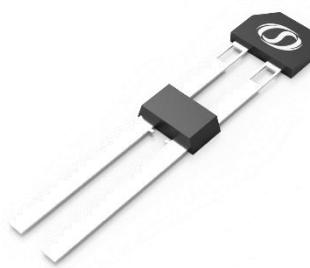


## PWM output two-wire differential wheel speed sensor

**FEATURES**

- Two wire current output interface
- PWM output monitoring angle and position
- Mounting place and Mounting position diagnose function
- Dynamic self-calibration theory
- Back magnetic can select between N and S
- 0 external components
- Single chip solution
- Wide supply voltage range: 4.5V to 24V
- Wide Operating temperature : -40°C to 150°C
- TS-2 package

**DESCRIPTION**

SC9642TS is a two-wire current output wheel speed sensor based on Pulse Width Modulation Technology. Could be apply to ABS which monitoring Rev speed and direction. High voltage Bic Mos technology is used to ensure high ESD and EMC protection. Excellent sensitivity performance and accuracy at all operating temperature make the device suitable for fierce automotive applications

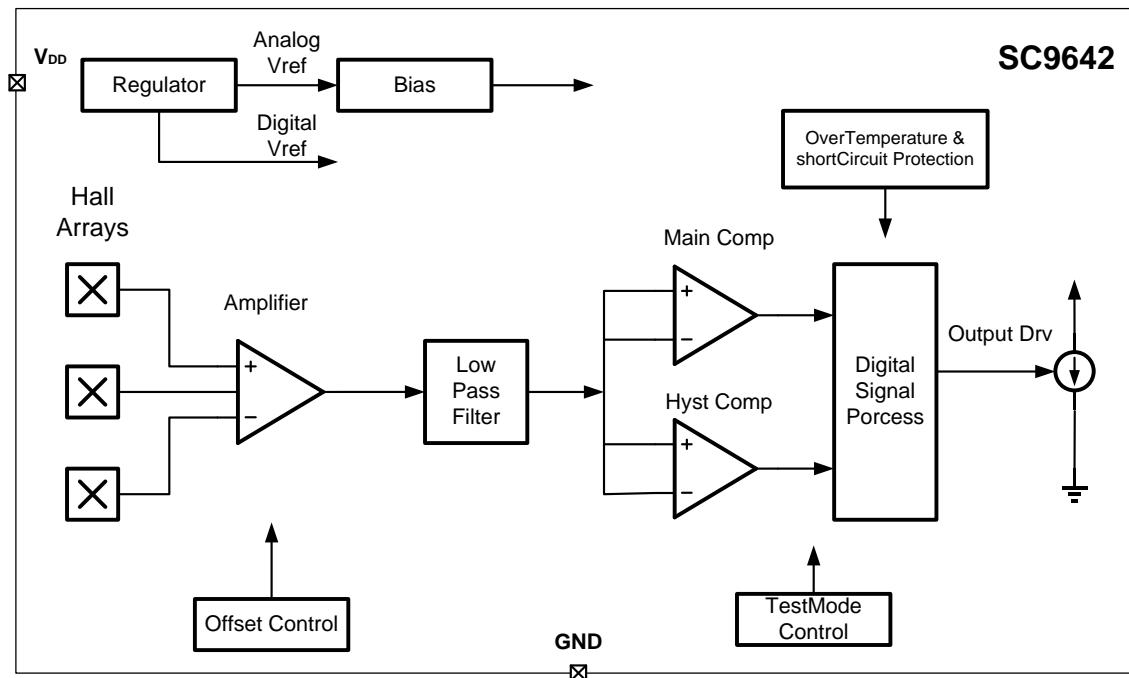
SC9642TS is integrated with a magnetic field that alters when the ring or gear rotates, the chip convert the magnetic field to voltage signal, and then output after being digital converted. SC9642TS is a two wire current output IC, different pulse width are used to indicate different speed and position of the gears or magnetic ring.

The package TS-2 is lead (Pb) free with 100% matte-tin lead frame plating.

