptional sensitivity of the acoustic detector coupled with the integrated PCB design reduces space requirements by more than 75 percent compared to modern state-of-the-art NDIR CO_2 sensors.

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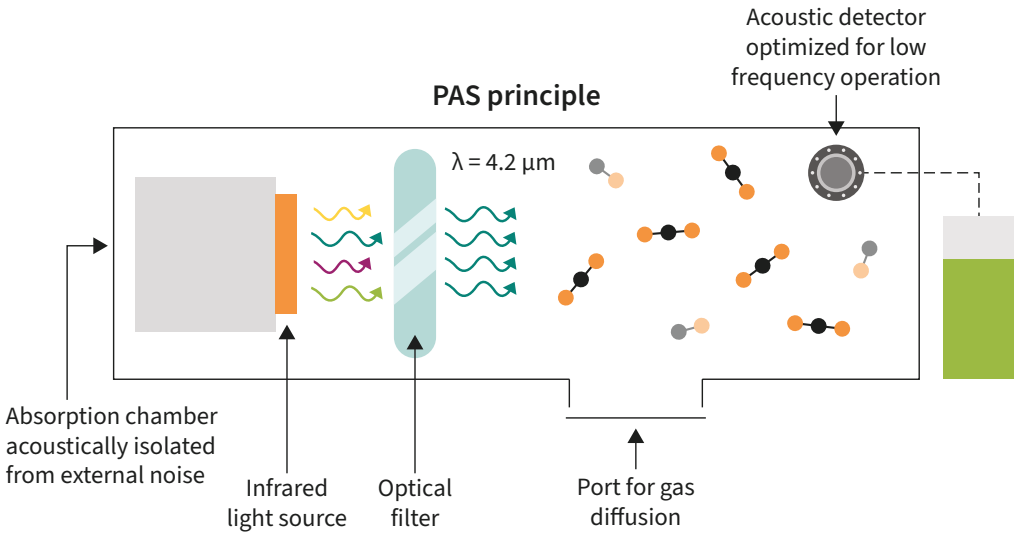
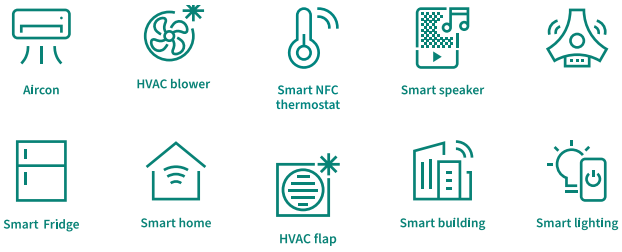
The PAS (photoacoustic spectroscopy) principle:
The sensor is characterized by a disruptive measurement principle called PAS (photoacoustic spectroscopy). It works as follows: pulses of infrared light pass through an optical filter tuned to the CO_2 absorption wavelength. The CO_2 molecules absorb the filtered light, causing them to shake and generate a pressure wave with each pulse. This is called the photoacoustic effect. The sound is then detected by an acoustic detector optimized for low-frequency operation and converted to a CO_2 concentration reading by the microcontroller.



Features
- Exceptionally small form factor (14 x 13.8 x 7.5 mm^3)
- SMD package delivered in tape and reel
- Advanced compensation and self-calibration algorithms
- Various configuration options (e.g., sampling rate, baseline calibration) and interfaces (UART, I^2C, PWM)
- Dust-proof design in compliance with ISO 20653:2013-02

Benefits
- Space savings in customers' end products
- High-quality data and compliance with smart building standards
- Cost-effective high-volume assembly and easy system integration
- Customer flexibility thanks to configuration options
- Increased energy efficiency and enhanced real estate value

Applications
- HVAC (heating, ventilation, and air conditioning) systems
- Smart home appliances such as air purifiers, air conditioners and thermostats
- Consumer devices for air quality monitoring such as personal assistants and CO_2 traffic lights
- Smart indoor lighting
- Smart horticulture
- Smart fridge



Product overview

Product	Accuracy	Interfaces	Operating range [ppm]	Supply voltage [V]
PASCO2V01	± (30 ppm +3%) of reading between 400 ppm and 5000 ppm	I^2C, UART and PWM	0–32000	3.3–12
PASCO2V15	± (50 ppm +5%) of reading between 400 ppm and 3000 ppm	I^2C, UART and PWM	0–32000	3.3–5

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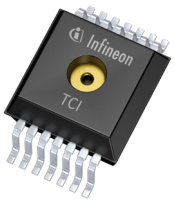
Thermal conductivity H2 gas sensors

XENSIV™ TCI gas sensors with I²C, ultralow power, and 15-years lifetime

Infineon's XENSIV™ TCI gas sensors provide reliable detection of hydrogen (H_2) gas in demanding automotive and industrial applications such as FCEVs, H2 combustion engines, H2 refueling stations, battery electric vehicles (BEVs), energy storage systems (ESS), H2 electrolyzers, and stationary fuel cells. Thanks to the thermal conductivity (TC) principle, the TCI-R sensor can also detect leakage of A2L refrigerants in HVAC systems and other industrial applications. For automotive HVAC systems, TCI-B is a suitable for detecting CO2 refrigerant (R744) and CO2 in high concentrations for other applications, such as medical applications. Infineon's TCIx gas sensors operate on the principle of TC and utilize a full differential MEMS sensor concept. The TC is measured by heating parts of the MEMS structures and measuring the heat transfer through the gas. TC sensing provides the highest robustness and stability for rough automotive applications. Unlike metal oxide-based (MOX) and catalytic combustion (CC) sensors, no chemical reaction occurs in TC gas sensors as they are based on a physical measuring principle. This makes TC gas sensors immune to the risk of poisoning and the tendency to offset high drift shown by chemical sensors.

