

KTH1701 Series

High Performance, Low Power
Omnipolar Hall Switch Sensor

Technical Support
sales.global@conntek.com.cn

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Region	Contact Information
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1 Features

- Low Power Consumption
 - 25Hz version: $0.9\mu A@1.8V$
 - 100Hz version: $2.4\mu A@1.8V$
 - 500Hz version: $10.4\mu A@1.8V$
- Wide Operating Voltage Range: $1.8V \sim 5.5V$
- Selectable Magnetic Field Thresholds (Bop)
 - $26Gs$ Ultra-low Threshold
 - $36Gs$ Low Threshold
 - $48Gs$ High Threshold
- Omnipolar Magnetic Field Detection
- CMOS Push-Pull Output
- Packages: SOT-23-3L, TO-92S
- Operating Temperature Range: $-40^{\circ}C \sim 125^{\circ}C$
- Excellent ESD Performance: $HBM8KV$
- RoHS Compliant and Green Package

2 Typical Applications

- Laptop and Tablet Switch Detection
- TWS Earphones, Mobile Phones
- Electronic Locks, Valve Position Detection
- Water Meters, Gas Meters, Flow Meters
- Non-contact Detection

3 Application Circuit Diagram

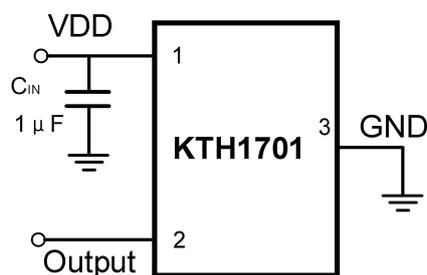


Figure 1: Note: To filter noise at the chip power supply end, connect a $1\mu F$ capacitor between the power supply and ground as close to the VDD pin as possible.

4 Overview

The **KTH1701** is a low-power Hall switch sensor designed for compact systems and battery-sensitive systems. It offers multiple magnetic field

thresholds, switching frequencies, and packaging options to suit various applications.

When the applied S-pole or N-pole magnetic induction intensity exceeds the operating point B_{OP} , the chip outputs a low level and maintains it. The output remains low until the magnetic induction intensity drops below the release point B_{RP} , at which point the output becomes high. The chip includes built-in temperature compensation and clock logic circuits to ensure stable operating points and switching frequencies. It provides omnipolar magnetic response with minimal current consumption.

The **KTH1701** operates within a supply voltage range of 1.8V to 5.5V and comes in standard SOT-23-3L and TO-92S packages.

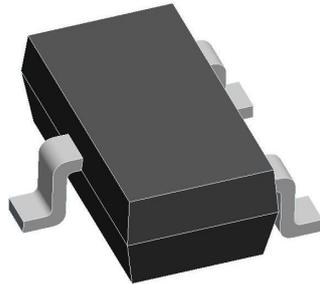


Figure 2: SOT-23-3L Package



Figure 3: TO-92S Package

5 Pin Definitions and Markings

5.1 SOT-23-3L

Pin Name	Pin Number	Function Description
VDD	1	Power Supply Input
OUTPUT	2	Output
GND	3	Ground

