

# Two-Wire High Accuracy Differential Speed Sensor IC

#### Features

- Two-wire current interface
- High sensitivity
- South and North pole pre-induction possible
- Large air gap
- Single chip solution
- Wide operating temperature range
- Output protection against electrical disturbances



#### Description

The differential Hall Effect sensor SC9641TS 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.



## **Device Information**

Part Number	Packing	Mounting	Ambient, T <sub>A</sub>	Marking
SC9641TS	1500 pieces/bag	2-pin SIP	<b>-40℃ to 150℃</b>	9641

# **Terminal Configuration and Functions**



Terminal		Type	Description	
Name	Number	туре	Description	
VDD	1	PWR	4.5V to 24 V power supply	
GND	2	Ground	Ground	



## **Functional Block Diagram**



#### **Functional Description**

The SC9641TS 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 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.



## **Absolute Maximum Ratings**

over operating free-air temperature range

Parameter	Symbol	Min.	Max.	Units
Power supply voltage	Vdd	-0.5	30	V
Output terminal voltage	Vout	-0.5	30	V
Output terminal current sink	Isink	0	20	mA
Operating ambient temperature	TA	-40	150	°C
Maximum junction temperature	TJ	-55	165	°C
Storage Temperature	Тѕтс	-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 Protection**

Human Body Model (HBM) tests according to: standard EIA/JESD22-A114-B HBM

Deremeter	Symbol	Limit V	Unito	
Farameter		Min.	Max.	Units
ESD-Protection	Vesd	-8	8	KV



# **Operating Characteristics**

over operating	froo-air tomporaturo	range $(V_{pp} = 12)$	unloss oth	orwise noted)
over operating	inee-an temperature	Tange (VDD-12V	, 0111055 011	leiwise noteu)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Units
Vdd	Operating voltage	TJ <tj(max)< td=""><td>4.5</td><td></td><td>24</td><td>V</td></tj(max)<>	4.5		24	V
I <sub>DD(Low)</sub>	Operating supply current	V <sub>DD</sub> =4.5V to 24 V	5.9	7.0	8.4	mA
IDD(High)	Operating supply current	V <sub>DD</sub> =4.5V to 24 V	12.0	14.0	16.0	mA
Rcur	Supply current ratio	IDD(High) / IDD(Low)	1.9			-
t <sub>po</sub> 1	Power-on time	V <sub>DD</sub> >4.5V		3.8	9	mS
t <sub>settle</sub> 2	Settling time	V <sub>DD</sub> >4.5V, f=1kHz	0		50	mS
t <sub>response</sub> <sup>3</sup>	Response time	V <sub>DD</sub> >4.5V, f=1kHz	3.8		59	mS
f <sub>cu</sub>	Upper corner frequency	-3dB, single pole	20			kHz
f <sub>cl</sub>	Lower corner frequency	-3dB, single pole			5	Hz
Magnetic Characteristics						
Bo	Pre-induction		-500		500	mT
Вор	Operated point	f=1kHz, Bdiff=5mT			0	mT
B <sub>RP</sub>	Released point	f=1kHz, Bdiff=5mT	0			mT
BHYS	Hysteresis		0.3	0.6	1.2	mT
∆Вм	Center of switching points		-2.0	0	+2.0	mT

<sup>1</sup>*Time required to initialize device.* 

<sup>2</sup>Time required for the output switch points to be within specification.

<sup>3</sup> Equal to  $t_{po} + t_{settle}$ .





# **Recommended Application**





#### **Gear Tooth Sensing**

In the case of ferromagnetic toothed wheel application, the IC can 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.)





#### **Package Designator**



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