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AS5172A / AS5172B

High-Resolution On-Axis Magnetic Angular Position Sensor with PSI5 Output

General Description

The AS5172 is a magnetic position sensor with a high resolution 12-bit PSI5 output according PSI5 specification Version 1.3 and 2.1.

Based on a Hall sensor technology, this device measures the orthogonal component of the flux density (Bz) over a full-turn rotation and compensates for external stray magnetic fields with a robust architecture based on a 14-bit sensor array and analog front-end (AFE). A sub-range can programmed to achieve the best resolution for the application. To measure the angle, only a simple two-pole magnet rotating over the center of the package is required. The magnet may be placed above or below the device. The absolute angle measurement provides an instant indication of the magnet's angular position. The AS5172 operates up to a voltage of 16.5V and is protected against overvoltage up to +20V. In addition, the supply pins are protected against reverse polarity up to –18V.

Programmability over the VDD pin reduces the number of pins on the application connector.

The AS5172 is available in a TSSOP14 package and in a SIP package.

The SIP package (System in Package) has integrated the AS5172 sensor die together with the decoupling capacitors necessary to pass system level ESD and EMC requirements. No additional components and PCB on the sensor side are needed.

The product is defined as SEooC (Safety Element out of Context) according ISO26262.

The product is fully system level EMC and ESD tested according OEM standards.

Ordering Information and Content Guide appear at end of datasheet.

Key Benefits and Features

The benefits and features of this device are listed below:

Figure 1:
Added Value of Using AS5172

Benefits	Features
• Resolve small angular excursion with high accuracy	• 12-bit resolution @90° minimum arc
• Accurate angle measurement	• Low output noise, low inherent INL
• Higher durability and lower system costs (no shield needed)	• Magnetic stray field immunity
• Enabler for safety critical applications	• Functional safety, diagnostics
• Suitable for automotive applications	• AEC-Q100 Grade 0 qualified (AS5172B) • AEC-Q100 Grade 1 qualified (AS5172A)
• SIP Package	• System cost reduction – no PCB and additional components are needed

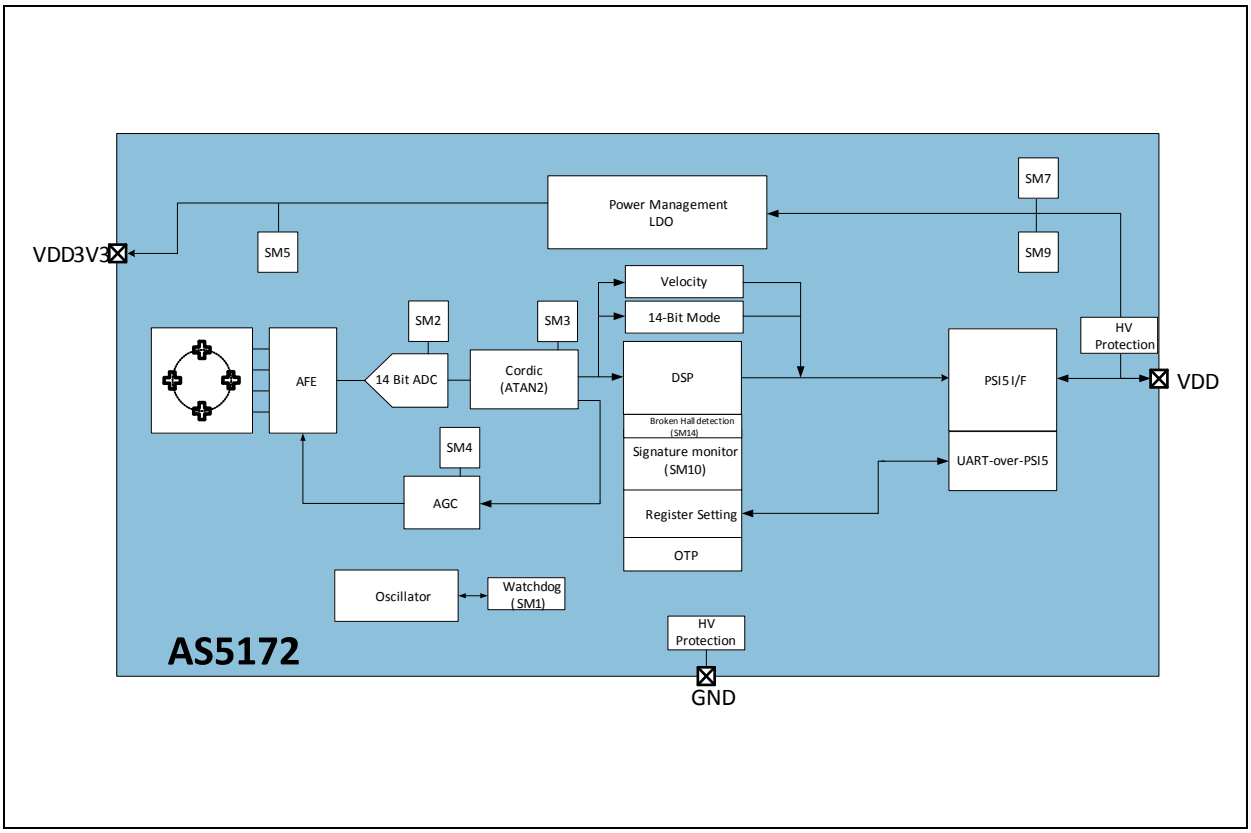
Applications

The AS5172 is ideal for automotive applications like brake and gas pedals, throttle valve and tumble flaps, steering angle sensors, chassis ride, EGR, fuel-level measurement systems, 2/4WD switch, and contactless potentiometers.

