Low Power Linear Hall Sensor XL42Z

Features

- Specially optimized for unipolar applications of magnetic axis keyboards
- Wide linear range:0.2V~2.07V@V_{DD}=3.3V
- Low Operation Current: 1.8mA
- Wide Operating Voltage Range: 2.7V~8V
- Zero-point (No magnetic field) output voltage: 2.07V@V_{DD}=3.3V
- Sensitivity: 2.30mV/Gs@V_{DD}=3.3V
- Linearity: ±1%
- Low noise output without external capacitor filtering
- Temperature Grade 2: -40℃ to 105℃ Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class2
- SOT23-3 package

Applications

- Magnetic Axis Keyboards

General Description

The XL42Z is a linear Hall-effect sensor specifically engineered for magnetic axis keyboards, featuring low power consumption, wide operating voltage, 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 XL42Z's typical operating voltage is 3.3V, the default zero-point output voltage (without magnetic field) at V_{DD}=3.3V is 2.07V, with low operation current, the operating temperature range supports -40℃~105℃.

The XL42Z 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

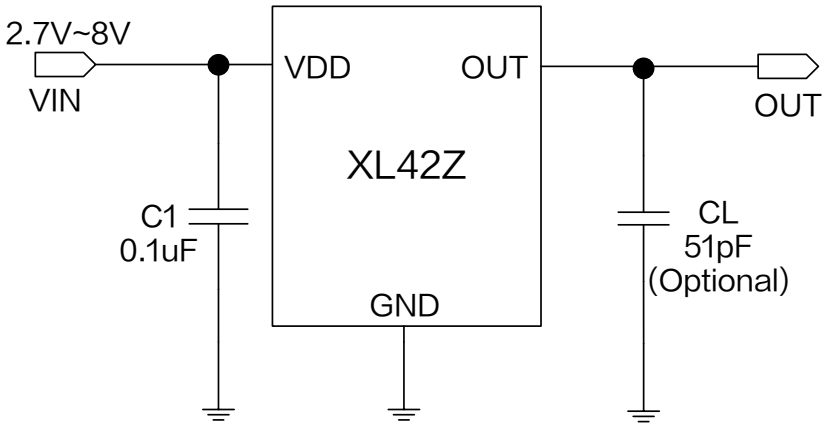


Figure1.XL42Z Typical application schematic

Pin Configurations

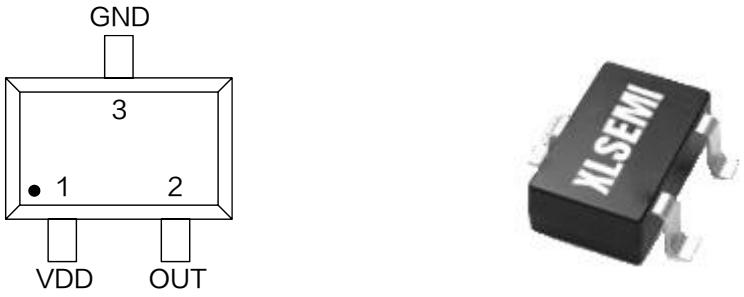


Figure2.Pin Configuration of XL42Z

Table 1. Pin Description

Pin Number	Pin Name	Description
1	VDD	Supply Voltage Input Pin. XL42Z operates from 2.7V to 8V DC voltage.
2	OUT	Output Pin.
3	GND	Ground pin.

Ordering Information

Order Information	Marking ID	Package Type	Eco Plan	Packing Type Supplied As
XL42Z	XL42Z	SOT23-3	RoHS & HF	3000 Units Per Reel

