

## Hall effect switch sensor

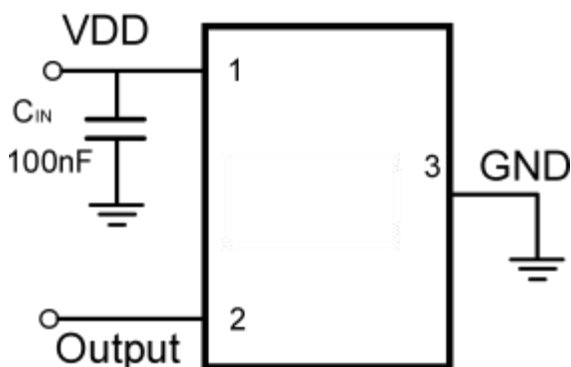
### 1.Features

- Low power consumption
  - 5Hz version: 1.6uA@ 1.8V
  - 20Hz version: 3.3uA@ 1.8V
- Wide operating voltage range: 1.6V~5.5V
- Selectable magnetic field threshold (Bop)
  - 33Gs Low Threshold
  - 46Gs High Threshold
- Single S-pole magnetic field detection
- CMOS Push-pull output
- Package: SOT-23
- Operating temperature range: -40°C~85°C
- Excellent ESD performance: HBM 8KV
- RoHS compliant

### 2.Typical Applications

- Laptop and Tablet Switch Detection
- TWS earphones, mobile phones
- Electronic lock, valve position detection
- Water meter, gas meter, flow meter
- Non-contact detection

### 3.Application Circuit Schematic



Note: In order to filter out the noise at the power supply end of the chip, a 100nF capacitor should be connected between the power supply and the ground, and the capacitor should be as close to the VDD pin as possible.

### 4.Description

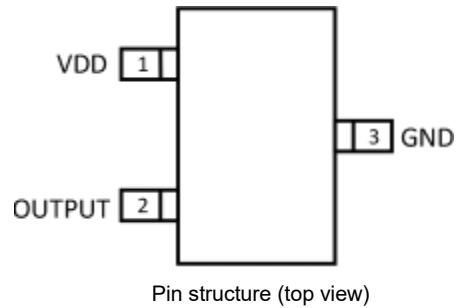
SL1613 is a low-power Hall switch sensor designed for space-constrained systems and battery-sensitive systems. The chip can provide a variety of magnetic field thresholds, switching operating frequencies and packaging forms to adapt to various applications. When the applied S-pole magnetic induction intensity exceeds the operating point  $B_{OP}$ , the chip outputs a low level and maintains a low level. Until the S-pole magnetic induction intensity is lower than the release point  $B_{RP}$ , the chip outputs a high level. The chip has built-in temperature compensation circuits and clock logic circuits to ensure the chip's stable operating point and switching frequency. The chip can provide a single S-pole magnetic response with extremely low current consumption. SL1613 can operate in a supply voltage range of 1.6V to 5.5V and uses a standard SOT-23 package