Key features

- FuSa QM/ASIL B capable
- AEC-Q100 up to 105°C
- Fast response time <100 ms
- Ultralow current consumption
- Robust and proven packages
- Lifetime of 15 years with low drift
- Autonomous operating mode for system level power saving



Benefits

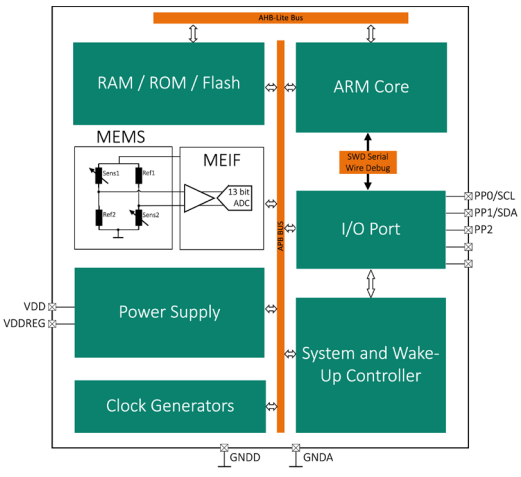
- Automotive grade sensor reliability
- ISO 26262 compliance capabilities up to ASIL B
- No maintenance or replacement costs
- Robustness and stability compared to catalytic- or metal oxide-sensors
- Low power mode state can be enabled by the customer

Potential applications

- Automotive battery management system (BMS)
- Fuel-cell electric vehicle (FCEV) drivetrain system
- Hydrogen economy (production, storage, and transportation) ESS leakage detection
- HVAC refrigerant leakage detection
- Medical applications

Product overview

Product	Accuracy	Interfaces	Supply voltage [V]
TCI	AEC-Q100 up to 105°C UL 2075, 60335-2-40/89	TCIXTMA1	Hydrogen (H2), CO_2
TCI-B	AEC-Q100 up to 105°C UL 2075, 60335-2-40/89 ISO 26262, ASIL B	Will be available soon	Hydrogen (H2), CO_2 (R744)
TCI-R	AEC-Q100 up to 105°C UL 2075, 60335-2-40/89	Will be available soon	R32, R455A, R454 A-B-C, R1234yf) and CO_2 (R744)



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Intuitive sensing

Giving things human-like senses for a better contextual awareness

Imagine a world where technology is unobtrusive and seamlessly integrated into our lives, where intentional/deliberate communication between people and devices is no longer necessary. In this world, there is no need to push buttons or issue commands to activate devices because technology can interpret implicit intentions and context. This enhances the user experience and makes it more natural – it almost seems the devices around us intuitively understand what we want them to do. At Infineon, this future is already becoming a reality. We develop sensor solutions that enable simple and effortless user interactions with all kinds of smart devices. Our technology is developed to make life easier, safer, greener, and more efficient, bridging the gap between the real and digital worlds. Our intuitive sensing solutions are at the very core of this mission. Reflecting our belief that the essential value of sensor technology lies in making our lives more convenient through seamless, natural interactions between people and sensing devices, we aim to leave you free to focus on what matters in life.

Choose your type of sense

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

Pressure sensors

Our digital barometric pressure sensors give designers the best choice regarding small form factors, the highest precision and accuracy over a wide temperature range, fast readout speeds and low power consumption.

Radar sensors

Radar supports existing applications while providing features that enable completely new use cases. It measures velocity, range and angle, both horizontal and vertical, for precise position mapping and 3D tracking.

MEMS microphones

MEMS microphones overcome existing audio chain limitations and are designed for applications where low self-noise (high SNR), wide dynamic range, low distortions, and a high acoustic overload point are required.

PAS CO2 gas sensors

Leveraging photoacoustic spectroscopy (PAS), Infineon has developed an exceptionally small CO_2 sensor that overcomes existing size, cost, and performance challenges.

Today, sensors already enable interactions between people and devices

This interaction often depends on interpreting and merging information from different sources. Machines cannot yet read our minds and do not always have the information necessary to evaluate a given situation correctly. We sometimes have to tell devices what we want them to do explicitly, which can be inconvenient and time-consuming. Inspired by human nature, Infineon intuitive sensing solutions are designed to simplify device interaction.

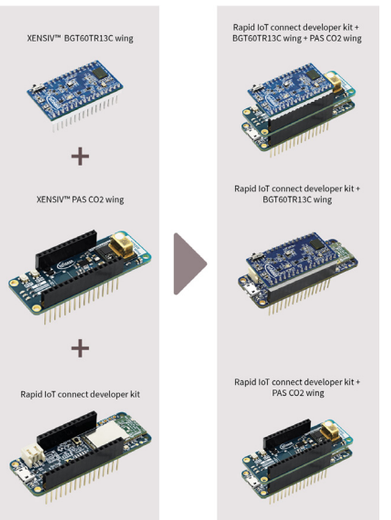
Reflecting a holistic approach, we combine different sensors with state-of-the-art software to create a comprehensive picture of the world around us. By fusing several smart sensors into one coherent, intelligent system, our intuitive sensing solutions simplify complex technical processes and enable people to interact with devices effortlessly. These smart devices intuitively sense the world around them, determining what is expected and needed from them.

