



TMR Angle Sensor

TAS series

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# TMR Angle Sensors

Product compatible with RoHS directive

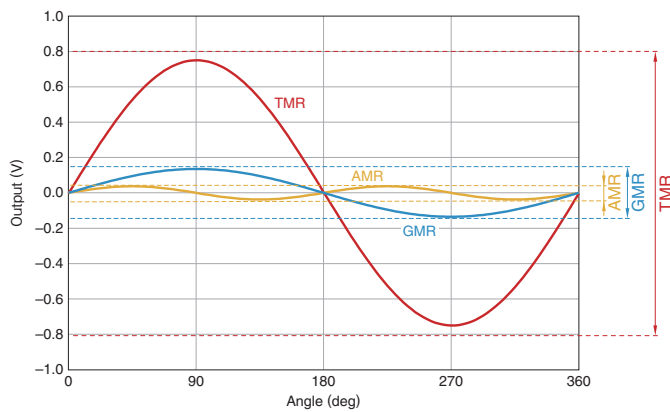
## Overview of the TAS series

### FEATURES

Magnetic Angle Sensor including TMR (Tunnel Magneto-Resistance) based on magnetic record sensing technology in HDD head. High-output, high-accuracy, and high-stability with low aging deterioration. Innovative TMR sensors are available in a compact package.

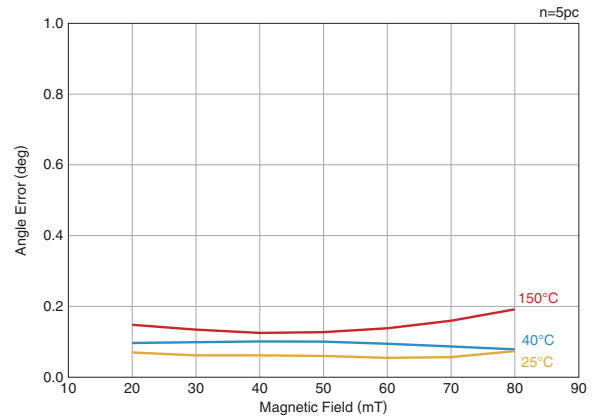
- High output at 1.5Vp-p/3.0Vp-p @5V
- Good angular accuracy of  $\pm 0.6^\circ$ . (1.5Vp-p differential output@5V),  $\pm 0.8^\circ$ . (3.0Vp-p differential output@5V)
- Low temperature drifts
- Low power consumption
- Detections can be made from 0 to 360°

(Output wave pattern comparison) TAS2141-AAAB (1.5Vp-p differential output)



20 times the AMR element, 6 times the GMR element, 500 times the Hall element

(Angle error graph) TAS2141-AAAB (1.5Vp-p differential output)



### APPLICATION

- Steering angles
- Pedal opening, throttle valve opening
- Brushless motors
- Motors for wipers, etc.

○ RoHS Directive Compliant Product: See the following for more details. <https://product.tdk.com/info/en/environment/rohs/index.html>

⚠ Please be sure to request delivery specifications that provide further details on the features and specifications of the products for proper and safe use. Please note that the contents may change without any prior notice due to reasons such as upgrading.

# TAS series

## Part Number Construction

T	A	S	2	1	4	1	-	A	A	A	B
(1)	(2)	(3)	(4)	(5)	(6)	(7)		(8)	(9)	(10)	(11)

### (1) Sensor technology

T	TMR
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### (2) Typical Application

A	Angle
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### (3) Sensor type

S	Sensor only
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### (4) Bridge/System

2	2
4	4

### (5) Bridge type

1	Full bridge
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### (6) Sensor axes

4	XY
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### (7) Internal code

0	0
1	1
2	2
3	3

### (8) Sensor package

A	TSSOP8
B	TSSOP16

### (9) Grade

A	Automotive
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### (10) Specials

A	none
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### (11) Product internal code

