

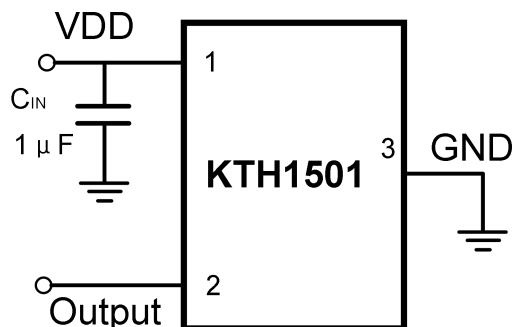
Features

- Low power Consumption
 - 5Hz Version: 1.6uA@1.8V (typical)
 - 20Hz Version: 3.3uA@1.8V (typical)
- Supply Voltage: 1.6V~5.5V
- High Magnetic Sensitivity
 - $B_{OP} = \pm 22Gs$ $B_{RP} = \pm 16GS$
 - $B_{OP} = \pm 33Gs$ $B_{RP} = \pm 23GS$
 - $B_{OP} = \pm 46Gs$ $B_{RP} = \pm 34GS$
- Magnetic Type: Omni-polar
- Push-Pull CMOS Output (No External Pull-up Resistors Required)
- Industrial Grade Package : SOT-23-3L(MSL1) , TO-92S
- Operating Temperature: $-40^{\circ}C \sim 125^{\circ}C$
- High ESD Rating: HBM 8KV
- RoHS Compliant

Application

- Meter anti-theft detection
- Doors, Lids, Covers and Tray Position Detect Switches
- Water, electric and gas utility meters
- IoT Contact-less Switches
- Medical equipment switch detection

Typical Application Circuit

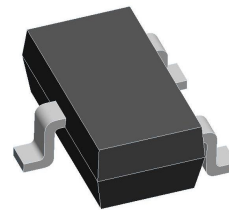


Note: C_{IN} is for stabilization and to strengthen the noise immunity, the recommended capacitance is $1 \mu F$ typical and should be placed as close to the supply pin as possible.

Descriptions

The KTH1501 is a miniature micropower magnetic Hall effect switch IC with single output. The temperature compensation circuitry improves stability of magnetic switch points over the whole operating range. If the magnetic flux density perpendicular to the part marking surface is larger than operating point (BOP), the output will be turned on; if it is less than releasing point (BRP), the output will be turned off. Designed for battery powered consumer equipment, home applications and industrial applications, the average supply current is only $1.6 \mu A$ at 1.8V. To support portable equipment the KTH1501 can operate over the supply range of 1.6V to 5.5V.

The KTH1501 family provides a variety of package to customers: SOT-23-3L for surface mount and TO-92S flat for through-hole mount. All package are RoHS compliant.