Click here to learn more:
www.infineon.com/intuitivesensing

XENSIV™ connected sensor kit

Rapid IoT prototyping experience enabled by XENSIV™ sensors

The XENSIV™ connected sensor kit enables rapid development of a custom solution built on Infineon products. The CSK supports customers in testing sensor-driven IoT products and use cases as well as in prototyping. It offers a real-time sensor evaluation with custom configurations and cloud-based sensor data visualization with sensor fusion. The development kit supports use cases based on XENSIV™ sensors e.g., BGT60TR13C, BGT60UTR11AIP 60 GHz radar sensors, PASCO2V01 gas sensor, and DPS368 pressure sensor(sense), PSOC™ 62 microcontroller embedded processing (compute), connectivity via Infineon AIROC™ CYW43012 dual-band 2.4 GHz and 5 GHz Wi-Fi 4 (802.11n) and Bluetooth® 5.4 combo radio module (connect), and hardware security with OPTIGA™ Trust M (secure). Code examples and sensor libraries are available in the ModusToolbox™ to help customers create use case-specific application codes for new product offerings.

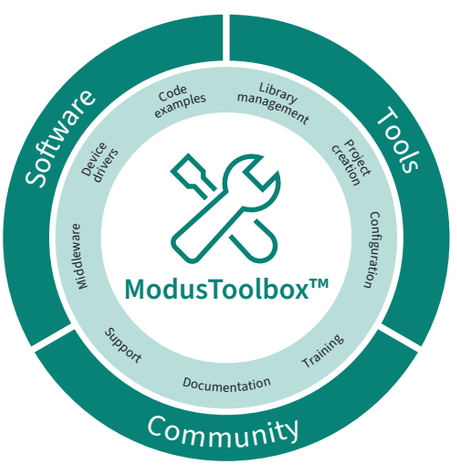


Key features

- Small form factor: 22.5 x 63 x 30 mm^3 – Adafruit Feather compatible
- Wi-Fi and Bluetooth® 5.0-compliant combo radio module
- Power optimized design, deployable with battery
- Interchangeable sensor wing boards stacked individually or combined
- Seamless integration into ModusToolbox™
- FCC and CE certified

Key benefits

- Ideal for prototyping battery-powered IoT devices due to optimized power consumption. Suited for customer field trials.
- Rapid development and deployment via code examples in ModusToolbox™ for presence detection, entrance counter, air quality measurements. Enabler for multi-sensor data fusion.
- Secure cloud device onboarding and management with OPTIGA™ Trust M.
- Secure kit provisioning (unique user ID)



The Infineon Rapid IoT Connect platform deployed on the XENSIV™ CSK provides hardware, firmware, and cloud artifacts to enable rapid onboarding to the Internet of Things. Bidirectional XENSIV™ sensor-to-cloud data communication is securely enabled. The XENSIV™ CSK is a pre-implemented Infineon prototyping sensor system that allows provision, monitoring, and managing Infineon hardware remotely. The CSK kit setup takes 10 minutes and 12 months of free user access to a dedicated cloud demo platform for sensor data collection, interpretation, and sensor data download.

Product	Description	OPN No.
KIT_CSK_PASCO2	Rapid prototyping platform for use cases based on Infineon's XENSIV™ PASCO2V01 sensor	KITCSKPASCO2TOBO1
KIT_CSK_BGT60TR13C	Rapid prototyping platform for use cases based on Infineon's XENSIV™ BGT60TR13C 60 GHz radar sensor	KITCSKBGT60TR13CTOBO1
KIT_CSK_BGT60UTR11AIP	Rapid prototyping platform for use cases based on Infineon's XENSIV™ BGT60UTRAIP 60 GHz radar sensor	KITCSKBGT60UTR11AIPTOBO1

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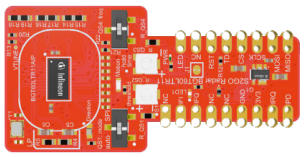
Shield2Go

Infineon's Shield2Go 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 Sensor2Go boards together with Infineon MyIoT adapters.

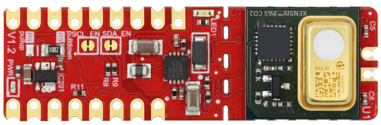
MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of the IoT system.