Block Diagram

The functional blocks of this device are shown below:

Figure 2:
Functional Blocks of the AS5172



Note(s):

1. Detailed safety mechanism information can be found in chapter Diagnostic

Pin Assignments

Pin Diagram

Figure 3:
AS5172B Pin Assignment (Top View, TSSOP14)

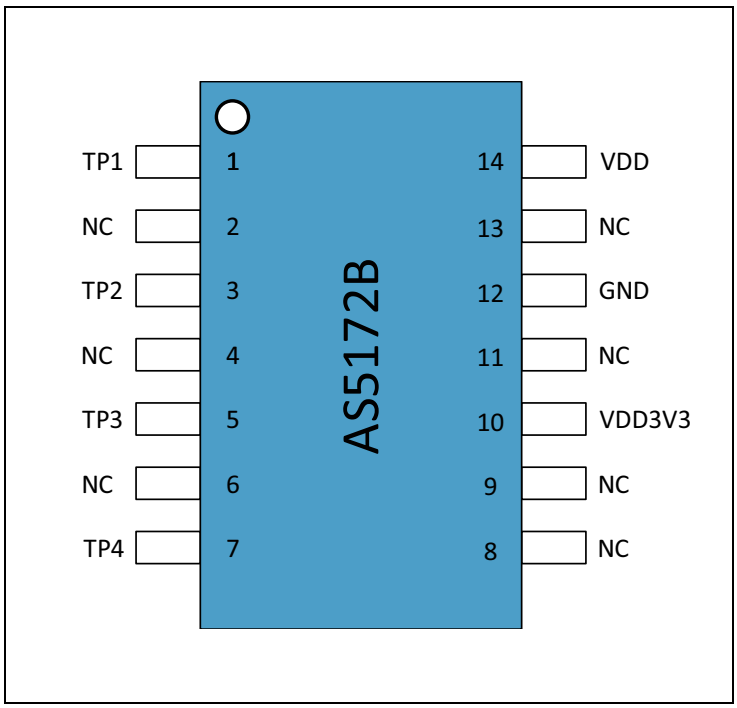


Figure 4:
AS5172B Pin Description

Pin Number	Name	Type	Description
1	TP1	Test pin	Connected to GND in application
2	NC	Not connected	Connected to GND in application
3	TP2	Test Pin	Connected to GND in application
4	NC	Not connected	Connected to GND in application
5	TP3	Test Pin	Connected to GND in application
6	NC	Not connected	Connected to GND in application
7	TP4	Test Pin	Connected to GND in application
8	NC	Not connected	Connected to GND in application
9	NC	Not connected	Connected to GND in application
10	VDD3V3	Supply	Requires a 470nF capacitor to GND

Pin Number	Name	Type	Description
11	NC	Not connected	Connected to GND in application
12	GND	Supply	Ground
13	NC	Not connected	Connected to GND in application
14	VDD	Supply	Supply/PSI5 interface/UART-over-PSI5 programming Requires a 15nF capacitor to GND

Figure 5:
AS5172A in SIP Package

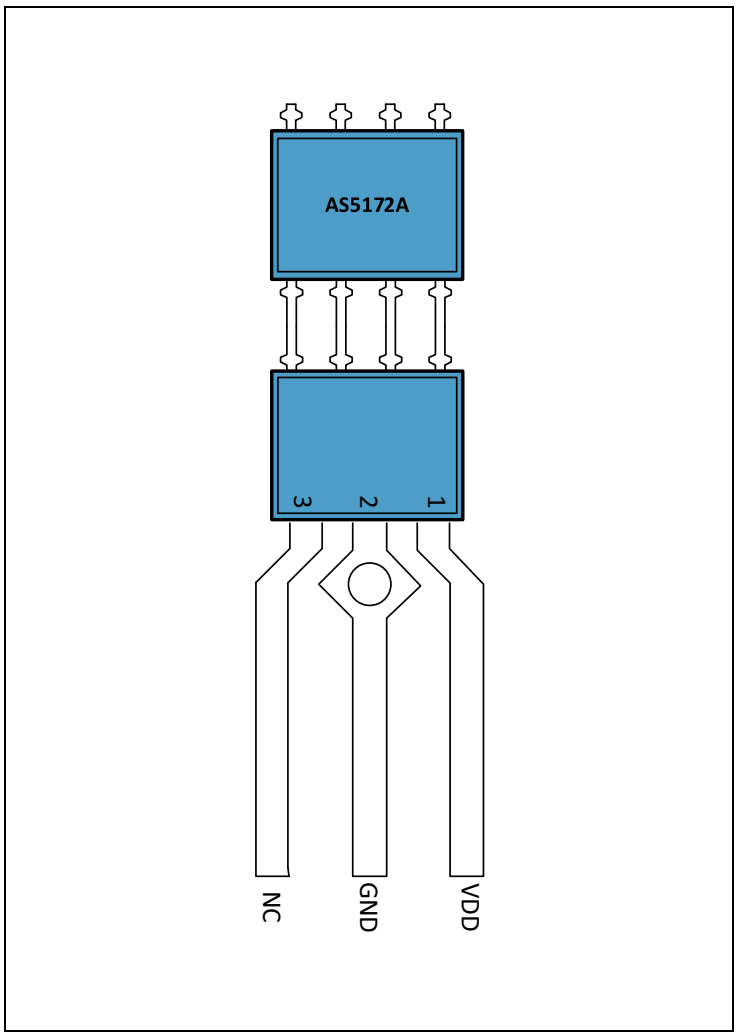


Figure 6:
AS5172A Pin Description

Pin Number	Name	Type	Description
1	VDD	Supply	Supply/PSI5 interface/UART-over-PSI5 programming
2	GND	Supply	Ground
3	NC	Not connected	Left open in application

Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under Operating Conditions is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Figure 7:
Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Units	Comments
Electrical Parameters					
VDD	DC Supply Voltage at VDD pin	-18	20	V	Not operational
VREGOUT	DC Voltage at the VDD3V3 pin	-0.3	5	V	
ISCR	Input Current (latch-up immunity)	±100		mA	AEC-Q100-004
Continuous Power Dissipation (T_{AMB} = 70°C)					
P_{T_Tssop}	Continuous Power Dissipation		377	mW	
P_{T_SIP}	Continuous Power Dissipation		377	mW	
Electrostatic Discharge					
$ESD_{HBM\ on\ all}$	Electrostatic Discharge HBM	±2		kV	AEC-Q100-002
$ESD_{HBM\ on\ TSSOP}$	On VDD and GND	±4		kV	AEC-Q100-002
$ESD_{HBM\ on\ SIP}$	On VDD and GND	±8		kV	AEC-Q100-002

Symbol	Parameter	Min	Max	Units	Comments
Temperature Ranges and Storage Conditions					
T_{AMB}	Operating Temperature Range	-40	125	°C	AS5172A ambient temperature
T_{AMB_LM}	Operating Temperature Range	-40	150	°C	AS5172B ambient temperature
TaProg	Programming Temperature	5	45	°C	Programming@ room temperature (25°C ± 20°C)
T_{STRG}	Storage Temperature Range	-55	125	°C	
T_{BODY}	Package Body Temperature		260	°C	The reflow peak soldering temperature (body temperature) is specified according to IPC/JEDEC J-STD-020 "Moisture/Reflow Sensitivity Classification for Non-hermetic Solid State Surface Mount Devices." The lead finish for Pb-free leaded packages is "Matte Tin" (100% Sn)
RH_{NC}	Relative Humidity (non-condensing)	5	85	%	
MSL	Moisture Sensitivity Level	3			Represents a maximum floor life time of 168 hours

System Electrical and Timing Characteristics

All limits are guaranteed. The parameters with min and max values are guaranteed with production tests or SQC (Statistical Quality Control) methods.
All in this datasheet defined tolerances for external components need to be assured over the whole operation conditions range and also over lifetime.

Overall Condition:

T_{AMB}= -40°C to 125°C for AS5172A;
T_{AMB}=-40°C to 150°C for AS5172B;
VDD= 4V – 12V (sync pulse voltage not included);
Components spec; unless otherwise noted

Figure 8:
Operating Conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VDD	Positive Supply Voltage	Static condition	4		12	V
VDD_Rx	Positive Supply Voltage	Dynamic condition	4		16.5	V
VDD3	Regulator Voltage		3.3	3.45	3.6	V
IDD	Current Consumption	No programming and no PSI5 communication	11	15	19	mA
IDDProg	Current Consumption	During programming		80		mA
IDDProgUN	Current Consumption of Unprogrammed Device	Unprogrammed device @ T_{AMB} = 25°C ± 10°C			49	mA
IDD max	Current Consumption	IDD + IS_Common			49	mA
IS_Common	Sink Current (common mode)		22	26	30	mA
IS_low power mode		Sink current (low power mode)	11	13	15	mA
IDD_D	Current Drift of IS in Low Power Mode		-4		4	mA
IDD_DRate	Current Drift Rate	Not tested			1	mA/s
TSUP	Start-Up Time, With ±2mA Tolerance in Respect to the Trimmed ILO Value (IL)	Functional mode			5	ms
PSI5_T	Fall/Rise Time of the Current Slope	Programmed in production	300	500	700	ns
PSI5_TBITL	Bit Time 125kbit/s Mode	Not tested - Guaranteed by Design	7.6	8.0	8.4	µs
PSI5_TBITH	Bit Time 189kbit/s Mode	Not tested - Guaranteed by Design	5.0	5.3	5.6	µs
PSI5_MSR	Mark/Space Ratio	$(t_{fall,80\%} - t_{rise,\ 20\%})$/PSI5_TBIT or $(t_{fall,20\%} - t_{rise,\ 80\%})$/PSI5_TBIT Programmed in production	47	50	53	%

Electrical System Characteristics

T_{AMB}= -40°C to 125°C for AS5172A;
T_{AMB}=-40°C to 150°C for AS5172B;

VDD = 4V – 12V (sync pulse voltage not included);
Magnetic Characterization; unless otherwise noted

Figure 9:
Electrical System Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
CRES	Core Resolution			14		bit
OutputRes		≥ 90° slope			12	bit
INLopt	Integral Non-Linearity (optimum)	Best aligned reference magnet (1) at 25°C over full turn 360°	-0.5		0.5	deg
INLtemp	Integral Non-Linearity (optimum)	Best aligned reference magnet (1) over temperature -40°C to 150°C over full turn 360°	-0.9		0.9	deg
INL	Integral Non-Linearity	Reference magnet (1) over temperature -40°C to 150°C over full turn 360° and displacement	-1.4		1.4	deg
ST	Sampling Time			128		µs
SPDF	System Propagation Delay Fast	Depending on the PSI5 standard	200		500	Us
CoreClk	Core Clock			16		MHz
Coreclk tol	Tolerance of the Core Clock		-3.5		3.5	%
ON	Output Noise Peak to Peak	Related to 12-bit Not tested			4	LSB