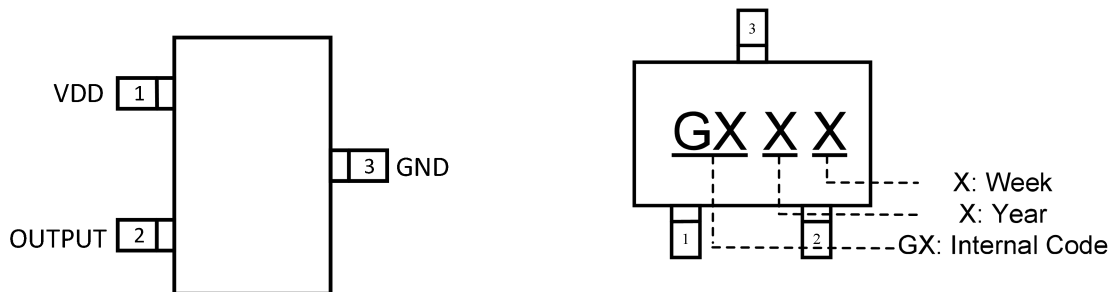
SOT-23-3L



TO-92S

Pin Descriptions

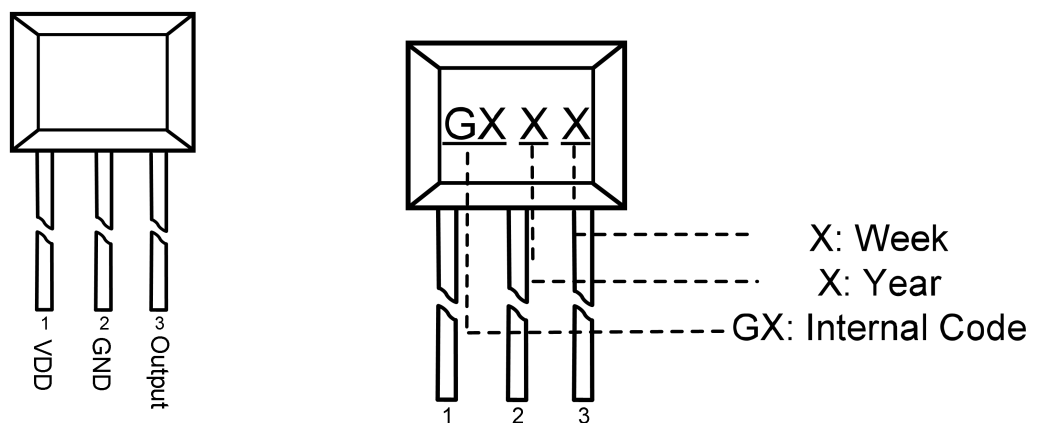
SOT-23-3L



Top view

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

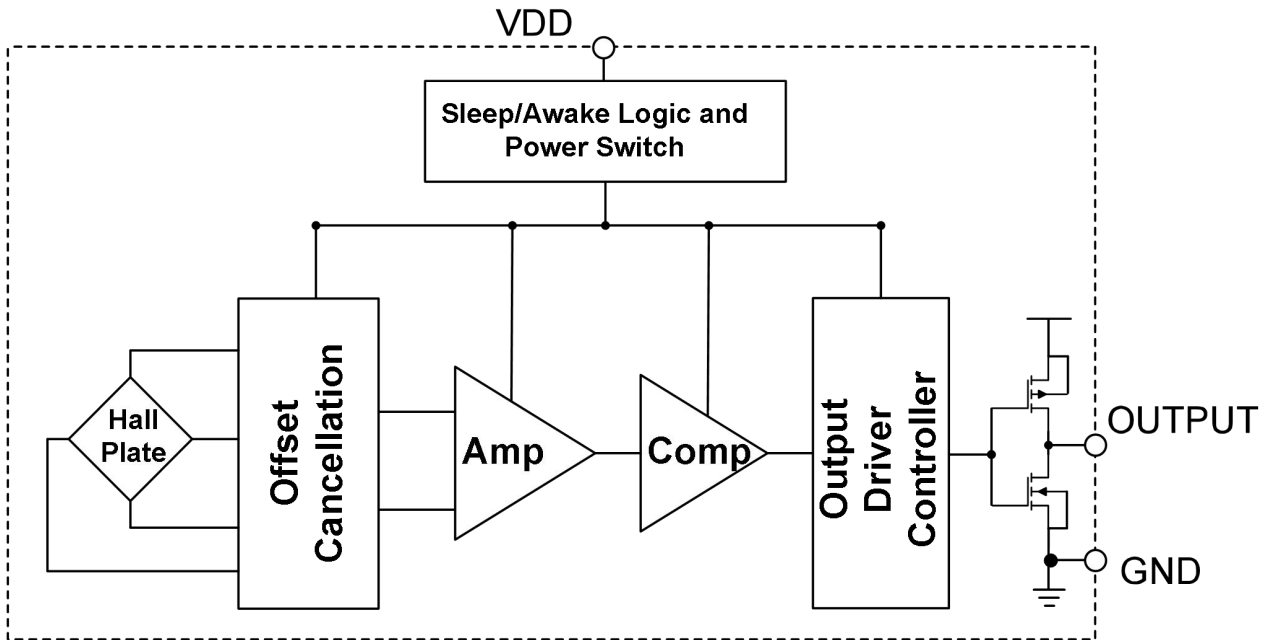
TO-92S



Top view

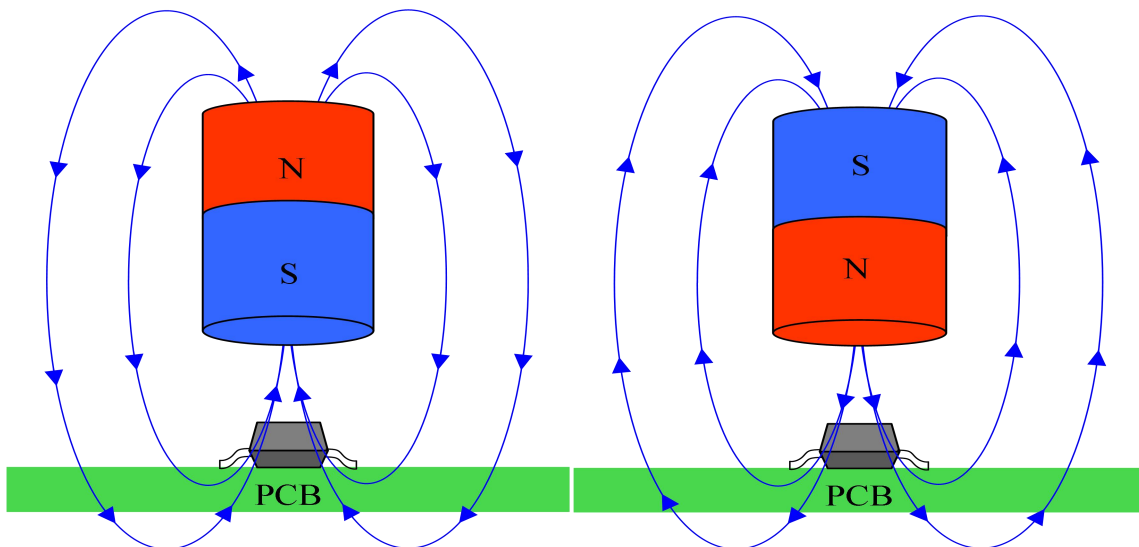
Pin Name	Pin Number	Function
VDD	1	Power Supply Input
GND	2	Ground Pin
OUTPUT	3	Output Pin