## CONTENTS

FEATURES.....	- 1 -	MAGNETIC FIELD MODE .....	- 7 -
DESCRIPTION.....	- 1 -	PWM TIMING DEFINITION.....	- 9 -
BLOCK DIAGRAM .....	- 3 -	TYPICAL APPLICATION.....	- 10 -
ORDERING INFORMATION.....	- 3 -	PACKAGE INFORMATION .....	- 11 -
TERMINAL CONFIGURATION.....	- 4 -	REVISION HISTORY .....	- 12 -
ABSOLUTE MAXIMUM RATINGS .....	- 5 -		
OPERATING CHARACTERISTICS.....	- 6 -		

## BLOCK DIAGRAM

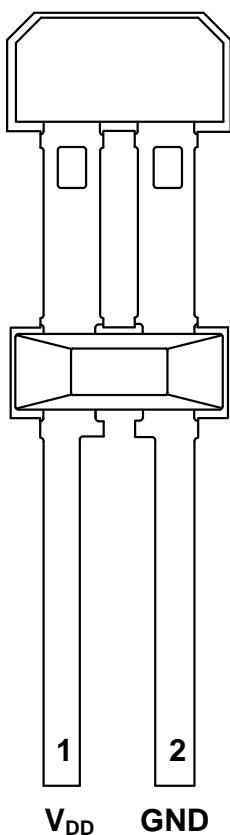


## ORDERING INFORMATION

Part Number	Packing	Mounting	Ambient, T <sub>A</sub>	Marking
SC9642TS	Bulk, 1500pcs/box	2-pin SIP	-40°C to 150°C	9642TS
SC9642TS braid	1500pcs/box	2-pin SIP	-40°C to 150°C	9642TS

## TERMINAL CONFIGURATION

2 Terminal SIP  
Ts package  
(TOP View)



Terminal		Type	Description
Name	Number		
V <sub>DD</sub>	1	PWR	4.5V ~ 24 V power supply
GND	2	Ground	Ground

## ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range

Parameter	Symbol	Min.	Max.	Units
Power supply voltage	V <sub>DD</sub>	-0.5	30	V
Output terminal voltage	V <sub>OUT</sub>	-0.5	30	V
Output terminal current sink	I <sub>SINK</sub>	0	20	mA
Operating ambient temperature	T <sub>A</sub>	-40	150	°C
Junction temperature, 5000h V <sub>DD</sub> < 16.5V	T <sub>J</sub>	-55	150	°C
Junction temperature, 2500h V <sub>DD</sub> < 16.5V	T <sub>J</sub>	-55	160	°C
Junction temperature, 500h V <sub>DD</sub> < 16.5V	T <sub>J</sub>	-55	170	°C
Storage temperature	T <sub>STG</sub>	-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 AEC-Q100-002 HBM

Parameter	Symbol	Limit Values		Units
		Min.	Max.	
ESD-Protection	V <sub>ESD</sub>	-5	5	kV

## OPERATING CHARACTERISTICS

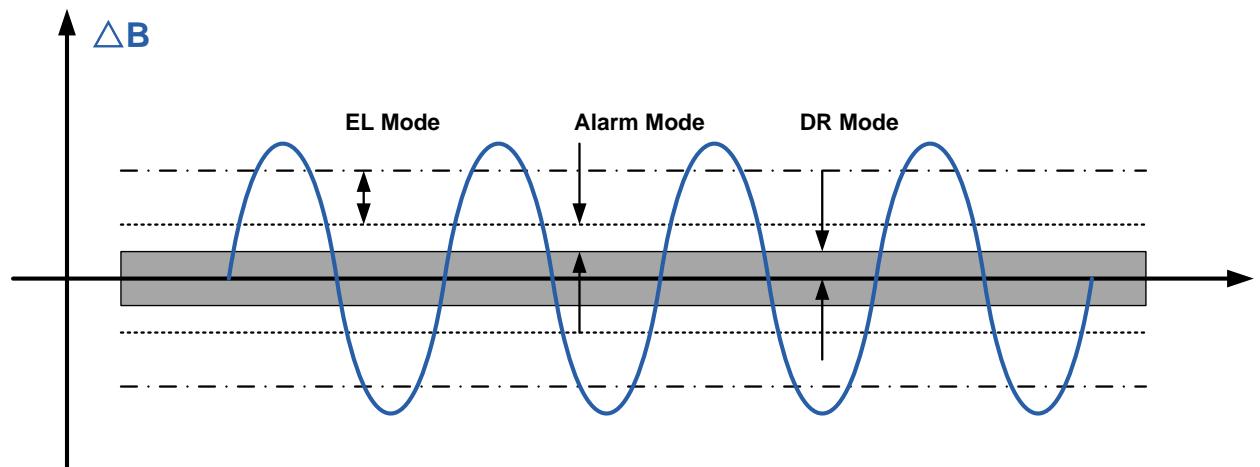
Valid through the full operating temperature range,  $V_{DD}=12V$ ,  $C_{BYPASS}=0.1\mu F$ ; unless otherwise specified.

