

Low Power Linear Hall Sensor

XL42K

Features

- Specially optimized for unipolar applications of magnetic axis keyboards
- Built in Output Anti Backflow Function
- Widelinear range: $0.33\text{V} \sim 2.97\text{V}$ @ $V_{DD}=3.3\text{V}$
- Low Operation Current: 1.3mA
- Wide Operating Voltage Range: $3\text{V} \sim 7\text{V}$
- Zero-point (No magnetic field) output voltage: 2.97V @ $V_{DD}=3.3\text{V}$
- Sensitivity: 2.3mV/Gs @ $V_{DD}=3.3\text{V}$
- Linearity: $\pm 1\%$
- Low Noise Output Without External Capacitor Filtering
- Temperature Grade 1: -40°C to 125°C
Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class3A
- SOT23-3 package

Applications

- Magnetic Axis Keyboards

General Description

The XL42K is a rail to rail linear Hall-effect sensor specifically engineered for magnetic axis keyboards, featuring low power consumption, wide operating voltage, wide linear range, and extended temperature range, with an output voltage varies proportionally with the strength of the induced magnetic field, and its linear output voltage range follows the variation of the power supply voltage. The XL42K's typical operating voltage is 3.3V , the default zero-point output voltage (without magnetic field) at $V_{DD}=3.3\text{V}$ is 2.97V , with low operation current, the operating temperature range supports $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$. It is widely used in consumer electronics and industrial control fields.

The XL42K integrates high precision current source, temperature compensation module, Hall array, amplifier, driver module and other circuit modules, which provides high linearity and strong immunity to electromagnetic interference over the full voltage range and full temperature range.

Typical application schematic

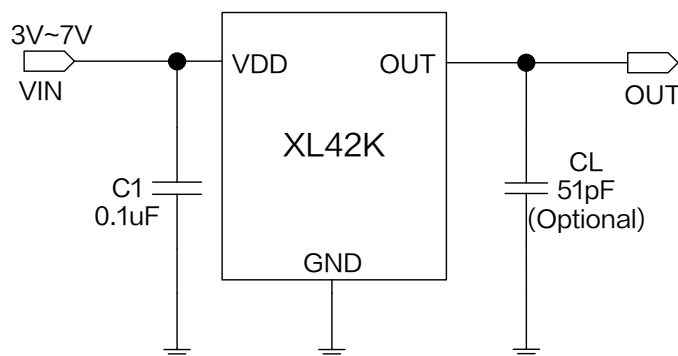


Figure1.XL42K Typical application schematic

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Pin Configurations



Figure2.Pin Configuration of XL42K

Table1.Pin Description

Pin Number	Pin Name	Description
1	VDD	Supply Voltage Input Pin , XL42K operates from 3V to 7V DC voltage.
2	OUT	Output Pin.
3	GND	Ground pin.

Ordering Information

Order Information	Marking ID	Package Type	Eco Plan	Packing Type Supplied As
XL42K	XL42K	SOT23-3	RoHS & HF	3000 Units Per Reel