Block Diagram

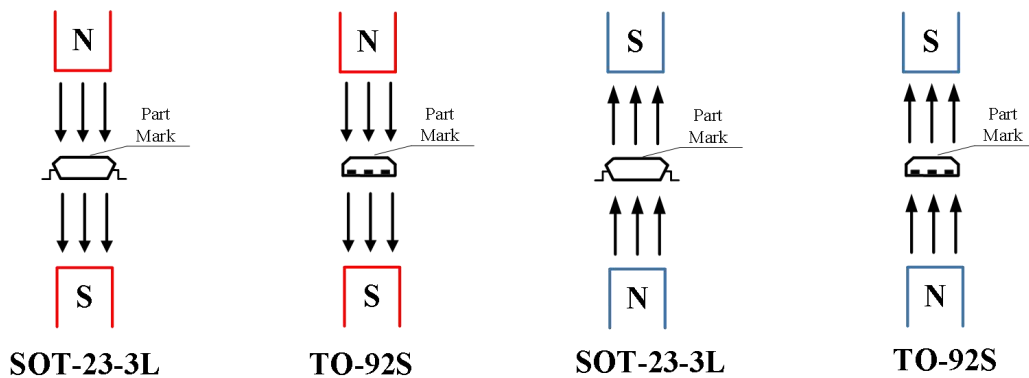
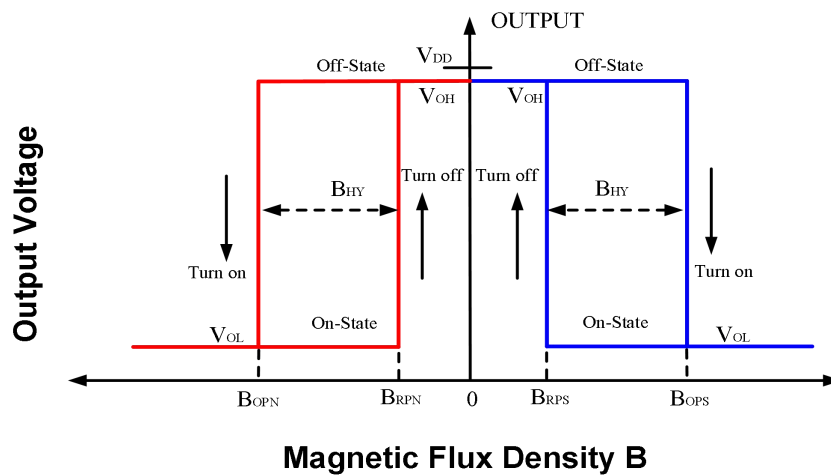
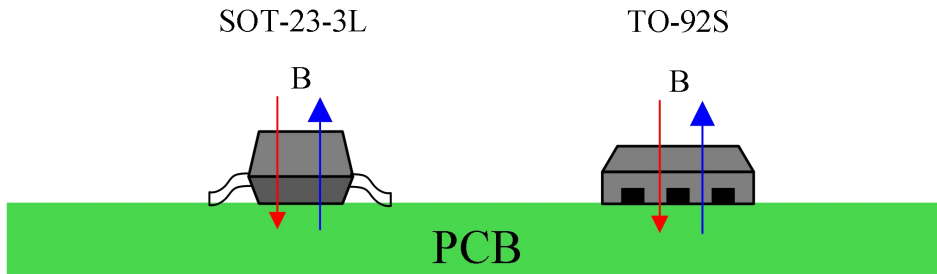


Output Switching Characteristics

As shown in the figure below, when the South Pole of the magnet is near the top of the chip, the magnetic induction line passes from the bottom of the chip to the top. It is considered that the magnetic flux density B is positive at this time. When the North Pole of the magnet is near the top of the chip, the magnetic induction line passes from the top of the chip to the bottom, and the magnetic flux density B is considered to be negative.



As shown in the figure below, KTH1501 can detect the magnetic fields of the South Pole and the North Pole.