SOT-23

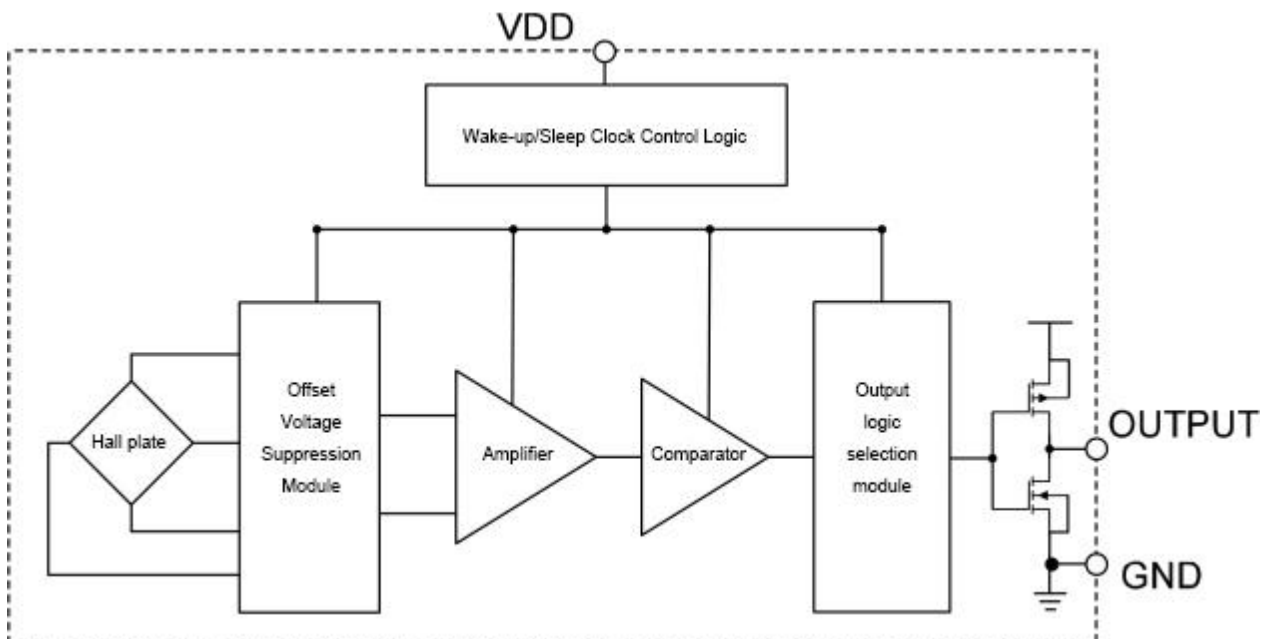
**5.Pin definition and marking information**

SOT-23



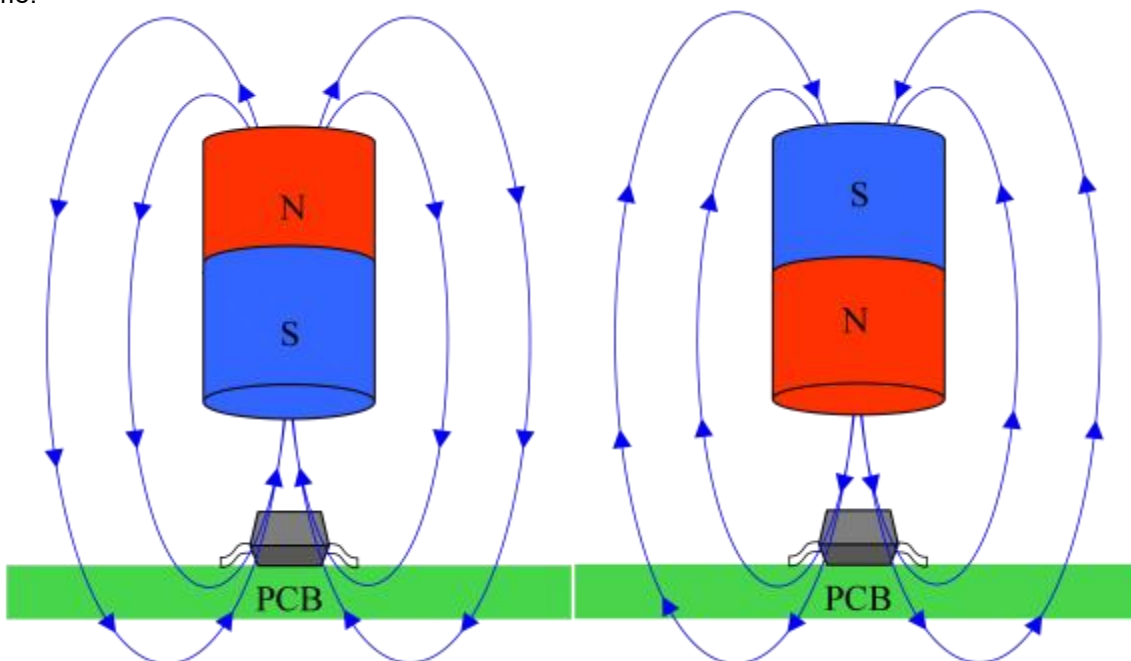
Pin Name	Pin Number	Functional Description
VDD	1	Power input
OUTPUT	2	Power output
GND	3	Ground

