

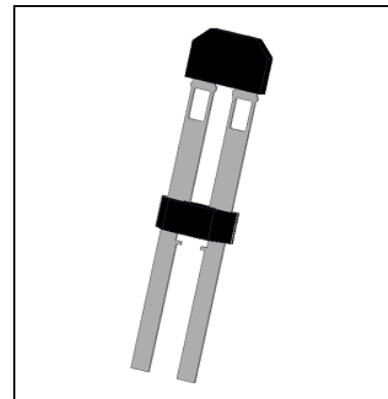
## Two-Wire High Accuracy Differential Speed Sensor IC CYGTS9641 with Continuous Calibration

The differential Hall Effect sensor CYGTS9641 is designed to provide information about rotational speed to modern vehicle dynamics control systems and ABS. The output has been designed as a two wire current interface. Excellent accuracy and sensitivity are specified for harsh automotive requirements with a wide temperature range, high ESD and EMC robustness.

The regulated current output is configured for two-wire applications and the 2.0mm spacing between the dual Hall elements is optimized for fine pitch target wheel configurations. The device is packaged in a 2-pin plastic SIP. It is lead (Pb) free, with 100% matte tin plated lead frame.

### Features

- Two-wire current interface
- High sensitivity
- South and North pole pre-induction possible
- Large air gap
- 4.5V to 24V supply operating range
- Wide operating temperature range -40°C ~150°C



### Applications

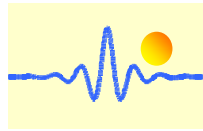
Automotive and Heavy Duty Vehicles	Industrial Areas:
<ul style="list-style-type: none"><li>• Camshaft and crankshaft speed and position</li><li>• Transmission speed</li><li>• Tachometers</li><li>• Anti-skid/traction control</li></ul>	<ul style="list-style-type: none"><li>• Sprocket speed</li><li>• Chain link conveyor speed/distance</li><li>• Stop motion detector</li><li>• High speed low cost proximity</li><li>• Tachometers, counters.</li></ul>

### Device Information

Part number	Packing	Mounting	Temperature range	Marking
CYGTS9641TS	Bulk, 500pcs/bag	2-pin SIP	-40°C~150°C	9641

### Operating Range

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Back Bias Range	$B_{Bias}$	Operating	-500	--	500	mT
Supply Voltage	$V_{DD}$	Operating	4.5	12	24	V
Operating Temperature	$T_A$		-40	~	150	°C
Storage Temperature	$T_S$		-65	~	175	°C



## Electrical and Magnetic Specifications

Operating Parameters  $T_A = -40^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ ,  $V_{DD} = 5\text{V}$  (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ.	Max	Unit
Operating Supply Voltage	$V_{DD}$	Operating	4.5	12	24	V
Operating Supply Current	$I_{DD(Low)}$	$V_{DD}=4.5\text{V}$ to $24\text{V}$	5.9	7.0	8.4	mA
Operating Supply Current	$I_{DD(High)}$	$V_{DD}=4.5\text{V}$ to $24\text{V}$	12.0	14.0	16.0	mA
Supply current ratio	$R_{CUR}$	$I_{DD(High)} / I_{DD(Low)}$	1.8	2	2.4	--
Power on time	$t_{po}^1$	$V_{DD} > 4.5\text{V}$	--	3.8	9.0	ms
Settling time	$t_{settle}^2$	$V_{DD} > 4.5\text{V}$ , $f=1\text{kHz}$	0	--	50	ms
Response time	$t_{response}^3$	$V_{DD} > 4.5\text{V}$ , $f=1\text{kHz}$	3.8	--	59	ms
Output Rise Time	$T_R^5$	$R1=1\text{k}\Omega$ $C=20\text{pF}$	--	0.4	1.0	$\mu\text{s}$
Output Fall Time	$T_F$	$R1=1\text{k}\Omega$ $C=20\text{pF}$	--	0.35	1.0	$\mu\text{s}$
Upper corner frequency	f <sub>cu</sub>	-3dB, single pole	15	--		kHz
Lower corner frequency	f <sub>cl</sub>	-3dB, single pole	--	--	5	Hz
Back Bias Range	$B_{Bias}$	Operating	-500	--	500	mT
Operating point	$\Delta B_{OP1}$	$f=1\text{kHz}$ , $B_{diff}=5\text{mT}$	--	--	0	mT
Release point	$\Delta B_{RP1}$	$f=1\text{kHz}$ , $B_{diff}=5\text{mT}$	0	--	--	mT
Hysteresis	$B_{HYS1}$	$f=1\text{kHz}$ , $\Delta B=5\text{mT}$	0.7	1.3	2.8	mT
Center of switching points	$\Delta B_{M1}$	$(B_{OP} + B_{RP})/2$	-2.0	0	2.0	mT

