

---

**High Sensitive Hall Effect Bipolar Switches**

---

**Description**

The SC41F Hall-Effect switch, produced with high voltage Bipolar technology, has been designed specifically for automotive and industrial applications. New considerations are given not only to protect the IC from the high voltage transients, but also achieving a high degree of noise immunity.

Each device includes a voltage regulator for operation with supply voltages of 3.8 to 40V volts, quadratic Hall-voltage generator, temperature compensation circuitry, small-signal amplifier, Schmitt trigger, and an open-collector output to sink up to 40mA.

**Features and Benefits**

- 3.8 to 40V supply voltage
- High transient voltage protection
- 40mA sinking capability
- High ESD rating
- 3-pin SIP package
- Operate/release points symmetrical around zero gauss
- RoHs compliant

**Potential Applications**

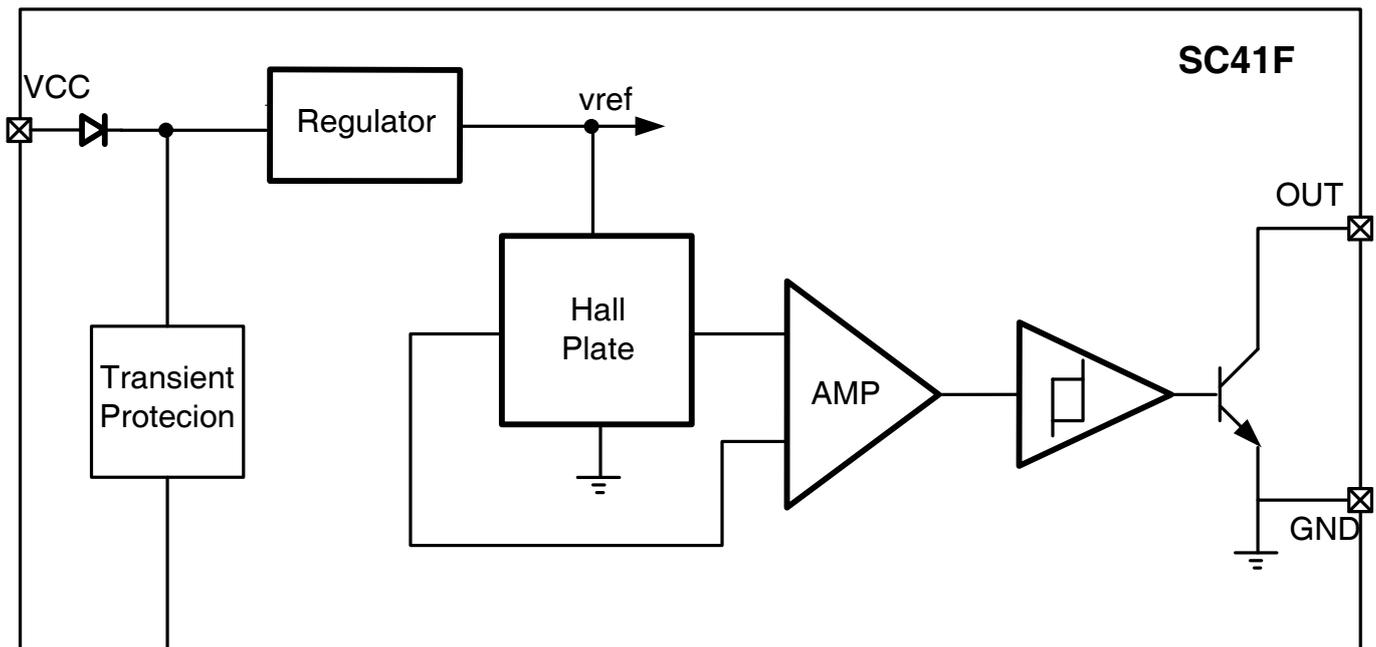
- Brushless DC motor
- Motor and fan control
- Automotive transmission position