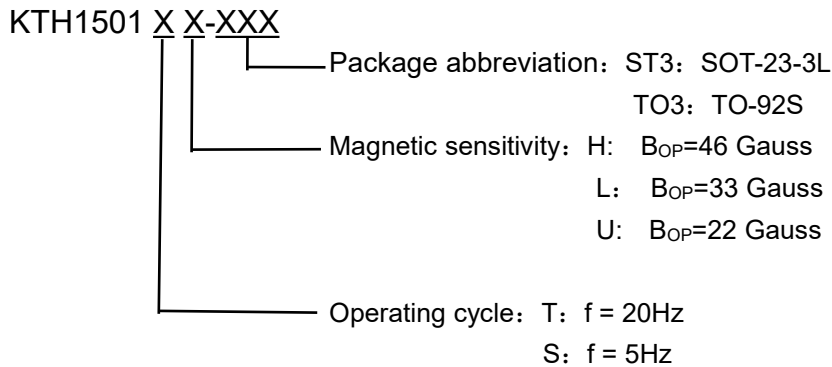
Magnetic Field Directions for Omnipolar Mode Operation

KTH1501 Series



High sensitivity, Low Power, Omni-polar Hall Switch

Product Name Structure



Absolute Maximum Ratings (@T_A=+25°C, unless otherwise specified)

Symbol	Parameter	Value	Unit
V _{DD}	Supply Voltage Dissipation	6	V
V _{DD_REV}	V _{IN} Range	-0.3	V
I _{OUTPUT}	Output Current	5	mA
B	Magnetic Flux Density	Unlimited	Gauss
P _D	Package Power Dissipation	400	mW
T _{STG}	Storage Temperature Range	-50~+150	°C
T _J	Maximum Junction Temperature	+150	°C
ESD HBM	Human Body Model ESD Capability	8000	V

Note: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum rated conditions for extended periods may affect device reliability.

Recommended Operating Range (@T_A=+25°C, unless otherwise specified)

Symbol	Parameter	Conditions	Value	Unit
V _{DD}	Supply Voltage	Operating	1.6~5.5	V
T _A	Operating temperature Range	Operating	-40~125	°C

KTH1501 Series

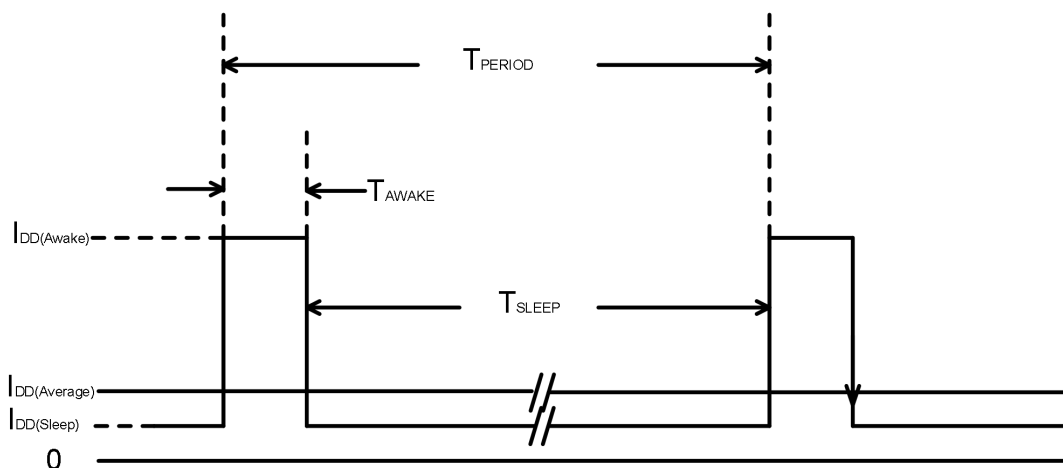


High sensitivity, Low Power, Omni-polar Hall Switch

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

KTH1501TX Series						
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
VDD	Supply Voltage	Operating	1.6	—	5.5	V
VOL	Output Low Voltage (On)	$I_{OUT}=1\text{mA}$	—	0.05	0.15	V
VOH	Output High Voltage (Off)	$I_{OUT}=1\text{mA}$	$V_{DD}-0.15$	$V_{DD}-0.05$	—	V
$I_{DD(AVG)}$	Average Supply Current	$T_A=+25^{\circ}\text{C}$, $V_{DD}=1.8\text{V}$	—	3.30	—	μA
$I_{DD(Awake)}$	Awake Supply Current	$T_A=+25^{\circ}\text{C}$, $V_{DD}=1.8\text{V}$	—	2.0	—	mA
$I_{DD(Sleep)}$	Sleep Supply Current	$T_A=+25^{\circ}\text{C}$, $V_{DD}=1.8\text{V}$	—	1.00	—	μA
T_{AWAKE}	Awake Time	Operating	—	50	—	μs
T_{PERIOD}	Period	Operating	—	50	—	ms
KTH1501SX Series						
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
VDD	Supply Voltage	Operating	1.6	—	5.5	V
VOL	Output Low Voltage (On)	$I_{OUT}=1\text{mA}$	—	0.02	0.15	V
VOH	Output High Voltage (Off)	$I_{OUT}=1\text{mA}$	$V_{DD}-0.15$	$V_{DD}-0.05$	—	V
$I_{DD(AVG)}$	Average Supply Current	$T_A=+25^{\circ}\text{C}$, $V_{DD}=1.8\text{V}$	—	1.6	—	μA
$I_{DD(Awake)}$	Awake Supply Current	$T_A=+25^{\circ}\text{C}$, $V_{DD}=1.8\text{V}$	—	2.0	—	mA
$I_{DD(Sleep)}$	Sleep Supply Current	$T_A=+25^{\circ}\text{C}$, $V_{DD}=1.8\text{V}$	—	1.0	—	μA
T_{AWAKE}	Awake Time	Operating	—	50	—	μs
T_{PERIOD}	Period	Operating	—	200	—	ms