Note(s):

1. Reference magnet: NdFeB, 8mm diameter, 2.5mm thickness.

Figure 10:
Power Management – Supply Monitor - Timing

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VDDUVTH	VDD Undervoltage Upper Threshold		3.6	3.8	4.0	V
VDDUVTL	VDD Undervoltage Lower Threshold		3.4	3.6	3.8	V
VDDUH	VDD Undervoltage Hysteresis	Info parameter	150	200	250	mV
UVDT	VDD Undervoltage Detection Time		10	50	250	µs
UVRT	Undervoltage Recovery Time		10	50	250	µs
VDDOVTH	VDD Overvoltage Upper Threshold	If sensor in overvoltage condition, ECU gets the Error flag. --> overheating possible in the application	16.7	18	19.1	V
VDDOVTL	VDD Overvoltage Lower Threshold		14.5	15.5	16.5	V
OVDT	VDD Overvoltage Detection Time	From the time VDD exceeding 16.5V		1000	2000	µs
OVRT	VDD Overvoltage Recovery Time	From the time VDD returning from VDD > 16.5V to normal operating voltage (4V< VDD < 17V)		1000	2000	µs
VDD3V3UVTH	VDD3V3 Reset Upper Threshold		2.5	2.8	2.95	V
VDD3V3UVTL	VDD3V3 Reset Lower Threshold		2.4	2.6	2.72	V
VDD3V3UVHYS	VDD3V3 Reset Hysteresis	Info parameter	105	175	245	mV
TDETWD	WatchDog Error Detection Time				12	ms

Magnetic Characteristics

T_{AMB}= -40°C to 125°C for AS5172A;

T_{AMB}=-40°C to 150°C for AS5172B;

VDD= 4V – 12V (sync pulse voltage not included); unless otherwise noted.

Two-pole cylindrical diametrically magnetized source:

Figure 11:
Magnetic Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Bz	Orthogonal Magnetic Field Strength	Required orthogonal component of the magnetic field strength measured at the package surface along a circle of 1.25 mm @= 0	30		70	mT
BzE	Orthogonal Magnetic Field Strength –Extended Mode	Required orthogonal component of the magnetic field strength measured at the package surface along a circle of 1.25mm MFER = 1	10		90	mT
Disp (1)	Displacement Radius	Offset between defined device center and magnet axis. Dependent on the selected magnet.		0.5		mm

Note(s):

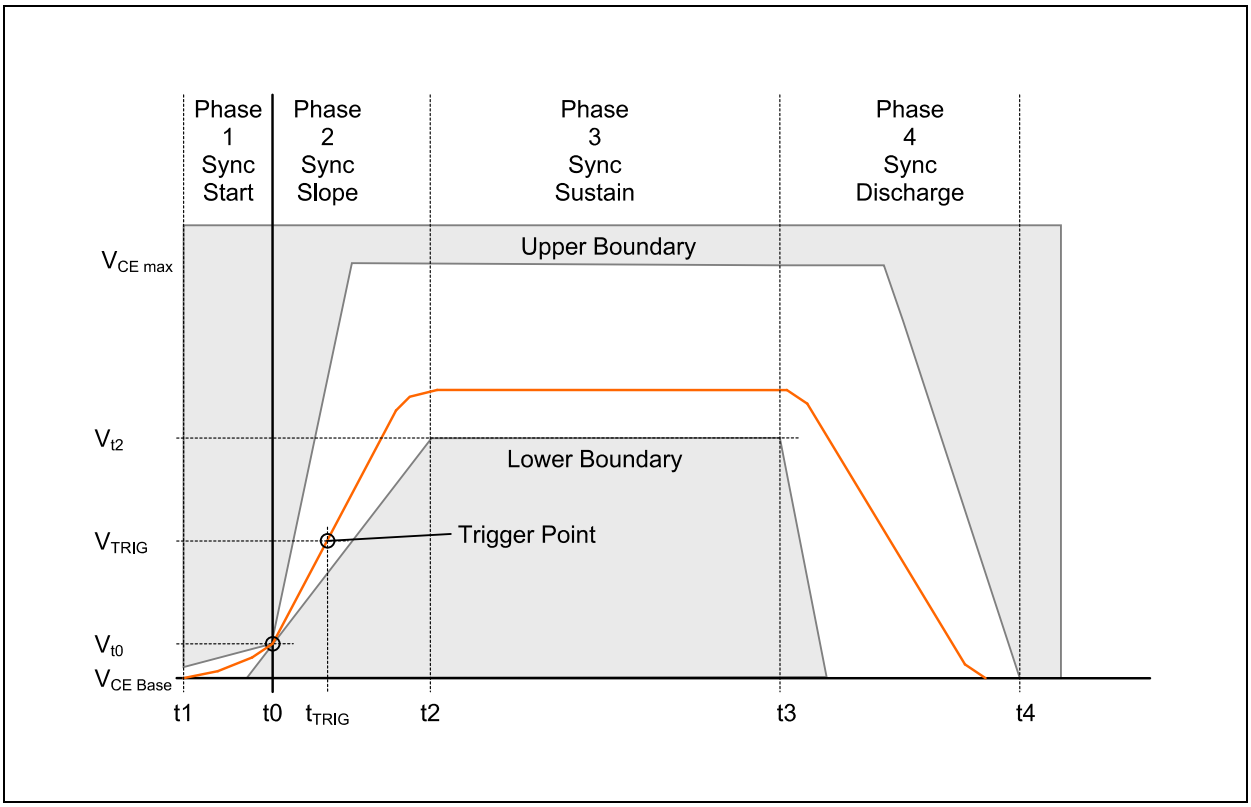
1. Reference magnet: NdFeB, 8mm diameter, 2.5mm thickness

Electrical and Timing Characterization of the PSI5 Interface

This chapter describes the synchronization signal from the ECU according to the PSI5 specification V1.3 and V2.1. The parameters in this chapter are not reflecting the full specification range of the detection circuit for the synchronization signal.

