ChenYang
Technologies GmbH & Co. KG

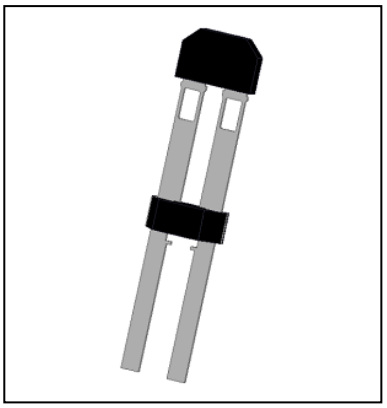
Two-Wire High Accuracy Differential Speed Sensor IC CYGTS9641 with Continuous Calibration

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 ring-magnet-based 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:
• Camshaft and crankshaft speed and position • Transmission speed • Tachometers • Anti-skid/traction control	• Sprocket speed • Chain link conveyor speed/distance • Stop motion detector • High speed low cost proximity • Tachometers, counters.

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

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Electrical and Magnetic Specifications

Operating Parameters T_A = -40°C to 150°C, V_{DD} = 5V (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}=4.5V to 24 V	5.9	7.0	8.4	mA
Operating Supply Current	$I_{DD(High)}$	V_{DD}=4.5V to 24 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} >4.5V	- -	3.8	9.0	ms
Settling time	t_{settle} [2]	V_{DD}>4.5V, f=1kHz	0	--	50	ms
Response time	$t_{response}$ [3]	V_{DD}>4.5V, f=1kHz	3.8	--	59	ms
Output Rise Time	T_R [5]	R1=1kΩ C=20pF	--	0.4	1.0	µs
Output Fall Time	T_F	R1=1kΩ C=20pF	--	0.35	1.0	µs
Upper corner frequency	fcu	-3dB, single pole	15	--		kHz
Lower corner frequency	fcl	-3dB, single pole	--	--	5	Hz
Back Bias Range	B_{Bias}	Operating	-500	--	500	mT
Operating point	ΔB_{OP1}	f=1kHz, B_{diff}=5mT	--	--	0	mT
Release point	ΔB_{RP1}	f=1kHz, B_{diff}=5mT	0	--	--	mT
Hysteresis	B_{HYS1}	f=1kHz, ΔB=5mT	0.7	1.3	2.8	mT
Center of switching points	ΔB_{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	°C
Maximum junction temperature	T_J	-55	165	°C
Storage temperature	T_{STG}	-65	175	°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}	±8.0	kV	According to Standard AEC-Q100-002

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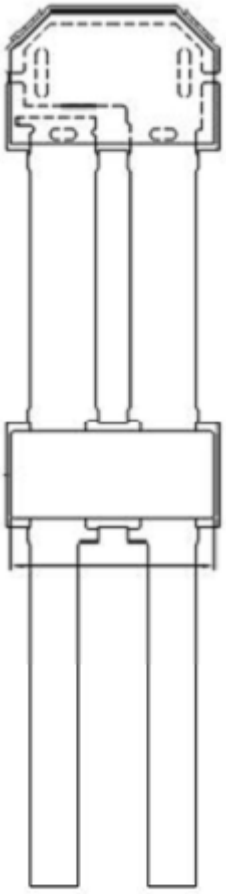
Pin Configuration

2-Terminal SIP TS package

(Top View)