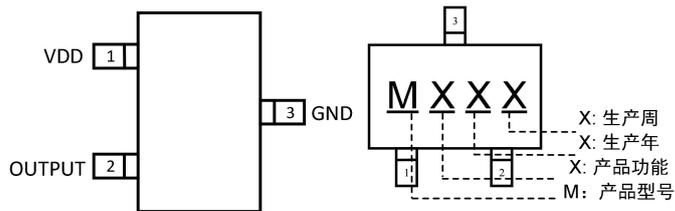


Figure 4: Top view of chip pin configurations

5.2 TO-92S

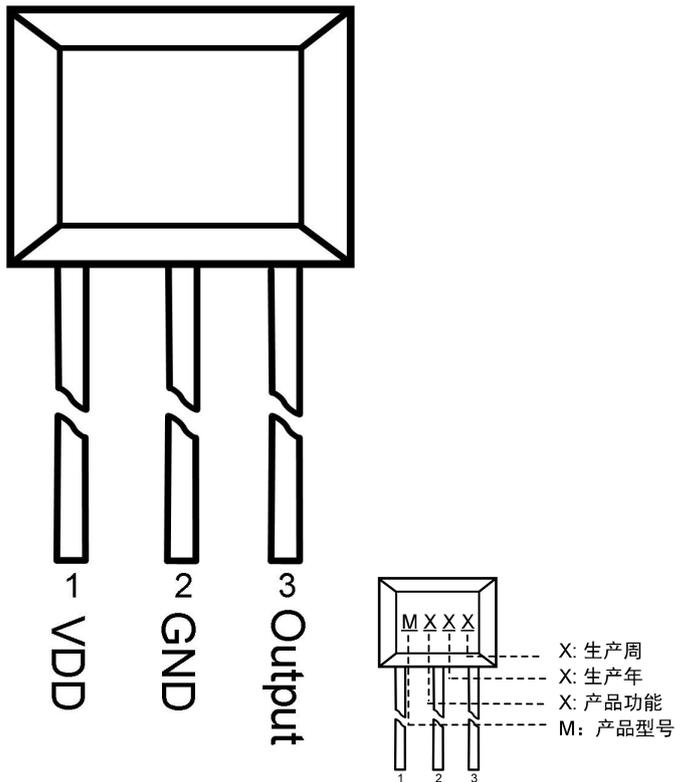


Figure 5: Top view of chip pin configurations

Pin Name	Pin Number	Function Description
VDD	1	Power Supply Input
GND	2	Ground
OUTPUT	3	Output

6 Functional Block Diagram

7 Switch Output Characteristics

When the south pole of a magnet approaches the top of the chip, magnetic lines pass through from the bottom to the top, considering the magnetic induction intensity B as positive. When the north pole approaches the top, magnetic lines pass from the top to the bottom, con-

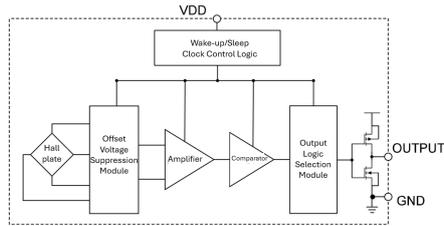
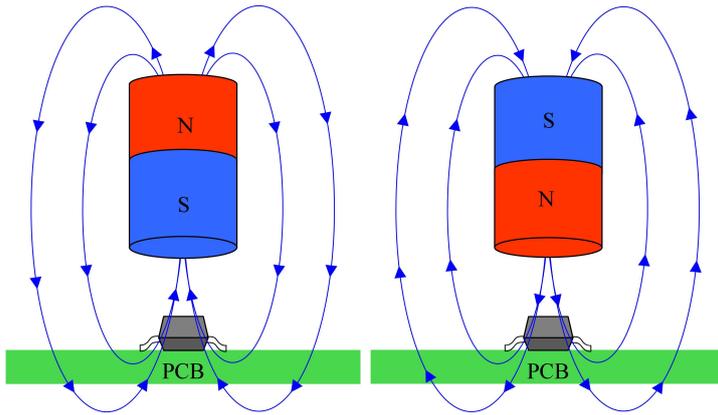
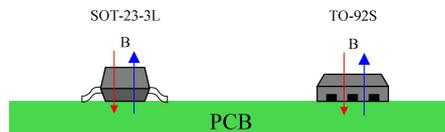


Figure 6: KTH1701 Functional Block Diagram

sidering B as negative.



The KTH1701 is sensitive to magnetic lines passing from the bottom to the top and from the top to the bottom of the chip.



