KTM1321 Series

High sensitivity, Low Power, North-Pole TMR Switch

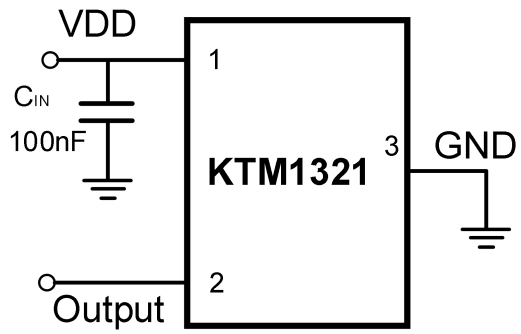
Features

- TMR+CMOS Monolithic Structure
- Low power Consumption
  - 50Hz Version：160nA@3.0V (typical)
  - Continuous Version：1.9uA@3.0V (typical)
- Supply Voltage：1.8V~5.5V
- High Magnetic Sensitivity
  - B_{OPN}=-45Gs B_{RPN}=-36Gs
  - B_{OPN}=-30Gs B_{RPN}=-21Gs
  - B_{OPN}=-18Gs B_{RPN}=-12Gs
  - B_{OPN}=-9 Gs B_{RPN}=-6 Gs
- Magnetic Type: Unipolar (North-Pole)
- Push-Pull CMOS Output
- Package：SOT-23-3L （MSL1） TO-92S
- Operating Temperature：-40℃~125℃
- High ESD Rating：HBM 8KV
- RoHS Compliant

Application

- Water, Electric and Gas Utility Meters
- Non-Contact Detection
- Door, Lids and Tray Position Switches

Typical Application Circuit

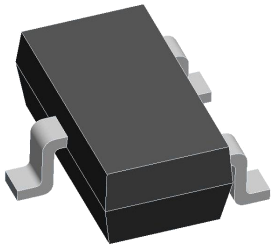


Note: C_{IN} is for stabilization and to strengthen the noise immunity, the recommended capacitance is 100nF typical and should be placed as close to the supply pin as possible.

Descriptions

The KTM1321 is an unipolar(North-pole) magnetic switch integrated with Tunneling Magnetoresistance (TMR) technology and CMOS process for use in industrial and consumer switch applications. The IC internally includes a TMR bridge, a voltage regulator for operation with supply voltage from 1.8V to 5.5V, digital logic control module, threshold adjustment module, Schmitt trigger and a push-pull output. If the magnetic flux density parallel to the part marking surface is larger than operating point (B_{OPN}), the output will be turned on; if it is less than releasing point (B_{RPN}), the output will be turned off.

The KTM1321 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.