Note: When the power is initially turned on, the operating VDD (1.6V to 5.5V) must be applied to guaranteed the output sampling. The output state is valid after the first operating cycle.。



KTH1501 Series



High sensitivity, Low Power, Omni-polar Hall Switch

Magnetic Characteristics (T_A=25°C, VDD=1.8V, unless otherwise noted)

Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
KTH1501X H Series						
B _{OPS}	Output Operation Point	TA=+25°C, VDD=1.8V	40	46	52	Gauss
B _{RPS}	Output Operation Point	TA=+25°C, VDD=1.8V	26	34	38	
B _{OPN}	Output Release Point	TA=+25°C, VDD=1.8V	-52	-46	-40	
B _{RPN}	Output Release Point	TA=+25°C, VDD=1.8V	-38	-34	-26	
B _{HY} (B _{OPX} - B _{RPX})	Hysteresis		-	12	-	

Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
KTH1501X L Series						
B _{OPS}	Output Operation Point	TA=+25°C, VDD=1.8V	26	33	38	Gauss
B _{RPS}	Output Operation Point	TA=+25°C, VDD=1.8V	16	23	28	
B _{OPN}	Output Release Point	TA=+25°C, VDD=1.8V	-38	-33	-28	
B _{RPN}	Output Release Point	TA=+25°C, VDD=1.8V	-28	-23	-16	
B _{HY} (B _{OPX} - B _{RPX})	Hysteresis		-	10	-	

Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
KTH1501X U Series						
B _{OPS}	Output Operation Point	TA=+25°C, VDD=1.8V	14	22	30	Gauss
B _{RPS}	Output Operation Point	TA=+25°C, VDD=1.8V	8	16	24	
B _{OPN}	Output Release Point	TA=+25°C, VDD=1.8V	-30	-22	-14	
B _{RPN}	Output Release Point	TA=+25°C, VDD=1.8V	-24	-16	-8	
B _{HY} (B _{OPX} - B _{RPX})	Hysteresis		-	6	-	

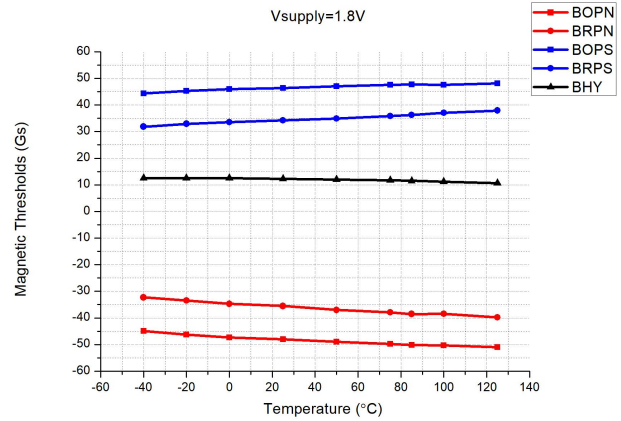
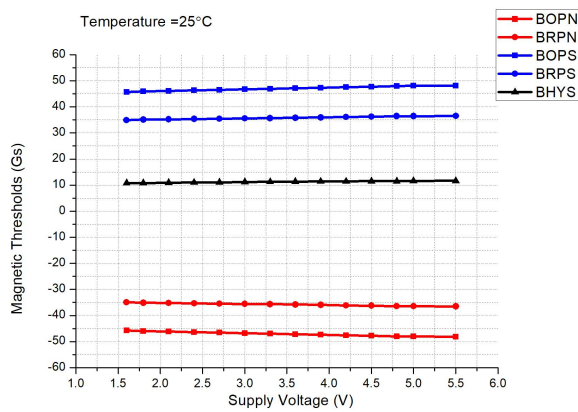
KTH1501 Series



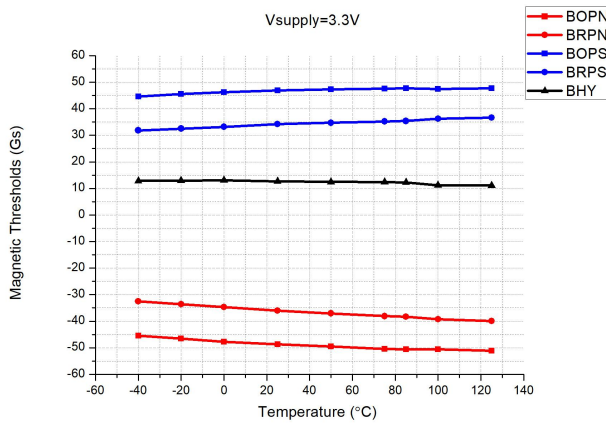
High sensitivity, Low Power, Omni-polar Hall Switch