**6.Function Diagram**

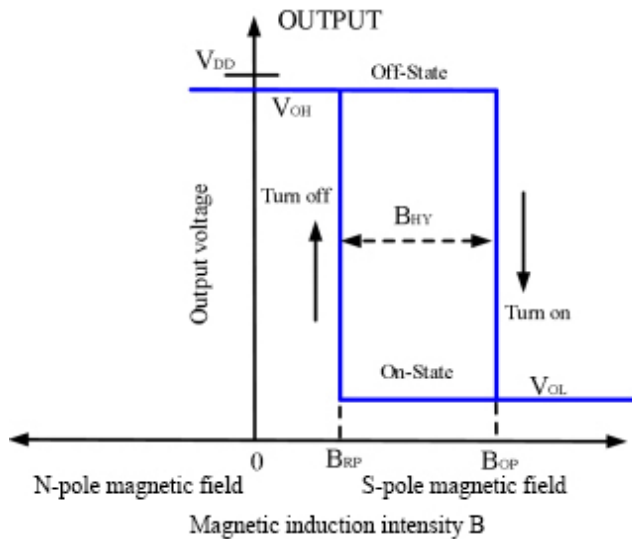


**7.Switching output characteristics**

As shown in the figure below, when the south pole of the magnet is close to the top of the chip, the magnetic flux lines pass from the bottom to the top of the chip, and the magnetic induction intensity  $B$  is considered to be positive at this time; when the north pole of the magnet is close to the top of the chip, the magnetic flux lines pass from the top to the bottom of the chip, and the magnetic induction intensity  $B$  is considered to be negative at this time.



**Output Characteristics**



**8.Product model composition**

SL 1613 - X X



Magnetic field threshold: H: High Threshold BOP=46Gauss  
 L: Low Threshold BOP=33Gauss  
 Operating frequency: T: Typical version f=20Hz  
 S: Low speed version f=5Hz

**9. Absolute Maximum Ratings (@TA=+25°C, Unless otherwise specified)**

Project	Parameter description	Value	Unit
V <sub>DD</sub>	Supply voltage	6	V
V <sub>DD_REV</sub>	Reverse supply voltage	-0.3	V
I <sub>OUTPUT</sub>	Output drive current	5	mA
B	Magnetic induction intensity	No limit	Gauss
P <sub>D</sub>	Package	400	mW
T <sub>STG</sub>	Operating temperature range	-50~+150	oC
T <sub>J</sub>	Maximum temperature resistance of the node	150	oC
ESD HBM	Human Body Model ESD Capability	8000	V

**Note: Stresses exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.**

**10. Reference working conditions (@TA=+25°C, Unless otherwise specified)**

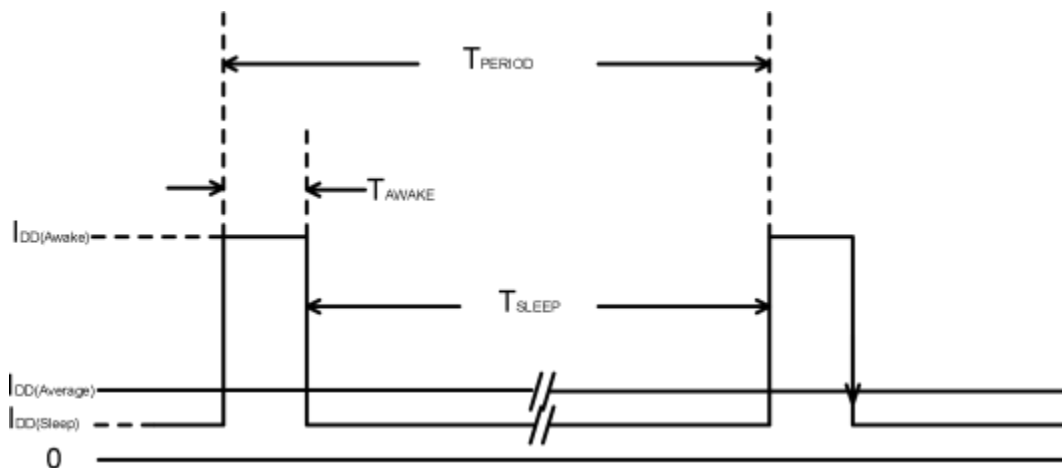
Project	Parameter description	Working conditions	Value	Unit
VDD	Supply voltage range	Chip working	1.6~5.5	V
TA	Operating temperature range	Chip working	-40~85	oC