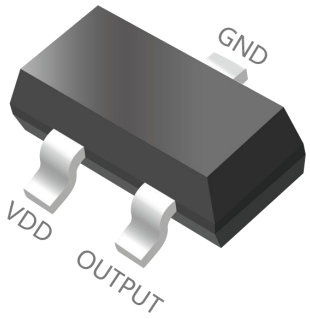


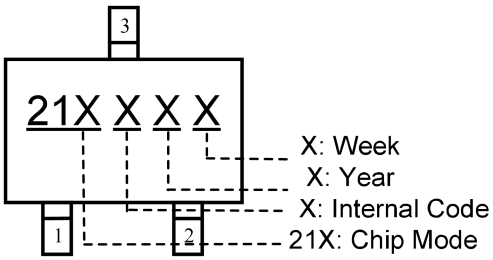
SOT-23-3L

TO-92S

Pin Descriptions

SOT-23-3L

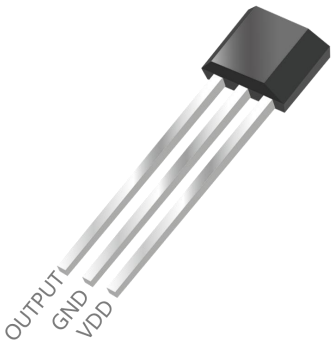


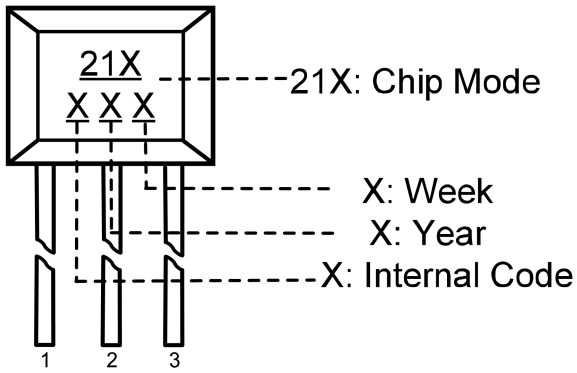


Top view

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

TO-92S

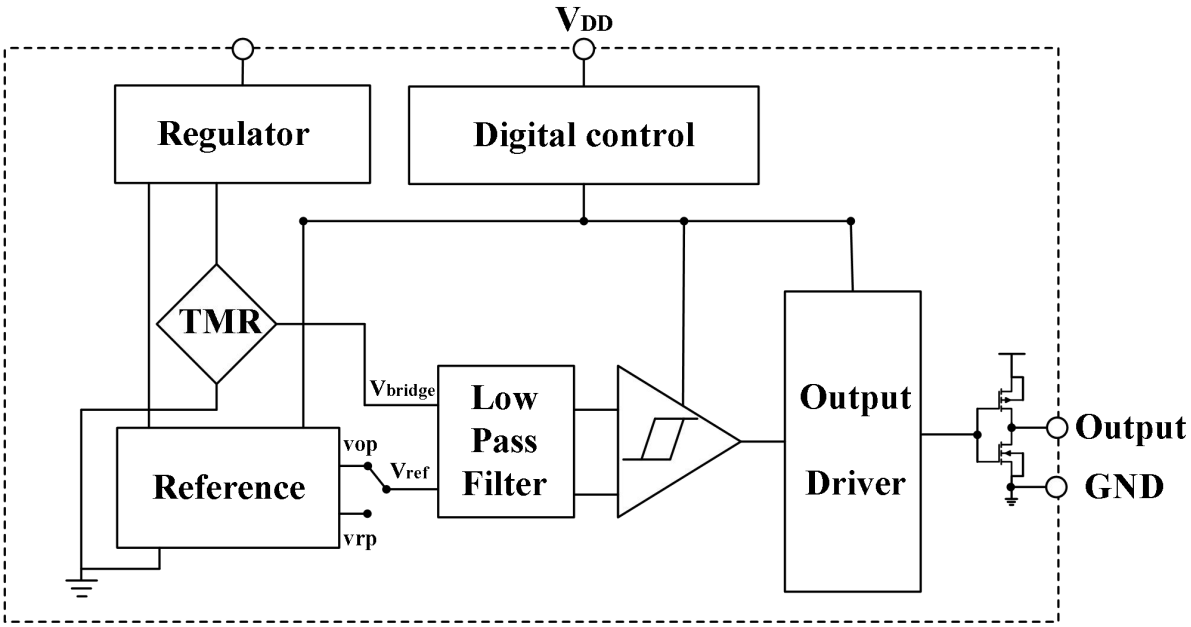




Top view

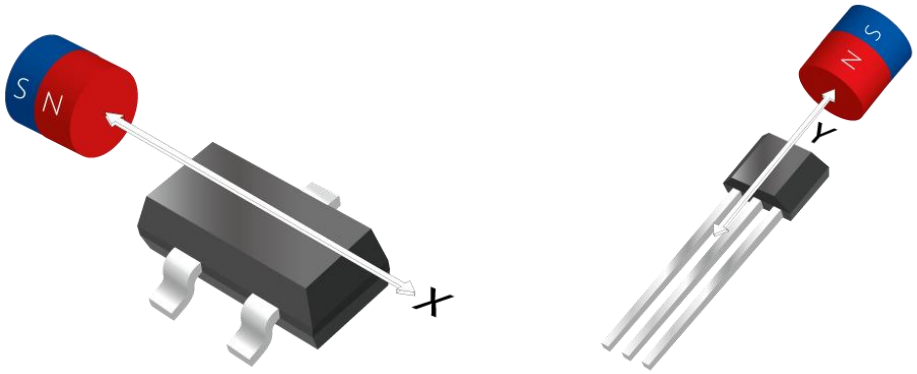
Pin Name	Pin Number	Function
VDD	3	Power Supply Input
GND	2	Ground Pin
OUTPUT	1	Output Pin