A	1
B	2

## PRODUCT LINEUP

TAS2141-AAAB: 1.5Vp-p differential output@5V

TAS2143-AAAA: 3.0Vp-p differential output@5V

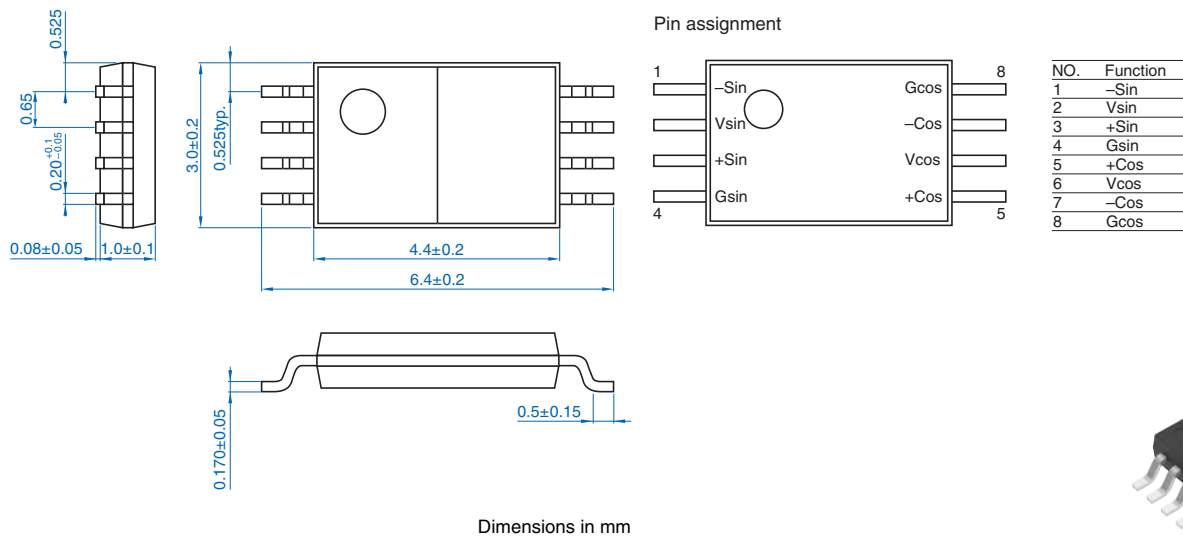
TAS4140-BAAB: 1.5Vp-p differential output@5V, (Corresponding to Redundancy)

TAS4142-BAAB: 3.0Vp-p differential output@5V, (Corresponding to Redundancy)

Product name	Sensor technology	Typical application	Sensor type	Bridge/System	Bridge type	Sensor axes	Internal code	Sensor package	Grade	Specials	Product internal code
TAS2141-AAAB	TMR	Angle	Sensor only	2	Full bridge	XY	1	TSSOP8	Automotive	none	1
TAS2143-AAAA	TMR	Angle	Sensor only	2	Full bridge	XY	2	TSSOP8	Automotive	none	1
TAS4140-BAAB	TMR	Angle	Sensor only	4	Full bridge	XY	0	TSSOP16	Automotive	none	1
TAS4142-BAAB	TMR	Angle	Sensor only	4	Full bridge	XY	1	TSSOP16	Automotive	none	1

# TAS2141-AAAB(1.5Vp-p differential output@5V, 2 Full Bridge)

## SHAPE & DIMENSIONS (TSSOP8)



## ABSOLUTE MAXIMUM RATINGS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage				6.5	Volt
Hex	External Magnetic field	≤5min			200	mT <sup>1)</sup>
ESD HBM	ESD tolerance: Human Body Model				4000	Volt
ESD MM	ESD tolerance: Machine Model				400	Volt
T opt	Operating Ambient Temperature		-40		150	°C
T stg	Storage Temperature		-55		150	°C
T reflow	Reflow Temperature				260	°C

1) 1mT = 795.8A/m.