**Device Information**

Part Number	Packing	Mounting	Ambient, T <sub>A</sub>	Marking
SC41F	1000 pieces/Bag	SIP3	-40°C to 150°C	41F

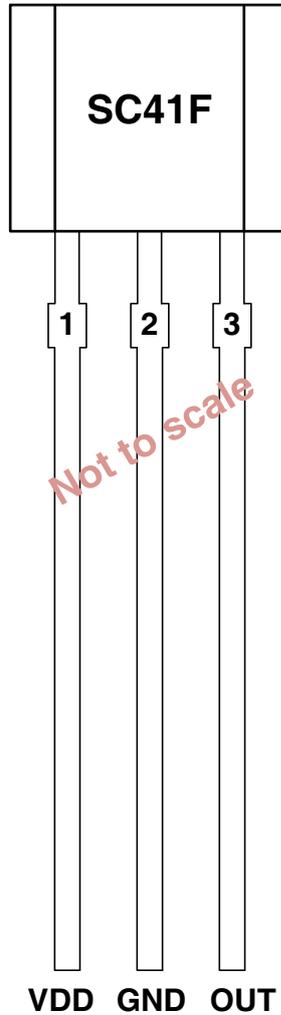
## Function Description

The circuit includes Hall generator, amplifier and Schmitt-Trigger on one chip. The internal reference provides the supply voltage for the components. A magnetic field perpendicular to the chip surface induces a voltage at the Hall probe. This voltage is amplified and switches as a Schmitt-Trigger with open-collector output. A protection diode against reverse power supply is integrated.



## Pin Description

3-Terminal SIP  
 UA Package  
 (Top View)



Terminal		Type	Description
Name	Number		
VDD	1	PWR	3.8 to 40 V power supply
GND	2	Ground	Ground terminal
OUT	3	Output	Open-drain output. The open drain requires a pull-up resistor

## Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) <sup>(1)</sup>

Parameter	Symbol	Min.	Max.	Units
Power supply voltage	V <sub>CC</sub>	-40	60	V
Output terminal voltage	V <sub>OUT</sub>	-0.5	60	V
Output terminal current sink	I <sub>SINK</sub>	0	50	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

*<sup>(1)</sup>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.*

## Electrical and magnetic Specifications

over operating free-air temperature range ( $V_{CC} = 5V$ , unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{CC}$	Operating voltage <sup>(1)</sup>	$T_J < T_{J(Max.)}$	3.8	--	40	V
$I_{CC}$	Operating supply current	$V_{CC}=3.8$ to 40 V, $T_A=25^\circ C$	--	4.0	10	mA
$I_{QL}$	Off-state leakage current	Output Hi-Z	--	--	3	$\mu A$
$V_{SAT}$	Output saturation voltage	$I_Q=20mA$ , $T_A=25^\circ C$	--	--	300	mV
$t_r$	Output rise time	$R1=1Kohm$ $C_o=20pF$	--	--	1.5	$\mu S$
$t_f$	Output fall time	$R1=1Kohm$ $C_o=20pF$	--	0.5	1.5	$\mu S$
Magnetic Characteristics						
$f_{BW}$	Bandwidth		--	--	100	kHz
$B_{OP}$	Operated point	$T_A=25^\circ C$	0.5	+5.0	9.5	mT <sup>(2)</sup>
$B_{RP}$	Release point		-9.5	-5.0 <sup>(3)</sup>	-0.5	mT
$B_{HYS}$	Hysteresis		--	10.0	--	mT

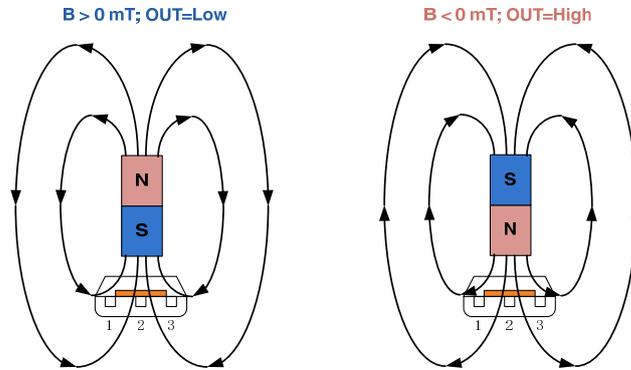
<sup>(1)</sup> Maximum voltage must be adjusted for power dissipation and junction temperature, see Thermal Characteristics

<sup>(2)</sup>  $1mT=10Gs$

<sup>(3)</sup> Magnetic flux density,  $B$ , is indicated as a negative value for North-polarity magnetic fields, and as a positive value for South-polarity magnetic fields.