Block Diagram

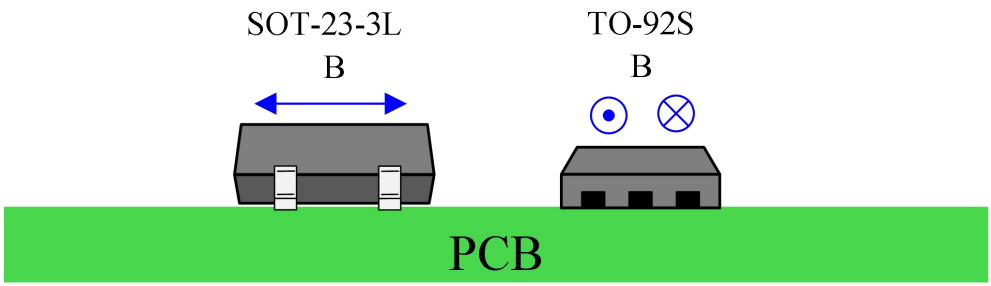


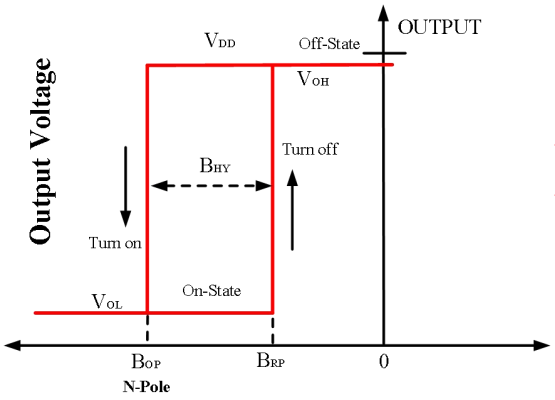
Output Switching Characteristics

To operate the TMR switch, the magnetic field should be applied to the sensor with sufficient magnetic flux density and correct direction.

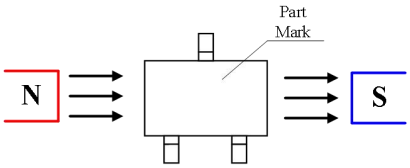


As shown in the figure below, a horizontal magnetic field parallel to the package can be detected.

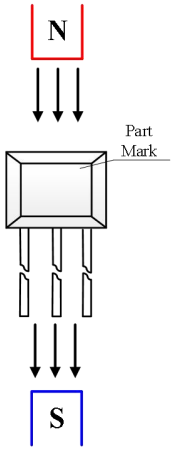




Magnetic Flux Density B



SOT-23-3L



TO-92S

Product Name Structure

KTM1321 X X-XXX

Package abbreviation: ST3：SOT-23-3L
TO3：TO-92S

Magnetic sensitivity：A: B_{OP}=-45 Gauss B: B_{OP}=-30 Gauss
C: B_{OP}=-18 Gauss D: B_{OP}= -9 Gauss

Operating cycle： T：Continuous Version
S： f = 50Hz

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

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage Dissipation	6	V
V_{DD_REV}	Reverse voltage (VDD)	-0.3	V
I_{OUTPUT}	Output Current	5	mA
B	Magnetic Flux Density	3000@<5min	Gauss
T_{STG}	Storage Temperature Range	-50～+150	℃
T_J	Maximum Junction Temperature	+150	℃
ESD HBM	Human Body Model ESD Capability	8000	V
T reflow	Reflow Temperature （MAX）	+260	℃

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℃, unless otherwise specified）

Symbol	Parameter	Conditions	Value	Unit
V_{DD}	Supply Voltage	Operating	1.8～5.5	V
T_A	Operating temperature Range	Operating	-40～125	℃

Electronics Characteristics （@T_A=+25℃, V_{DD}=3.0V, unless otherwise specified）

KTM1321SX Series						
Symbol	**Parameter**	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
VDD	Supply Voltage	Operating	1.8	—	5.5	V
VOL	Output Low Voltage (On)	I_{OUT}=1mA	—	0.008	0.05	V
VOH	Output High Voltage (Off)	I_{OUT}=1mA	V_{DD}-0.05	V_{DD}-0.015	—	V
$I_{DD(AVG)}$	Average Supply Current	TA=+25℃， VDD=3.0V	—	160	—	nA
$I_{DD(Awake)}$	Awake Supply Current	TA=+25℃， VDD=3.0V	—	1.9	—	μA
$I_{DD(Sleep)}$	Sleep Supply Current	TA=+25℃， VDD=3.0V	—	148		nA
T_{AWAKE}	Awake Time	Operating	—	40	—	μs
T_{PERIOD}	Period	Operating	—	20	—	ms

KTM1321TX Series						
Symbol	**Parameter**	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
VDD	Supply Voltage	Operating	1.8	—	5.5	V
VOL	Output Low Voltage (On)	I_{OUT}=1mA	—	0.008	0.05	V
VOH	Output High Voltage (Off)	I_{OUT}=1mA	V_{DD}-0.05	V_{DD}-0.015	—	V
$I_{DD(AVG)}$	Awake Supply Current	TA=+25℃， VDD=3.0V	—	1.9	—	μA
F_S	Sampling Frequency	Operating	—	5000	—	Hz

Magnetic Characteristics (T_A=25℃, VDD=3.0V, unless otherwise noted)

Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
KTM1321XA Series						
B_{OPN}	Magnetic threshold operate point	TA=+25℃， VDD=3.0V	-50	-45	-40	Gauss
B_{RPN}	Magnetic threshold release point	TA=+25℃， VDD=3.0V	-41	-36	-31	
B_{HY} ($\|B_{OPX}\|$-$\|B_{RPX}\|$)	Magnetic hysteresis		-	9	-	