## RECOMMENDED OPERATING CONDITIONS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage		3	5	5.5	Volt
T opt	Operating Ambient Temperature		-40	25	150	°C
Hex	External Magnetic field		20		80	mT

## ELECTRICAL CHARACTERISTICS

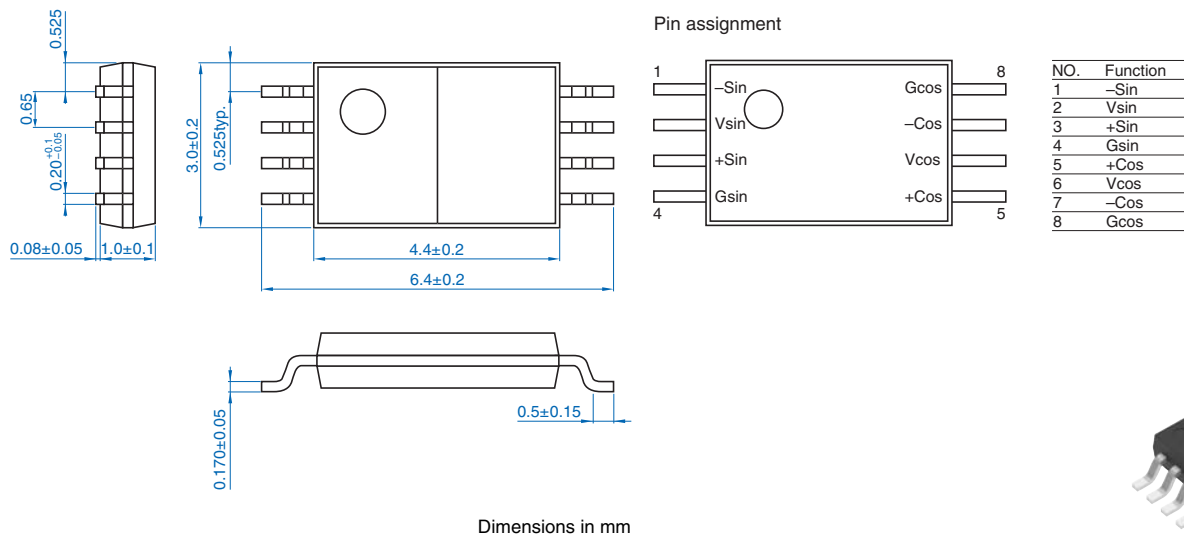
TOPT=25°C, BEXT=30mT, VSIN=2.7 to 5.5V. VCOS=2.7 to 5.5V unless otherwise specified

Items	Parameter	Conditions	min.	typ.	max.	Unit
R bridge	Bridge Resistance	T opt=25°C, Hex=30mT	4	5	6	kΩ
V out	Differential Output Voltage Peak to Peak per Vcc	T opt=25°C, Hex=30mT	0.24	0.3	0.36	V/V
Angle Error (After compensation)		T opt=-40°C to 150°C Nominal Magnetic Range: 20mT to 80mT			0.6	deg
Orthogonality		T opt=-40°C to 150°C, 20mT to 80mT	87	90	93	deg
V offset	Differential Output Offset as an "initial offset"	per supply Voltage, 20mT to 80mT	-5	—	5	mV/V
TC output	Temperature Coefficient of Differential Output	T opt=-40°C to 150°C, 20mT to 80mT	-0.135	-0.115	-0.095	%/K
TC R bridge	Temperature Coefficient of Bridge Resistance	T opt=-40°C to 150°C, 20mT to 80mT	-0.070	-0.050	-0.030	%/K
Hyst.	Hysteresis of Output Voltage	more than Hex=20mT	No Hysteresis			
k	Amplitude Synchronism ratio	T opt=25°C, Hex=30mT	97	100	103	%
Tck	Temperature Coefficient of Amplitude Synchronism	T opt=-40°C to 150°C, 20mT to 80mT	-0.015		0.015	%/K

\* LT=-40°C., RT=25°C., HT=150°C

# TAS2143-AAAA(3.0Vp-p differential output@5V, 2 Full Bridge)

## SHAPE & DIMENSIONS (TSSOP8)



## ABSOLUTE MAXIMUM RATINGS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage				6.5	Volt
Hex	External Magnetic field	≤5min			200	mT <sup>1)</sup>
ESD HBM	ESD tolerance: Human Body Model				4000	Volt
ESD MM	ESD tolerance: Machine Model				400	Volt
T opt	Operating Ambient Temperature		-40		150	°C
T stg	Storage Temperature		-55		150	°C
T reflow	Reflow Temperature				260	°C

1) 1mT = 795.8A/m.