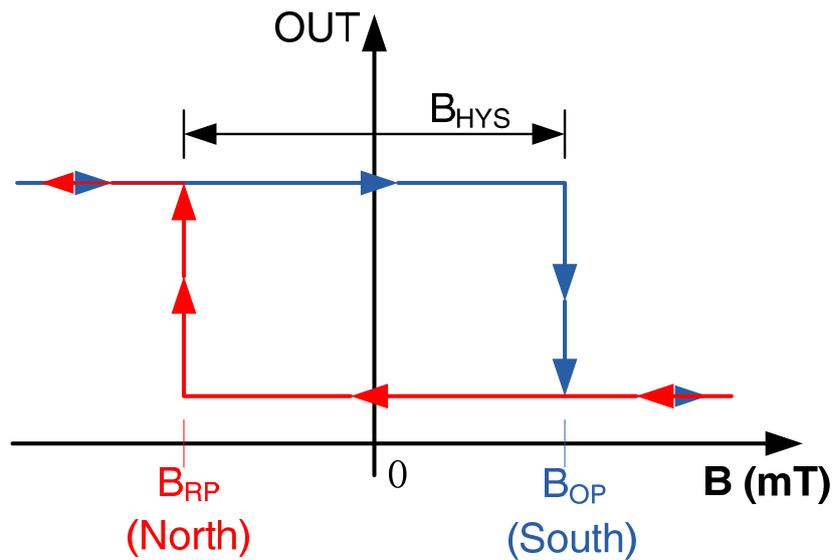
## Field Direction Definition

A positive magnetic field is defined as a South pole near the marked side of the package.

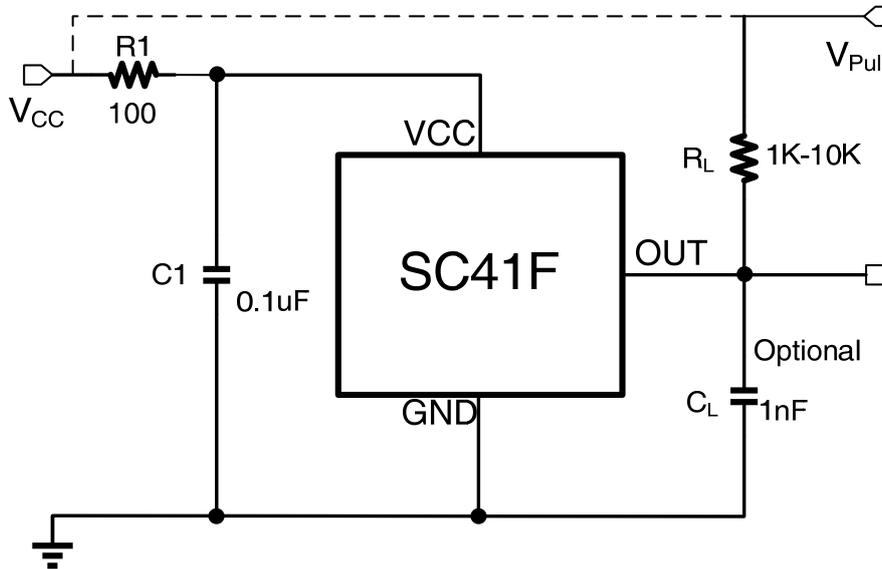


## Transfer Function

Powering-on the device in the hysteresis region, less than  $B_{OP}$  and higher than  $B_{RP}$ , allows an indeterminate output state. The correct state is attained after the first excursion beyond  $B_{OP}$  or  $B_{RP}$ . If the field strength is greater than  $B_{OP}$ , then the output is pulled low. If the field strength is less than  $B_{RP}$ , the output is released.