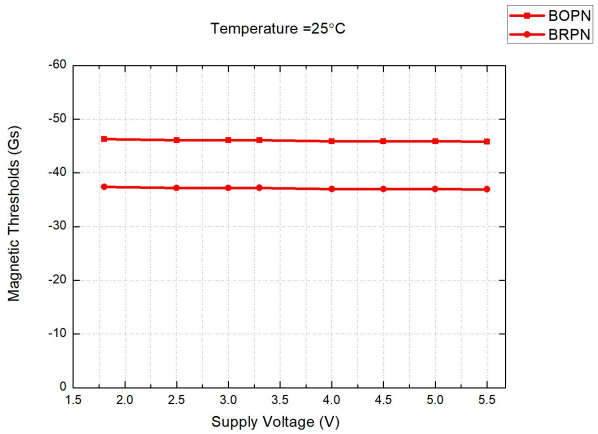
Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
KTM1321XB Series						
B_{OPN}	Magnetic threshold operate point	TA=+25℃， VDD=3.0V	-36	-30	-26	Gauss
B_{RPN}	Magnetic threshold release point	TA=+25℃， VDD=3.0V	-26	-21	-16	
B_{HY} ($\|B_{OPX}\|$-$\|B_{RPX}\|$)	Magnetic hysteresis		-	9	-	

Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
KTM1321XC Series						
B_{OPN}	Magnetic threshold operate point	TA=+25℃， VDD=3.0V	-24	-18	-15	Gauss
B_{RPN}	Magnetic threshold release point	TA=+25℃， VDD=3.0V	-15	-12	-9	
B_{HY} ($\|B_{OPX}\|$-$\|B_{RPX}\|$)	Magnetic hysteresis		-	6	-	

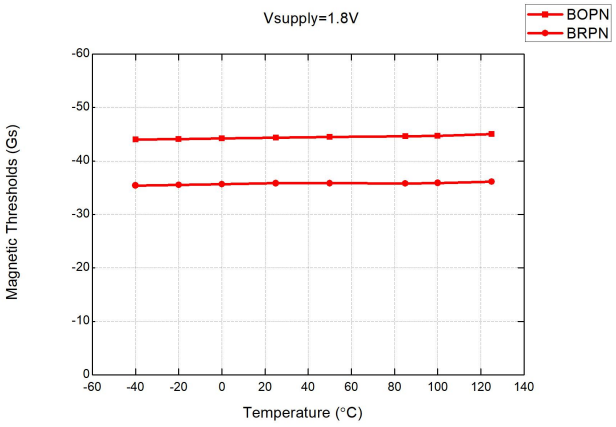
Symbol	Characteristics	Condition	Min.	Typ.	Max.	Unit
KTM1321XD Series						
B_{OPN}	Magnetic threshold operate point	TA=+25℃， VDD=3.0V	-12	-9	-6	Gauss
B_{RPN}	Magnetic threshold release point	TA=+25℃， VDD=3.0V	-9	-6	-3	
B_{HY} ($\|B_{OPX}\|$-$\|B_{RPX}\|$)	Magnetic hysteresis		-	3	-	

Performance Graphs

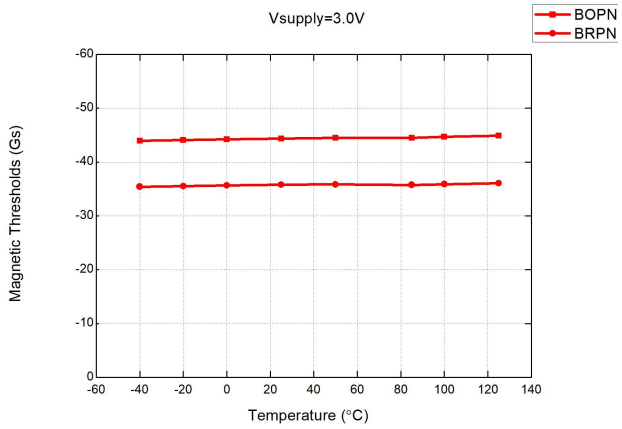
KTM1321XA Series



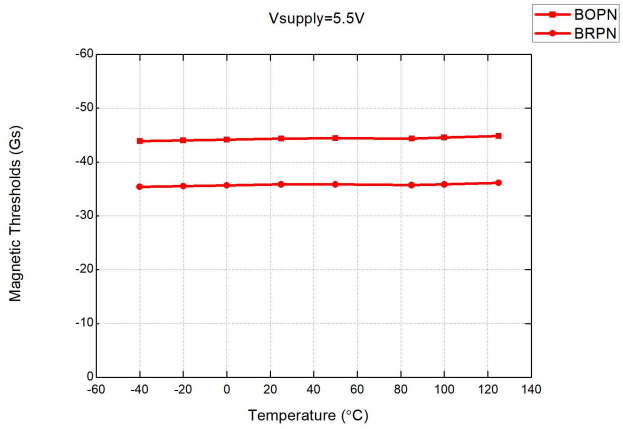
Magnetic Thresholds vs. Supply Voltage @T_A=25℃