Performance Graphs

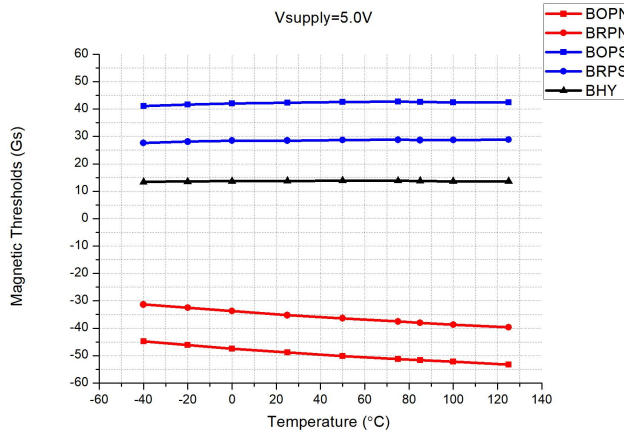
KTH1501XH Series (B_{OP}=46Gs)



Magnetic Thresholds vs. Supply Voltage @T_A=25°C



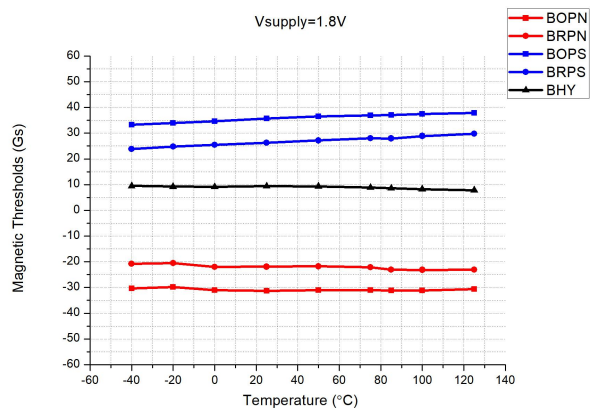
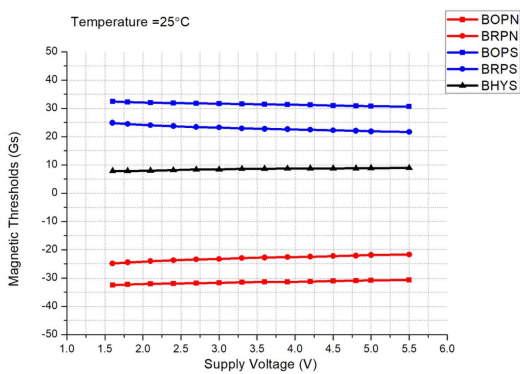
Magnetic Thresholds vs T_A @VDD=1.8V



Magnetic Thresholds vs T_A @VDD=3.3V

Magnetic Thresholds vs T_A @VDD=5.0V

KTH1501XL Series (B_{OP}=33Gs)



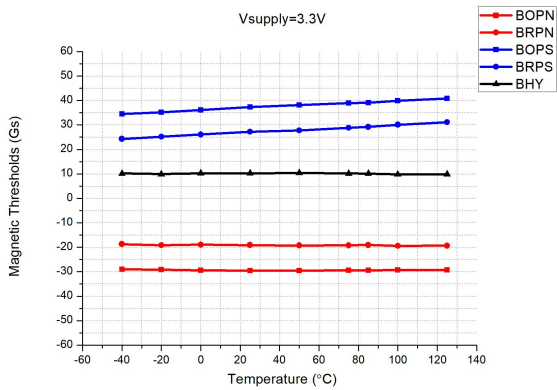
Magnetic Thresholds vs. Supply Voltage @T_A=25°C

