Product Document

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Position Sensors

About ams

ams is a global leader in the design and manufacture of advanced sensor solutions. Leading manufacturers around the globe rely on ams' sensing know-how for advanced systems design. For ams, "Sensing is Life" and our passion is in creating the sensor solutions that make devices smarter, safer, convenient and more environment-friendly.

ams' sensor solutions are at the heart of the products and technologies that define our world today – from smartphones and mobile devices to smart homes and buildings, industrial automation, medical technology, and connected vehicles.

Our products drive applications requiring small form factor, low power, highest sensitivity and multi-sensor integration. We offer sensors (including optical sensors), interfaces and related software for consumer, communications, industrial, medical, and automotive markets.

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We offer our customers more than just a product…

Intelligent position sensors from ams make your application smarter. Our magnetic and inductive sensor ICs deliver best-in-class, effective and true stray field immune position sensing. Fit for motor control and any tough position sensing applications in the industrial, consumer and automotive field.

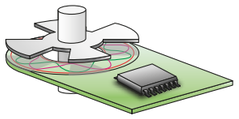
Technology

Magnetic position sensors contactlessly measure the absolute angle of a diametric magnetized on-axis magnet. Its robust design eliminates the influence of any homogenous external magnetic stray fields.

Besides our broad magnetic position sensor portfolio, we also offer inductive technology.

Inductive position sensors contactlessly measure the coupling between coils and a moveable target. The coils are executed as printed circuit and the target is a simple punched metal part.

Magnetic Technology



Inductive Technology

Benefits

Stray Field Immunity
- Robustness against unwanted external magnetic stray fields
- Reduced BOM - eliminates the need for shielding
- Overachieves ISO 11452-8

Improved Accuracy & Lowest Propagation Delay
- Up to 14 bit resolution and ≈ ±1.0° maximum angle error
- Wide operating Magnetic Field Range 10mT to 90mT
- Elimination of angle measurement lag >>> faster refresh rates
- (1.9µs) at high RPMs

Increased Functionality + ISO26262 Support
- Several interface variants for improved performance
- On-chip linearization for increased immunity to mechanical/magnet misalignment
- On-chip diagnostics for ISO26262 compliance w/ OTP for improved security

Increases Battery Endurance
- Automatic low power modes enable ultra-low power consumption >> optimized for battery driven applications

Innovative Package Options
- Ultra small packages: WL-CSP (2.07mm x 2.63mm)
- Dual Die – redundant sensor enables ASIL-D
- System in Package - Lower system costs and improved EMC/ESD protection

For more information on our Position Sensors, please go to:
ams.com/position-sensors

Automotive qualified position sensors for a safer, smarter & greener driving experience

As a result of the on-going electrification of vehicles, the environment is becoming more electromagnetically and mechanically harsh. Therefore new standards such as ISO11452-8 (immunity to magnetic fields) and ISO26262 (functional safety) are becoming the de facto standard.

Functional Safety
Consistent with ams' strategy of helping its customers meet the ever-increasing demand for automotive safety features built into critical vehicle systems, ams' sensors provide full data path diagnostics, enabling automotive system OEMs to achieve a higher level of ISO26262 system-level compliance.

Automotive Qualification
ams' Safe Launch Program is our zero-defect-strategy that includes the AEC-Q100 automotive qualification, the burn-in and three-temperature testing procedures. The burn-in procedure is an artificial, accelerated aging process and the three-temperature test provides data on reliability at lowest, highest and room temperature as well as the temperature specification limits of the respective devices. This program has led to improved screening by ensuring literally zero defects for a minimum of 100,000 parts during the ramp-up phase.

Position Sensors Longevity Program

Our commitment to delivering product supply and support for designated position sensors till at least 1 January 2031.

Industrial Position Sensors

Enabling the smart home & industry field to create new applications which elevate our daily lives

Industrial & Robotic High Speed Applications

Motor position detection – flexible designs and highly accurate position sensing also at higher rotational speed:
Industry hub motor, robotic joint motor position, electric drive motors and any other motor-driven application equipped with BLDC motors, PMSM motors or servo motor control

Part No.	Accuracy (Linearity)	Output resolution	Max speed	Output Type	Programming Interface	Supply Voltage	Supply Current[2]	Feature	Operating Temperature	Package
		degree	rpm			V	mA		°C	
AS5715R[1]	1% linearity error	Analog	480k	Analog (sin/cos)	I²C	5.0	10	Flexible coil design: on-axis; off-axis	-40 to 160	TSSOP14
AS5047D	+/- 1° INL_{MAX}	0.022 (14bit)	14.5k	ABI - 11 bit UVW - 7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	15	DAEC™ Low price	-40 to 125	TSSOP14
AS5047P	+/- 1° INL_{MAX}	0.022 (14bit)	28k	ABI - 12 bit UVW -7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	15	DAEC™	-40 to 125	TSSOP14
AS5047U	+/- 1° INL_{MAX}	0.022 (14bit)	28k	ABI - 14 bit UVW - 7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	15	DAEC™ DFS	-40 to 125	TSSOP14

Consumer Position Sensing

Contactless and super precise position sensing fitting in many different applications:
Position sensing of robotic joints, robot gripper position, rotary knobs and switches, potentiometer replacement, e-bike derailleur position