## Typical Application



The SC41F contains an on-chip voltage regulator and can operate over a wide supply voltage range. In applications that operate the device from an unregulated power supply, transient protection must be added externally. For applications using a regulated line, EMI/RFI protection may still be required. R1 is for improved CI performance, and could be 100 or 200  $\Omega$  typically.

The SC41F device output stage uses an open-drain NPN transistor, and it is rated to sink up to 40mA of current. For proper operation, calculate the value of the pull-up resistor  $R_L$  is required. The size of  $R_L$  is a tradeoff between OUT rise time and the load capacity when OUT is pulled low. A lower current is generally better, however faster transitions and bandwidth require a smaller resistor for faster switching.

Select a vaule for  $C_L$  based on the system bandwidth specifications as:

$$2 \times f \text{ (Hz)} = \frac{1}{2\pi \times R \times C}$$

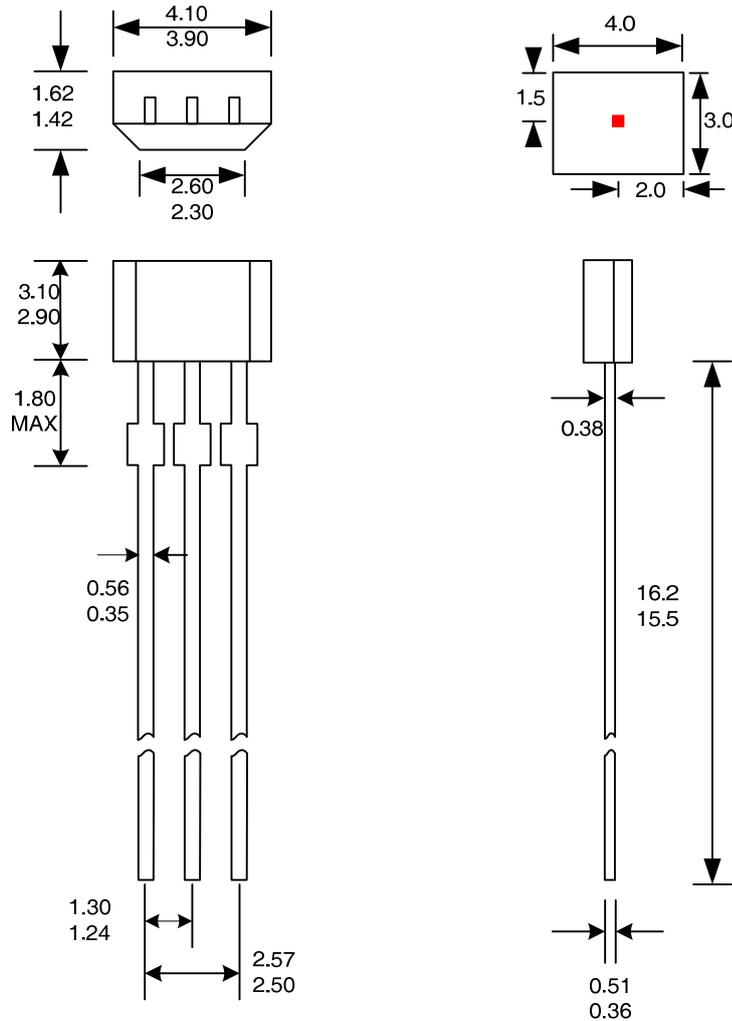
Most applications do not require this  $C_L$  filtering capacitor.

$V_{PULL}$  is not restricted to  $V_{CC}$ , and could be connected to other voltage reference. The allowable voltage range of this terminal is specified in the Absolute Maximum Ratings.

## Mechanical Dimensions

### 3-Terminal UA Package

Dimension:mm



#### 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.