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Function Block

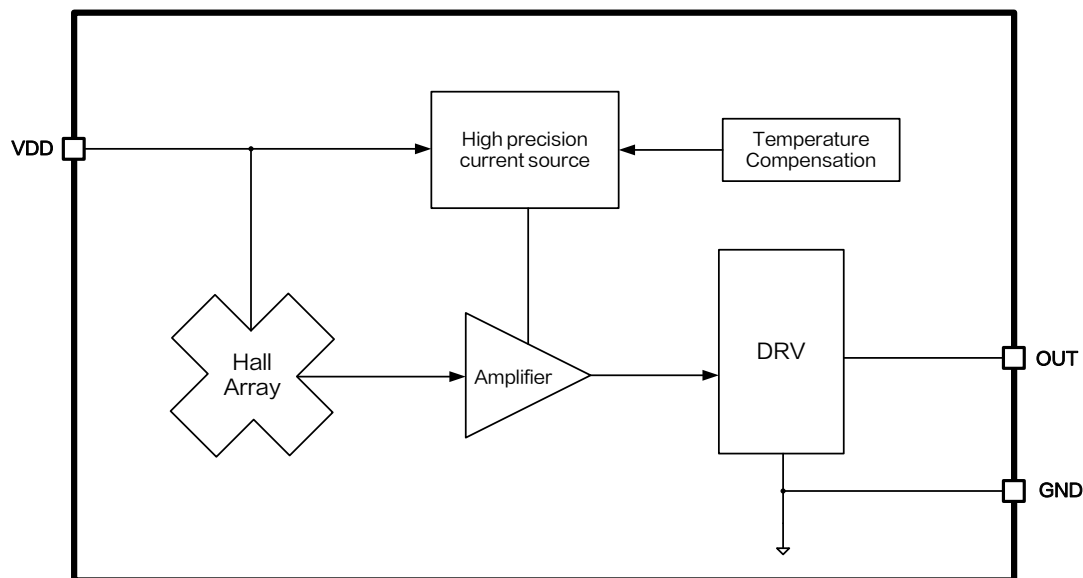


Figure3.Function Block Diagram of XL42K

Absolute Maximum Ratings (Note1)

Parameter	Symbol	Value	Unit
Input Pin Voltage	V_{DD}	-0.3 ~ 25	V
Output Pin Voltage	V_{OUT}	-0.3 ~ 25	V
Thermal Resistance(SOT23-3) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	200	°C/W
Operating Temperature	T_A	-40 ~ 125	°C
Operating Junction Temperature	T_J	-40 ~ 150	°C
Storage Temperature	T_{STG}	-65 ~ 150	°C
Lead Temperature(Soldering,10sec)	T_{LEAD}	260	°C
ESD(HBM)	—	>4000	V

Note1: Stresses greater than those listed under Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

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XL42K Electrical Characteristics (Note2)

$T_A = 25^{\circ}\text{C}$, $V_{DD} = 3.3\text{V}$, system parameters test circuit figure1, unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operation Voltage	V_{DD}	–	3	3.3	7	V
Operation Current	I_{DD}	–	1.1	1.3	1.6	mA
Output Load Resistance	R_L	$B = -1500\text{Gs}$	–	10	–	$\text{k}\Omega$
Output Voltage Range	$V_{OUT(H)}$	$B = +1500\text{Gs}$ $V_{DD} = 3.3\text{V}$	3.05	3.1	–	V
		$B = +1500\text{Gs}$ $V_{DD} = 5.0\text{V}$	4.75	4.8	–	V
	$V_{OUT(L)}$	$B = -1500\text{Gs}$ $V_{DD} = 3.3\text{V}$	–	0.2	0.25	V
		$B = -1500\text{Gs}$ $V_{DD} = 5.0\text{V}$	–	0.2	0.25	V
Static Output Voltage	$V_{OUT(Q)}$	$B = 0\text{Gs}$ $V_{DD} = 3.3\text{V}$	2.911	2.97	3.029	V
		$B = 0\text{Gs}$ $V_{DD} = 5.0\text{V}$	–	4.50	–	V
Linearity	Lin	–	–1	–	1	%
Output Settling Time	–	$B = 0\text{Gs}$	–	15	20	μs
Output Noise	–	Bandwidth = 10Hz to 10kHz	–	0.8	–	mV

Note2:

- (1) Linearity is the degree to which the static characteristic curve between the input and output quantities deviates from a straight line.
- (2) The output settling time is the time interval from when the output voltage begins to establish until it stabilizes at 90% of the steady-state output voltage.
- (3) Built in output anti backflow function, when used in parallel, if some chips fail or lose power, their output will be high impedance.

