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## High Sensitive Hall Effect Bipolar Switches

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### FEATURES

- 3.8 to 40V supply voltage
- High transient voltage protection
- 40mA sinking capability
- Operate/release points symmetrical around zero gauss
- 3-pin SIP, SOT23-3 packages are available
- RoHS compliant

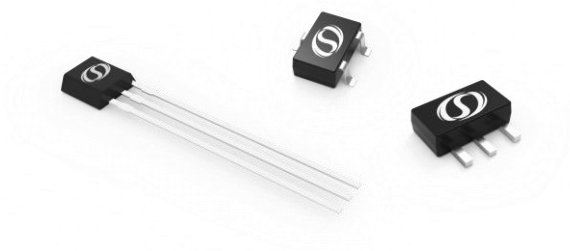
### DESCRIPTION

The SC1245 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 40 volts, quadratic Hall-voltage generator, temperature compensation circuitry, small-signal amplifier, Schmitt trigger, and an open-collector output to sink up to 40mA.

### APPLICATIONS

- Motor and fan control
- Automotive transmission position
- Brushless

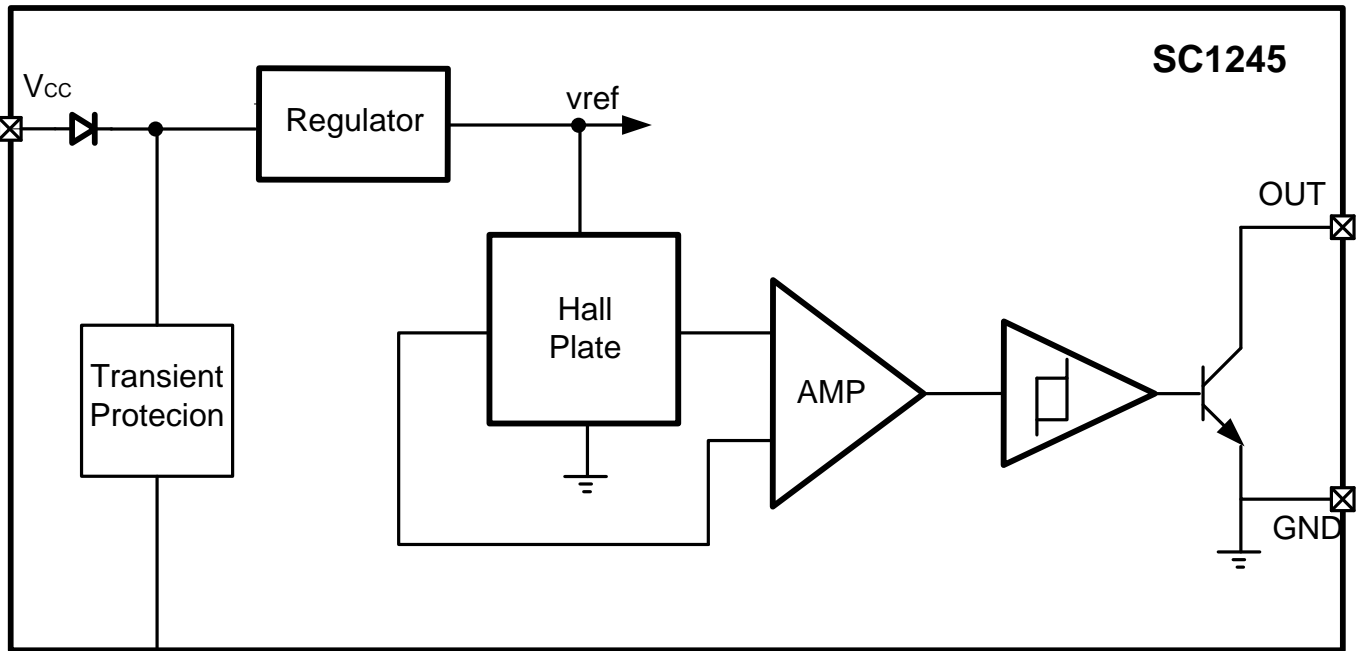


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## BLOCK DIAGRAM

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.