Magnetic Thresholds vs T_A @VDD=1.8V

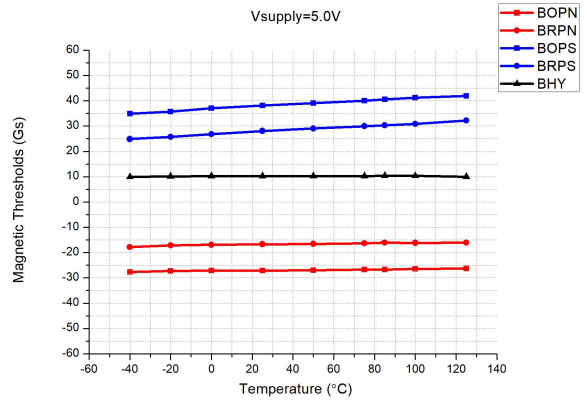


KTH1501 Series

High sensitivity, Low Power, Omni-polar Hall Switch

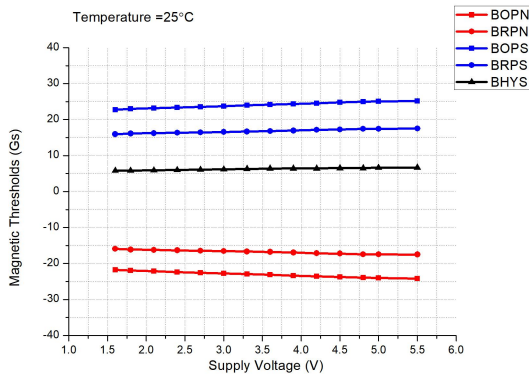


Magnetic Thresholds vs T_A @VDD=3.3V

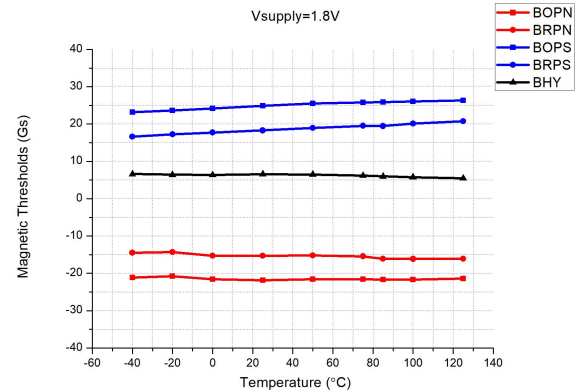


Magnetic Thresholds vs T_A @VDD=5.0V

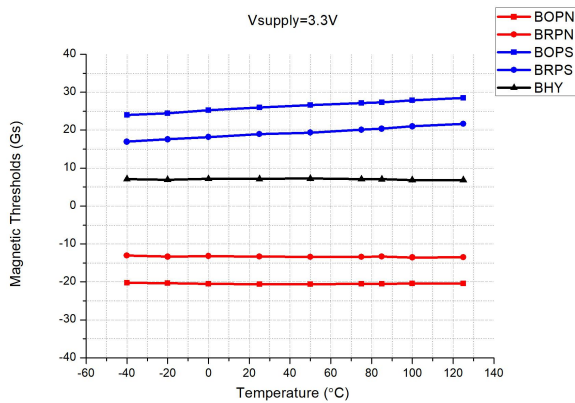
KTH1501XU Series ($B_{Op}=22Gs$)



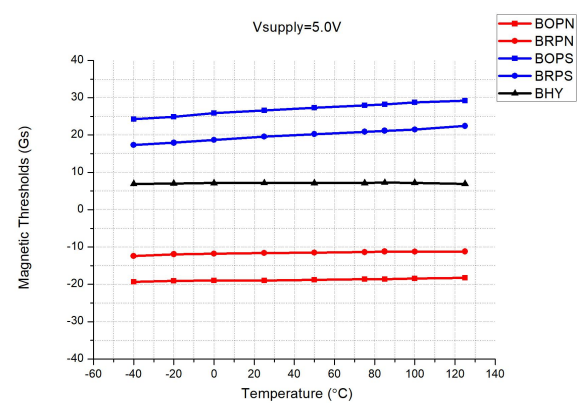
Magnetic Thresholds vs. Supply Voltage @ $T_A=25^\circ C$



Magnetic Thresholds vs T_A @VDD=1.8V



Magnetic Thresholds vs T_A @VDD=3.3V



Magnetic Thresholds vs T_A @VDD=5.0V

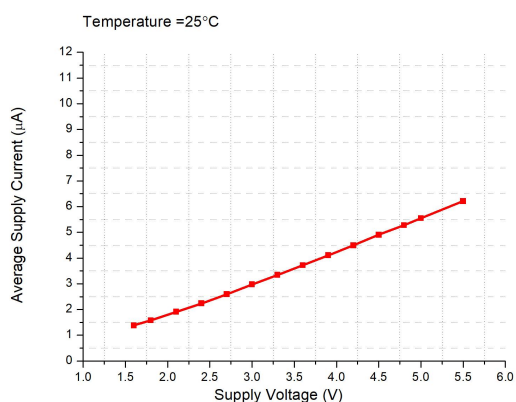


KTH1501 Series

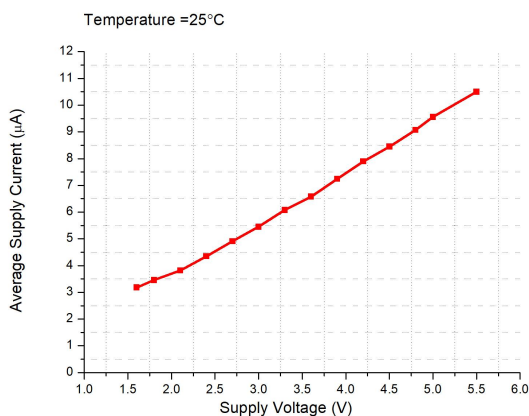
High sensitivity, Low Power, Omni-polar Hall Switch