Synchronization Signal PSI5 V1.3

Figure 12:
Synchronization Signal



The synchronization signal start time t0 is defined as a crossing of the Vt0 value. In the “Sync Start” phase before this point, a “rounding in” of the voltage starting from VCE, Base to Vt0 is allowed for a maximum of t1. During the “Sync Slope” phase, the voltage rises within given slew rates to a value between the minimum sync signal voltage Vt2 and the maximum interface voltage VCE, max. After maintaining the voltage between this limits until a minimum of t3, the voltage decreases in the “Sync Discharge” phase until having reached the initial VCE, base value until latest t4.

Figure 13:
Synchronization Signal PSI5 V1.3 (1)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VBase	Base Supply Voltage	Voltage value at ECU	5.7		11	V
Vto	Sync Slope Reference Voltage	Reference to VBase		0.5		V
Vt2	Sync Signal Sustain Voltage	Reference to VBase	3.5			V
Vce,max	Maximum Interface Voltage				16.5	V
t0	Reference Time	Reference time base; time when the sync signal crosses Vt0		0		µs
t1	Sync Signal Earliest Start	$V=V_{CE}$ Delta current less than 2mA	-3		0	µs
t2	Sync Signal Sustain Start	@ Vt2		7		µs
	Sync Slope Rising Slew Rate	Lower limit is valid for V_{t0} to V_{t2}	0.43	1.0	1.5	V/µs
	Sync Slope Falling Slew Rate		-1.5			V/µs
t3	Sync Signal Sustain Time			16		µs
t4	Discharge Time Limit			35		µs
Tslot1	Start of Time Slot 1		44	51	59	µs
Tslot2	Start of Time Slot 2		181.3	195	210	µs
Tslot3	Start of Time Slot 3		328.9	350	373	µs

Note(s):

1. The parameters in this table are just info parameters and therefore not production tested. The production related parameters are in the PSI5 Block Parameters table.

Figure 14:
Synchronization Signal PSI5 V2.1 (1)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VBase	Base Supply Voltage	Voltage value at ECU	5.7 (4.4)		11	V
Vto	Sync Slope Reference Voltage	Reference to VBase		0.5		V
Vt2	Sync Signal Sustain Voltage	Reference to VBase	3.5 (2.5)			V
Vce,max	Maximum Interface Voltage				16.5	V
t0	Reference Time	Reference time base; time when they sync signal crosses Vt0		0		µs
t1	Sync Signal Earliest Start	$V=V_{CE}$ Delta current less than 2mA	-3		0	µs
t2	Sync Signal Sustain Start	@ Vt2		7		µs
	Sync Slope Rising Slew Rate	Lower limit is valid for V_{t0} to V_{t2}	0.43		1.5	V/µs
	Sync Slope Falling Slew Rate		-1.5			V/µs
t3	Sync Signal Sustain Time			16		µs
t4	Discharge Time Limit				35	µs
Tslot1	Start of Time Slot 1		44			µs

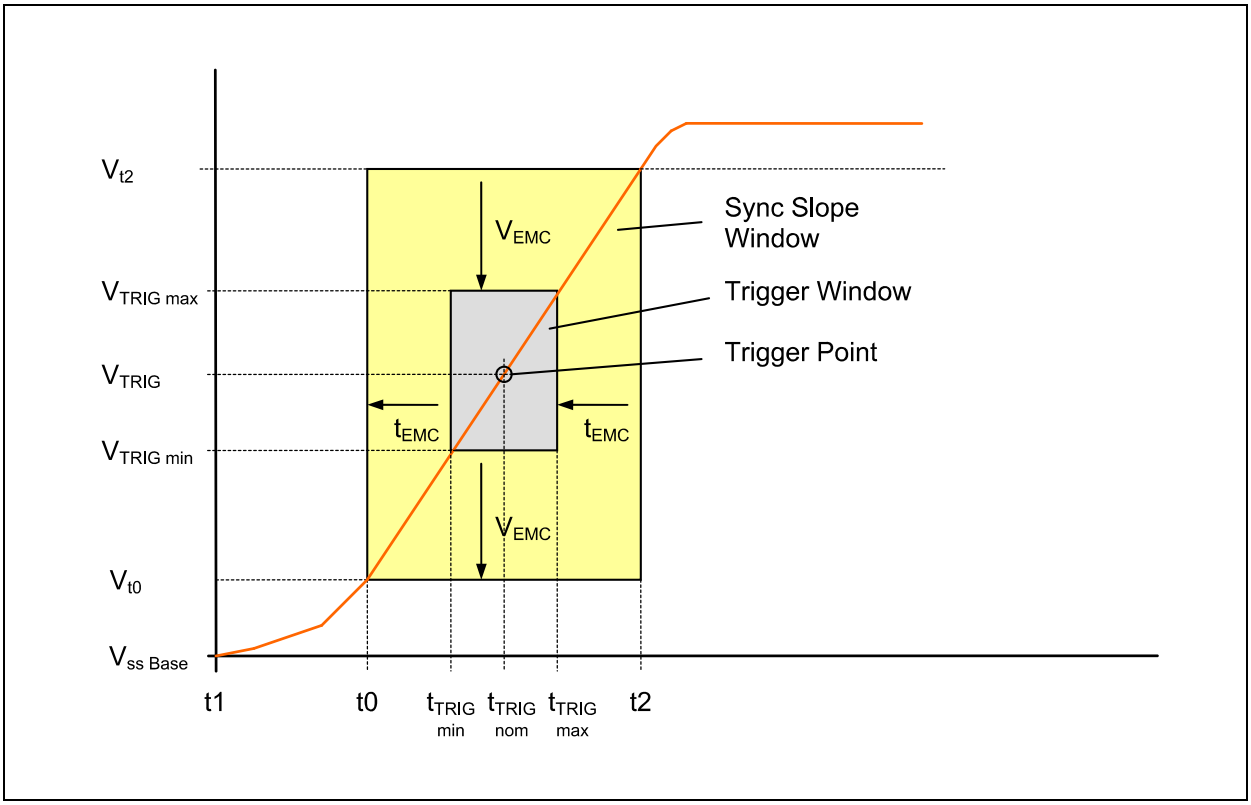
Note(s):