Function Block

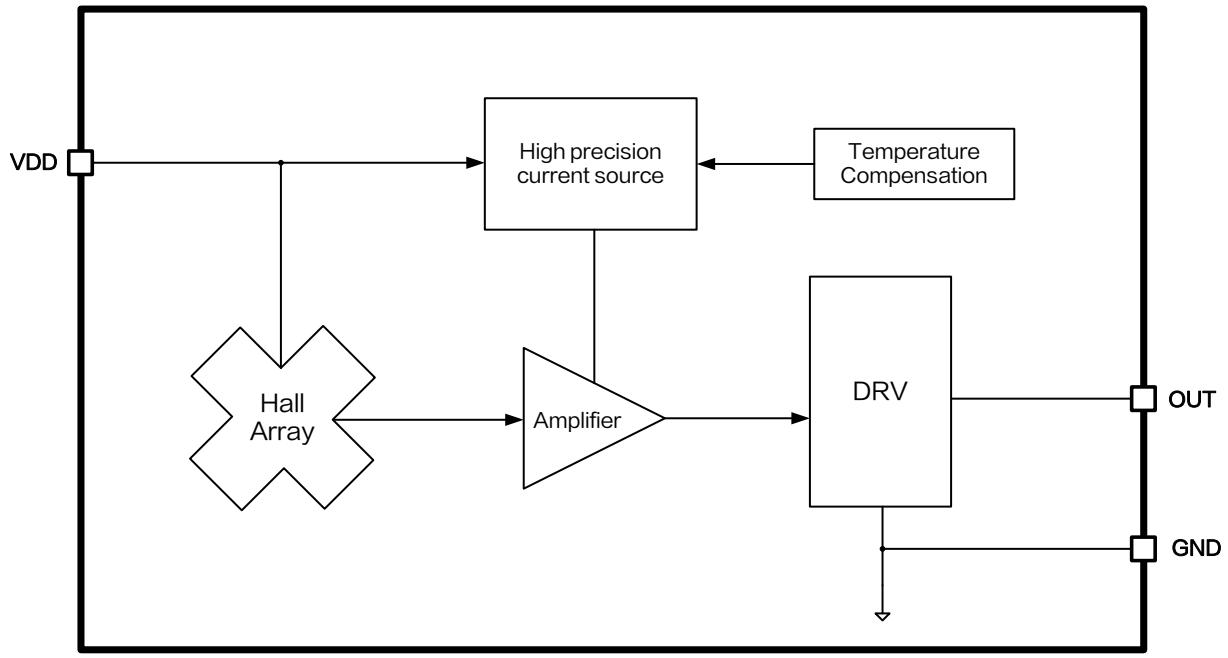


Figure3.Function Block Diagram of XL42Z

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Pin Voltage	V_{DD}	−0.3 ~ 25	V
Output Pin Voltage	V_{OUT}	−0.3 ~ 25	V
Output Current	I_{OUT}	2	mA
Thermal Resistance (SOT23−3) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	200	℃/W
Operating Temperature	T_A	−40 ~ 105	℃
Operating Junction Temperature	T_J	−40 ~ 125	℃
Storage Temperature	T_{STG}	−65 ~ 150	℃
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	℃
ESD (HBM)	−	⩾2000	V

Note 1: 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.

XL42Z Electrical Characteristics (Note 2)

T_A = 25℃, V_{DD} = 3.3V, system parameters test circuit figure1, unless otherwise specified.

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operation Voltage	V_{DD}	–	2.7	3.3	8	V
Operation Current	I_{DD}	–	1.2	1.8	2.4	mA
Output Load Resistance	R_L	B=–1000Gs	20	–	–	kΩ
Output Voltage Range	$V_{OUT(H)}$	B=+1000Gs V_{DD}=3.3V	2.45	2.5	–	V
		B=+1000Gs V_{DD}=5.0V	4.15	4.2	–	V
	$V_{OUT(L)}$	B=–1000Gs V_{DD}=3.3V	–	0.2	0.25	V
		B=–1000Gs V_{DD}=5.0V	–	0.2	0.25	V
Static Output Voltage	$V_{OUT(Q)}$	B=0Gs V_{DD}=3.3V	1.904	2.07	2.236	V
		B=0Gs V_{DD}=5.0V	–	3.14	–	V
Linearity	Lin	–	–1	–	1	%
Output Settling Time	–	B=0Gs	–	2	–	μs
Output Noise	–	Bandwidth= 10Hz to 10kHz	–	0.8	–	mV

Note 2:

(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.

XL42Z Magnetic Characteristics (Note 3)

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Sensitivity	Sens	V_{DD}=3.3V	2.020	2.30	2.580	mV/Gs
		V_{DD}=5.0V	–	6.90	–	mV/Gs

Note 3:

(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 back side of the chip's marking surface.

(2) XL42Z is optimized for unipolar applications of magnetic axis keyboards. When V_{DD}=3.3V, the sensitivity corresponding to output voltage is in the linear range of 0.2V~2.07V as shown in the table. When V_{DD}=5.0V, the sensitivity corresponding to output voltage is in the linear range of 0.2V~3.14V as shown in the table.

Output Characteristics

T_A = 25℃, system parameters test circuit figure1, unless otherwise specified.