**11. Electrical parameters (@TA=+25°C, VDD=1.8V Unless other wise specified)**

SL 1613-TX Series						
Project	Parameter description	Working conditions	Min	Typ	Max	Unit
V <sub>DD</sub>	Supply voltage	Working status	1.6	—	5.5	V
V <sub>OL</sub>	Output low level	I <sub>OUT</sub> = 1mA	—	0.02	0.1	V
V <sub>OH</sub>	Output high level	I <sub>OUT</sub> = 1mA	V <sub>DD</sub> -0.1	V <sub>DD</sub> -0.02	—	V
I <sub>DD(AVG)</sub>	Average current	TA=+25°C , VDD= 1.8V	—	3.3	—	μA
I <sub>DD(Awake)</sub>	Wake-up state current	TA=+25°C , VDD= 1.8V	—	2	—	mA
I <sub>DD(Sleep)</sub>	Sleep state current	TA=+25°C , VDD= 1.8V	—	1	—	μA
T <sub>AWAKE</sub>	Wake-up time	Working status	—	50	—	μs
T <sub>PERIOD</sub>	Cycle	Working status	—	50	—	ms

SL1613-SX Series						
Project	Parameter description	Working conditions	Min	Typ	Max	Unit
V <sub>DD</sub>	Supply voltage	Working status	1.6	—	5.5	V
V <sub>OL</sub>	Output low level	I <sub>OUT</sub> = 1mA	—	0.02	0.1	V
V <sub>OH</sub>	Output high level	I <sub>OUT</sub> = 1mA	V <sub>DD</sub> -0.1	V <sub>DD</sub> -0.02	—	V
I <sub>DD(AVG)</sub>	Average current	TA=+25°C , V <sub>DD</sub> = 1.8V	—	1.6	—	μA
I <sub>DD(Awake)</sub>	Wake-up state current	TA=+25°C , V <sub>DD</sub> = 1.8V	—	2	—	mA
I <sub>DD(Sleep)</sub>	Sleep state current	TA=+25°C , V <sub>DD</sub> = 1.8V	—	1	—	μA
T <sub>AWAKE</sub>	Wake-up time	Working status	—	50	—	μs
T <sub>PERIOD</sub>	Cycle	Working status	—	200	—	ms

**Note:** After the chip is powered on (VDD is 1.6V~5.5V), the output starts sampling and output state is valid after second working cycle.



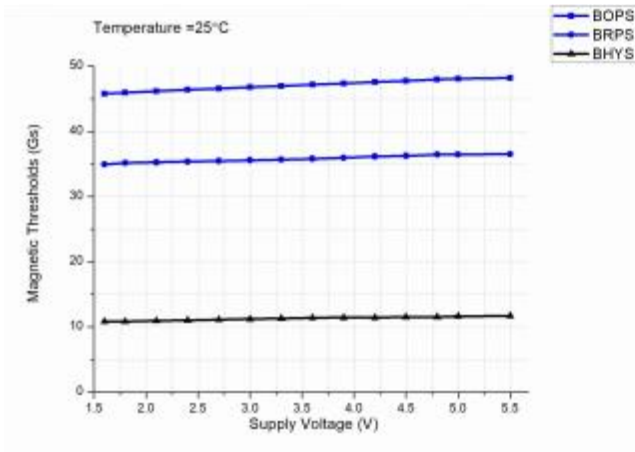
## 12. Magnetic parameters (@TA=+25°C, VDD=1.8V Unless otherwise specified)

