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## Dual Channel Hall-effect Switch with Internal Pull-up Resistor

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### FEATURES

- Two matched Hall switches on a substrate
- Dual quadrature outputs
- Superior temperature stability
- High sensitivity ( $B_{OP}$  and  $B_{RP}$ )
- Supports a wide voltage range
  - 2.5 to 24V
- Built-in pull-up resistor
- Reverse battery protection

### APPLICATIONS

- Anti-pinch electric motor control
- Magnetic encoding
- Rotating shaft monitoring
- Garage door openers
- Power sliding doors
- Sunroofs motor



### DESCRIPTION

The SC2546 is a dual-channel, bipolar switch with two Hall-effect sensing elements, each providing a separate digital output for speed and direction signal processing capability. The Hall elements are photolithographically aligned to better than 1 $\mu$ m. Maintaining accurate mechanical location between the two active Hall elements eliminates the major manufacturing hurdle encountered in fine-pitch detection applications. The SC2546 is a highly sensitivity, temperature stable magnetic sensing device ideal for use in ring magnet based, speed and direction systems located in harsh automotive and industrial environments.

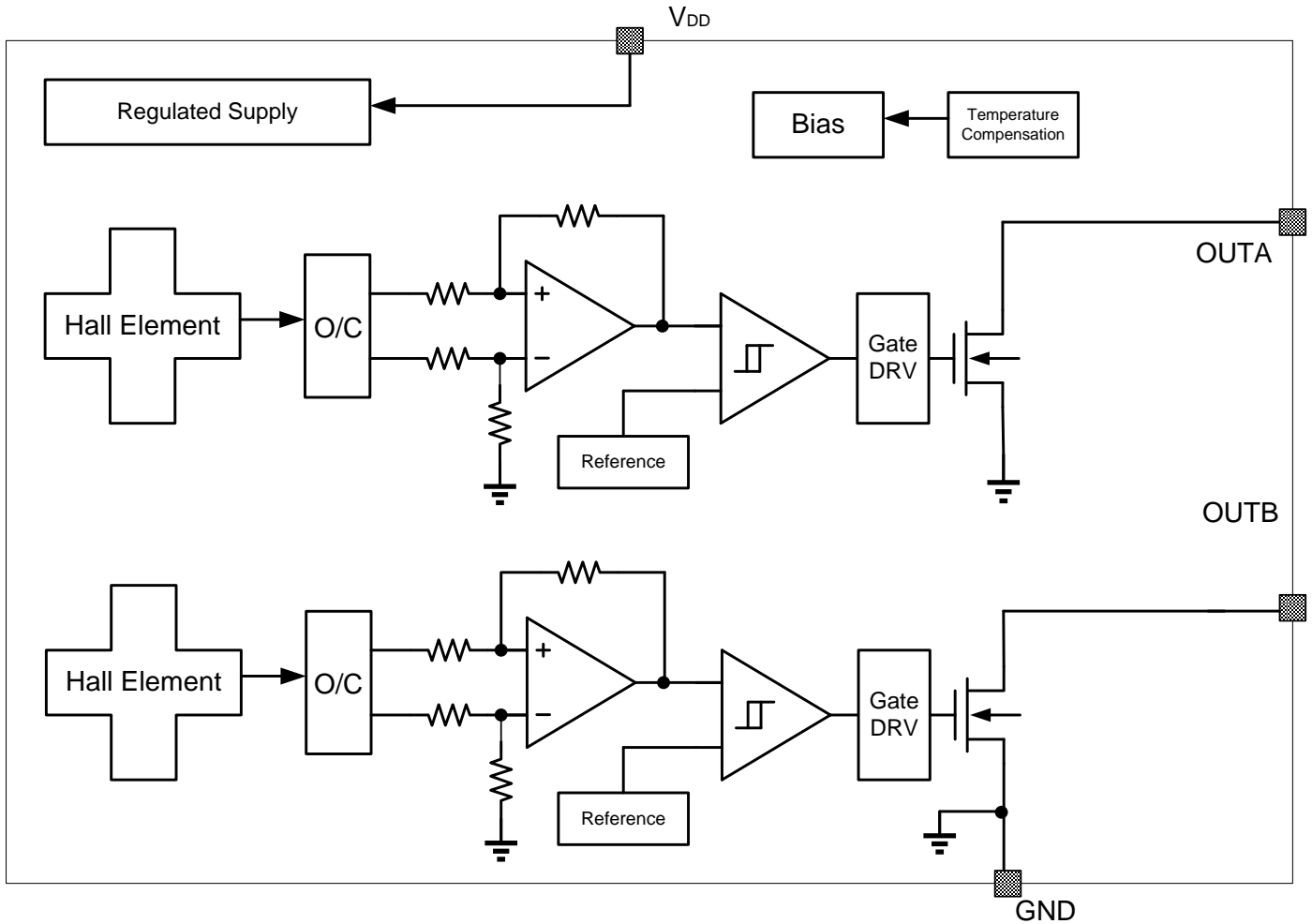
The Hall elements of the SC2546 are spaced 0.95mm apart, which provides excellent speed and direction information for small-geometry targets. Extremely low-drift amplifiers guarantee symmetry between the switches to maintain signal quadrature. An on-chip regulator allows the use of this device over a wide operating voltage range of 2.5 to 24V.