Sensors



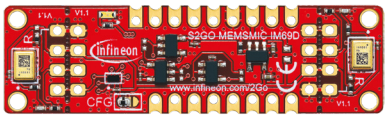
Product name: BGT60LTR11AIP Radar Shield2Go
Sales name: S2GO RADAR BGT60LTR11
Ordering code: SP005594890

Product information



Product name: PASCO2V01 Shield2Go
Sales name: SHIELD_PASCO2_SENSOR
Ordering code: SP005569590

Product information



Product name: IM69D130 Microphone Shield2Go
Sales name: S2GO MEMSMIC IM69D
Ordering code: SP002851544

Product information

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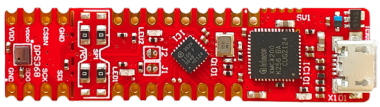
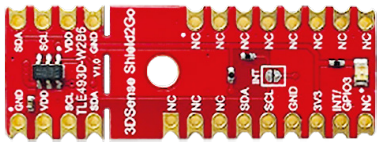
Shield2Go

Sensors



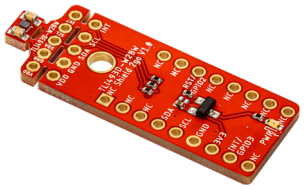
Product name: DPS368 pressure sensor Shield2Go
Sales name: KIT_DPS368_2GO
Ordering code: SP005729572

Product information



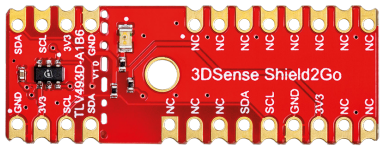
Product name: TLE493DW2B6 3D Sense Shield2Go
Sales name: S2GO_3D_TLE493DW2B6-A0
Ordering code: SP004308594

Product information



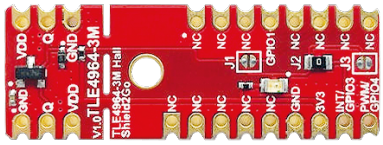
Product name: TLI493D-W2BW 3D Sense Shield2Go in small WFWLB-5-2 package (1.13 mm x 0.93 mm x 0.59 mm)
Sales name: S2GO_3D_TLI493DW2BW-A0
Ordering code: SP005410385

Product information



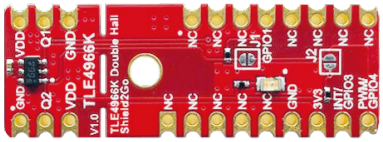
Product name: TLV493D 3D Sense Shield2Go
Sales name: S2GO_3D-SENSE_TLV493D
Ordering code: SP001823678

Product information



Product name: TLE4964-3M Hall Sense Shield2Go
Sales name: S2GO_HALL_TLE4964-3M
Ordering code: SP004308590

Product information



Product name: TLE4966K Double Hall Sense Shield2Go
Sales name: S2GO_2_HALL_TLE4966K
Ordering code: SP004308598

Product information

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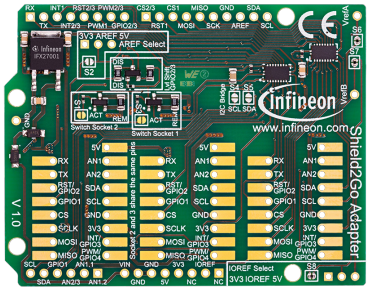
Shield2Go

Microcontroller

Product name: XMC1400 2Go kit
Sales name: KIT_XMC14_2GO
Ordering code: SP006065576

Product information

MyIoT Adapter

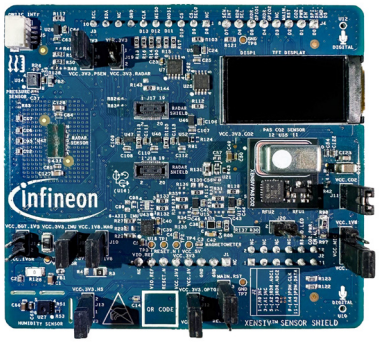


Product name: MyIoT Adapter
Sales name: MY IOT ADAPTER
Ordering code: SP002434972

Infineon's Shield2Go 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 Shield2Go 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.

Product information

XENSIV™ Sensor Shield



Product name: XENSIV™ Sensor Shield
Sales name: SHIELD_XENSIV_A
Ordering code: SP006018677

Infineon's XENSIV™ Sensor Shield provides seamless hardware compatibility between sensors, microcontrollers, and connectivity products. When paired with an MCU / Wi-Fi baseboard via the Arduino UNO interface, the board enables developers to quickly evaluate and develop with environmental sensors like:

- 60 GHz radars
- PAS CO2 sensor
- PDM microphones
- Pressure sensors
- Six-axis IMU
- Three-axis magnetometer
- Temperature and humidity

The shield also features a TFT display (80x160), and OPTIGA™ Trust-M secure element, and a QWIIC connector for additional peripheral expandability.

Product information

Click here to learn more:

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Sensor2Go kits

Ready to use, budget-priced plug- and play boards

Already equipped with a sensor combined with an Arm® Cortex®-M0 CPU. The Sensor2Go kits provide a complete set of on-board devices, including an on-board debugger. Build your own application and gadget with the Sensor2Go kits.