1 Time required initializing device.

2 Time required for the output switch points to be within specification.

3 Equal to  $t_{po} + t_{settle}$ .

## Absolute Maximum Ratings

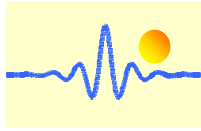
Parameter	Symbol	Minimal value	Maximal value	Unit
Power supply voltage	$V_{DD}$	-0.5	30	V
Operating ambient temperature	$T_A$	-40	150	$^{\circ}\text{C}$
Maximum junction temperature	$T_J$	-55	165	$^{\circ}\text{C}$
Storage temperature	$T_{STG}$	-65	175	$^{\circ}\text{C}$

Note: Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## ESD (Emergency Shutdown System) Protection

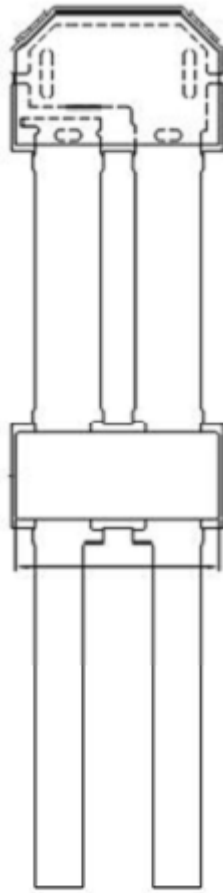
Human Body Model (HBM) Tests

Parameter	Symbol	Max.	Unit	Note
ESD	$V_{ESD}$	$\pm 8.0$	kV	According to Standard AEC-Q100-002



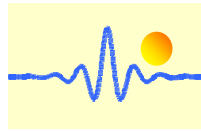
## Pin Configuration

2-Terminal SIP TS package  
(Top View)