Project	Parameter description	Working conditions	Min	Typ	Max	Unit
SL1613-XL Series						
B <sub>OPS</sub>	Magnetic field operating point	TA=+25°C , VDD= 1.8V	26	33	38	Gauss
B <sub>RPS</sub>	Magnetic field release point	TA=+25°C , VDD= 1.8V	16	23	28	
B <sub>HY</sub> ( B <sub>OPS</sub>  -  B <sub>RPS</sub>  )	Hysteresis		-	10	-	

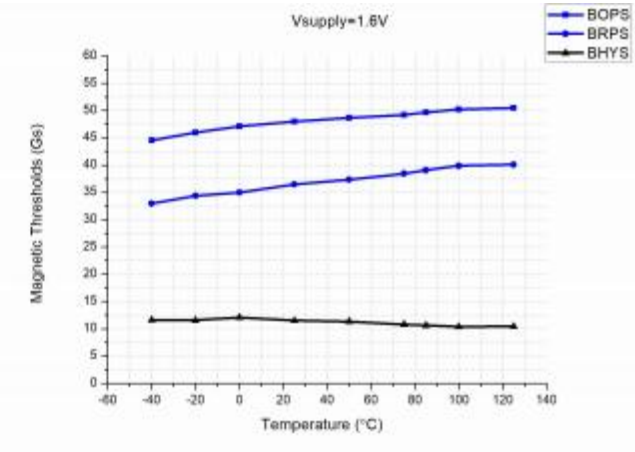
Project	Parameter description	Working conditions	Min	Typ	Max	Unit
<b>SL1613-XL Series</b>						
BOPS	Magnetic field operating point	TA=+25°C , VDD= 1.8V	26	33	38	Gauss
BRPS	Magnetic field release point	TA=+25°C , VDD= 1.8V	16	23	28	
BHY ( BOPS - BRPS )	Hysteresis			10		

### 13. Performance curvegraph

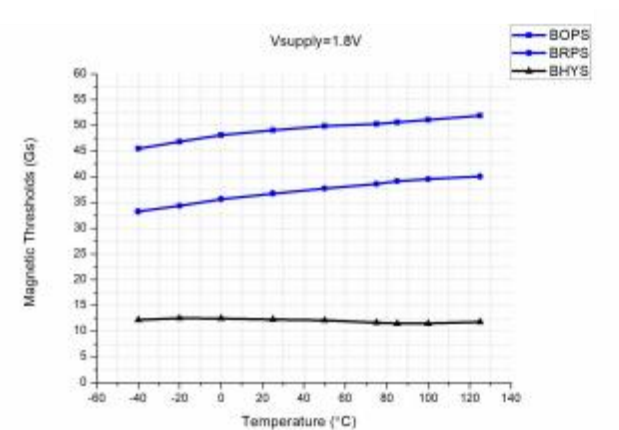
SL1613-XH Series (High threshold version)



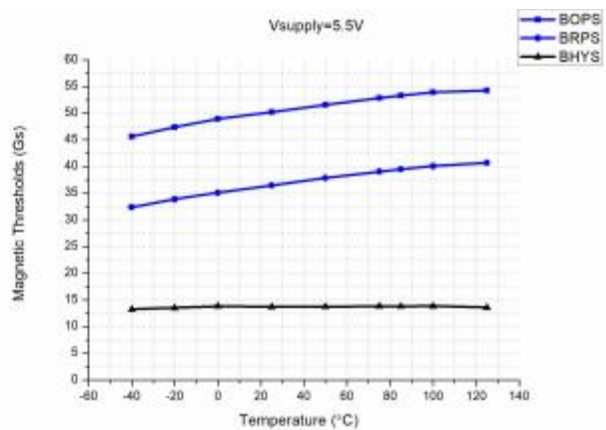
Magnetic field threshold vs Supply voltage @TA=25°C