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XL42K Magnetic Characteristics (Note3)

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Sensitivity	Sens	$V_{DD}=3.3V$	2.185	2.30	2.415	mV/Gs
		$V_{DD}=5.0V$	–	3.70	–	mV/Gs

Note3:

(1) The magnetic South Pole (S) is defined as the positive magnetic field. The sensitivity in the table corresponds to measurements taken with the magnetic field perpendicular to the backside of the chip's marking surface.

(2) XL42K is optimized for magnetic axis keyboards. When $V_{DD}=3.3V$, the sensitivity corresponding to output voltage is in the linear range of 0.33V~2.97V as shown in the table. When $V_{DD}=5.0V$, the sensitivity corresponding to output voltage is in the linear range of 0.5V~4.5V as shown in the table.

XL42K Output Characteristics

$T_A = 25^\circ C$, system parameters test circuit figure1, test methods figure4, unless otherwise specified.

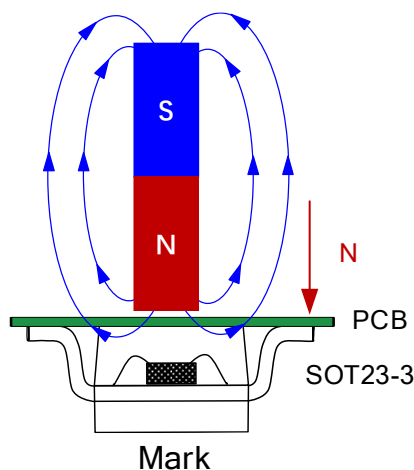


Figure4.Application diagram of XL42K

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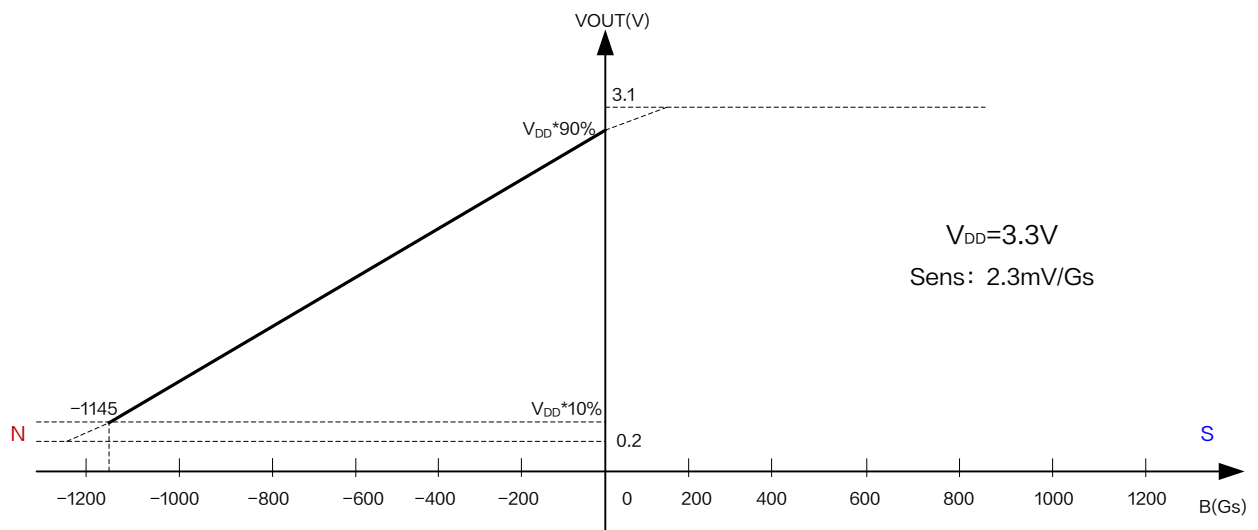


Figure5.Output Characteristic Curve of XL42K ($V_{DD} = 3.3V$)