Magnetic Thresholds vs T_A @VDD=1.8V

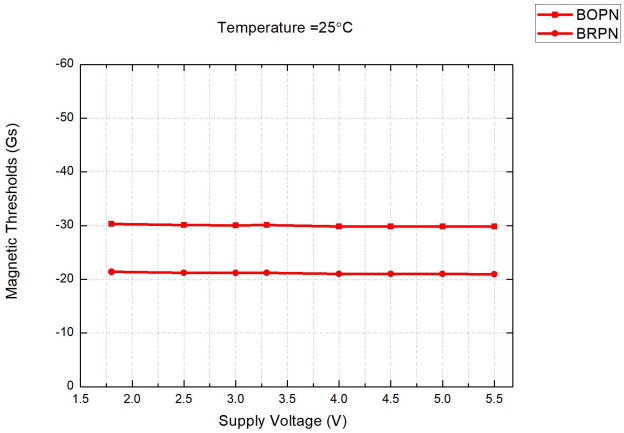


Magnetic Thresholds vs T_A @VDD=3.0V

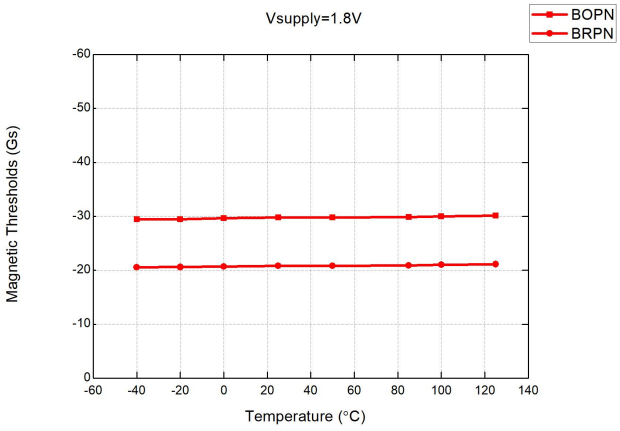


Magnetic Thresholds vs T_A @VDD=5.5V

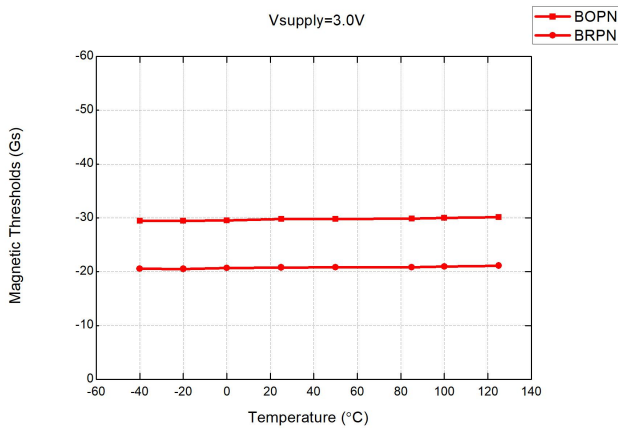
KTM1321XB Series



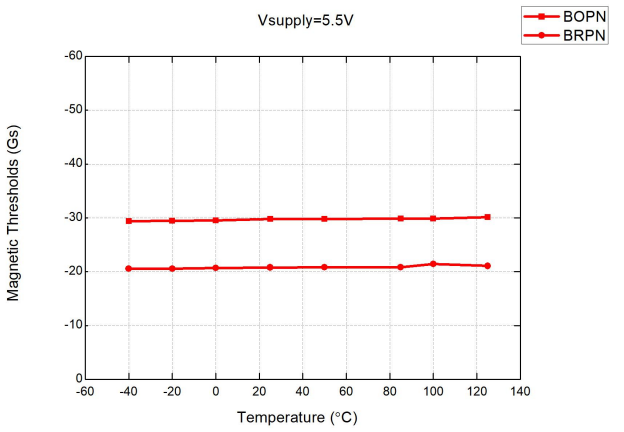
Magnetic Thresholds vs. Supply Voltage @T_A=25℃