8 Product Model Composition

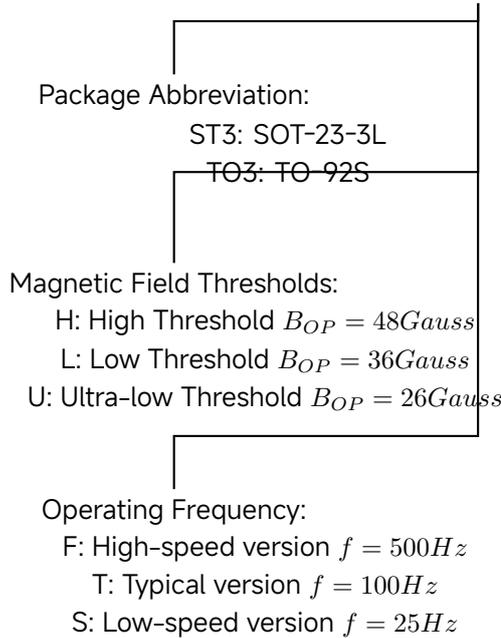
9 Absolute Maximum Ratings

(@ $T_A = +25^\circ\text{C}$, unless otherwise specified)

Item	Parameter Description	Value	Unit
VDD	Supply Voltage	6	V
VDD_REV	Reverse Power Voltage	-0.3	V
IOUTPUT	Output Drive Current	5	mA
B	Magnetic Induction Intensity	No Upper Limit	Gauss
TSTG	Storage Temperature Range	-50 ~ +150	$^\circ\text{C}$
TJ	Maximum Junction Temperature	+150	$^\circ\text{C}$
ESD	HBM ESD Capability	8000	V

- Note: Exceeding absolute maximum ratings may cause permanent damage. Prolonged operation at absolute maximum ratings may

KTH1701 X X-XXX



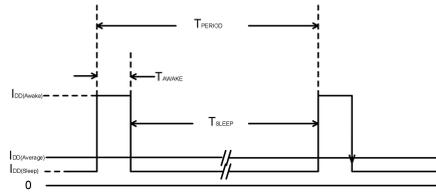
11.2 KTH1701TX Series

Item	Parameter Description	Operating Condition	Min.	Typ.	Max.	Unit
VDD	Supply Voltage	Operating State	1.8	—	5.5	V
VOL	Output Low Level	$I_{OUT}=1mA$	—	0.05	0.15	V
VOH	Output High Level	$I_{OUT}=1mA$	VDD-0.15	VDD-0.1	—	V
$I_{DD(AVG)}$	Average Current	$T_A = +25^\circ C, VDD=1.8V$	—	2.4	—	μA
$I_{DD(Awake)}$	Awake State Current	$T_A = +25^\circ C, VDD=1.8V$	—	2.0	—	mA
$I_{DD(Sleep)}$	Sleep State Current	$T_A = +25^\circ C, VDD=1.8V$	—	0.4	—	μA
T_{Awake}	Wake-up Time	Operating State	—	10	—	μs
T_{Period}	Period	Operating State	—	10	—	ms

11.3 KTH1701SX Series

Item	Parameter Description	Operating Condition	Min.	Typ.	Max.	Unit
VDD	Supply Voltage	Operating State	1.8	—	5.5	V
VOL	Output Low Level	$I_{OUT}=1mA$	—	0.05	0.15	V
VOH	Output High Level	$I_{OUT}=1mA$	VDD-0.15	VDD-0.1	—	V
$I_{DD(AVG)}$	Average Current	$T_A = +25^\circ C, VDD=1.8V$	—	0.9	—	μA
$I_{DD(Awake)}$	Awake State Current	$T_A = +25^\circ C, VDD=1.8V$	—	2.0	—	mA
$I_{DD(Sleep)}$	Sleep State Current	$T_A = +25^\circ C, VDD=1.8V$	—	0.4	—	μA
T_{Awake}	Wake-up Time	Operating State	—	10	—	μs
T_{Period}	Period	Operating State	—	40	—	ms

Note: After the chip is powered on (VDD=1.8V to 5.5V), the output starts sampling, and the output state is valid after the second operation cycle.