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Electrical Characteristics</b>						
Supply Voltage	$V_{DD}$		4.5	12.0	24.0	V
Anti-ac interference	$V_{AC}$	$f < 50 \text{ kHz}$	--	--	8	$V_{pp}$
Back magnetic strength range	$B_0$		-5000	0	5000	Gs
Hall sensor point magnetic deviation	$\Delta B_0$		-200	0	200	Gs
Hall sensor point deviation induction	$\Delta B_{ind}$		-120	--	120	Gs
Power Off Current	$I_{LOW}$		5.9	7	8.4	mA
Power On Current	$I_{HIGH}$		11.8	14	16.8	mA
Current Proportion	$I_{HIGH}/I_{LOW}$		1.9	--	--	
Output rate of pendulum	$t_r, t_f$	$R_m=75\text{ohm} T < 150$	8	--	26	mA/uS
Current Ripple	$I_x$	$dI_x/dV_{DD}$	--	--	90	$\mu A/V$
Extreme Threshold	$\Delta B_{limit}$	1Hz--2500Hz	--	7.7	--	Gs
Warning Threshold	$\Delta B_{warning}$	1Hz--2500Hz	--	11.5	--	Gs
Threshold Proportion		$\Delta B_{warning}/\Delta B_{limit}$	1.3	2	2.7	
Installation Site Proportion	$\Delta BEI$	: 1Hz--2500Hz	52	72	96	Gs
Initialize delay time	$T_d$		--	--	300	uS
Calibrate magnetic field edges figure			--	--	6	pulse
Operating Frequency			1.0	--	5000	Hz
Waveform jitter	$S_{Jit-Close}$	$\Delta B > 20\text{Gs} 1\text{Hz} < f_B$ $< 2500\text{Hz}$	--	--	$\pm 3$	%
	$S_{Jit-Far}$		--	--	$\pm 6$	%
	$S_{Jit-AC}$		--	--	$\pm 3$	%

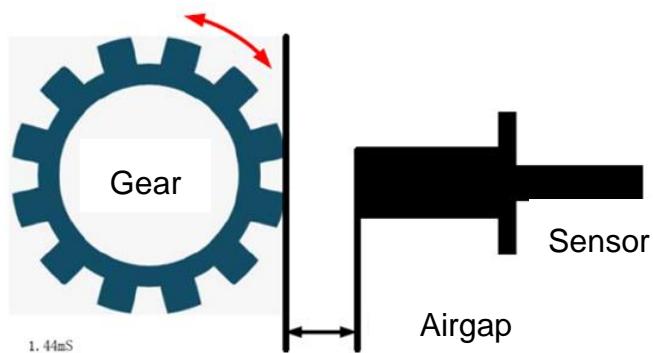
### Timing Characteristics

Pre- Low Time	$t_{pre-low}$		38	45	52	$\mu s$
Warning Pulse Width	$t_{Warning}$		38	45	52	$\mu s$
DR-L mode Pulse Width	$t_{DR-L}$		76	90	104	$\mu s$
DR-R mode Pulse Width	$t_{DR-R}$		153	180	207	$\mu s$
DR-L & EL mode Pulse Width	$t_{DR-L&EL}$		306	360	414	$\mu s$
DR-R & EL mode Pulse Width	$t_{DR-R&EL}$		616	720	828	$\mu s$
EL mode shift frequency	$f_{ELmax}$		--	117	--	Hz
Stand Still mode Pulse Width	$t_{Stop}$		1.232	1.44	1.656	mS
Stand Still mode Pulse Width	$T_{Stop}$		590	737	848	mS