The SC2546 is available in a 4-pin SIP package. Both packages are lead (Pb) free, with 100% matte tin lead frame plating.

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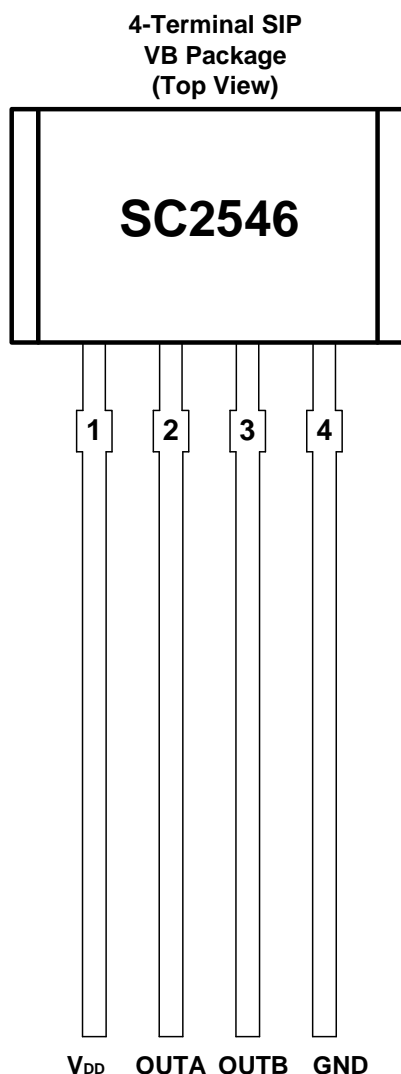
## BLOCK DIAGRAM



## ORDERING INFORMATION

Part Number	Packing	Mounting	Ambient, $T_A$	$B_{OP}(Typ.)$	$B_{RP}(Typ.)$
SC2546VB	Bulk, 500pieces/bag	4-pin SIP	-40°C to 150°C	+2.0mT	-2.0mT

## TERMINAL CONFIGURATION



Terminal		Type	Description
Name	Num.		
V <sub>DD</sub>	1	PWR	2.5V t~ 24 V power supply
OUTA	2	Output	A channel output. with internal pull-up resistor
OUTB	3	Output	B channel output. with internal pull-up resistor
GND	4	Ground	Ground terminal

## ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range

Parameter	Symbol	Min.	Max.	Units
Power supply voltage	V <sub>DD</sub>	-28	28	V
Output terminal voltage	V <sub>OUT</sub>	-0.5	28	V
Output terminal current sink	I <sub>SINK</sub>	0	30	mA
Operating ambient temperature	T <sub>A</sub>	-40	150	°C
Maximum junction temperature	T <sub>J</sub>	-55	165	°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	Min.	Max.	Units
ESD-Protection	V <sub>ESD</sub>	-4	4	KV

## THERMAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Rating	Units
R <sub>θJA</sub>	VB Package thermal resistance	Single-layer PCB, with copper limited to solder pads	177	°C/W

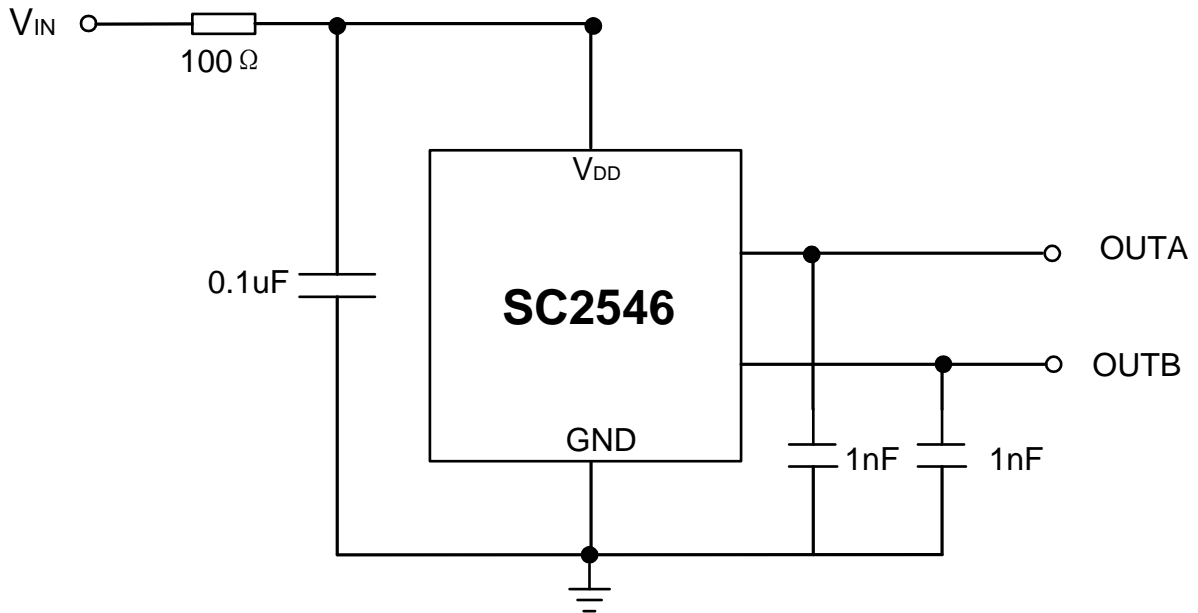
## OPERATING CHARACTERISTICS

over operating free-air temperature range ( $V_{DD} = 5.0V$ , unless otherwise noted)