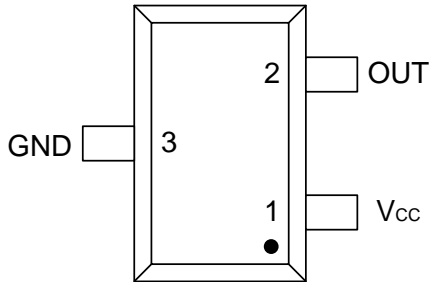


## ORDERING INFORMATION

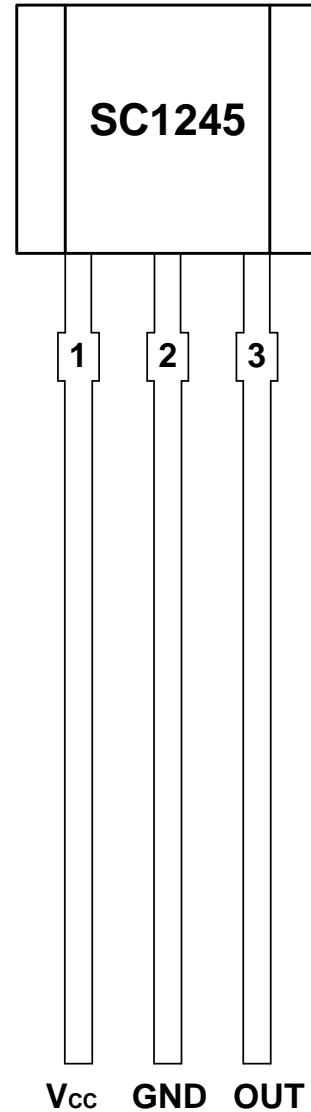
Part Number	Packing	Mounting	Ambient, TA	Marking
SC1245UA	1000 pieces/Bag	SIP3	-40°C to 150°C	1245
SC1245BU	1000 pieces/Bag	SOT89	-40°C to 150°C	1245
SC1245SO-N	3000 pieces/Reel	SOT23-3	-40°C to 150°C	1245

## TERMINAL CONFIGURATION

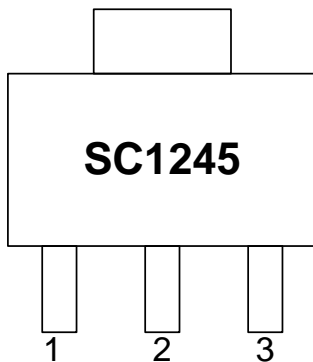
3-Terminal SOT-23  
SO Package  
(Top View)



3-Terminal SIP  
UA Package  
(Top View)



3-Terminal SOT89  
BU Package  
(Top View)



Name	Terminal		Type	Description
	Number			
	UA/BU	SO		
V <sub>cc</sub>	1	1	PWR	3.8V~40 V power supply
GND	2	3	Ground	Ground terminal
OUT	3	2	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	$V_{CC}$	-40	60	V
Output terminal voltage	$V_{OUT}$	-0.5	60	V
Output terminal current sink	$I_{SINK}$	0	50	mA
Operating ambient temperature	$T_A$	-50	150	°C
Maximum junction temperature	$T_J$	-55	165	°C
Storage temperature	$T_{STG}$	-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.