Magnetic field threshold vs Temperature @VDD=1.6

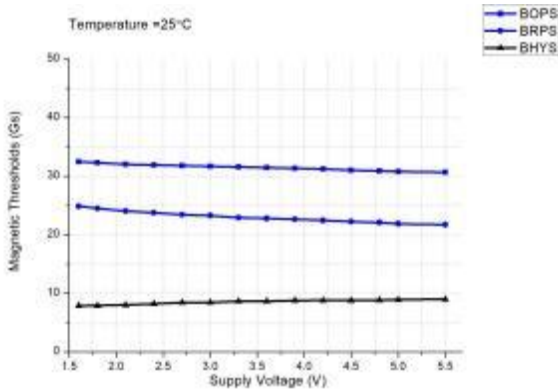


Magnetic field threshold vs Temperature @VDD=1.8V

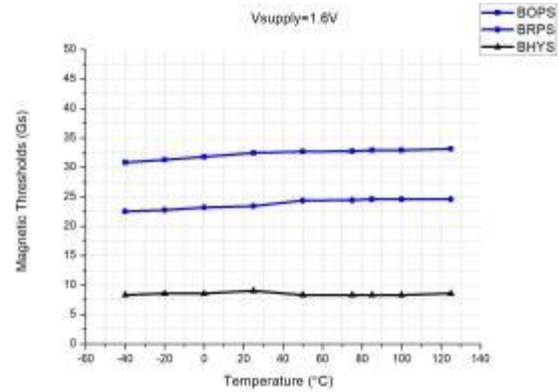


Magnetic field threshold vs Temperature @VDD=5.5

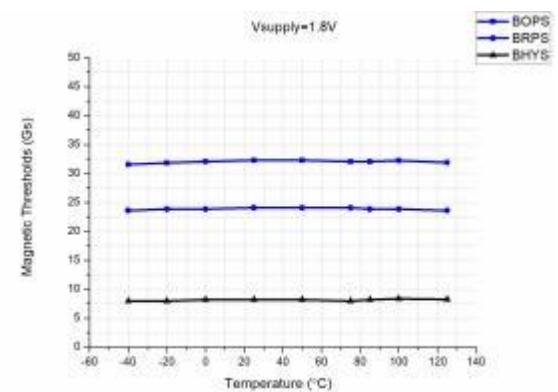
## SL1613-XL Series (Low threshold version)



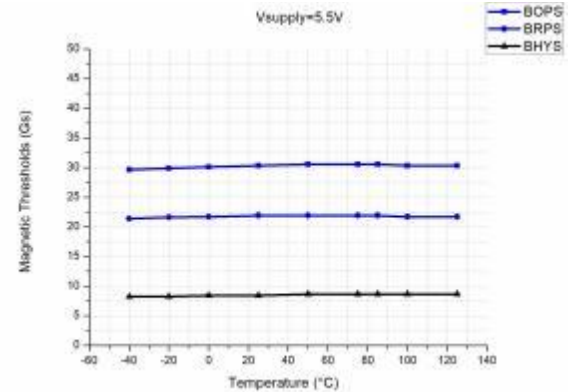
Magnetic field threshold vs Supply voltage @TA=25°C