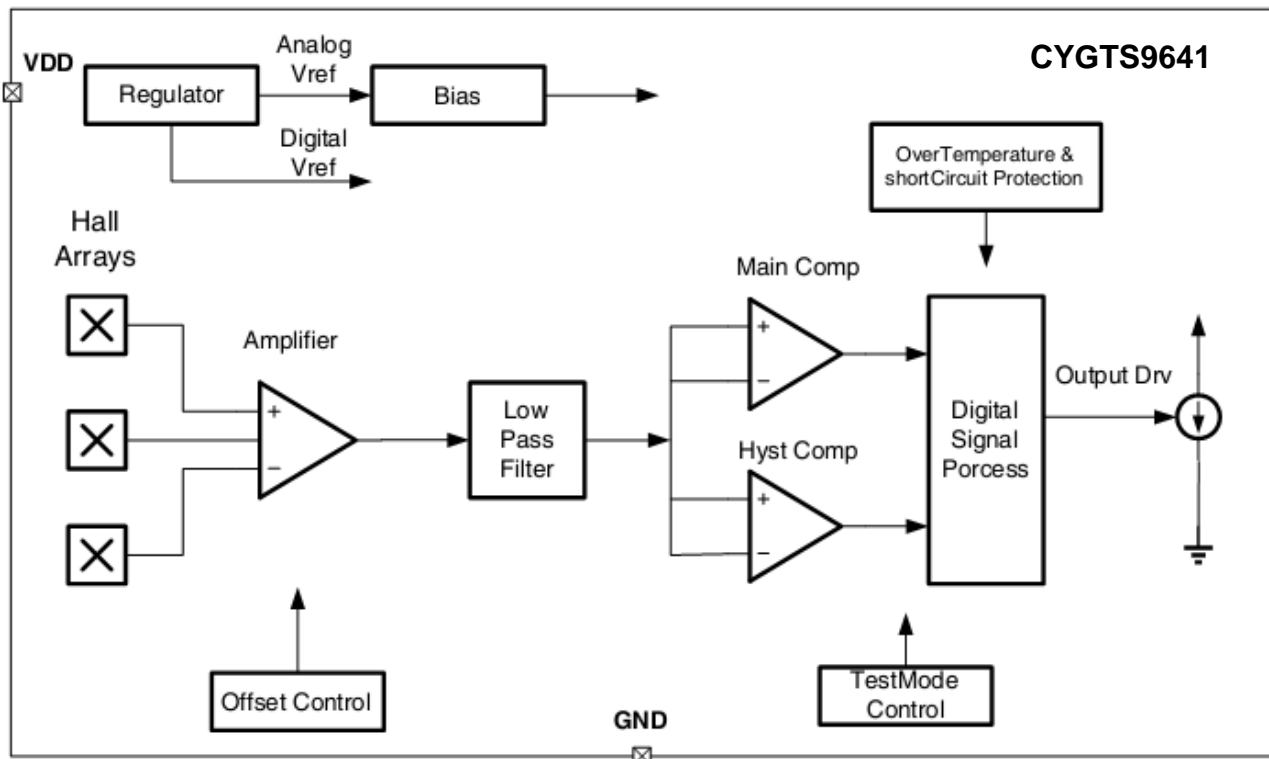


**VDD GND**

Pin No.	Symbol	Type	Description
1	$V_{DD}$	Supply voltage	3.8V to 24V power supply
2	GND	Ground	Ground terminal



## Functional Block Diagram

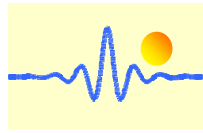


## Functional Description

The CYGTS9641 is an optimized Hall Effect sensing integrated circuit that provides a user-friendly solution for ferromagnetic target wheel sensing in two-wire applications. This small package can be easily assembled used in conjunction with a wide variety of target shapes and sizes.

The integrated circuit incorporates a dual-element Hall Effect sensor and signal processing that switches to differential magnetic signals created by a ferromagnetic target wheel. The circuitry contains a sophisticated digital circuit to reduce system offsets and to calibrate the gain for air-gap-independent switch points.

The regulated current output is configured for two-wire applications and the sensor is ideally suited for obtaining speed and duty cycle information in ABS (antilock braking systems). The 2.0 mm spacing between the dual Hall elements is optimized for fine pitch target wheels. The package is lead (Pb) free, with 100% matte tin lead frame plating.