## ESD PROTECTION

Human Body Model (HBM) tests according to: standard AEC-Q100-002

Parameter	Symbol	Min.	Max.	Units
ESD-Protection	$V_{ESD}$	-2	2	kV

## OPERATING CHARACTERISTICS

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

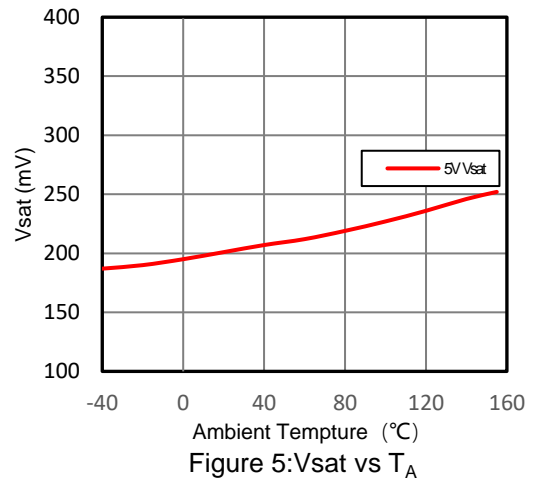
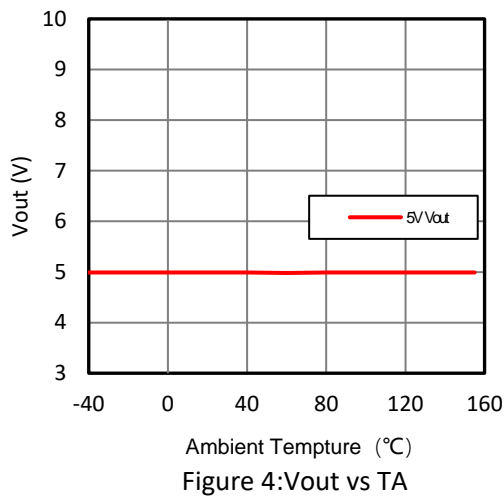
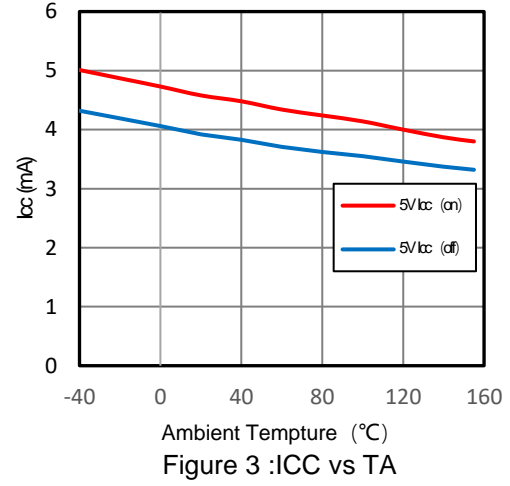
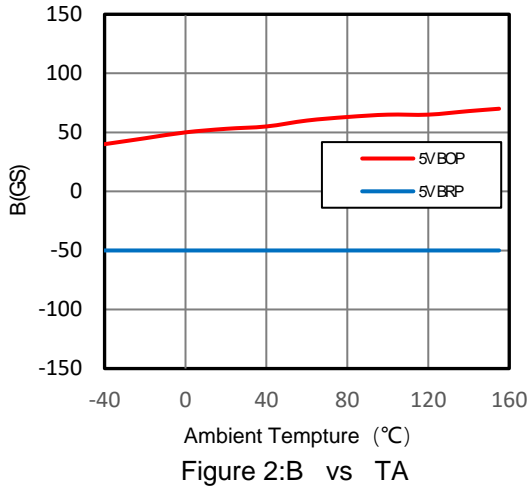
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{CC}$	Operating voltage <sup>(1)</sup>	$T_J < T_{J(Max.)}$	3.8	--	40	V
$I_{CC}$	Operating supply current	$V_{CC}=3.8$ to 40 V, $T_A=25^\circ C$	--	4.0	10	mA
$I_{QL}$	Off-state leakage current	Output Hi-Z	--	--	3	$\mu A$
$V_{SAT}$	Output saturation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