## RECOMMENDED OPERATING CONDITIONS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage		3	5	5.5	Volt
T opt	Operating Ambient Temperature		-40	25	150	°C
Hex	External Magnetic field		20		80	mT

## ELECTRICAL CHARACTERISTICS

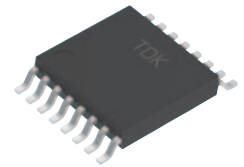
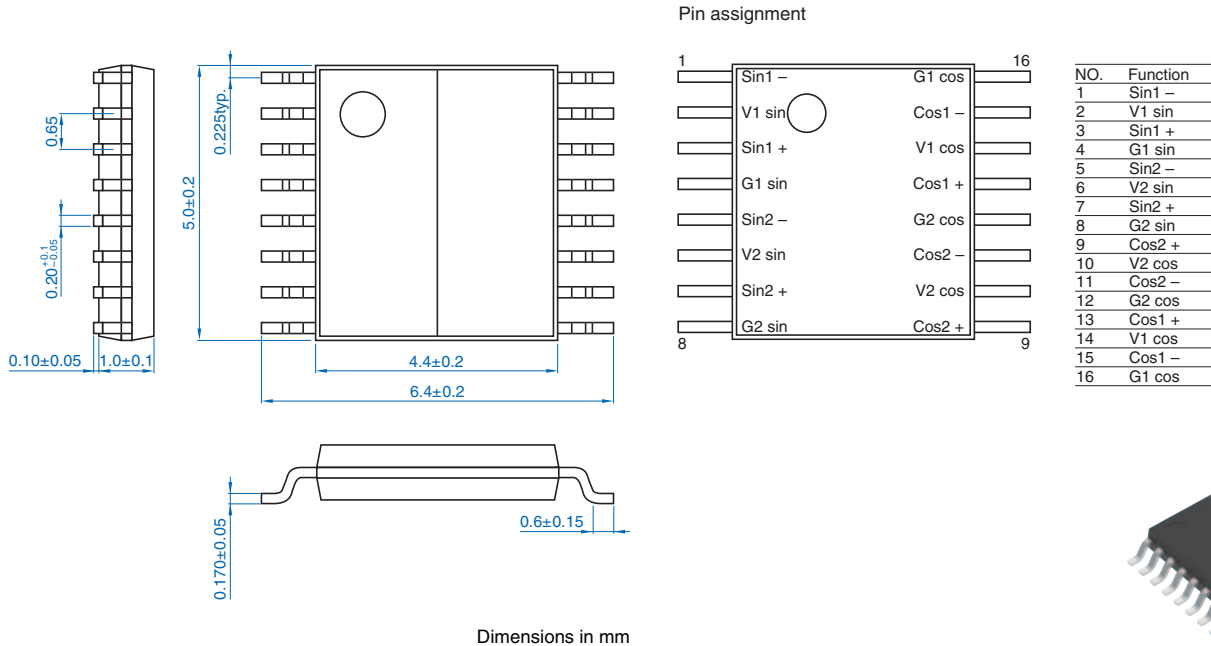
TOPT=25°C, BEXT=30mT, VSIN=2.7 to 5.5V. VCOS=2.7 to 5.5V unless otherwise specified