Magnetic field threshold vs Temperature @VDD=1.6

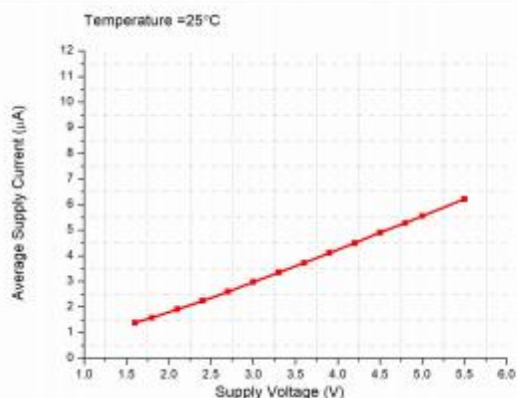


Magnetic field threshold vs Temperature @VDD=1.8V



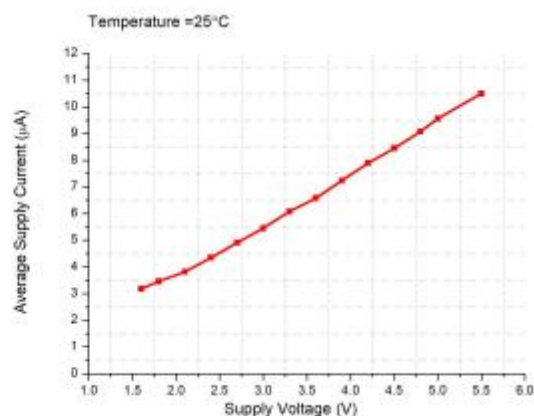
Magnetic field threshold vs Temperature @VDD=5.5

## SL1613- SX Series (Low speed version)



Average operating current vs. Supply voltage @ TA=25°C

## SL1613-TX Series(Typical version)

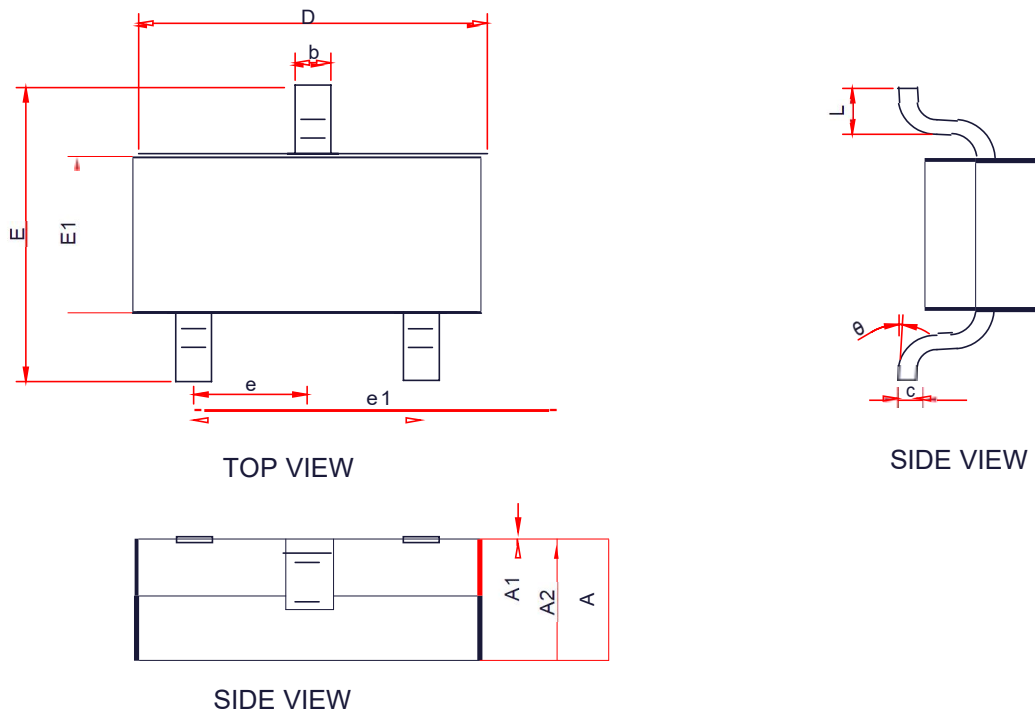


Average operating current vs. Supply voltage @ TA=25°C



**14.Ordering Information**

<b>Model</b>	<b>Package</b>	<b>Pin</b>	<b>Magnetic field threshold (Bop)</b>	<b>Switching frequency</b>	<b>Temperature</b>	
SL1613-TH	SOT-23	3	46Gauss	20Hz	-40°C~85°C	
SL1613-TL	SOT-23	3	33Gauss	20Hz	-40°C~85°C	
SL1613-SH	SOT-23	3	46Gauss	5Hz	-40°C~85°C	
SL1613- SL	SOT-23	3	33Gauss	5Hz	-40°C~85°C	

**Package Dimensions**
**SOT-23**


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
$\theta$	0°	-	8°