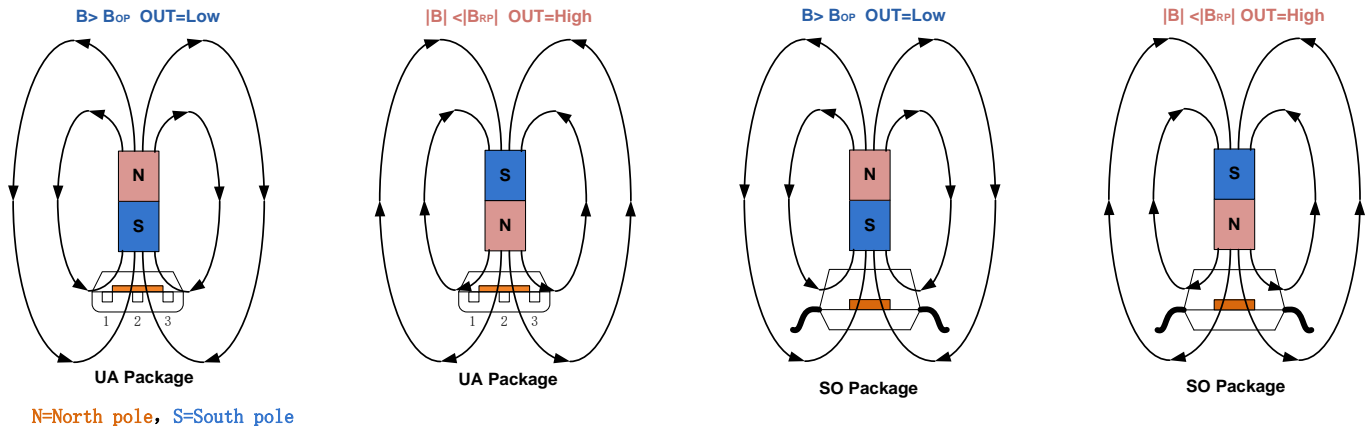
## TYPICAL CHARACTERISTICS



## FUNCTIONAL DESCRIPTION

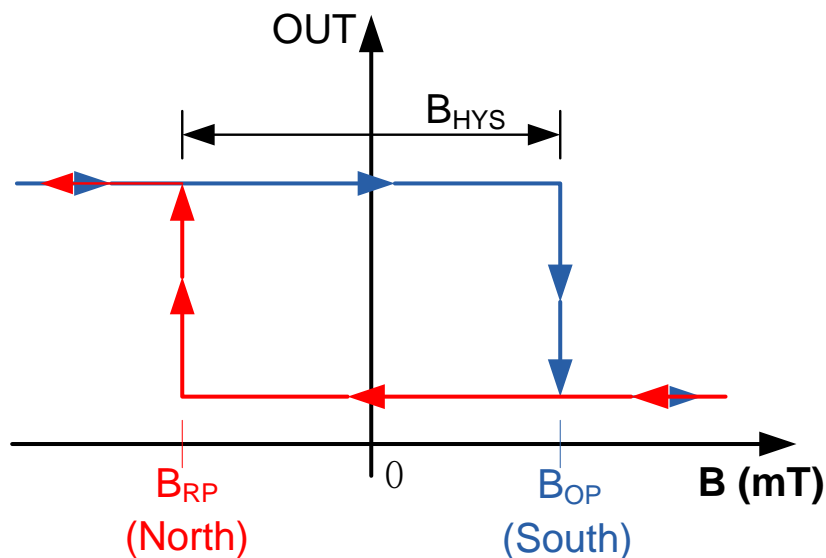
### Field Direction Definition

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



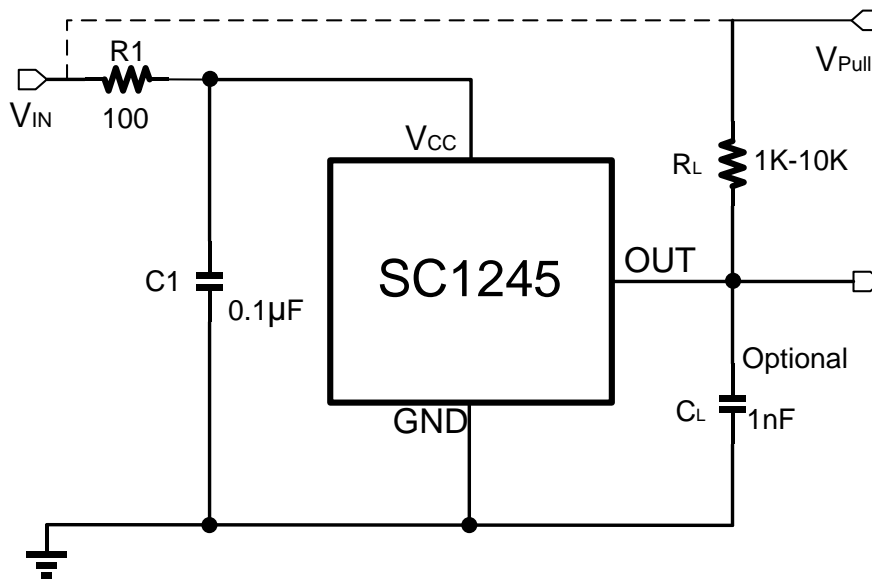
### Transfer Function

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 SC1245 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. It is recommended to shunt C1 capacitors to the ground near the chip V<sub>CC</sub> power supply, with a typical value of 0.1 μF. At the same time in the external optional series resistor R1 their typical values for 100 Ω. The output capacitor C<sub>L</sub> is used as the output filter, typically 1 nF.