Automotive pressure Sensor2Go kit		Product information
Product name:	**Ordering code:**	
KP215F1701-PS2GO-KIT	SP002676652	
KP229E3518-PS2GO-KIT	SP002676656	
KP236-PS2GO-KIT	SP002676664	
KP254-PS2GO-KIT	SP002676664	
KP276-PS2GO-KIT	SP005910372	
3D magnetic Sensor2Go kit		Product information
Product name:	**Ordering code:**	
TLE493D-A2B6 MS2GO	SP001707582	
TLE493D-W2B6 MS2GO	SP001707578	
TLV493D-A1B6 MS2GO	SP001707574	
Angle Sensor2Go kit		Product information
Product name:	**Ordering code:**	
TLE5012B_E1000_MS2GO	SP002133956	
TLI5012B_E1000_MS2GO	SP002133960	
TLE5012B_E5000_MS2GO	SP002133964	
TLE5012B_E9000_MS2GO	SP002133968	
TLI4971 current Sensor2Go kit		Product information
Product name:	**Ordering code:**	
TLI4971_MS2GO	SP005345474	
TLE4973 current Sensor2Go kit		Product information
Product name:	**Ordering code:**	
TLE4973_MS2GO	SP006039680	
Speed Sensor2Go kit		Product information
Product name:	**Ordering code:**	
TLE4922 MS2GO	SP003029974	
TLE4966 Hall switches Sensor2Go kit		Product information
Product name:	**Ordering code:**	
TLE4966_MS2GO	SP005406992	
PAS CO2 Sensor2Go kit		Product information
Product name:	**Ordering code:**	
EVAL_PASCO2_SENSOR2GO	SP005582413	
EVAL_CO2_5V_SENSOR2GO	SP006037148	

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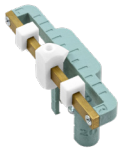
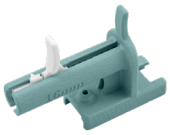
www.infineon.com/mems
www.infineon.com/radar

Add ons for Sensor2Go kits and Shield2Go

	**Joystick for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** JOYSTICK FOR 3D 2 GO KIT **Ordering code:** SP001491834	Product information
	**Rotate knob for all 3D magnetic Sensor2Go kits, Angle Sensor2Go kits and 3D magnetic sensor Shield2Go** **Product name:** ROTATE KNOB 3D 2 GO KIT **Ordering code:** SP001504602	Product information
	**Linear slider for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** LINEAR-SLIDER 2GO **Ordering code:** SP002043034	Product information
	**Out of shaft adapter for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** OUT OF SHAFT FOR 3D 2 GO **Ordering code:** SP003475178	Product information
	**Linear control trigger for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** POWER_DRILL2GO **Ordering code:** SP005350194	Product information
	**Human machine interface (HMI) direction indicator for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** DIR_INDICATOR2GO **Ordering code:** SP005350196	Product information
	**HMI mini control with 4 directions and 360° rotation for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** MINI_CONTROL2GO **Ordering code:** SP005350192	Product information

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Add ons for Sensor2Go kits and Shield2Go

	**OpenClose adapter for Hall switch Shield2Go** **Product name:** OPENCLOSE2GOHS **Ordering code:** SP005544849	Product information
	**Play2Go for 3D magnetic sensor** **Product name:** 3D PLAY2GO KIT **Ordering code:** SP005731811	Product information
	**Contactless switch array for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** Contactless switch array **Ordering code:** Simply use our 3D printing files, link to, and start your 3D print.	Product information
	**Spindle2Go for all 3D magnetic sensor Shield2Go** **Product name:** SPINDLE2GO **Ordering code:** SP005989689	Product information
	**Drill Trigger V2 for all 3D magnetic Sensor2Go kits** **Product name:** DRILL TRIGGER V2 **Ordering code:** SP006066136	Product information

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Evaluation boards – for simple and easy evaluation

MEMS microphones flex evaluation kits

Product name:	Ordering code:
EVAL_IM69D130_FLEXKIT	SP002153022
EVAL_IM69D120_FLEXKIT	SP002153026
EVAL_IM69D127_FLEXKIT	SP005403891
EVAL_IM73D135_FLEXKIT	SP005415695
EVAL_IM72D128_FLEXKIT	SP005429924
EVAL_IM70A135_FLEXKIT	SP005728204
EVAL_IM67D120_FLEXKIT	SP005560671
EVAL_IM67D130_FLEXKIT	SP005537489
KIT_IM68A130A_FLEX	SP005834257

Product information

Current sensors evaluation boards

Product name:	Ordering code:
TLE4973 EVAL 120A	SP006015313
TLE4973 EVAL INLAY	SP005853842
TLE4973 EVAL STD PCB	SP005853840
TLE4973 EVAL VER BAR	SP005853847
TLE4973 EVAL LAT BAR	SP005853844
TLE4972 EVAL LAT BAR	SP005632140
TLE4972 EVAL STD PCB	SP005632136
TLE4972 EVAL INLAY	SP005632138
TLI4971 EVAL 120A	SP005876845
TLE4971 EVAL 120A	SP005343588

Product information

MEMS microphones for ATV plug and play boards

Product name:	Ordering code:
EVAL AHNB DIGITALV01	SP005955184
EVAL AHNB ANALOGV01	SP005568087

Product information

TMR linear sensors evaluation boards

Product name:	Ordering code:
TLI5590 SATELLITE	SP005857647
TLI5590 EVAL KIT	SP005857645

Product information

PAS CO2 sensor evaluation boards

Product name:	Ordering code:
EVAL_CO2_5V_MINIBOARD	SP006037150
EVAL_PASCO2_MINIBOARD	SP005577475

Product information

Position sensors evaluation boards
Product name: GAME CONTROLLER
Ordering code: SP006056290

Product information

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Choose the best fit magnetic sensor solution from the broadest portfolio

Our sensor simulation tools allow you to compare products in application conditions. The tools are easy-to-use and will guide you in identifying the most suitable Infineon XENSIV™ sensor combined with the best-fit magnet.