12 Magnetic Characteristics

(@ $T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V unless otherwise specified)

12.1 KTH1701X H Series

Item	Parameter Description	Operating Condition	Min.	Typ.	Max.	Unit
B_{OPS}	Magnetic Field Operating Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	38	48	58	Gauss
B_{RPS}	Magnetic Field Release Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	18	28	38	Gauss
B_{OPN}	Magnetic Field Operating Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	-58	-48	-38	Gauss
B_{RPN}	Magnetic Field Release Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	-38	-28	-18	Gauss
$B_{HY}(B_{OPX} - B_{RPX})$	Magnetic Hysteresis		—	20	—	Gauss

12.2 KTH1701X L Series

Item	Parameter Description	Operating Condition	Min.	Typ.	Max.	Unit
B_{OPS}	Magnetic Field Operating Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	26	36	46	Gauss
B_{RPS}	Magnetic Field Release Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	10	20	30	Gauss
B_{OPN}	Magnetic Field Operating Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	-46	-36	-26	Gauss
B_{RPN}	Magnetic Field Release Point	$T_A = +25\text{ }^\circ\text{C}$, VDD=1.8V	-30	-20	-10	Gauss
$B_{HY}(B_{OPX} - B_{RPX})$	Magnetic Hysteresis		—	16	—	Gauss

12.3 KTH1701X U Series

Item	Parameter Description	Operating Condition	Min.	Typ.	Max.	Unit
B_{OPS}	Magnetic Field Operating Point	$T_A = +25^\circ\text{C}$, VDD=1.8V	16	26	36	Gauss
B_{RPS}	Magnetic Field Release Point	$T_A = +25^\circ\text{C}$, VDD=1.8V	4	14	24	Gauss
B_{OPN}	Magnetic Field Operating Point	$T_A = +25^\circ\text{C}$, VDD=1.8V	-36	-26	-16	Gauss
B_{RPN}	Magnetic Field Release Point	$T_A = +25^\circ\text{C}$, VDD=1.8V	-24	-14	-4	Gauss
$B_{HY}(B_{OPX} - B_{RPX})$	Magnetic Hysteresis		—	12	—	Gauss