Part No.	Accuracy (Linearity)	Output resolution	Angle Range	Output Type	Programming Interface	Supply Voltage	Supply Current[2]	Feature	Operating Temperature	Package
		degree				V	mA		°C	
AS5600	+/- 1° INL_{MAX}	0.09 (12bit)	360°	Analog, PWM	I²C	3.3 or 5.0	6.5 (1.5)[3]	Potentiometer replacement	-40 to 125	SOIC8
AS5600L	+/- 1° INL_{MAX}	0.09 (12bit)	360°	PWM	I²C	5.0	6.5 (1.5)[3]	Small package	-40 to 125	SOIC8, WLCSP
AS5055A	+/- 1.41° INL_{MAX}	0.09 (12bit)	360°	SPI	SPI	3.3	8.5 (3µA)[3]	Low power consumption	-40 to 85	QFN16
AS5070	+/- 1.4° INL_{MAX}	0.022 (14bit)	360°	Analog, PWM, SENT	UART	5.0	12	High resolution	-40 to 150	SOIC8

Linear Position Sensing

Contactless linear movement sensing with flexible and small form factor:
Smart toothbrush head, camera lens position, servo drive and reliable position sensing in medical surgery robots

Part No.	Accuracy (Linearity)	Output resolution	Stroke	Output Type	Programming Interface	Supply Voltage	Supply Current[2]	Feature	Operating Temperature	Package
						V	mA		°C	
AS5510	3% linearity error	10bit	2mm	I²C	I²C	3.0	3.5 (25µA)[3]	Low power consumption	-40 to 85	WLCSP
AS5715R[1]	1% linearity error	Analog	Depending on design	Analog (sin/cos)	I²C	5.0	10	Stroke >2mm (depending on coil-design)	-40 to 160	TSSOP14

Automotive Position Sensors

Enabling advanced electrification across vehicles and contribute to a safer, smarter & greener driving experience

Automotive High Speed Applications

Motor Position Detection – Accurate and highly reliable position sensing at higher rotational speed:
Traction motor of electric cars, transmission gearbox encoder, rack motor (EPS – Electric Power Steering), electric servo pump, electric braking, starter/alternator and also replacement of optical encoders and resolvers

Part No.	Accuracy (Linearity)	Output resolution	Max speed	Output Type	Programming Interface	Supply Voltage	Supply Current[2]	Feature	Operating Temperature	Package
		degree	rpm			V	mA		°C	
AS5715R[1]	1% linearity error	Analog	480k	Analog (sin/cos)	I²C	5.0	10	Flexible coil design: on-axis; off-axis	-40 to 160	TSSOP14
AS5147	+/- 1° INL_{MAX}	0.022 (14bit)	14.5k	ABI - 11 bit UVW - 7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	15	DAEC™ Low price	-40 to 150	TSSOP14
AS5147P	+/- 1° INL_{MAX}	0.022 (14bit)	28k	ABI - 12 bit UVW -7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	15	DAEC™	-40 to 150	TSSOP14
AS5147U	+/- 1° INL_{MAX}	0.022 (14bit)	28k	ABI - 14 bit UVW - 7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	15	DAEC™ DFS	-40 to 150	TSSOP14
AS5247[4]	+/- 1° INL_{MAX}	0.022 (14bit)	14.5k	ABI - 11 bit UVW - 7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	30	DAEC™ Stacked dual die	-40 to 150	MLF-40 (7x7)
AS5247U[4]	+/- 1° INL_{MAX}	0.022 (14bit)	28k	ABI - 14 bit UVW - 7 PP SPI - 14 bit PWM - 12 bit	SPI	3.3 or 5.0	30	DAEC™ DFS Stacked dual die	-40 to 150	TQFP32
AS5116	+/- 1° INL_{MAX}	Analog	30k	Analog (sin/cos)	UART	3.3 or 5.0	17	Small package	-40 to 150	SOIC8

Automotive Angle Sensing

Contactless and super precise position sensing in harsh environments:
Pedal position, chassis ride height at active suspension systems, throttle valve position, gear box position, tumble flap, steering angle, headlight control, potentiometer, gear shifter, rotary knobs

Part No.	Accuracy (Linearity)	Output resolution	Angle Range	Output Type	Programming Interface	Supply Voltage	Supply Current[2]	Feature	Operating Temperature	Package
		degree				V	mA		°C	
AS5171	+/- 1.4° INL_{MAX}	0.022 (14bit)	360°	Analog, PWM, SENT	UART	5.0	12	System in Package	-40 to 150	SiP
AS5172	+/- 1.4° INL_{MAX}	12bit / 14bit	360°	PSI5	UPSi5	4.0 to 12.0	15	PSi5	-40 to 125 / -40 to 150	TSSOP14, SiP
AS5270[4]	+/- 1.4° INL_{MAX}	0.022 (14bit)	360°	Analog, PWM, SENT	UART	5.0	24	High resolution Stacked dual die	-40 to 150	MLF-16 (6x6)
AS5200L[4]	+/- 1° INL_{MAX}	0.09 (12bit)	360°	PWM	I²C	5.0	14	Stacked dual die	-40 to 125	MLF-16 (5x5)

(1) Inductive Technology
(2) Supply current is doubled at dual-die versions
(3) Power consumption in power down mode
(4) Stacked dual die: 2 dies in 1 package for increased redundancy

Abbreviations:
DAEC™ Dynamic Angle Error Compensation
DFS Dynamic Filter System