Items	Parameter	Conditions	min.	typ.	max.	Unit
R bridge	Bridge Resistance	T opt=25°C, Hex=30mT	4	5	6	kΩ
V out	Differential Output Voltage Peak to Peak per Vcc	T opt=25°C, Hex=30mT	0.54	0.6	0.67	V/V
Angle Error (After compensation)		T opt=-40°C to 150°C Nominal Magnetic Range: 20mT to 80mT			0.8	deg
Orthogonality		T opt=-40°C to 150°C, 20mT to 80mT	87	90	93	deg
V offset	Differential Output Offset as an "initial offset"	per supply Voltage, 20mT to 80mT	-5	—	5	mV/V
TC output	Temperature Coefficient of Differential Output	T opt=-40°C to 150°C, 20mT to 80mT	-0.115	-0.095	-0.075	%/K
TC R bridge	Temperature Coefficient of Bridge Resistance	T opt=-40°C to 150°C, 20mT to 80mT	-0.070	-0.050	-0.030	%/K
Hyst.	Hysteresis of Output Voltage	more than Hex=20mT	No Hysteresis			
k	Amplitude Synchronism ratio	T opt=25°C, Hex=30mT	97	100	103	%
Tck	Temperature Coefficient of Amplitude Synchronism	T opt=-40°C to 150°C, 20mT to 80mT	-0.015		0.015	%/K

\* LT=-40°C., RT=25°C., HT=150°C

# TAS4140-BAAB (1.5Vp-p differential output@5V, 4 Full Bridge(Corresponding to Redundancy))

## SHAPE & DIMENSIONS (TSSOP16)



## ABSOLUTE MAXIMUM RATINGS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage				6.5	Volt
Hex	External Magnetic field	≤5min			200	mT <sup>1)</sup>
ESD HBM	ESD tolerance: Human Body Model				4000	Volt
ESD MM	ESD tolerance: Machine Model				400	Volt
T opt	Operating Ambient Temperature		-40		150	°C
T stg	Storage Temperature		-55		150	°C
T reflow	Reflow Temperature				260	°C

<sup>1)</sup> 1mT = 795.8A/m.

## RECOMMENDED OPERATING CONDITIONS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage		3	5	5.5	Volt
T opt	Operating Ambient Temperature		-40	25	150	°C
Hex	External Magnetic field		20		80	mT

## ELECTRICAL CHARACTERISTICS

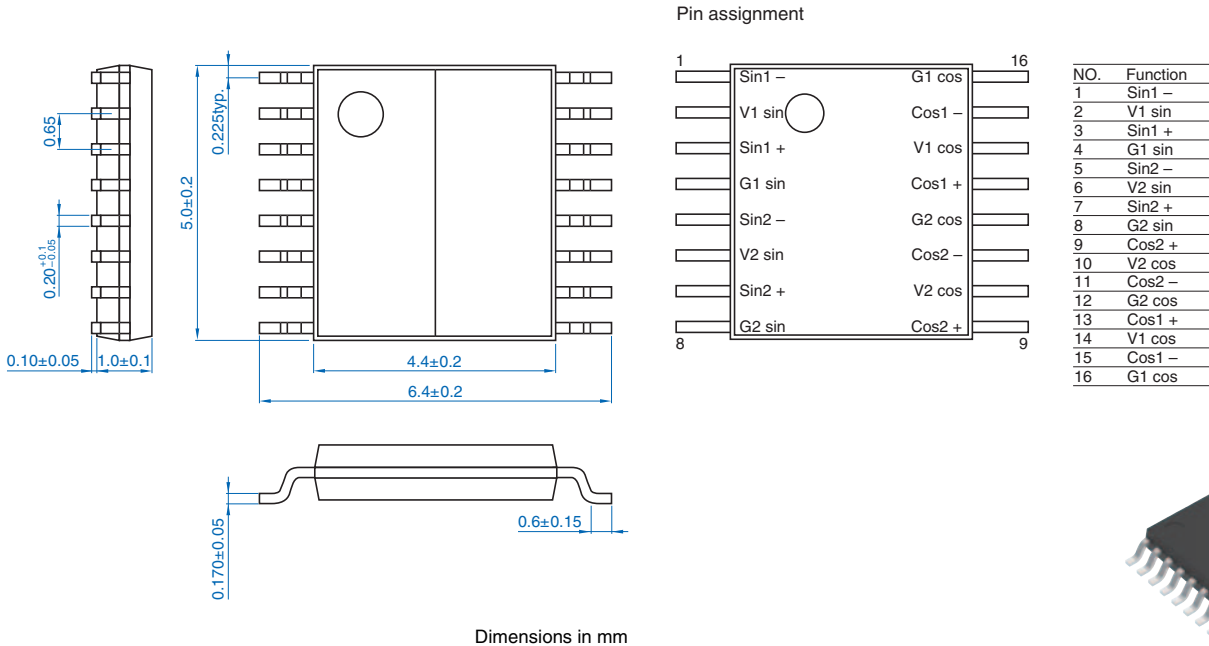
TOPT=25°C, BEXT=30mT, VSIN=2.7 to 5.5V. VCOS=2.7 to 5.5V unless otherwise specified