Current sensor

XENSIV™ – Current sensor simulation tool
Define and optimize the current sensing structure for your system. The tool supports design of lateral and vertical insertions for PCB (two to ten layer stack) or bus-bar based applications. The simulation will provide insertion resistance, field transfer factor, sensitivity range, measurement range, and power dissipation as well as cross-talk in case of a three-phase system.

Direct link to the Current Sensor Simulation Tool:
https://currentsensorsim.infineon.com/

3D magnetic sensor

XENSIV™ – 3D magnetic sensors simulation tool
3D magnetic field sensor for smaller, more accurate, and robust designs. The sensor family, with low current consumption and cost-optimized design, specifically addresses the needs of new magnetic sensor applications in consumer, industrial, and automotive. They are ideally suited for the measurement of three dimensional movement within a magnetic field, linear slide movement as well as 360° angle rotation.

Direct link to the 3D Magnetic Sensors Simulation Tool:
https://www.infineon.com/3dsim

Magnetic switches

XENSIV™ – Magnetic switches simulation tool
Discover Infineon's broad energy saving portfolio of Hall switches in smallest package. Simulate your Hall switch applications and see the results in an accurate simulation of the magnetic field and the switching behavior of the Hall switch in the application.

Direct link to the Hall Switches Simulation Tool:
https://www.infineon.com/hallsim

Angle sensor

XENSIV™ – Magnetic angle sensor simulation tool
Highest variety - low end to high end, standardized and specialized in all four magnetic technologies: Hall, GMR, AMR, and TMR. This tool calculates the valid distance from the magnet surface to the sensor and the assembly error, given certain parameters: magnetic properties, sensor specification, and assembly tolerances.

Direct link to the Angle Sensors Simulation Tool:
https://www.infineon.com/anglesim

Speed sensors

XENSIV™ Speed sensor solution tool
Infineon's innovative speed sensor solution tool will provide a sensor recommendation for your tooth wheel and back bias magnet geometry. The sensors are ranked according their expected maximum air gap capability. Customer constraints like enhanced strayfield immunity, the necessity for a direction channel, or the sensor interface are considered in the selection process.

Direct link to the Speed Sensor Solution Tool:
https://speedsensortool.infineon.com

Position sensors

XENSIV™ – Position sensors simulation tool
Infineon's innovative design tool covers some typical applications which can be addressed with 3D, angle or linear magnetic sensors:
– Angle measurement (rotational movement of the magnet)
– Linear position measurement (linear movement of the magnet)
– Joystick (3D movement of the magnet)
– Additionally: stray field consideration

The tool provides pre-defined or user-customized magnets. The tool automatically calculates the magnetic field components at the sensor location. Calculation is based on the sensor arrangement defined by the user. Mechanical mounting tolerances of the sensor and the magnet are considered.

Direct link to the Position sensors Simulation Tool:
https://osts.infineon.com/magsimx

Click here to learn more:

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ISO 26262 – Functional Safety (FuSa)

Dependable electronics based on Functional Safety

Automotive Functional Safety – we ease the process of integrating safety features with our safety guidelines and services.

Infineon provides dependable electronics to support today's safety-relevant systems and future fail-operational systems as essential components that allow customers to fulfill their safety requirements on the application level. Highly integrated systems equipped with safe electronic semiconductors are essential for key application areas like connectivity, electromobility, and higher levels of automated driving. The ISO 26262 standards set requirements and guidance for integrating products into automotive safety applications.

- Discover Infineon's products with ISO 26262 classification

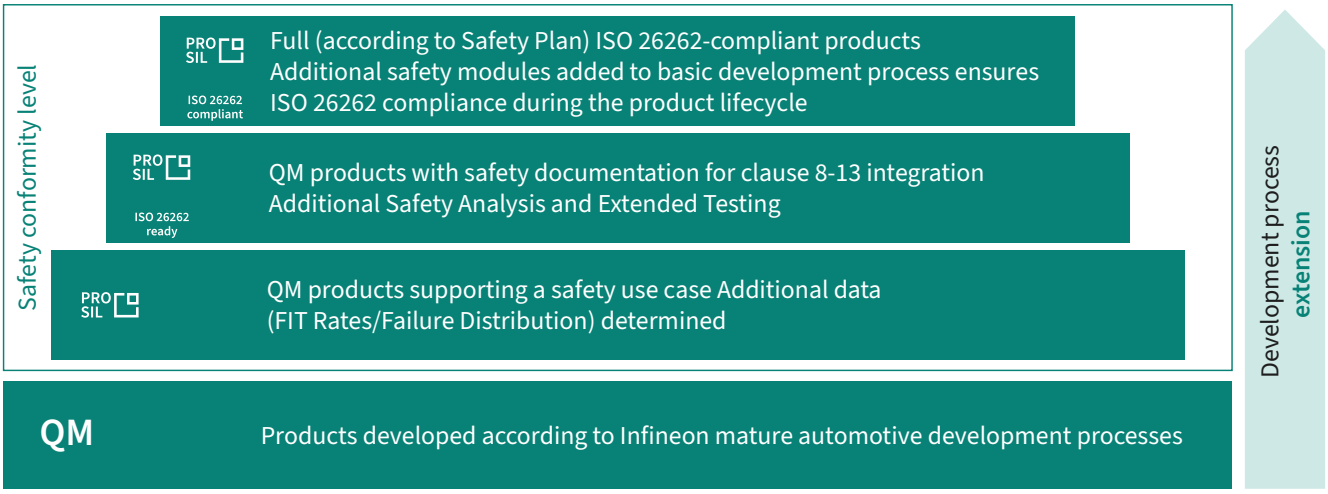
With our holistic approach towards functional safety, Infineon is responding to the increased complexity and strict requirements that make functional safety projects costly and time-consuming. We provide the necessary products, including documentation and supporting information, to ease the integration and reduce the effort at the system integrator level.