Magnetic Thresholds vs T_A @VDD=1.8V

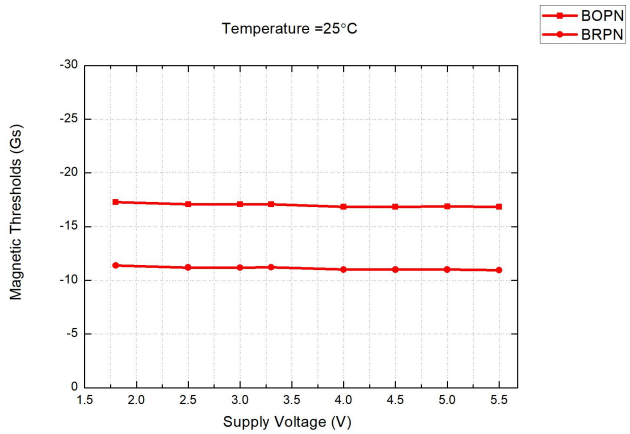


Magnetic Thresholds vs T_A @VDD=3.0V

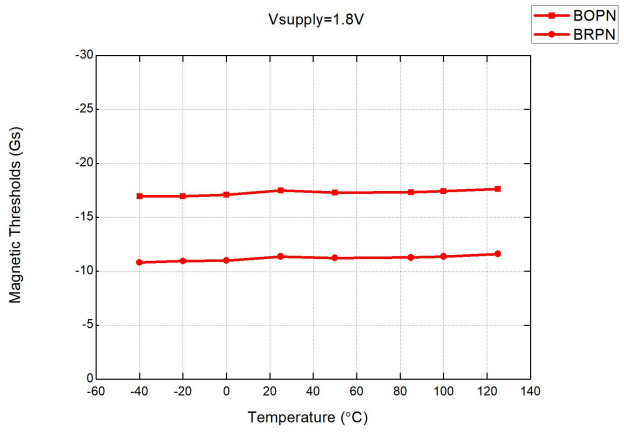


Magnetic Thresholds vs T_A @VDD=5.5V

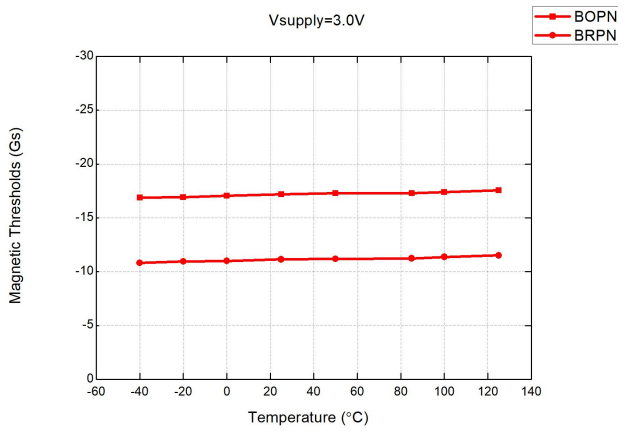
KTM1321XC Series



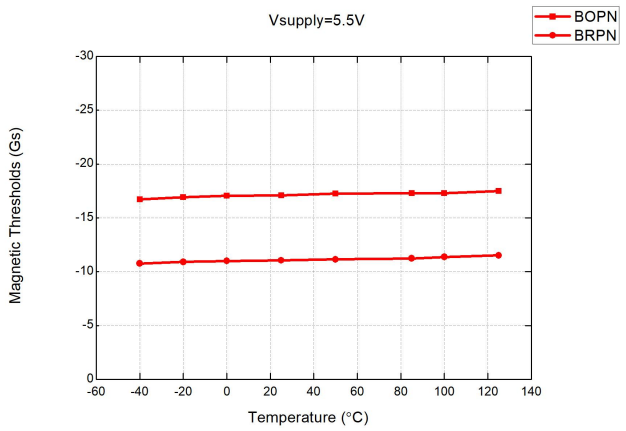
Magnetic Thresholds vs. Supply Voltage @T_A=25℃