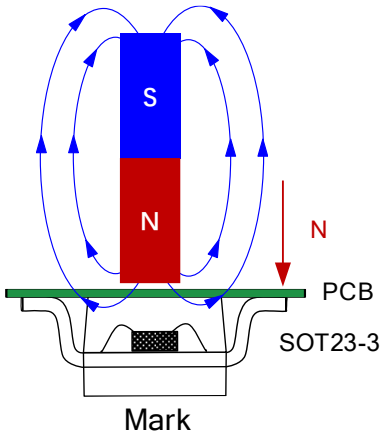


Figure4.Application diagram of XL42Z

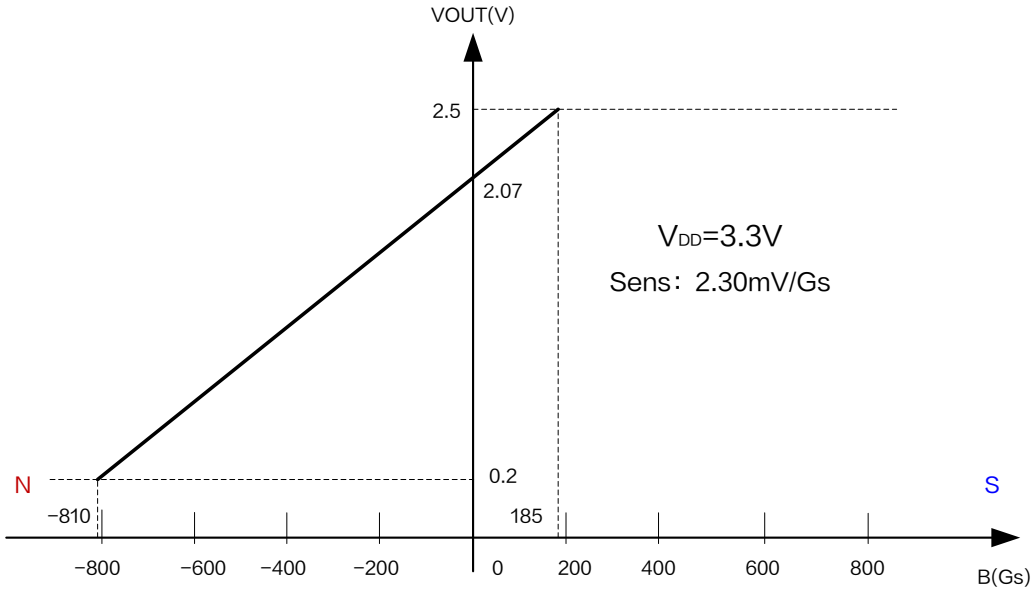


Figure5.XL42Z Output characteristic curve (V_{DD} = 3.3V)

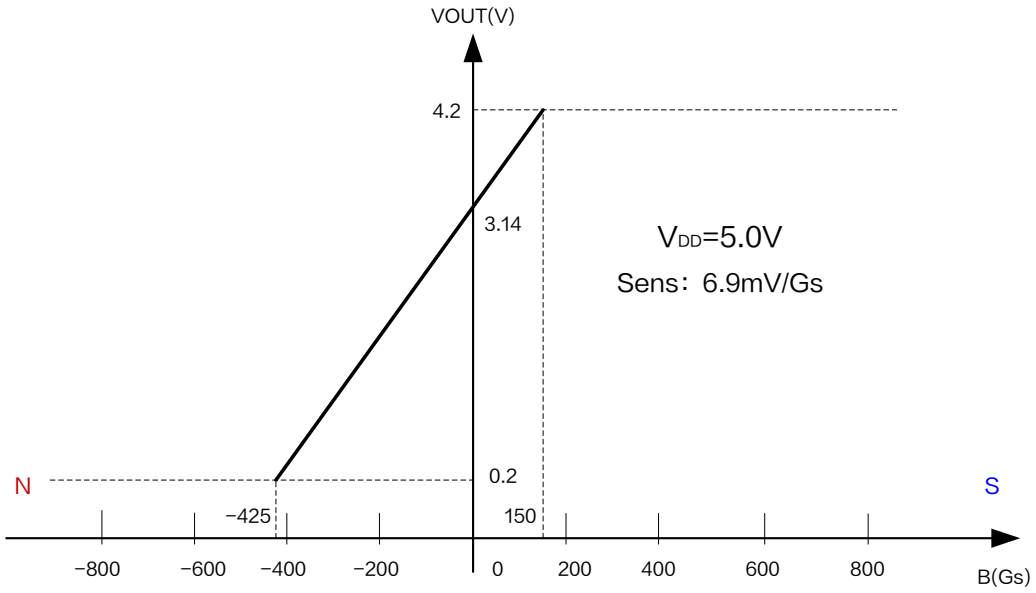


Figure6.XL42Z Output characteristic curve (V_{DD} = 5.0V)

Note 4: At room temperature, when V_{DD}=3.3V, the linear range of chip unipolar is 0.2V~2.07V; When V_{DD}=5.0V, the linear range of unipolar polarity of the chip is 0.2V~3.14V.