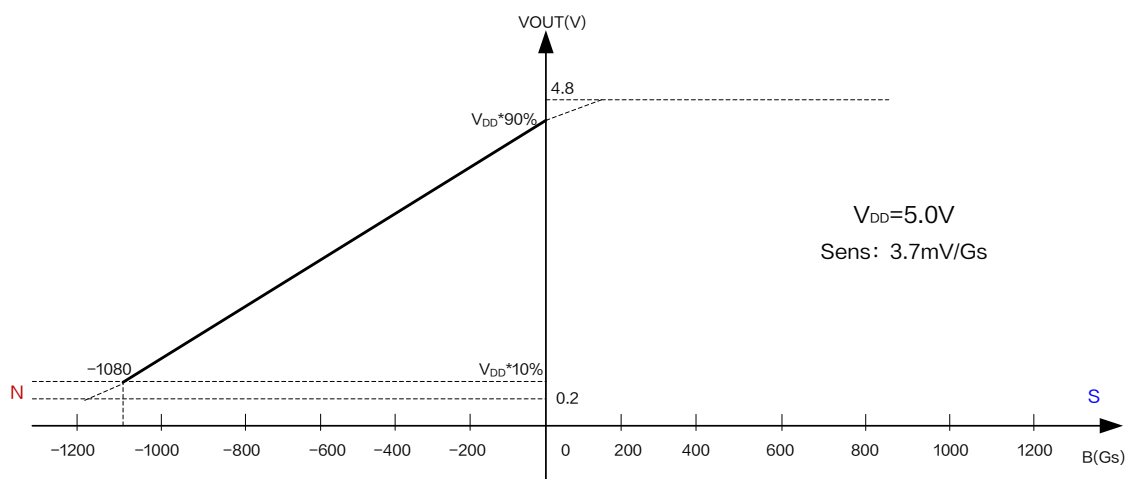


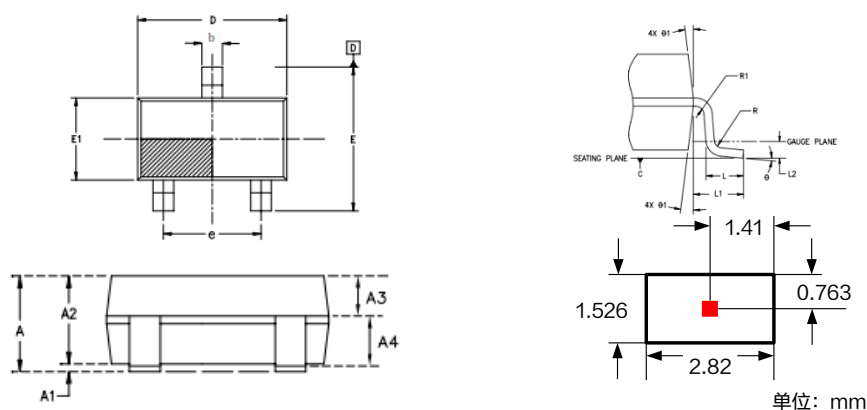
Figure6.Output Characteristic Curve of XL42K ($V_{DD} = 5.0V$)

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Package Information

SOT23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.00	1.35	0.039	0.053
A1	0.00	0.15	0.000	0.006
A2	1.00	1.20	0.039	0.047
A3	0.349	0.449	0.014	0.018
A4	0.511	0.701	0.020	0.028
b	0.30	0.50	0.012	0.020
b1	0.32	0.38	0.013	0.015
c	0.10	0.20	0.004	0.008
c1	0.14	0.16	0.006	0.006
D	2.82	3.05	0.111	0.120
E	2.60	3.00	0.102	0.118
E1	1.50	1.73	0.059	0.068
e	1.80	2.00	0.071	0.079
L	0.30	0.60	0.012	0.024
L1	0.6REF		0.024REF	
L2	0.25REF		0.01REF	
R	0.1	—	0.004	—
R1	0.1	0.25	0.004	0.010
θ	0°	8°	0°	8°
θ1	5°	15°	5°	15°

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