## MAGNETIC FIELD MODE



Magnetic field map



Mounting distance diagram

**Stand Still-mode:** The installation distance is long or the gear does not rotate,  $\Delta B$  is less than 7GS, and the chip output waveform is 1.44ms pulse width.

**Alarm-mode :** When the installation distance is at the critical position,  $\Delta B$  between 7GS to 12GS, the chip output waveform is 45 $\mu$ S pulse width.

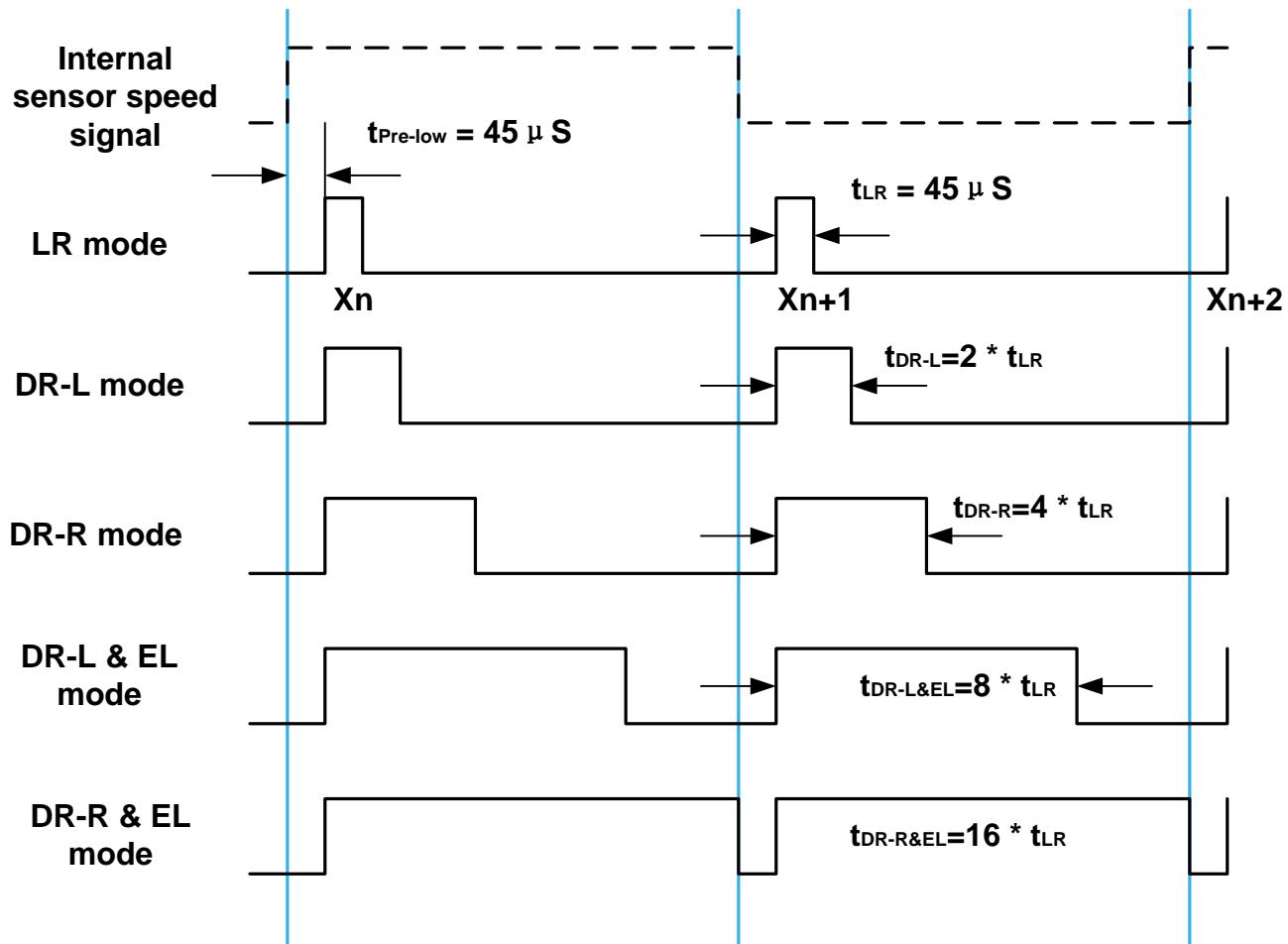
**EL-mode:** When the installation distance is moderate,  $\Delta B$  between 12GS and 65GS, and the speed is slow,