Magnetic Thresholds vs T_A @VDD=1.8V

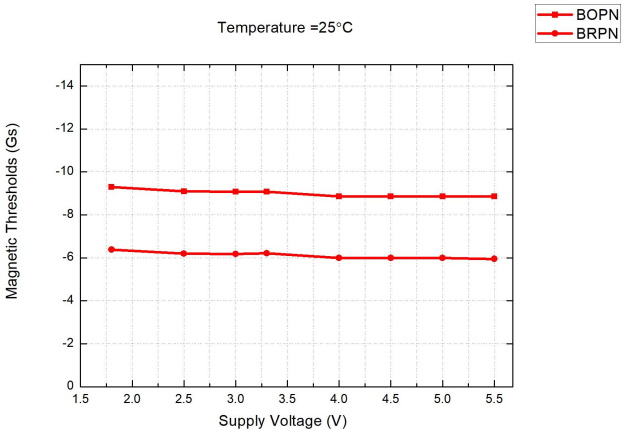


Magnetic Thresholds vs T_A @VDD=3.0V

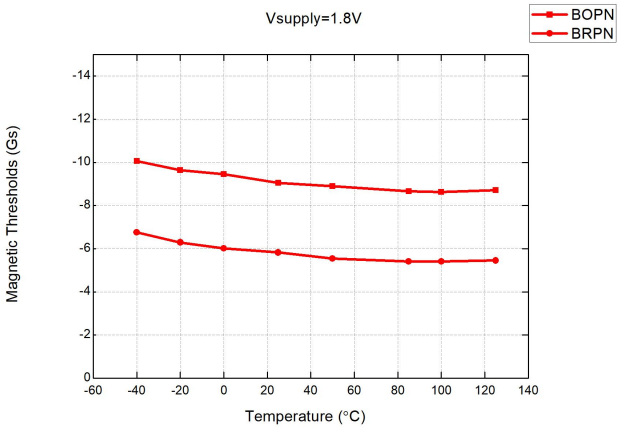


Magnetic Thresholds vs T_A @VDD=5.5V

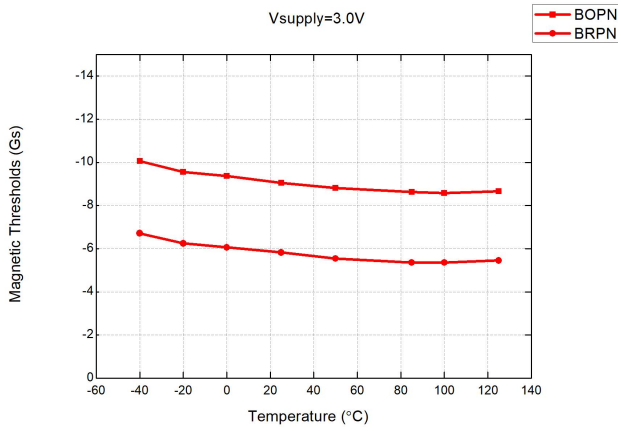
KTM1321XD Series



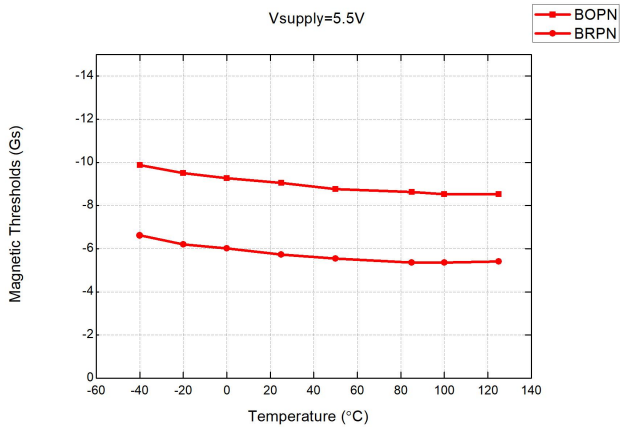
Magnetic Thresholds vs. Supply Voltage @T_A=25℃



Magnetic Thresholds vs T_A @VDD=1.8V

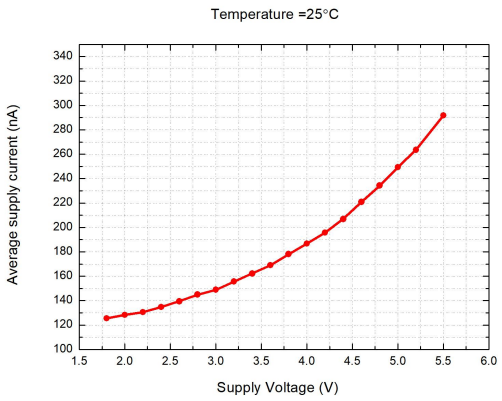


Magnetic Thresholds vs T_A @VDD=3.0V



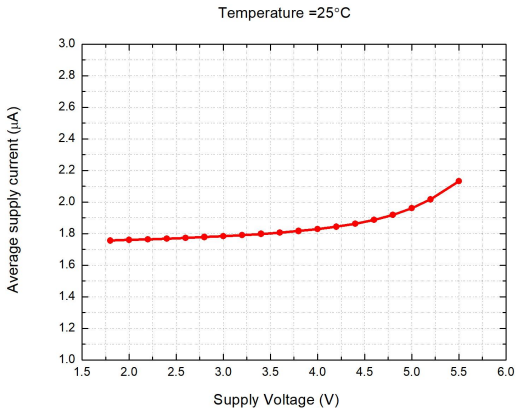
Magnetic Thresholds vs T_A @VDD=5.5V

KTM1321SX Series （5Hz）



Current Consumption vs. Supply Voltage @T_A=25℃

KTM1321TX Series（Continuous）



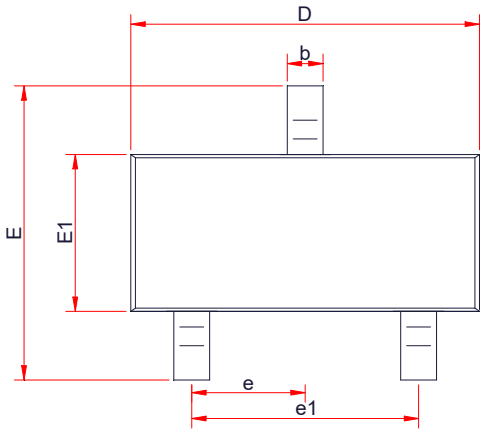
Current Consumption vs. Supply Voltage @T_A=25℃