13 Performance Curves

13.1 KTH1701X H Series (High Threshold Version)

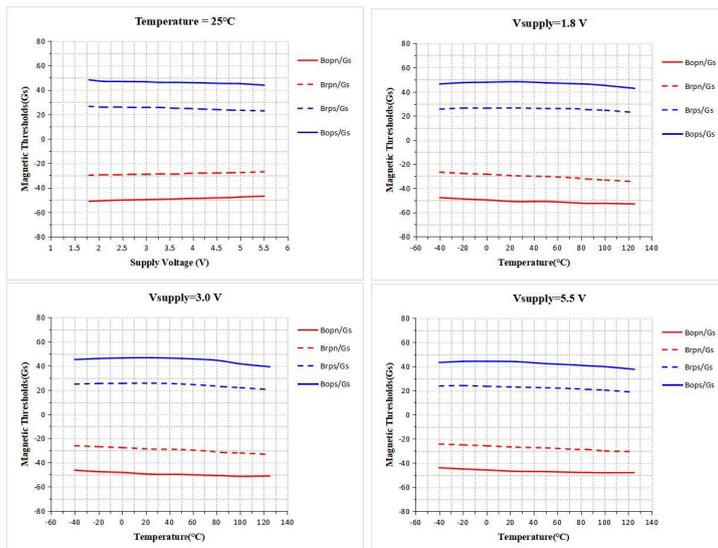


Figure 8: Magnetic Field Threshold vs. Supply Voltage @ $T_A = 25^\circ\text{C}$

Figure 9: Magnetic Field Threshold vs. Temperature @ VDD=1.8V

Figure 10: Magnetic Field Threshold vs. Temperature @ VDD=3.0V

Figure 11: Magnetic Field Threshold vs. Temperature @ VDD=5.5V

13.2 KTH1701X L Series (Low Threshold Version)

13.3 KTH1701X U Series (Ultra-low Threshold Version)

13.4 KTH1701SX, KTH1701TX, and KTH1701FX Series

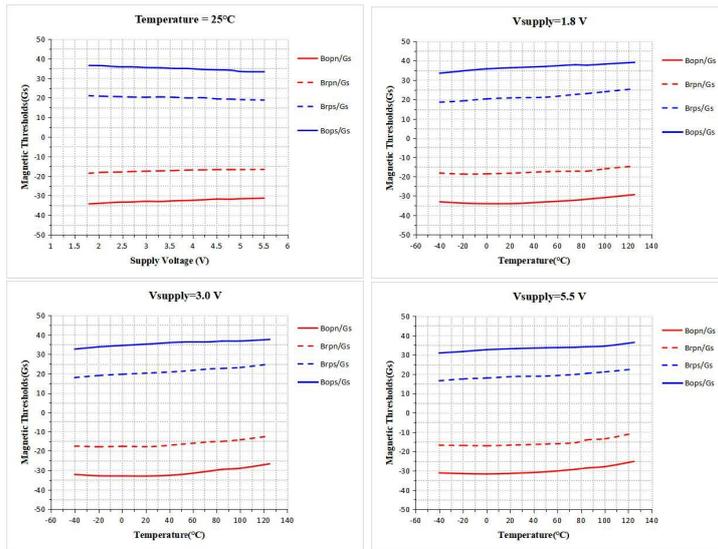


Figure 12: Magnetic Field Threshold vs. Supply Voltage @ $T_A = 25^\circ\text{C}$

Figure 13: Magnetic Field Threshold vs. Temperature @ VDD=1.8V

Figure 14: Magnetic Field Threshold vs. Temperature @ VDD=3.0V

Figure 15: Magnetic Field Threshold vs. Temperature @ VDD=5.5V

14 Ordering Information

Model	Package	Pin Count	Magnetic Threshold (Bop)	Switching Frequency	Temperature
KTH1701FH-ST3	SOT-23-3L	3	48Gauss	500Hz	-40 °C ~ 125 °C
KTH1701TL-ST3	SOT-23-3L	3	36Gauss	100Hz	-40 °C ~ 125 °C
KTH1701TU-ST3	SOT-23-3L	3	26Gauss	100Hz	-40 °C ~ 125 °C
KTH1701SL-ST3	SOT-23-3L	3	36Gauss	25Hz	-40 °C ~ 125 °C
KTH1701SU-ST3	SOT-23-3L	3	26Gauss	25Hz	-40 °C ~ 125 °C
KTH1701FH-TO3	TO-92S	3	48Gauss	500Hz	-40 °C ~ 125 °C
KTH1701TL-TO3	TO-92S	3	36Gauss	100Hz	-40 °C ~ 125 °C
KTH1701TU-TO3	TO-92S	3	26Gauss	100Hz	-40 °C ~ 125 °C
KTH1701SL-TO3	TO-92S	3	36Gauss	25Hz	-40 °C ~ 125 °C
KTH1701SU-TO3	TO-92S	3	26Gauss	25Hz	-40 °C ~ 125 °C

- For SOT23-3L packaged products, SPQ (Standard Packing Quantity) is 3000 units per reel.
- For TO-92S packaged products, SPQ (Standard Packing Quantity) is 1000 units per bulk.

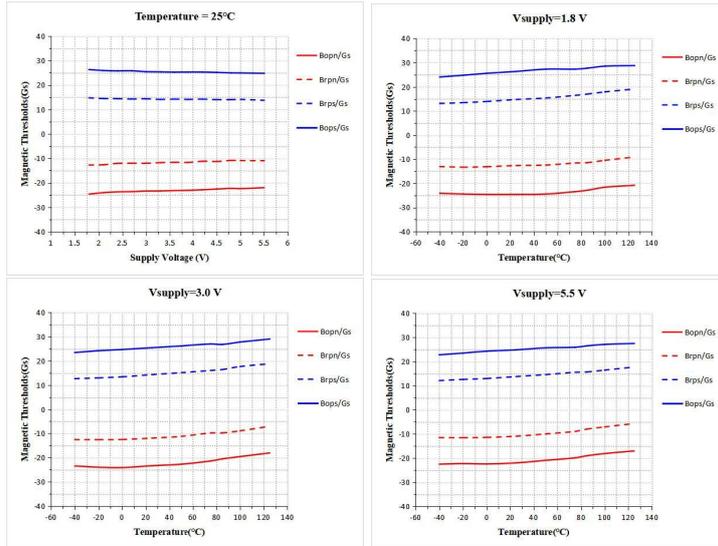


Figure 16: Magnetic Field Threshold vs. Supply Voltage @ $T_A = 25^\circ\text{C}$