The pulse frequency is less than 117Hz, the forward rotation ( $V_{DD} \rightarrow GND$ ) output waveform with 360 $\mu$ S pulse width is DR-L&EL, and the reverse rotation ( $GND \rightarrow V_{DD}$ ) output waveform with 720 $\mu$ S pulse width is DR-R&EL.

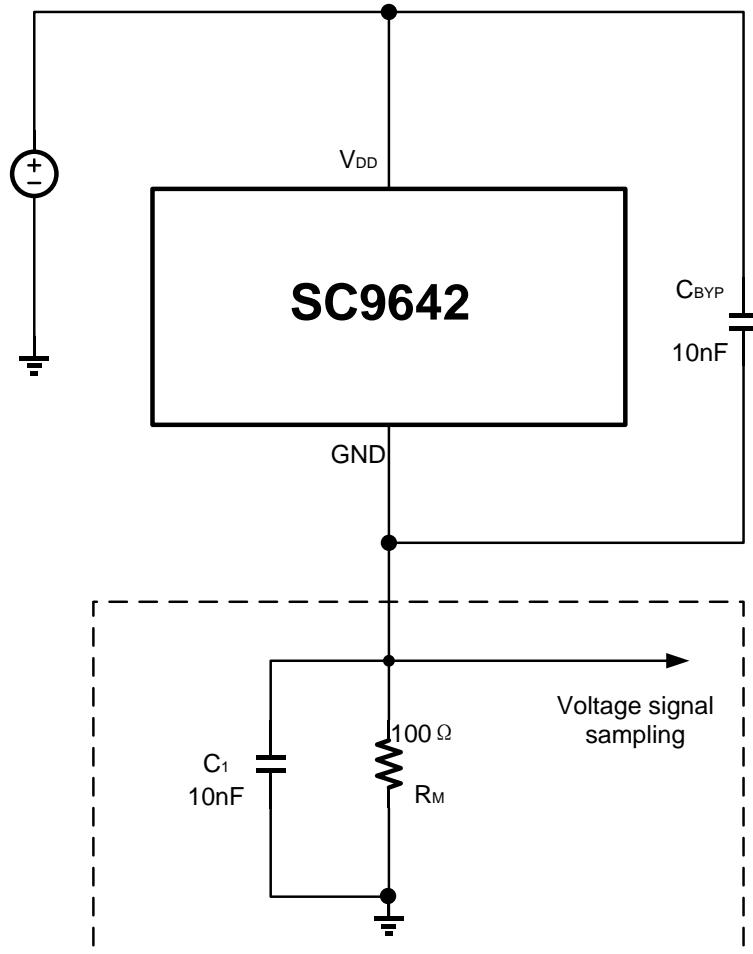
When the speed is fast, the pulse frequency is greater than 117Hz, the forward rotation ( $V_{DD} \rightarrow GND$ ) outputs the waveform with 90 $\mu$ S pulse width, and the reverse rotation ( $GND \rightarrow V_{DD}$ ) outputs the waveform with 180 $\mu$ S pulse width.

**DR-mode:** When the installation distance is relatively close,  $\Delta BD$  is greater than 65GS, regardless of speed, forward rotation ( $V_{DD} \rightarrow GND$ ) output waveform with 90 $\mu$ S pulse width, mode is DR-L, reverse ( $GND \rightarrow V_{DD}$ ) output waveform with 180 $\mu$ S pulse width, mode is DR-R.