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

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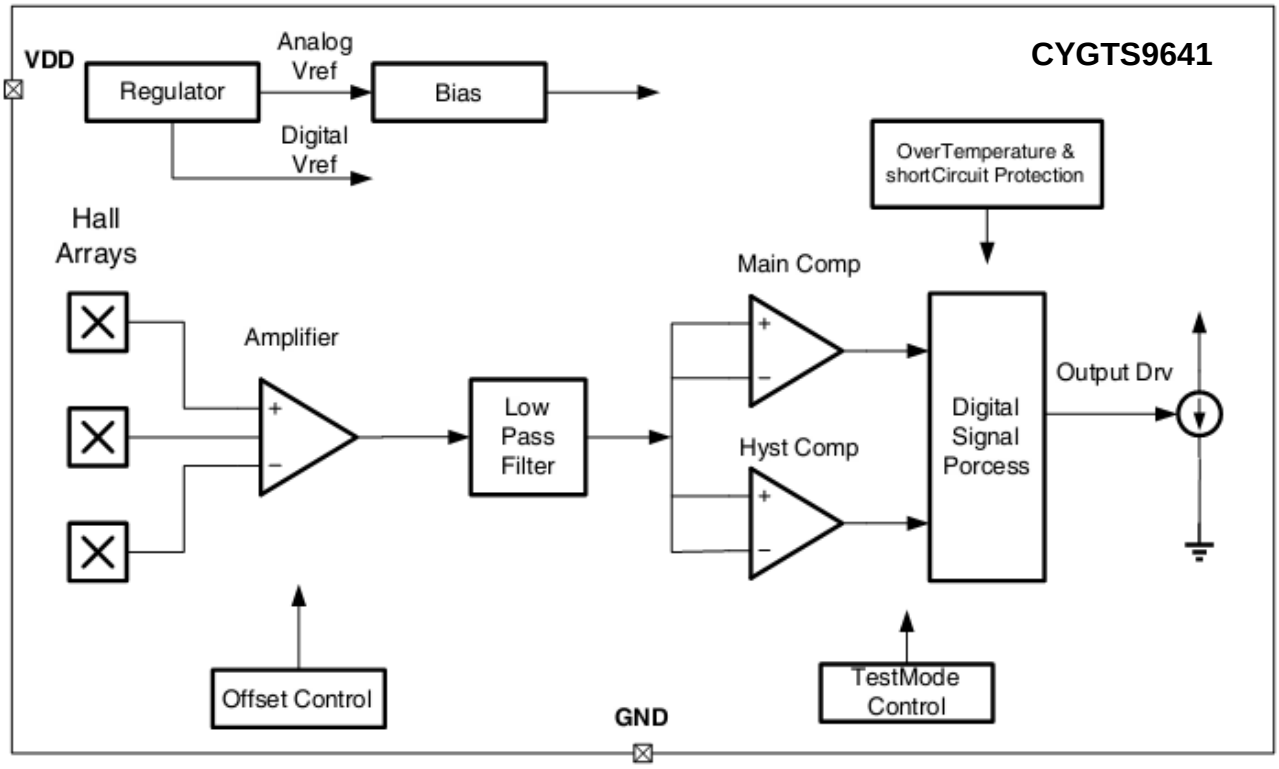
Functional Block Diagram



Functional Description

The CYGTS9641 is an optimized Hall Effect sensing integrated circuit that provides a user-friendly solution for ring-magnet 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 ring magnet poles. 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 ring-magnet-based configurations. The package is lead (Pb) free, with 100% matte tin lead frame plating.

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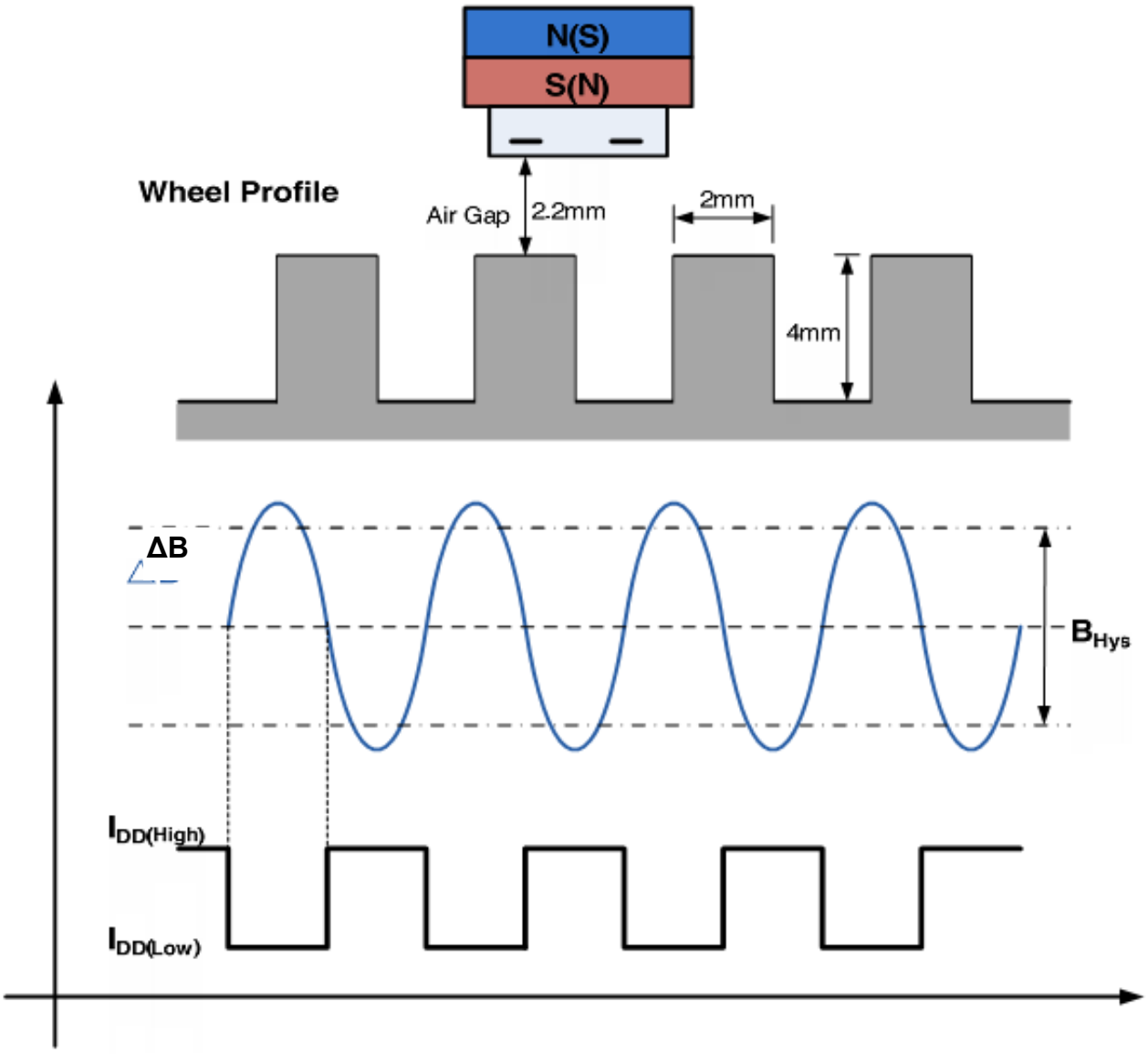
Gear Tooth Sensing