1. The parameters in this table are just info parameters and therefore not production tested. The production related parameters are in the PSI5 Block Parameters table.

Synchronization Signal Detection

The AS5172 has to detect the trigger within the "trigger window" during the rising slope of the synchronization signal at the trigger point with the trigger voltage V_{TRIG} and the trigger time t_{TRIG}

Figure 15:
Trigger Window



In order to take into account voltage differences at different points of the interface lines, an additional safety margin for the trigger detection is defined by V_{EMC} and t_{EMC}.

The values are based on the PSI5 specification and shows the detection of the synchronization signal from the ECU according the PSI5 specification.

Figure 16:
Synchronization Detection (1)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VEMC_C	Margin for Voltage Variations	Common power mode	-0.9		0.9	V
VEMC_LP	Margin for Voltage Variations	Low power mode	-0.7		0.7	V
VTrig_C	Trigger Voltage Threshold	Common power mode	1.4	2.0	2.6	V
VTrig_LP	Trigger Voltage Threshold	Low power mode	1.2	1.5	1.8	V
tTRIG	Nominal Trigger Detection Time	@ V_{TRIG}, @ AS5172 Pins; Referenced to a straight sync signal slope with nominal slew rate of 0.43 V/µs	2.1	3.5	4.9	µs
VCE,max	Maximum Interface Voltage				16.5	V
tEMC	Margin for Timing Variations of the Signal on the Interface Line	Relative to nominal trigger window time	-2.1		2.1	µs
ttol detect	Tolerance of Internal Trigger Detection Delay				3	µs
TTRIG	Trigger Detection Time	$T_{TRIG} = t_{TRIG} + t_{tol\ detect} + t_{EMC}$; Reference for AS5172 time base	0		10	µs

Note(s):

1. The parameters in this table are just info parameters and therefore not production tested. The production related parameters are in the PSI5 Block Parameters table.

Synchronization Signal with Discharge by AS5172

This chapter describes the modifications required if the ECU uses a special transreceiver.

The parameters in this chapter are not reflecting the full specification range of the detection circuit for the synchronization signal