Order Information

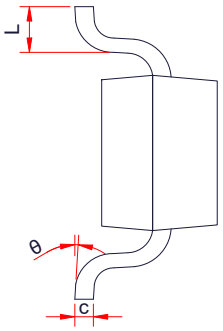
Part Numbers	Package	Number of Pins	Bop	Operating Frequency	Temperature
KTM1321TA-ST3	SOT-23-3L	3	45Gauss	Continuous	-40℃~125℃
KTM1321TB-ST3	SOT-23-3L	3	30Gauss	Continuous	-40℃~125℃
KTM1321TC-ST3	SOT-23-3L	3	18Gauss	Continuous	-40℃~125℃
KTM1321TD-ST3	SOT-23-3L	3	9Gauss	Continuous	-40℃~125℃
KTM1321SA-ST3	SOT-23-3L	3	45Gauss	50Hz	-40℃~125℃
KTM1321SB-ST3	SOT-23-3L	3	30Gauss	50Hz	-40℃~125℃
KTM1321SC-ST3	SOT-23-3L	3	18Gauss	50Hz	-40℃~125℃
KTM1321SD-ST3	SOT-23-3L	3	9Gauss	50Hz	-40℃~125℃
KTM1321TA-TO3	TO-92S	3	45Gauss	Continuous	-40℃~125℃
KTM1321TB-TO3	TO-92S	3	30Gauss	Continuous	-40℃~125℃
KTM1321TC-TO3	TO-92S	3	18Gauss	Continuous	-40℃~125℃
KTM1321TD-TO3	TO-92S	3	9Gauss	Continuous	-40℃~125℃
KTM1321SA-TO3	TO-92S	3	45Gauss	50Hz	-40℃~125℃
KTM1321SB-TO3	TO-92S	3	30Gauss	50Hz	-40℃~125℃
KTM1321SC-TO3	TO-92S	3	18Gauss	50Hz	-40℃~125℃
KTM1321SD-TO3	TO-92S	3	9Gauss	50Hz	-40℃~125℃

PACKAGE OUTLINE DIMENSIONS

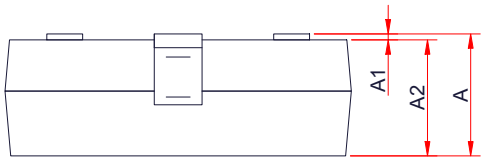
SOT-23-3L



TOP VIEW



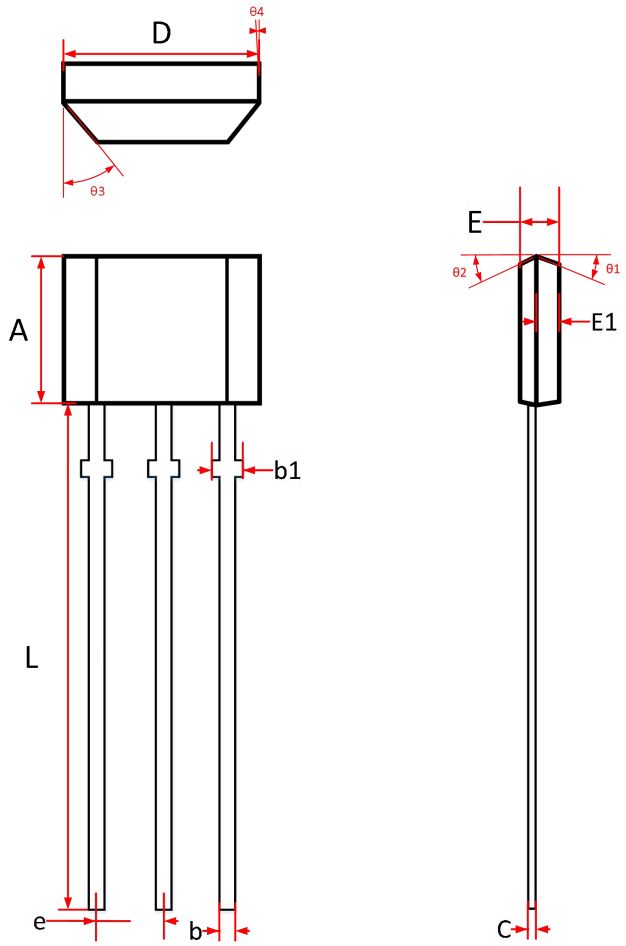
SIDE VIEW



SIDE VIEW

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	1.0	-	1.25
A1	0.00	-	0.15
A2	1.00	1.10	1.20
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	3.05	3.25
b	0.33	0.415	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
θ 1		6°	
θ 2		3°	
θ 3		45°	
θ 4		3°	