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.)



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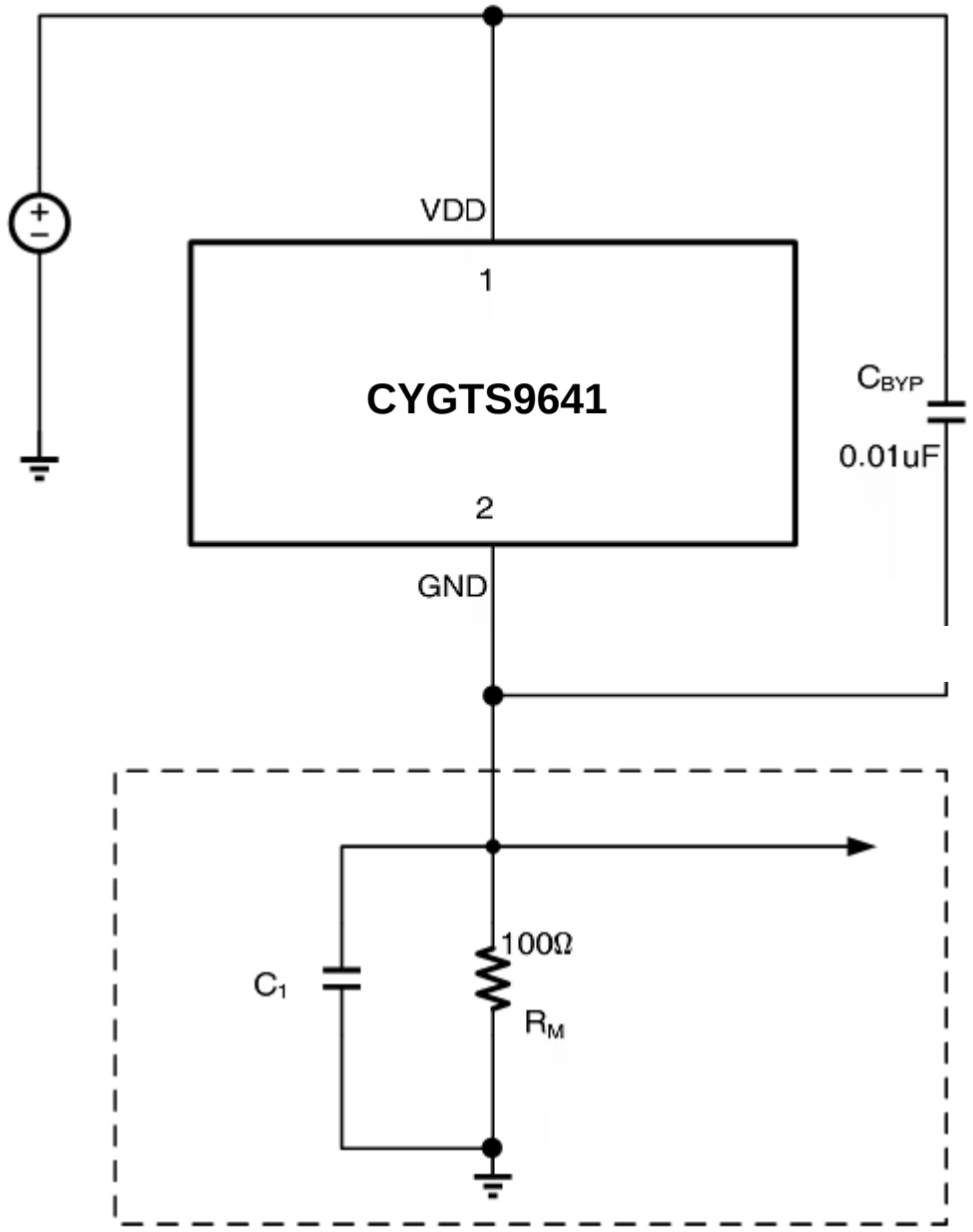
Recommended Application