Items	Parameter	Conditions	min.	typ.	max.	Unit
R bridge	Bridge Resistance	T opt=25°C, Hex=30mT	4	5	6	kΩ
V out	Differential Output Voltage Peak to Peak per Vcc	T opt=25°C, Hex=30mT	0.24	0.3	0.36	V/V
Angle Error (After compensation)		T opt=-40°C to 150°C Nominal Magnetic Range: 20mT to 80mT			0.6	deg
Orthogonality		T opt=-40°C to 150°C, 20mT to 80mT	87	90	93	deg
V offset	Differential Output Offset as an "initial offset"	per supply Voltage, 20mT to 80mT	-5	—	5	mV/V
TC output	Temperature Coefficient of Differential Output	T opt=-40°C to 150°C, 20mT to 80mT	-0.135	-0.115	-0.095	%/K
TC R bridge	Temperature Coefficient of Bridge Resistance	T opt=-40°C to 150°C, 20mT to 80mT	-0.070	-0.050	-0.030	%/K
Hyst.	Hysteresis of Output Voltage	more than Hex=20mT	No Hysteresis			
k	Amplitude Synchronism ratio	T opt=25°C, Hex=30mT	97	100	103	%
TCK	Temperature Coefficient of Amplitude Synchronism	T opt=-40°C to 150°C, 20mT to 80mT	-0.015		0.015	%/K

\* LT=-40°C., RT=25°C., HT=150°C

# TAS4142-BAAB (3.0Vp-p differential output@5V, 4 Full Bridge(Corresponding to Redundancy))

## SHAPE & DIMENSIONS (TSSOP16)



## ABSOLUTE MAXIMUM RATINGS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage				6.5	Volt
Hex	External Magnetic field	≤5min			200	mT <sup>1)</sup>
ESD HBM	ESD tolerance: Human Body Model				4000	Volt
ESD MM	ESD tolerance: Machine Model				400	Volt
T opt	Operating Ambient Temperature		-40		150	°C
T stg	Storage Temperature		-55		150	°C
T reflow	Reflow Temperature				260	°C

<sup>1)</sup> 1mT = 795.8A/m.

## RECOMMENDED OPERATING CONDITIONS

Items	Parameter	Conditions	min.	typ.	max.	Unit
Vcc	Supply Voltage		3	5	5.5	Volt
T opt	Operating Ambient Temperature		-40	25	150	°C
Hex	External Magnetic field		20		80	mT

## ELECTRICAL CHARACTERISTICS

TOPT=25°C, BEXT=30mT, VSIN=2.7 to 5.5V. VCOS=2.7 to 5.5V unless otherwise specified

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Angle Error (After compensation)		T opt=-40°C to 150°C Nominal Magnetic Range: 20mT to 80mT			0.8	deg
Orthogonality		T opt=-40°C to 150°C, 20mT to 80mT	87	90	93	deg
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\* LT=-40°C., RT=25°C., HT=150°C

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