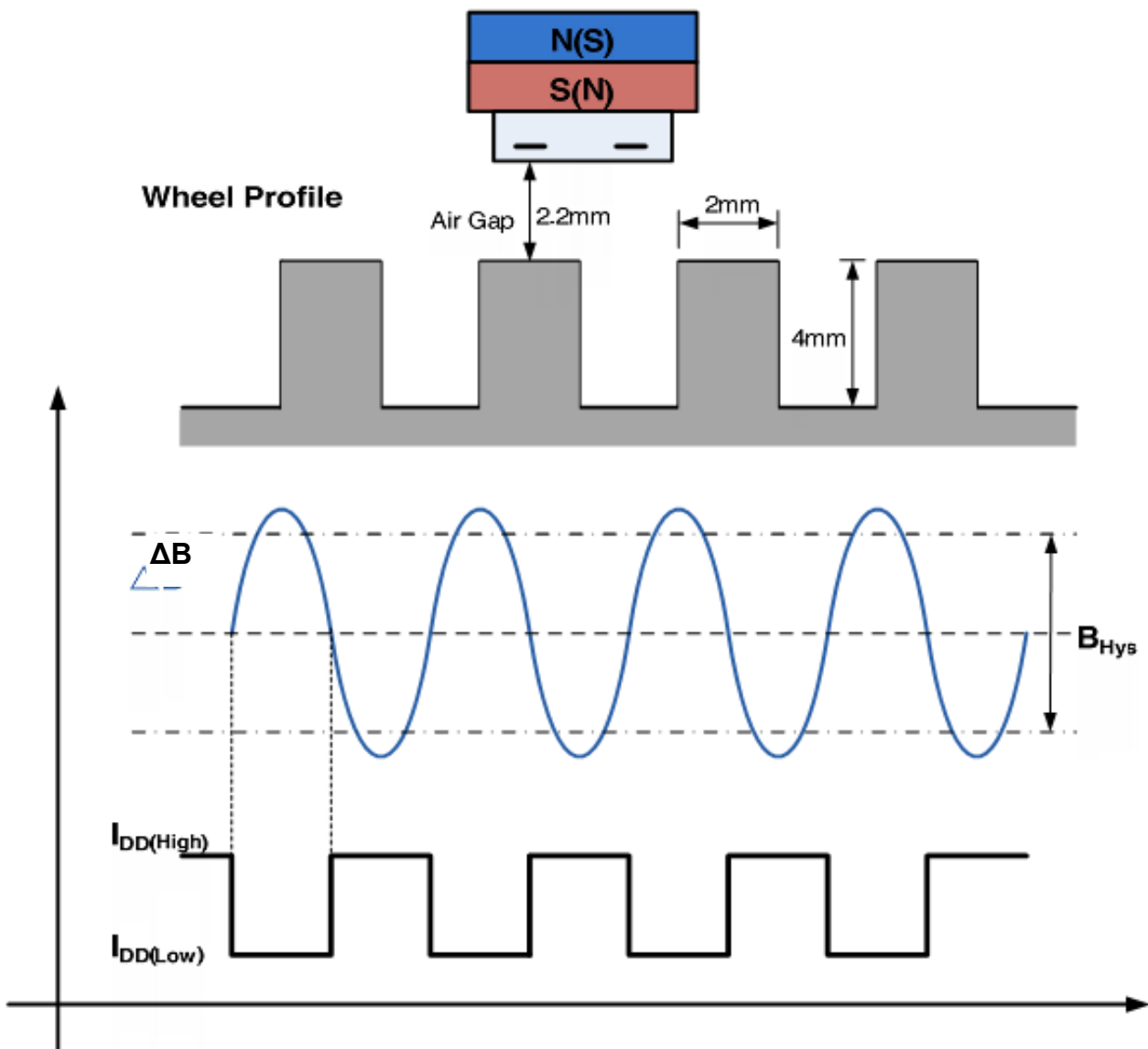


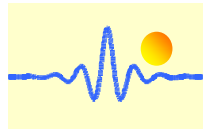
## Gear Tooth Sensing

In the case of ferromagnetic toothed wheel application the IC has to be biased by the South or North Pole of a permanent magnet which should cover both Hall probes

The maximum air gap depends on

- the magnetic field strength (magnet used; pre-induction), and
- the toothed wheel that is used (dimensions, material, etc.)