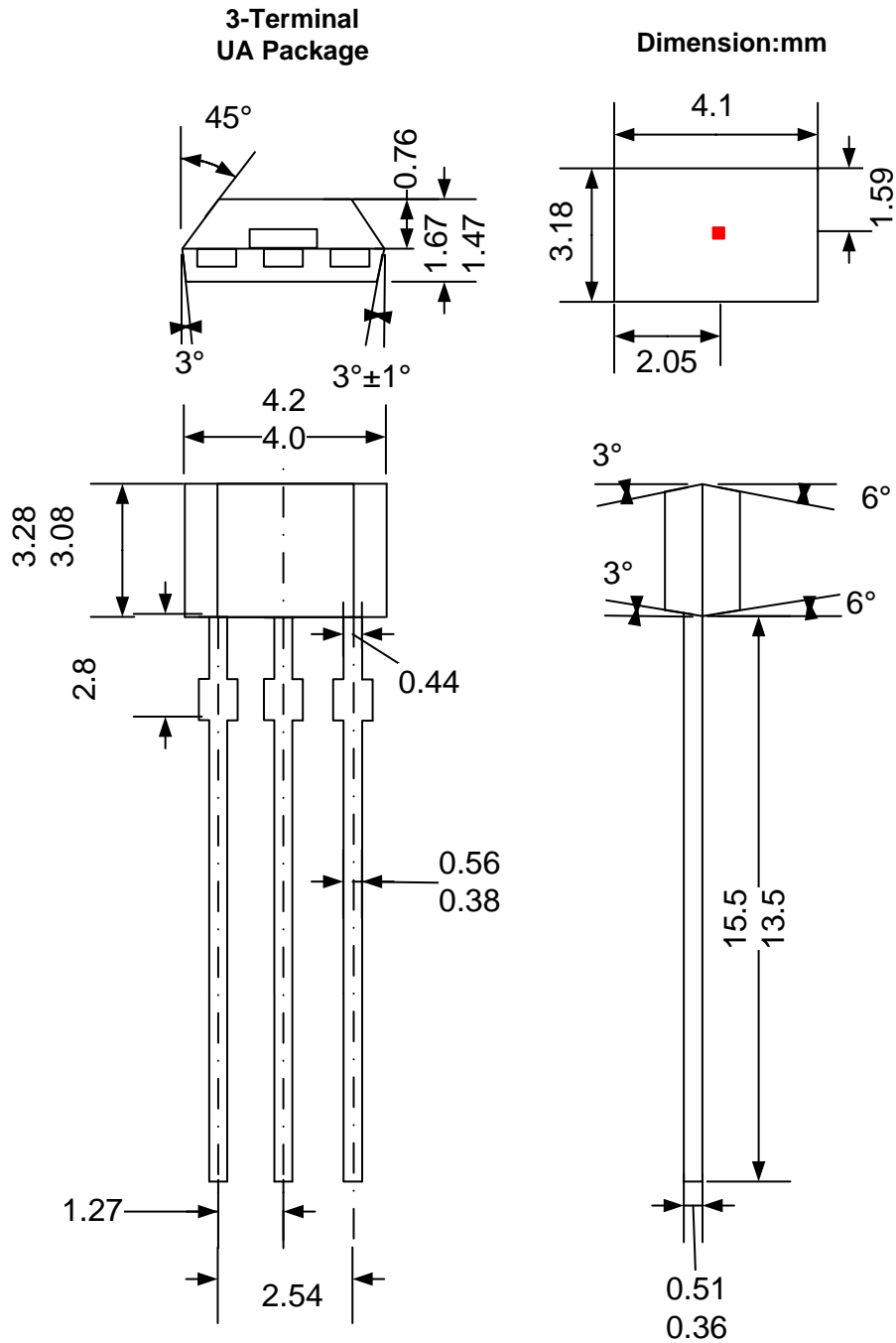
Select a value for C<sub>L</sub> based on the system bandwidth specifications as:

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

The output stage of the SC1245 device is an Open collector NPN tube, which provides a load capacity of 20mA. Adjust the pull-up resistor R<sub>L</sub> to make it work properly. The R<sub>L</sub> provides a high level for the leak-opening output. In general, less current is better, but faster transient response and bandwidth are required, with a smaller resistor R<sub>L</sub> for faster switching.

V<sub>PULL</sub> is not restricted to V<sub>CC</sub>, and could be connected to other voltage reference. The allowable voltage range of this terminal is specified in the Absolute Maximum Ratings.