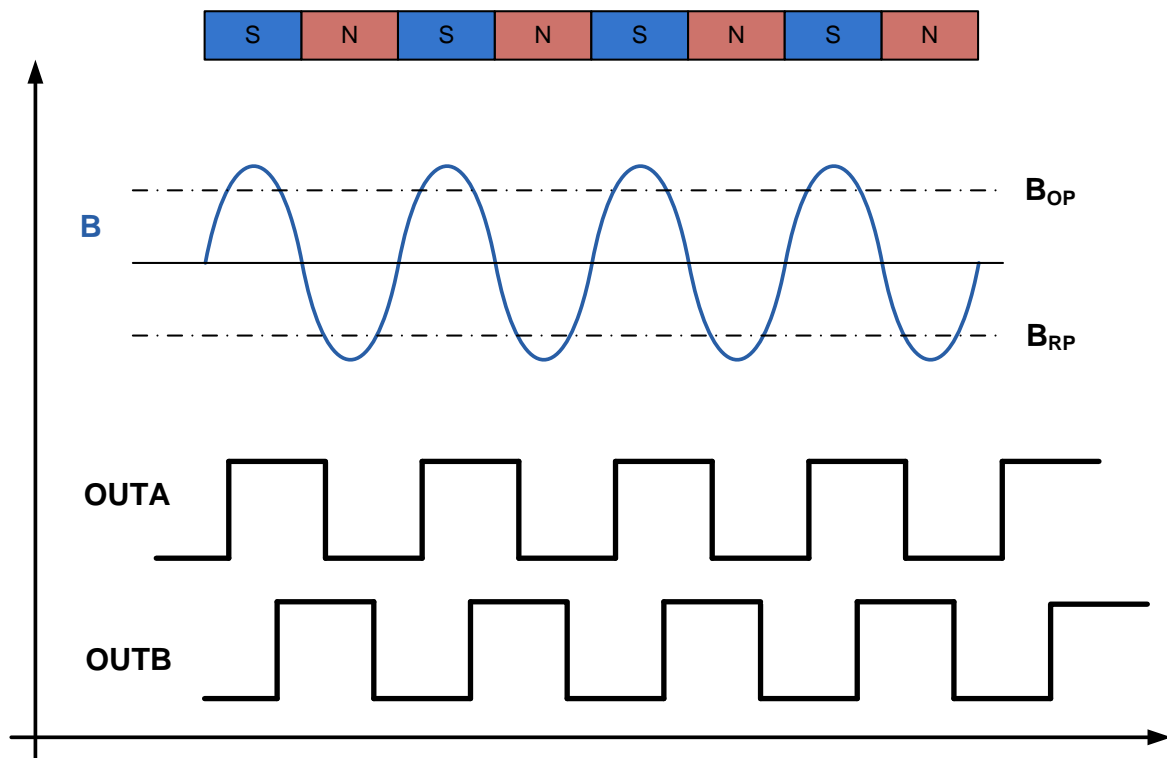
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{DD}$	Operating voltage	$T_J < T_{J(Max.)}$	2.5	--	24	V
$I_{DD}$	Operating supply current	$V_{DD}=2.8$ to 24 V	1.0	3.5	5.5	mA
$t_{on}$	Power-on time		--	35	50	$\mu S$
$I_{QL}$	Off-state leakage current	Output Hi-Z	--	--	3	$\mu A$
$R_{UP}$	Internal pull-up resistor		5,0	10.0	15	K $\Omega$
$R_{DS(on)}$	FET on-resistance	$V_{DD}=5V, I_o=10mA,$ $T_A=25^\circ C$	--	20	--	$\Omega$
$t_d$	Output delay time	$B=B_{RP}$ to $B_{OP}$	--	13	25	$\mu S$
$t_r$	Output rise time	$R1=1Kohm$ $Co=50pF$	--	--	0.5	$\mu S$
$t_f$	Output fall time	$R1=1Kohm$ $Co=50pF$	--	--	0.2	$\mu S$
Magnetic Characteristics						
$f_{BW}$	Bandwidth		40	--	--	kHz
$B_{OP}$	Operated point	VB Package	0.5	2.0	3.5	mT
$B_{RP}$	Release point		-3.5	-2.0	-0.5	mT
$B_{HYS}$	Hysteresis		--	4.0	--	mT
$B_O$	Magnetic offset		$B_O=(B_{OP}+B_{RP})/2$	--	0	--