Figure 17:
Synchronization Signal from ECU with Discharge by the AS5172

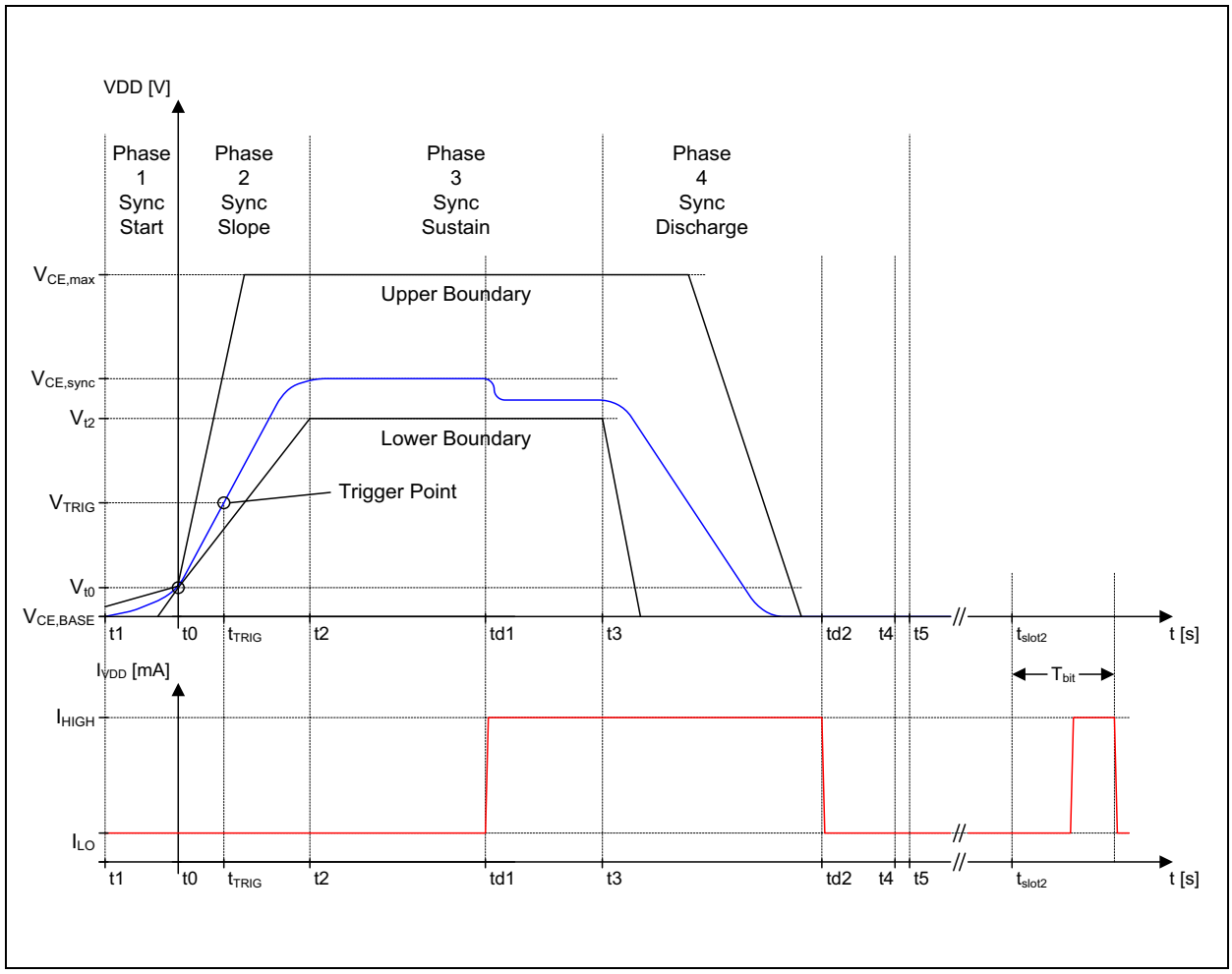


Figure 18:
Synchronization Signal from ECU with Discharge Parameter (1)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE, BASE}$	Base Supply Voltage	Mean voltage value at ECU	5.0	6.0	7.0	V
$V_{CE, BASE\_R}$	Base Supply Voltage Including Ripple		4.5	6.0	7.0	V
V_{t0}	Sync Slope Reference Voltage	Referenced to $V_{CE, BASE}$		0.5		V
V_{t2}	Sync Signal Sustain Voltage	Referenced to $V_{CE, BASE}$	+3.5	+5.0	+6.0	V
$V_{CE,max}$	Sync Signal Max. Voltage		10	11	14.5	V
V_{CE,max_R}	Sync Signal Max. Voltage Including Ripple		10	14	16.5	V
t0	Reference Time	Reference time base; time when the synchronization signal crosses V_{t0}		0		µs
t1	Sync Signal Earliest Start	$V=V_{CE, BASE}$	-3		0	µs
t2	Sync Signal Sustain Start	@ V_{t2}	3	4	5	µs
$S_{sync,r}$	Sync Slope Rising Slew Rate	10% to 90% of $V_{CE,max}$	0.7	1.0	1.6	V/µs
$S_{sync,f}$	Sync Slope Falling Slew Rate	90% down to 10% of $V_{CE,max}$	-1.6	-1.0	-0.7	V/µs
t3	Sync Signal Sustain Time	$V=V_{CE,sync}$	27.5	31	35.1	µs
td1	AS5172 Signals Discharge		18.5	22.75	28	µs
td2	Discharge Stop Time		38	43.25	50	µs
t4	Enable Pull Down to $V_{CE,BASE}$ by ECU		62.5	65	65.5	µs
t5	Receiver (ECU) Enable Start Time	Receiver (ECU) read for transmission	63	66.2	65.5	µs
V_{TRIG}	Trigger Voltage Threshold		1.4	2.0	2.6	V
t_{TRIG}	Nominal Trigger Detection Time	@ V_{TRIG}, @ AS5172 Pins; Referenced to a straight sync signal slope with nominal slew rate of 0.7 V/µs	1.25	2.15	3.05	µs
t_{EMC}	Margin for Timing Variations of the Signal on the Interface Line	Relative to nominal trigger window time	-1.25		1.25	µs

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{tol\ detect}$	Tolerance of Internal Trigger Detection Delay				3	µs
T_{TRIG}	Trigger Detection Time	$T_{TRIG} = t_{TRIG} + t_{tol\ detect} + t_{EMC}$; Reference for sensor time base	0		7.5	µs
$t_{slot\ 1}$	Start of Time Slot 1	Time slot 1 cannot be used in this communication mode	44	51	59	µs
t_{slot2}	Start of Time Slot 2		181.3	195	210	µs
t_{slot3}	Start of Time Slot 3		328.9	350	373	µs

Note(s):

1. The parameters in this table are just info parameters and therefore not production tested. The production related parameters are in the PSI5 Block Parameters table.