Benefit from:

- Innovative solutions for automotive safety-related applications
- Improved time-to-market through comprehensive safety documentation of ISO 26262-compliant products
- Reduced integrator's efforts with ISO 26262-compliant and -ready products
- Broad portfolio of ISO 26262-compliant products already available
- Newly developed automotive parts will primarily be part of an ISO 26262-compliant development flow

Safety conformity levels:

- PRO-SIL™ ISO 26262-compliant devices meet all relevant requirements for semiconductors as defined in the ISO 26262 series of standards for automotive functional safety.
- The PRO-SIL™ ISO 26262-ready marking designates QM devices that can be integrated into a safety-related application by customer usage of the ISO 26262:2018 clause 8-13 class II hardware evaluation.
- The Infineon automotive Ensured Compliance process framework has been certified by SGS-TÜV Saar for process compliance with ISO 26262:2018 as of April 2022. This certification underpins our focus on automotive functional safety.



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Dependability is the key driver for the megatrend towards autonomous driving

The future car is fully connected and always online. It is all-electric and autonomous. At Infineon, we believe that it takes both technology and trust to realize it.

The increased need for safe electronic systems in vehicles, that drivers and passengers can rely on, are the foundation of trust and shape the future towards higher levels of automated driving.

Winning the trust of tomorrow's passengers starts with dependable electronics that enable highly available, dependable, robust, safe, and secure systems that operate in all conditions.

Infineon is your trusted partner, offering all relevant ingredients for your dependable systems – automotive quality, Functional Safety, cybersecurity, innovative products, system understanding, and operational excellence.

Dependable electronics based on quality
As vehicles become more reliant on electronic components, the demand for safe and reliable systems is growing. Especially the rising levels of automated driving depend on the trust that drivers and passengers have towards the quality and reliability of each component. The complexity and
requirements in the automotive industry will continue to grow in terms of quality and dependability to keep vehicles running safely and smoothly over 15 years of lifetime.

Infineon's passion for high quality and dependable products create a portfolio with superior performance and unmatched durability through our zero-defect mentality. We go beyond the standards to fit the real application requirements.

Upgrade your automotive systems and applications with our high-quality semiconductor components for your design.

Dependable electronics based on quality
Automotive quality beyond the standards with a zero defect mindset.
Vehicle complexity and functionalities will continue to grow, driving the need for dependable electronics, with quality being one of its key ingredients. Our passion for quality creates a product portfolio that meets high-quality requirements and leads to highly reliable and robust products.

How Infineon differentiates as a quality leader:
1. Our goal is to go beyond standards to better fit real application requirements: from intensive screening methods to detect production defects, to advanced AEC Q100/101 tests where required, to sub 1 dpm validation to achieve low dpm rates.
2. Our track record of achievements, such as multiple quality awards from our customers Toyota (Honor Quality Award in 2020) and Continental (Supplier of the year in 2019) prove that we consistently achieve outstanding quality targets in the automotive industry.
3. Infineon offers the highest customer service, which includes a regional network of failure analysis labs and strong localized competencies, technical trainings, and regional quality analysis lab capabilities with state of the art failure analysis.
4. Meeting customer needs through best-in-class product requirements, design, manufacturing, and testing: We integrate quality criteria in the development processes (e.g., RDDF), design rules (e.g., ADeGo), materials, large manufacturing processes and process controls, proprietary testing, and screening methods.

Infineon's Zero Defect mentality is built upon:
- We produce 24/7/365 at sub dpm level: translated into a year's timeline: we deliver zero defect for all but the last three seconds of a year
- We deliver sub ppm quality levels
- 90 percent of our products are already Zero Defect

We go beyond the standards to better fit the real application requirements.

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Infineon support for sensors

Useful links and helpful information

Further information, datasheets, and documents

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Infineon customized solutions

Your specific needs, realized

A customized solution (commonly known in the industry as an ASIC—Application Specific IC or CSP—Customer Specific Product) is designed, planned, developed, and used for a specific purpose. Its mission is to be optimized, efficient, and have all the required functionalities and features for a specific application for a single customer.

Infineon as your one-stop-shop from design to delivery

Infineon, as a market leader in customized solutions, believes innovation comes through collaboration and exploring new paths. Working closely with our customers, understanding their needs, and combining them with our cutting-edge solutions, we know there is always a benefit for every customer and application. Whether the challenge is related to IP, BOM constraints, or simply requires higher integration – an ASIC can be the solution. Furthermore, customers benefit from Infineon's trusted quality, supply guarantee, and experience, which are combined with more advantages such as IP protection and a well-established partner network.