1mT=10Gs

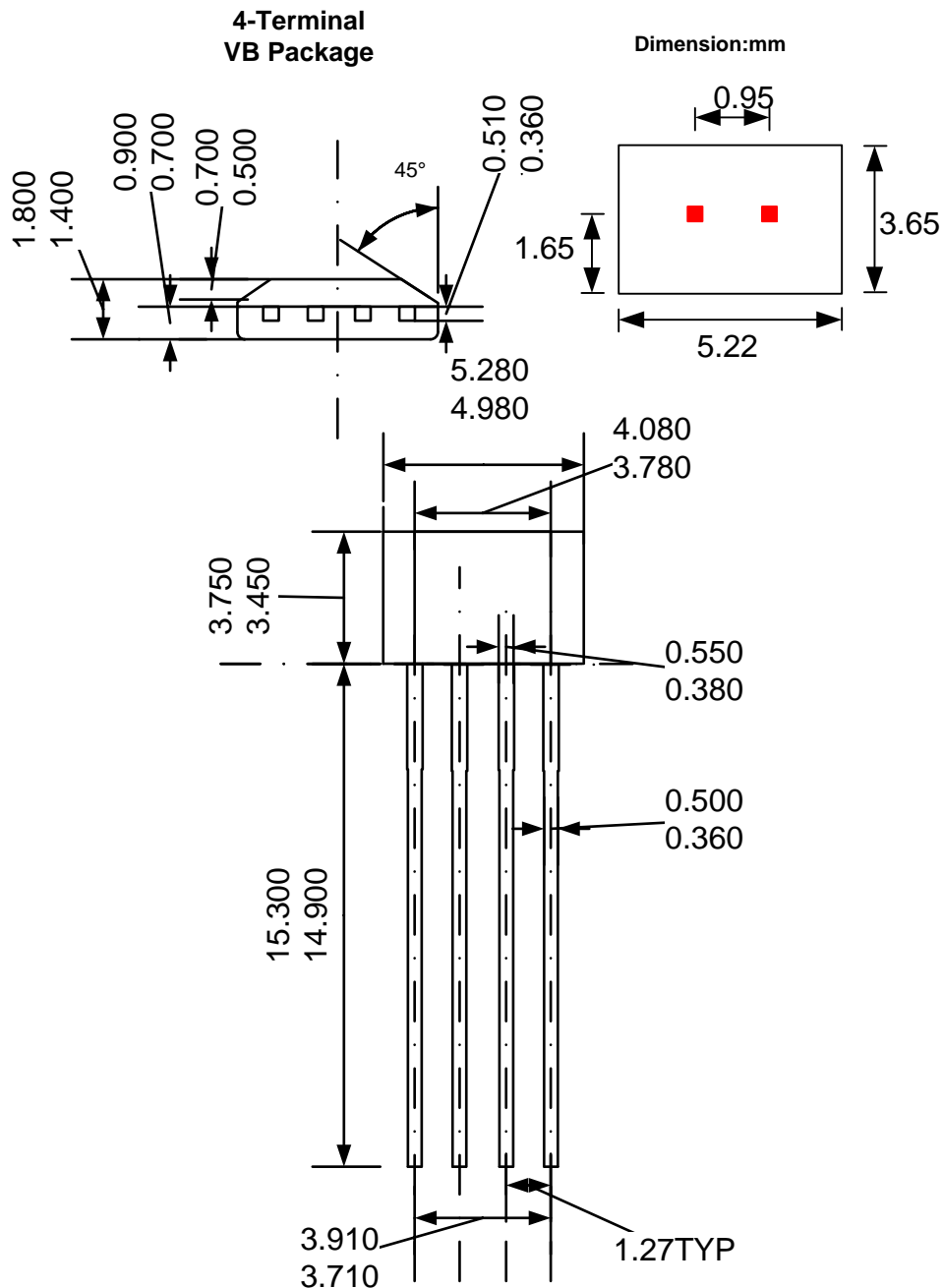
## TYPICAL APPLICATION



## TYPICAL OUTPUT WAVEFORM



## PACKAGE INFORMATION (VB)



**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.



## REVISION HISTORY

Revision	Date	Description
Rev.0.1	2018-05-08	Preliminary datasheet
Rev.2.3	2019-03-16	The final revision of old datasheet
RevA/1.1	2020-11-06	Unified datasheet format