PSI5 Block Parameters

Figure 19:
Block Parameters

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE,BASE\ ECU}$	Base ECU Supply Voltage	Voltage at ECU	4.4		11	V
$V_{CE,BASE}$	Base Supply Voltage	Voltage at the Sensor	4.0		11	V
V_{SUPPLY}	Low Supply Voltage	Supply voltage for comparator	3.3	3.45	3.6	V
V_{t0}	Sync Slope Reference	Referred to $V_{CE,BASE}$		0.5		V
V_{t2}	Minimum Sync Signal Sustain Voltage (common mode)	Referred to $V_{CE,BASE}$	3.5			V
V_{t2_L}	Minimum Sync Signal Sustain Voltage (low power mode)	Referred to $V_{CE,BASE}$	2.5			V
$V_{CE\ MAX}$	Maximum Interface Voltage				16.5	V
t_2	Sync Signal Sustain Start	Voltage @ V_{t2}			7	µs
SL_{RISE}	Rising Slope		0.43		1.6	V/µs
SL_{FALL}	Falling Slope	Depends on voltage and discharge limit, external load has to meet these values	-1.75			V/µs
t_3	Sync Signal Sustain Time	Info parameter: Recommended ECU timing	16		35.1	µs
t_4	Discharge Time Limit	Info parameter: Allowed variation of synch pulse width for synch pulse detection circuit	17.67		62	µs
T_{SYNC}	Synchronization Period	Info parameter: To prevent shifts of detection threshold	250	500		µs
V_{TRIG}	Trigger Voltage Threshold (common mode)		1.4	2.0	2.6	V
V_{TRIG_L}	Trigger Voltage Threshold (low power mode)		1.2	1.5	1.8	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{TRIG\ EMC}$	Trigger Voltage Threshold Under EMC (common mode)	At SL_{RISE} = 0.43 V/µs; For EMC ≤$1V_{PEAK}$ ≥ 100kHz Not tested - Guaranteed by Design	0.5	2.0	3.5	V
$V_{TRIG\ EMC}$	Trigger Voltage Threshold Under EMC (low power mode)	At SL_{RISE} = 0.43 V/µs; For EMC ≤ $1V_{PEAK}$ ≥ 100kHz Not tested - Guaranteed by Design	0.5	1.5	2.5	V
$t_{tol\ detect}$	Tolerance of Internal Trigger Detection Delay				3	µs
t_{BLANK}	Output Signal Blanking Time	Blanking of trigger signal in digital part after first rising edge to avoid multiple trigger signals during EMC events. Not tested - Guaranteed by Design	121		135	µs
V_{COM}	Comparator Input Common Mode Voltage			1.5		V
RES_{div}	Resistor Divider Division Factor	Not tested - Guaranteed by Design 2% mismatch	7.84	8	8.16	V/V
f_{C_LP}	Low Pass Filter Cut-Off Frequency	Not tested - Guaranteed by Design	2.5	5	7.5	kHz

Detailed Description

The AS5172 is a Hall-based rotary magnetic position sensor using a CMOS technology. The lateral Hall sensor array converts the magnetic field component perpendicular to the surface of the chip into a voltage.

The signals coming from the Hall sensors are first amplified and filtered before being converted by the analog-to-digital converter (ADC). The output of the ADC is processed by the CORDIC block (Coordinate-Rotation Digital Computer) to compute the angle and magnitude of the magnetic field vector. The sensor and analog front-end (AFE) section works in a closed loop alongside an AGC to compensate for temperature and magnetic field variations. The calculated magnetic field strength (MAG), the automatic gain control (AGC) and the angle can be read through the UART-over-PSI5 protocol during programming.

The magnetic field coordinates provided by the CORDIC block are fed into a linearization block (DSP) which generates the transfer function.

The output of the AS5172 can be programmed to define a starting position (zero angle) and a stop position (maximum angle).

The AS5172 can be programmed through the VDD Pin with a special UART-over-PSI5 protocol which allows writing an on-chip non-volatile memory (One Time Programmable memory) where the specific settings are stored.

The AS5172 is equipped with a PSI5 Interface current driver and a PSI5 Interface receiver. The current driver drives the additional sink current to reach the I_high level on the VDD. The receiver is comparing the voltage level at the VDD Pin with the internal voltage thresholds.

The Sensor to ECU communication is described in the chapters below and is based upon the PSI5 standard.

The AS5172 supports, according the PSI5 standard, the synchronous mode or in asynchronous mode.

In PSI5 V1.3 (10-bit mode), the asynchronous modes can only use one time slot per period. For a transmission of one 12/16 bit data word, two periods are necessary

AS5172 supports the bus modes PSI5-U and PSI5-P. The daisy chain mode is not supported.

Register Description

OTP (non-volatile memory) Register Description

Figure 20:
OTP (non-volatile memory) Register Description

Address	Bit Nr.	Symbol	Description
0x01	0	Factory settings	**ams** factory settings
	1		
	2	Direction	Changes direction in 14-bit mode
	3	PSI5_14bit_angle	Enables 14-bit angle output
	4	PSI5_quad_info	Enables quadrant information
	5	PSI5_16bit_frame	Enables the PSI5 16-bit frame
	6	Velocity_extended_range	0 = 1250 deg/s 1 = 5000 deg/s
	7	Extended_init_phase	0 = 22 datablocks during Init phase 1 = 32 datablocks during Init phase
0x02	0	Factory settings	**ams** factory settings
	7:1	**ams** ID	**ams** ID (F9)
0x03	7:0	**ams** ID	**ams** ID (F9)
0x04	5:0	**ams** ID	**ams** ID (F9)
	7:6	Factory settings	**ams** factory settings
0x05	7:0	Factory settings	**ams** factory settings
0x06	7:0		
0x07	7:0		
0x08	7:0		
0x09	7:0		
0x0A	7:0		
0x0B	7:0		

Address	Bit Nr.	Symbol	Description
0x0C	0	Month[3]	Sensor Production Date (F8)
	1	Year[0]	
	2	Year[1]	
	3	Year[2]	
	4	Year[3]	
	5	Year[4]	
	6	Year[5]	
	7	Year[6]	
0x0D	0	Day[0]	Sensor Production Date (F8)
	1	Day[1]	
	2	Day[2]	
	3	Day[3]	
	4	Day[4]	
	5	Month[0]	
	6	Month[1]	
	7	Month[2]	
0x0E	0	Type[0]	Sensor Type (F4)
	1	Type[1]	
	2	Type[2]	
	3	Type[3]	
	4	Parameter[4]	Sensor Parameter (F5)
	5	Parameter[5]	
	6	Parameter[6]	
	7	Parameter[7]	