## PACKAGE INFORMATION (TO-92S-A1)

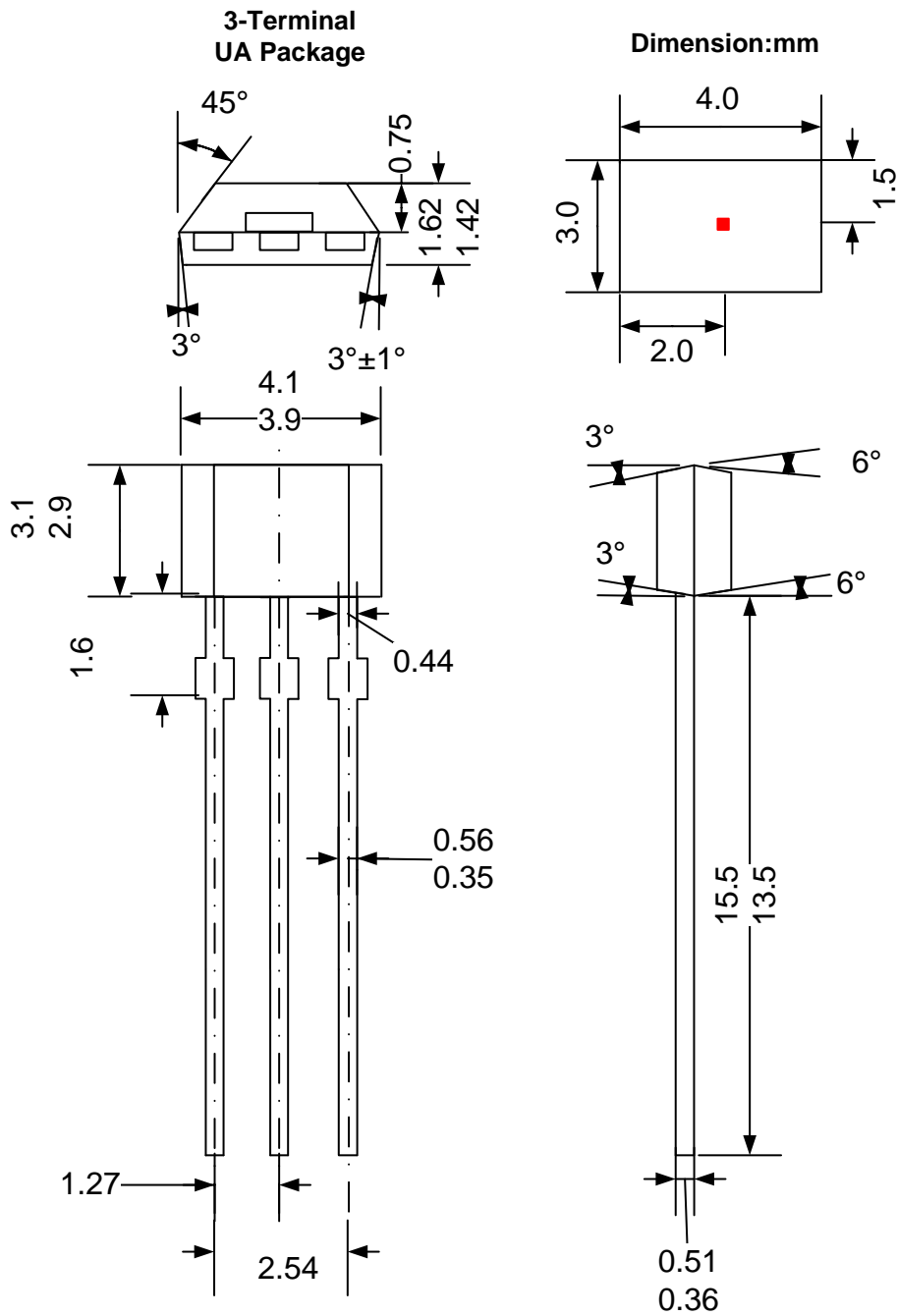


**Notes:**

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.