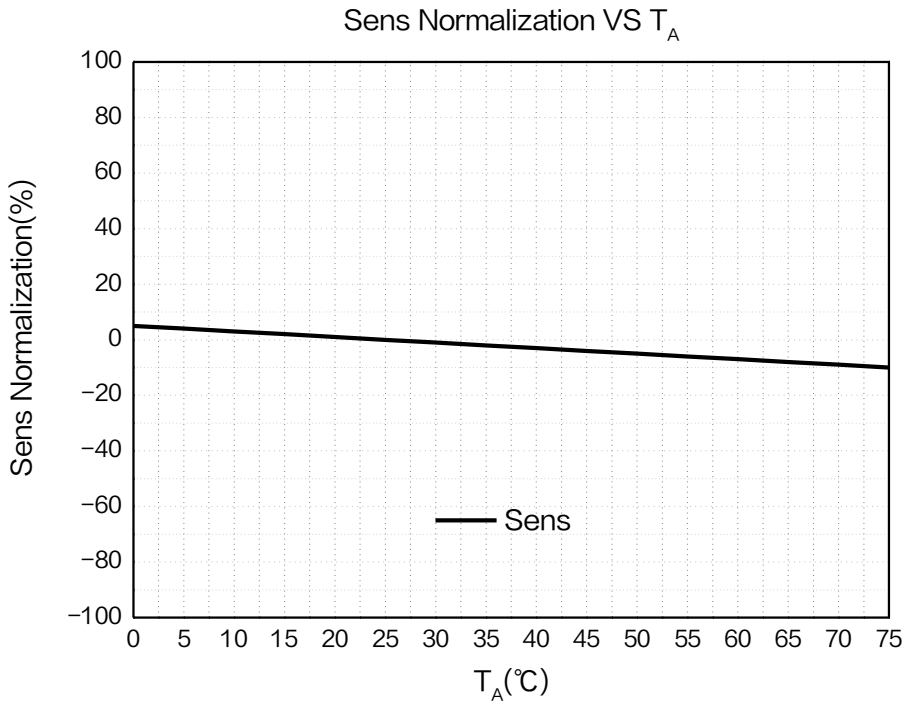
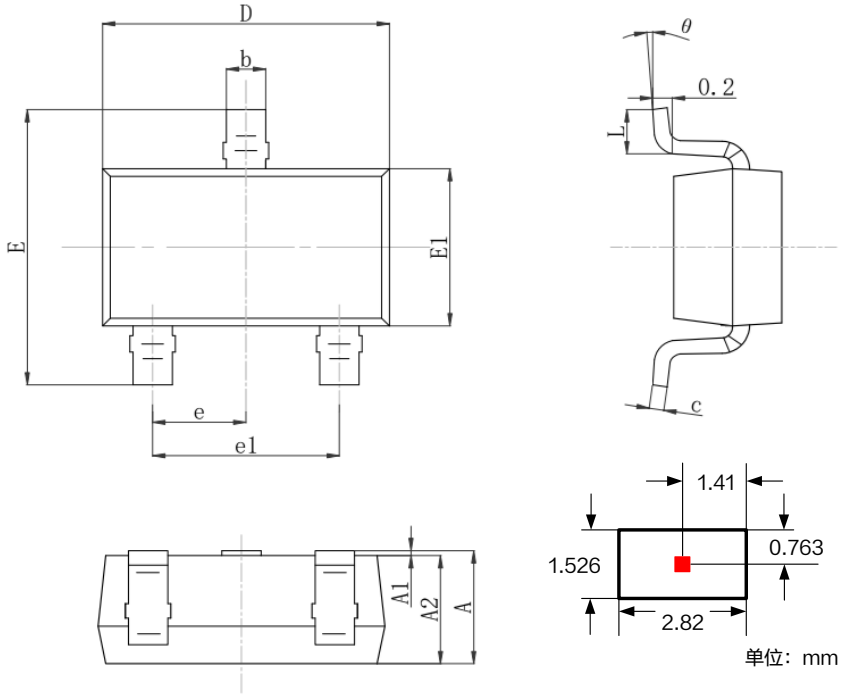


Figure7.Sensitivity versus temperature curve of XL42Z (V_{DD} = 3.3V)

Package Information

SOT23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.000	1.350	0.039	0.053
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.050	0.111	0.120
E1	1.500	1.726	0.059	0.068
E	2.600	3.000	0.102	0.118
e	0.950 REF		0.037 REF	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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