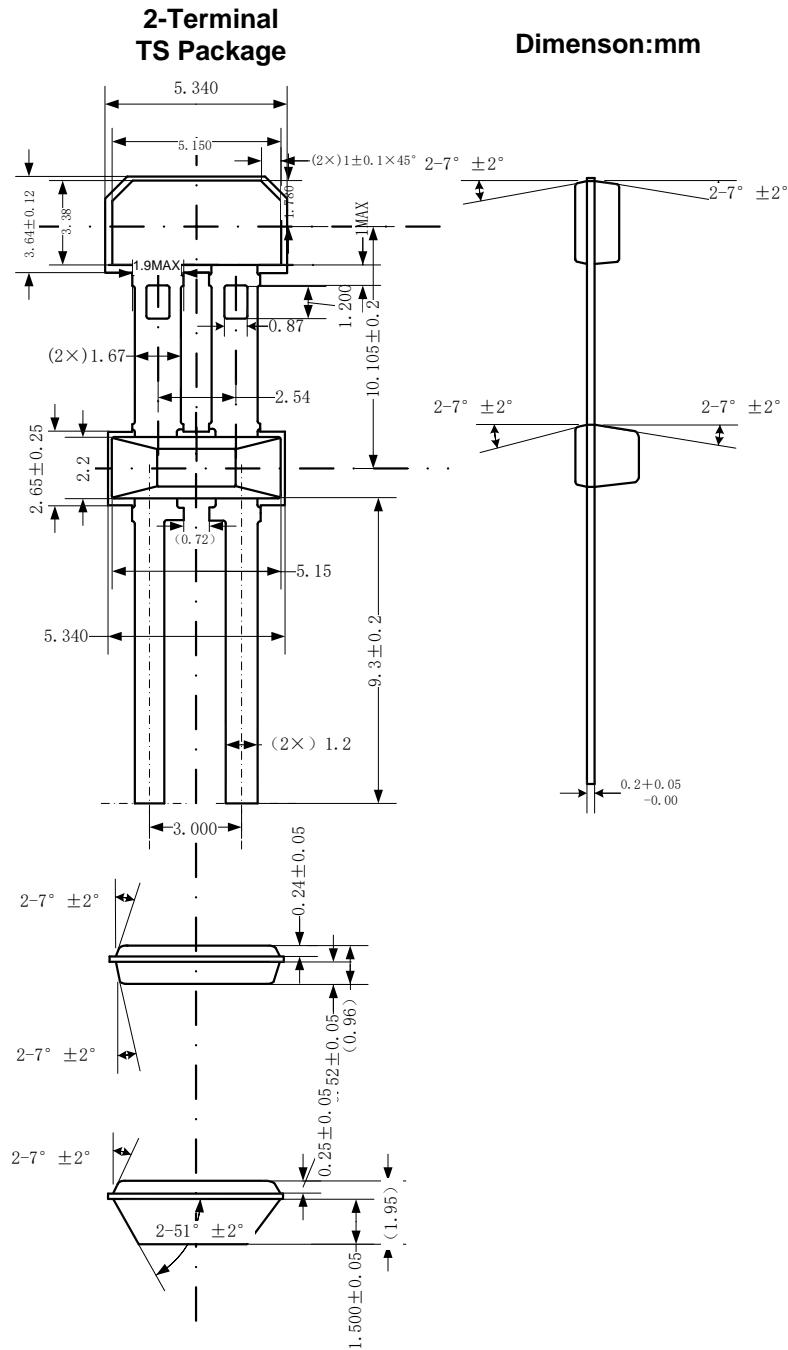
## PWM TIMING DEFINITION



## TYPICAL APPLICATION



## PACKAGE INFORMATION



**Notes:**

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

Where no tolerance is specified, dimension is nominal.

## REVISION HISTORY

Revision	Date	Description
Rev0.1	2018-05-08	The Preliminary revision
Rev2.3	2019-10-12	The final revision of old datasheet
RevA/1.0	2020-11-19	Unified datasheet format