## PACKAGE INFORMATION (TO-92S-B1)

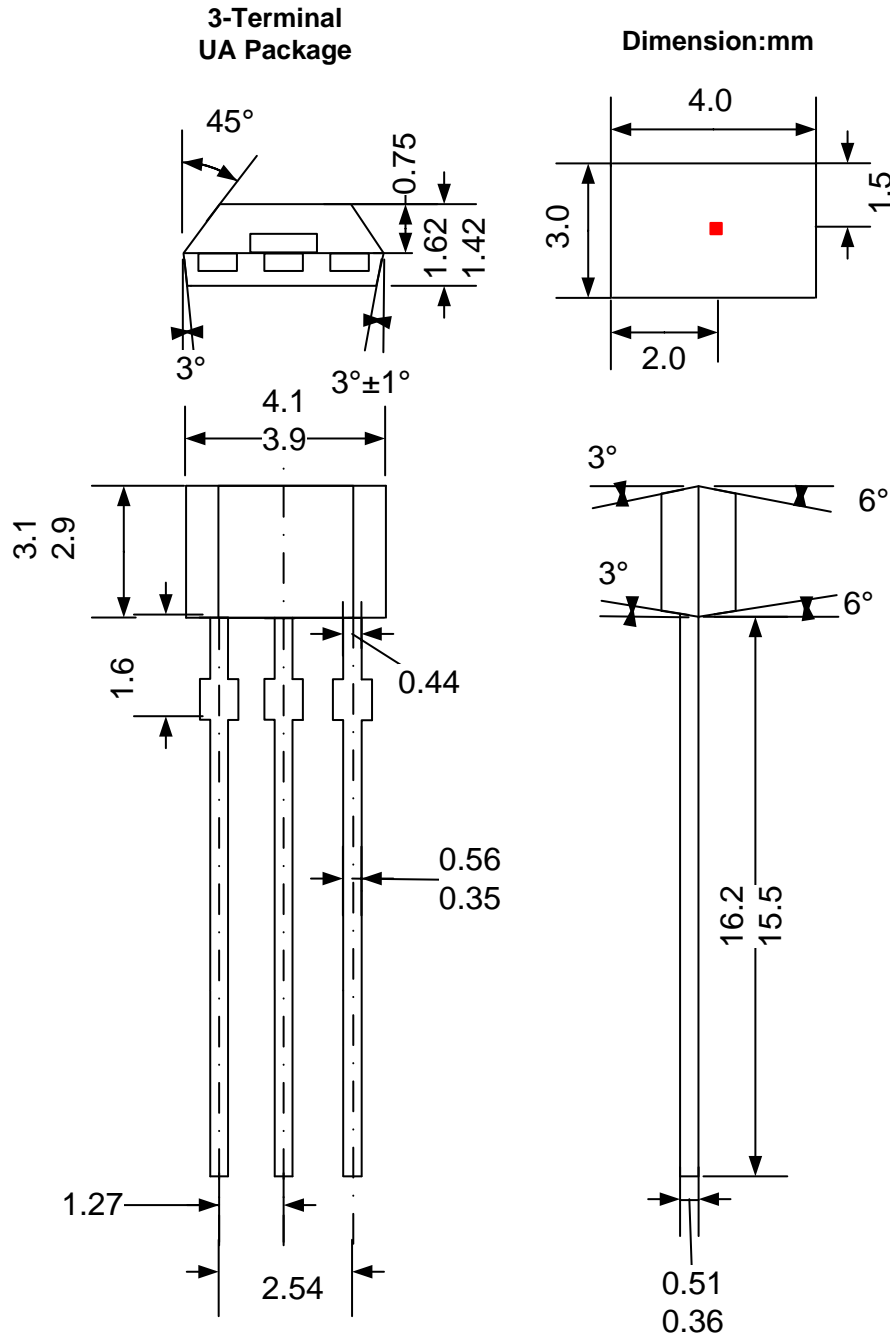


**Notes:**

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.