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

Two-Wire Connection



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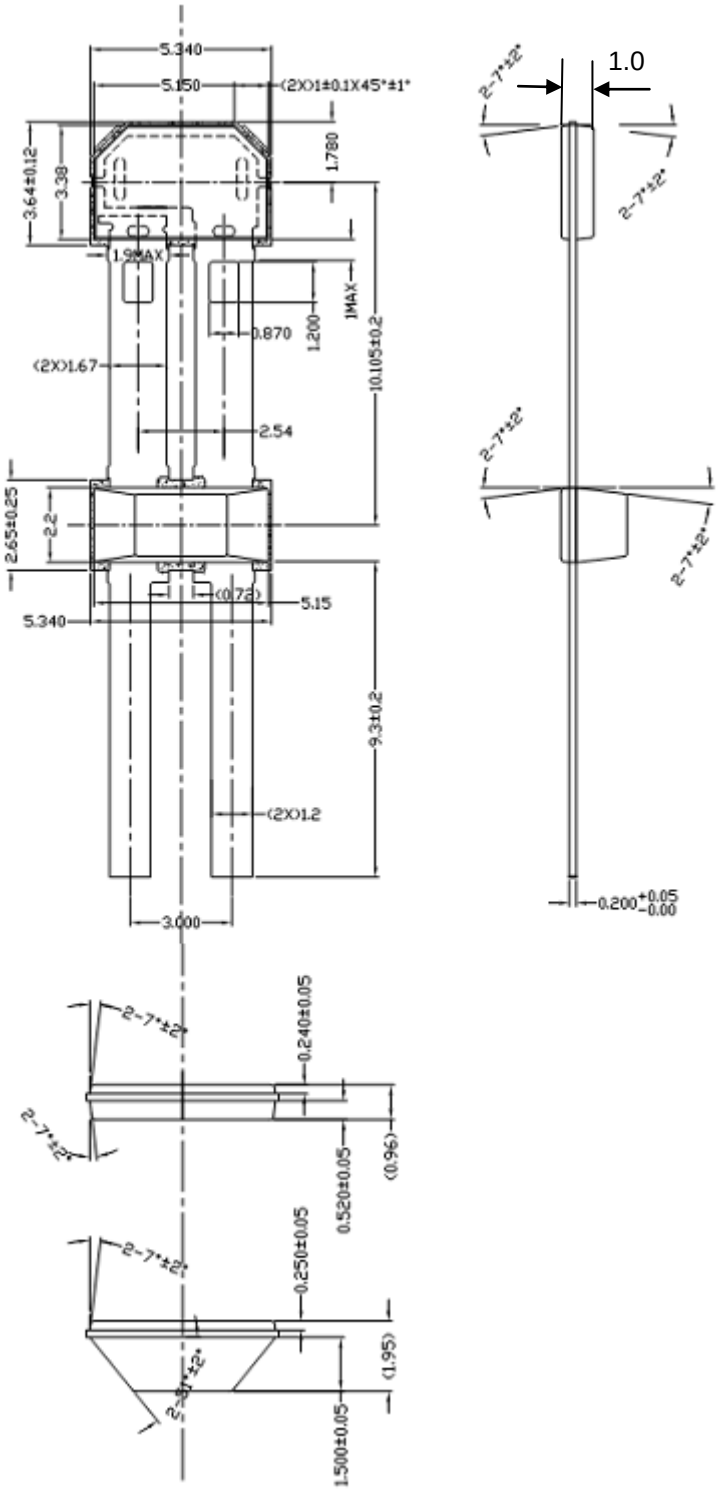
Package Designator



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.

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