Figure 17: Magnetic Field Threshold vs. Temperature @ VDD=1.8V

Figure 18: Magnetic Field Threshold vs. Temperature @ VDD=3.0V

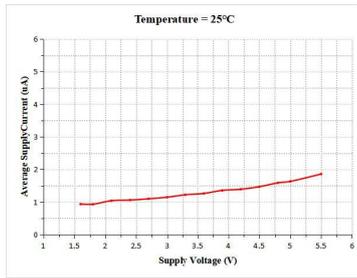
Figure 19: Magnetic Field Threshold vs. Temperature @ VDD=5.5V

15 Package Dimensions

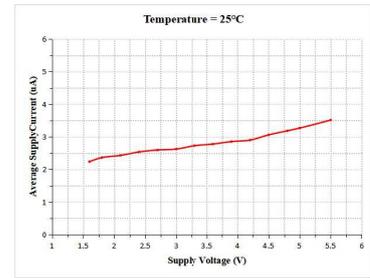
15.1 SOT-23-3L

15.2 TO-92S

KTH1701SX Series (25Hz Version)

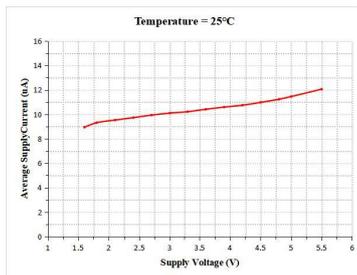


KTH1701TX Series (100Hz Version)



Average Operating Current vs. Supply Voltage @ $T_A = 25^\circ\text{C}$ Average Operating Current vs. Supply Voltage @ $T_A = 25^\circ\text{C}$

KTH1701FX Series (500Hz Version)



Average Operating Current vs. Supply Voltage @ $T_A = 25^\circ\text{C}$

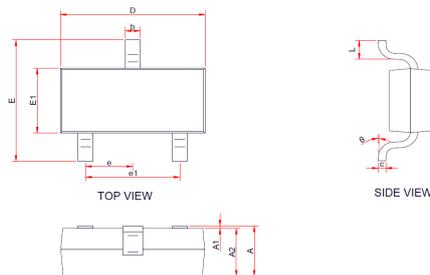


Figure 20: SOT-23-3L Package Dimensions

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	-	-	1.22
A1	0.00	-	0.1
A2	1.00	1.10	1.15
b	0.30	-	0.50
c	0.10	-	0.20
D	2.82	2.95	3.02
E	2.65	2.80	2.95
E1	1.50	1.65	1.70
e	0.85	0.95	1.05
e1	1.80	1.90	2.00
L	0.30	0.45	0.60
θ	0°	-	8°

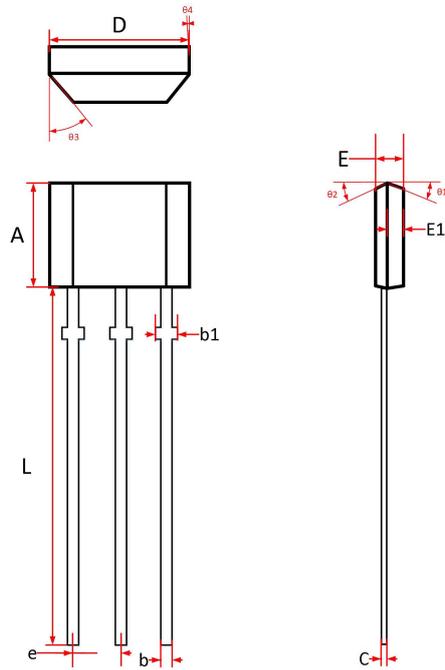


Figure 21: TO-92S Package Dimensions

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	2.90	3.00	3.10
b	0.35	0.39	0.50
b1	0.40	0.44	0.55
C	0.36	0.38	0.45
D	3.90	4.00	4.10
E	1.42	1.52	1.62
E1	-	0.75	-
e	-	1.27 TYP	-
L	13.50	14.50	15.50
$\theta 1$	-	6°	-
$\theta 2$	-	3°	-
$\theta 3$	-	45°	-
$\theta 4$	-	3°	-

Table 1: Package Dimensions