## PACKAGE INFORMATION (TO-92S-B2)



**Notes:**

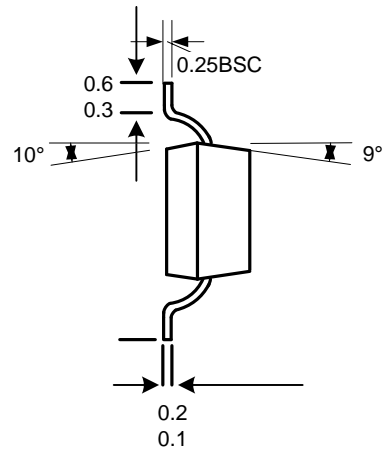
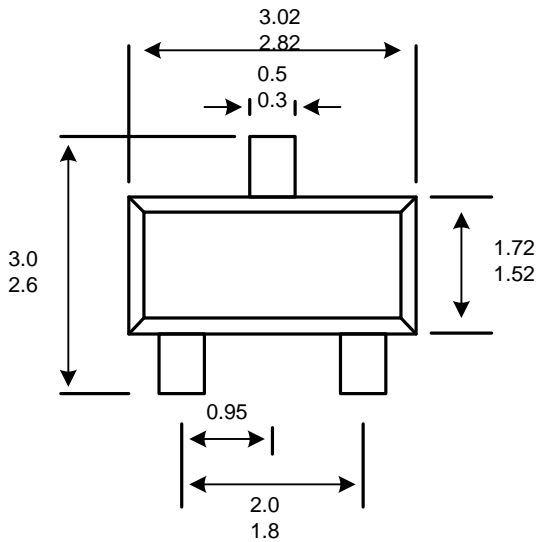
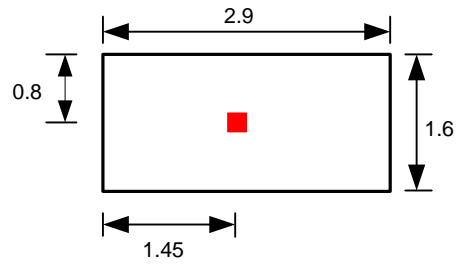
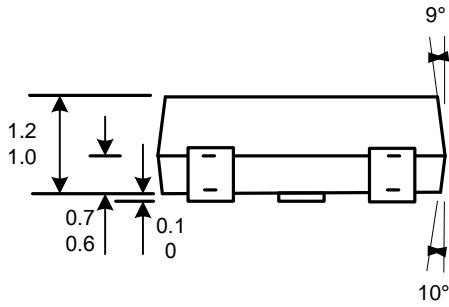
1. Exact body and lead configuration at vendor's option within limits shown.
2. Height does not include mold gate flash.

Where no tolerance is specified, dimension is nominal.

## PACKAGE INFORMATION (SO)

**3-Terminal  
SO Package**

**Dimension:mm**



**Notes:**

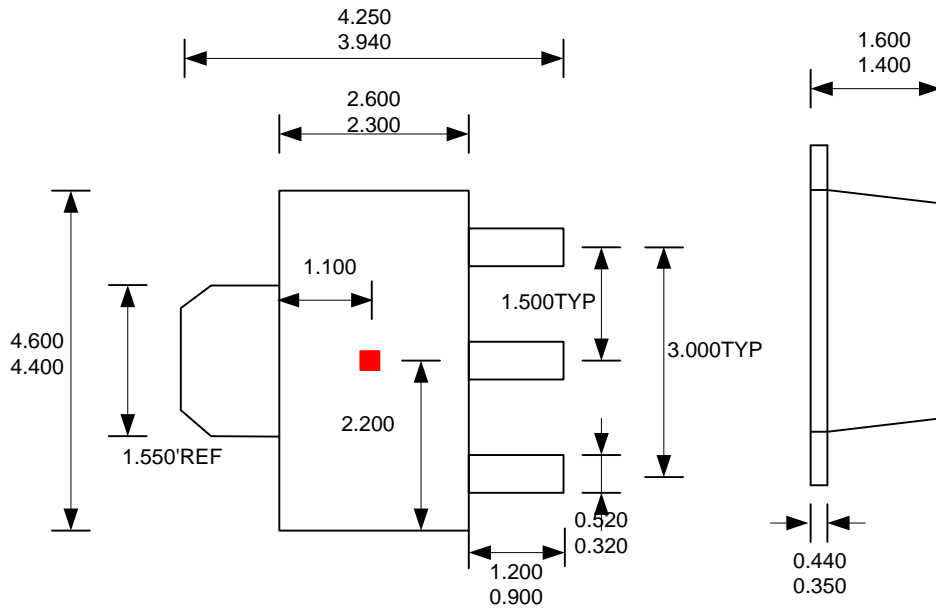
1. Exact body and lead configuration at vendor's option within limits shown.
2. Height does not include mold gate flash.

Where no tolerance is specified, dimension is nominal.

## PACKAGE INFORMATION (BU)

### 3-Terminal BU 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.

## REVISION HISTORY

Revision	Date	Description
Rev.0.1	2017-01-21	Preliminary revision
Rev.2.3	2018-12-21	The final revision of old datasheet
Rev.A/1.0	2020-12-04	Unified datasheet format