KTH1501SX Series (t_{CYCLE}=200ms)

KTH1501T X Series (t_{CYCLE}=50ms)



Current Consumption vs. Supply Voltage @T_A=25°C



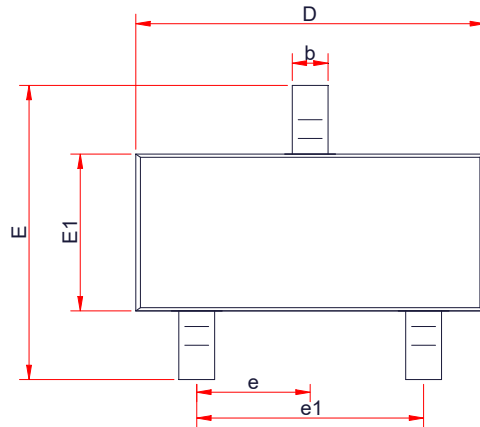
Current Consumption vs. Supply Voltage @T_A=25°C

Order Information

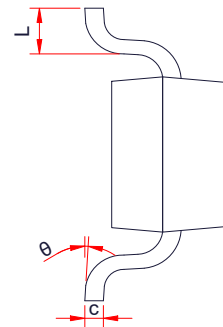
Part Numbers	Package	Number of Pins	Bop	Operating Frequency	Temperature
KTH1501TH-ST3*	SOT-23-3L	3	46Gauss	20Hz	-40°C~125°C
KTH1501TL-ST3*	SOT-23-3L	3	33Gauss	20Hz	-40°C~125°C
KTH1501TU-ST3*	SOT-23-3L	3	22Gauss	20Hz	-40°C~125°C
KTH1501SH-ST3*	SOT-23-3L	3	46Gauss	5Hz	-40°C~125°C
KTH1501SL-ST3	SOT-23-3L	3	33Gauss	5Hz	-40°C~125°C
KTH1501SU-ST3*	SOT-23-3L	3	22Gauss	5Hz	-40°C~125°C
KTH1501TH-TO3*	TO-92S	3	46Gauss	20Hz	-40°C~125°C
KTH1501TL-TO3*	TO-92S	3	33Gauss	20Hz	-40°C~125°C
KTH1501TU-TO3*	TO-92S	3	22Gauss	20Hz	-40°C~125°C
KTH1501SH-TO3*	TO-92S	3	46Gauss	5Hz	-40°C~125°C
KTH1501SL-TO3*	TO-92S	3	33Gauss	5Hz	-40°C~125°C
KTH1501SU-TO3*	TO-92S	3	22Gauss	5Hz	-40°C~125°C

PACKAGE OUTLINE DIMENSIONS

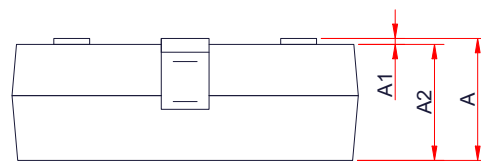
SOT-23-3L



TOP VIEW



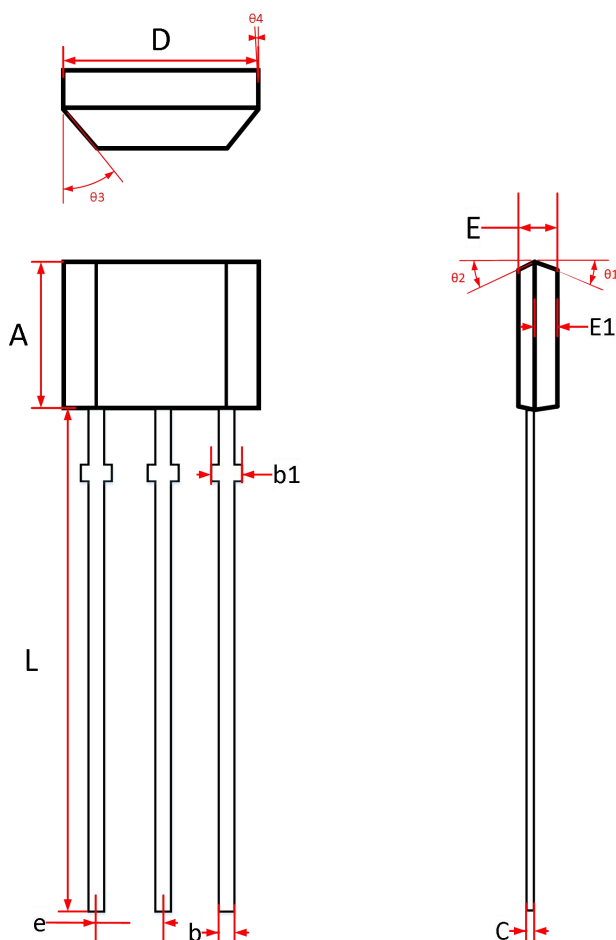
SIDE VIEW



SIDE VIEW

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	-	-	1.25
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 °

TO-92S



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°	