Click here to learn more:
www.infineon.com/asic

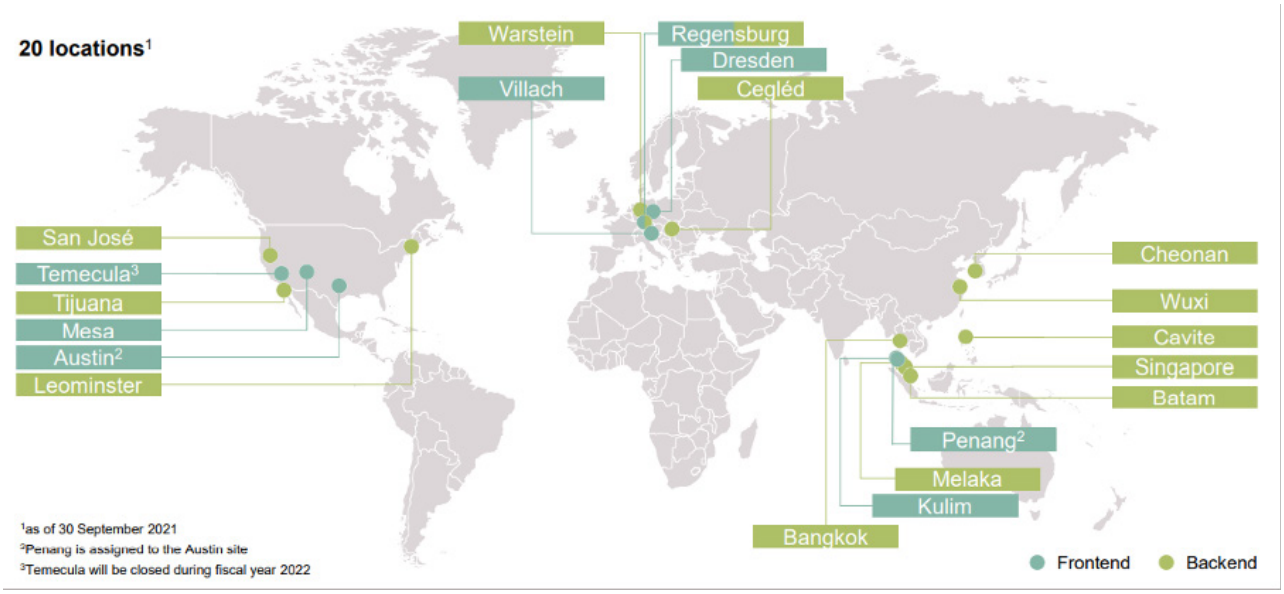
A process streamlined through efficiency, expertise, and experience

The journey starts with you and a focus on feasibility - we match your needs early on with our 40 years of expertise in building world-class, industry-leading semiconductors and ensure successful implementation of your requirements.

From technology advantage to supply stability

Whether it is digital, analog, mixed-signal devices, an embedded processor or integrated sensors, we have the experience and product know-how. Being one of the largest semiconductor companies, we also have a vast array of IPs. We can integrate almost anything into your chip from the vast variety of our sensors, discrete devices, drivers, and many more, including support for higher voltage levels. Our in-house fabrication facilities and design centers around the globe are known for the highest quality standards. We also have well-established partnerships with all major silicon foundries and assembly test fabs to complement our in-house technologies. At every step along the way, we take pride in the highest quality Infineon is known for.

If you are interested and would like to find out further information, visit **www.infineon.com/asic**



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The Infineon Partner Program

Together we create and innovate for our customers' success

Find solutions from our partners to accelerate your business of tomorrow. Infineon's global network of partners are experts in designing products, solutions, or services leveraging Infineon components in 5 key domains: software, hardware, services, tools, and end applications.

The Infineon Partner Program is a global ecosystem of qualified companies, offering knowledge and experience to enable and implement Infineon products. Our associated, preferred, and premium partners help design your device and application based on our components. They have been carefully selected by us on the basis of their competence and ability to design and deliver strong and trustworthy solutions, especially for new technologies and use cases.

Hardware	Software	Tools	Services	End applications
Partners manufacturing electronic components, demo boards, and turnkey modules	Partners programming various types of software, algorithms, and operating systems	Partners designing computer programs for the development of embedded systems	Partners providing cloud and engineering services, application support or trainings	Partners creating end products and related applications
... jointly we create and commercialize value added solutions, while reaching new buyers	... jointly we enhance our portfolio with complementary components and expand technology know-how	... jointly we enable a complete and immersive development experience for customers	... jointly we build up engineering capabilities and offer it to a world class customer network	... jointly we provide customers with state-of-the-art solutions and innovative use cases

Find out more about the Infineon Partner Program, the latest news and solutions from our partners, and much more on our webpage.

Looking for a specific partner solution in your region? Our partner finder provides an overview of our partners and their offerings. Simply specify your search in the dropdown menu and browse through the companies and their solutions to navigate directly to the respective website for further information.

Additionally, use the "partner tab" on our product and application pages to find out more about Infineon's partner solutions.

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Infineon hotline – get connected with the answers! Wherever, whenever.

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