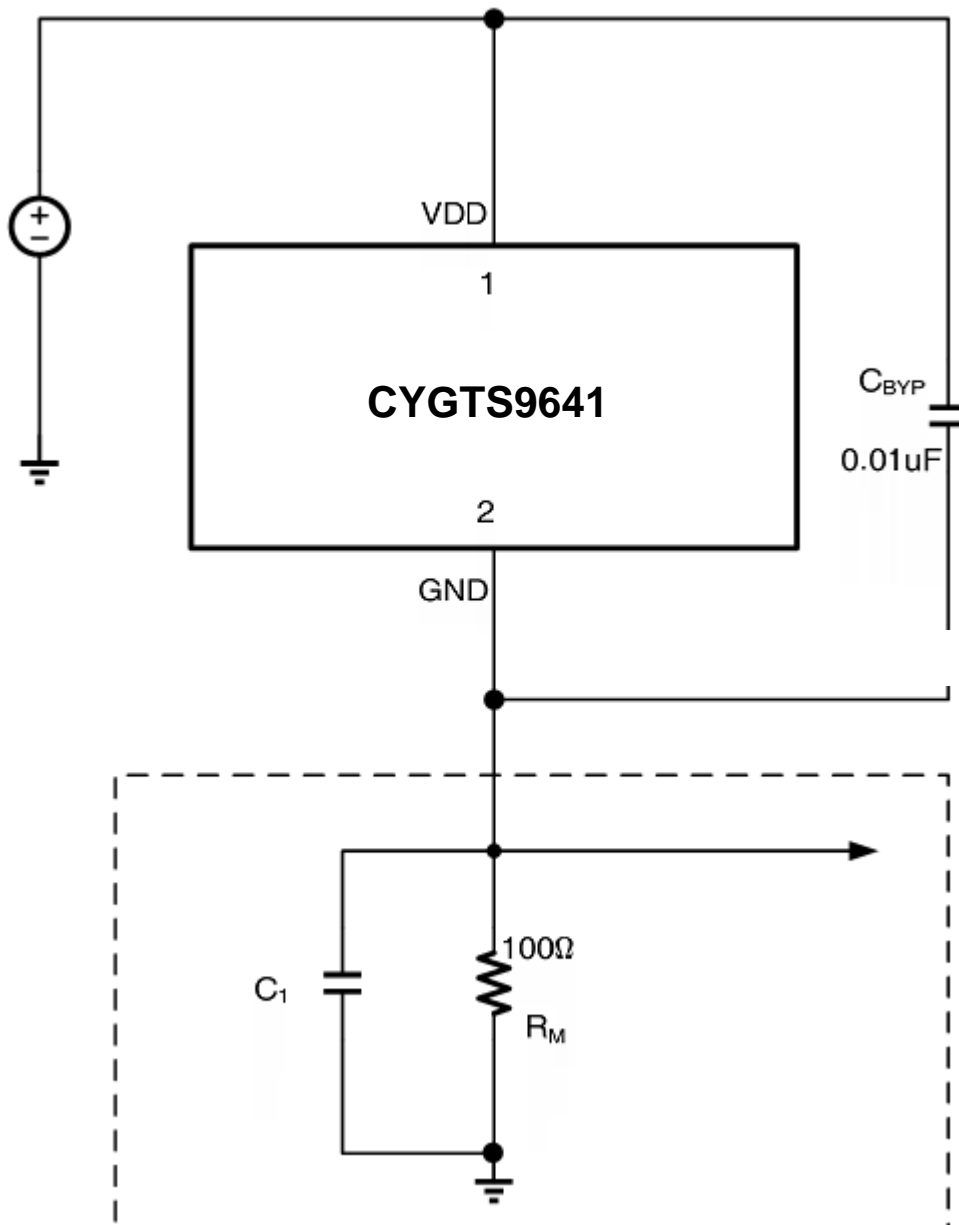


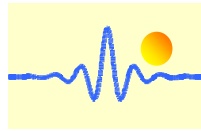


## Recommended Application

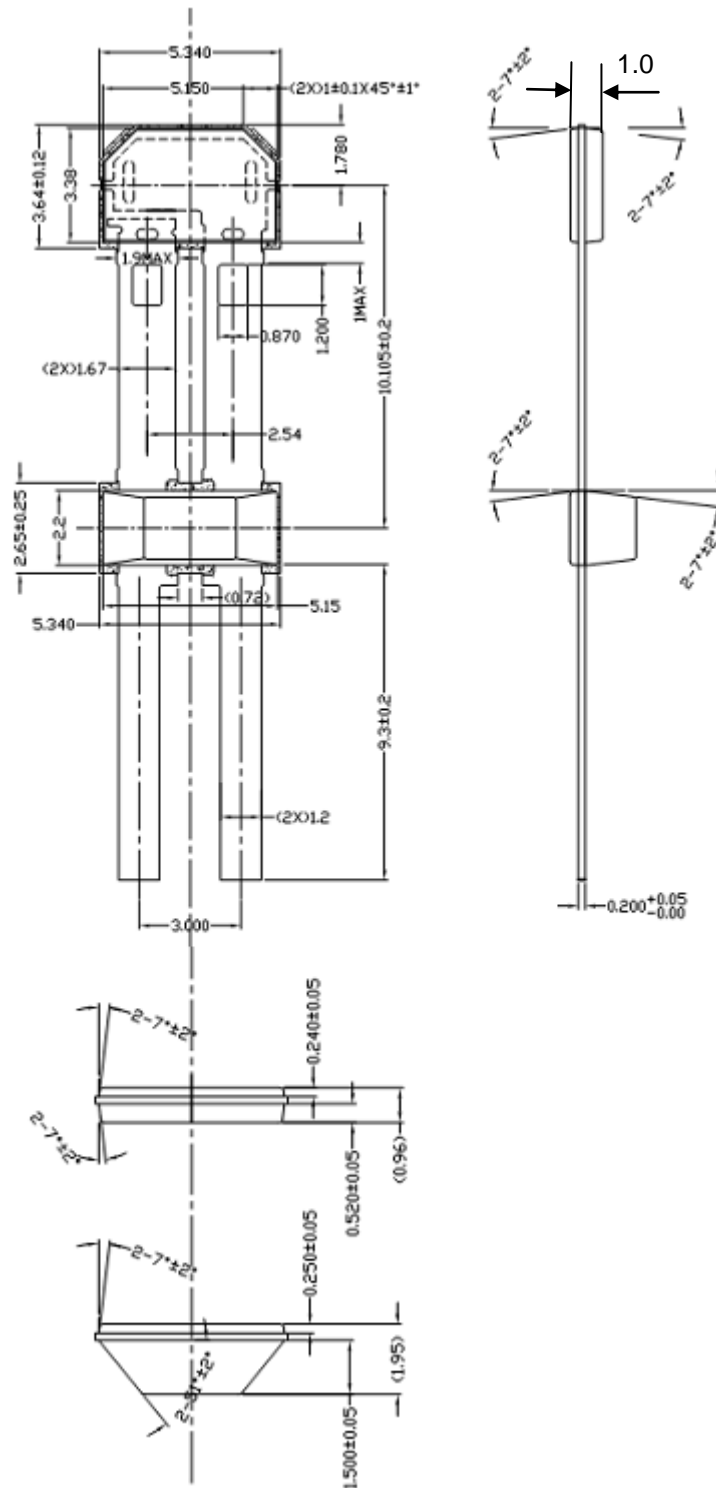
The CYGTS9641 contains an on-chip voltage regulator and can operate over a wide supply voltage range.

### Two-Wire Connection





## Package Designator



### Notes:

1. Exact body and lead configuration at vendor's option within limits shown.
2. Height does not include mold gate flash.

Where no tolerance is specified, dimension is nominal.