

Low Power Linear Hall Sensor

XL49

Features

- Specially optimized for unipolar applications of magnetic axis keyboards
- Wide linear range: $0.8V \sim 2.05V @ V_{DD}=3.3V$
- Low Operation Current : 1.4mA
- Wide Operating Voltage Range: 2.7V~8V
- Zero-point (No magnetic field) output voltage: 2.05V
- Linearity $\pm 4\%$
- Sensitivity: $2.2mV/Gs @ V_{DD}=3.3V$
- Low noise output without external capacitor filtering
- Temperature Grade 2: $-40^{\circ}C$ to $105^{\circ}C$
Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class2
- SOT23-3 package

Applications

- Magnetic Axis Keyboards

General Description

The XL49 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 that varies proportionally to the supply voltage, and proportional to the strength of the magnetic field it senses. The XL49's output voltage without magnetic field defaults to 2.05V, the chip's typical operating voltage is 3.3V, with low operation current. The operating temperature range supports $-40^{\circ}C \sim 105^{\circ}C$.

The XL49 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

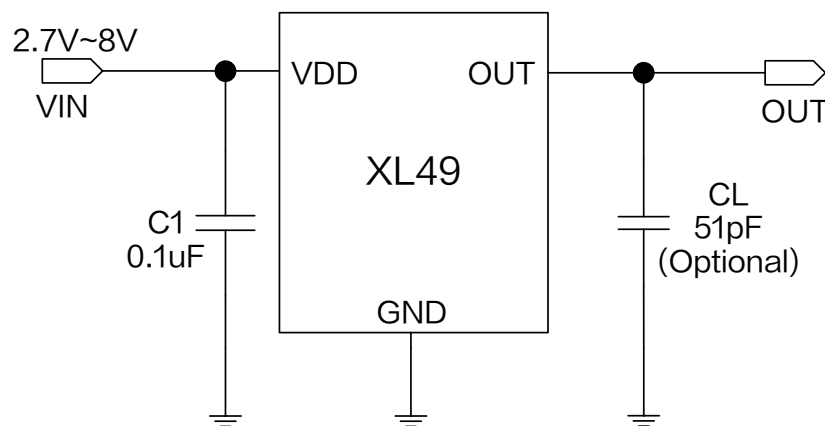


Figure1. XL49 Typical application schematic

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Pin Configurations

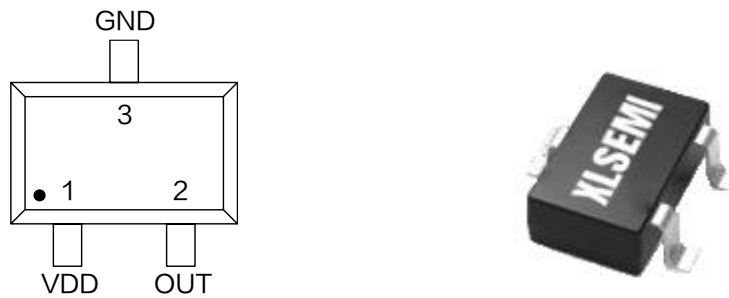


Figure2. Pin Configuration of XL49

Table 1 Pin Description

Pin Number	Pin Name	Description
1	VDD	Supply Voltage Input Pin. XL49 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
XL49	XL49	SOT23-3	RoHS & HF	3000 Units Per Reel

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Function Block

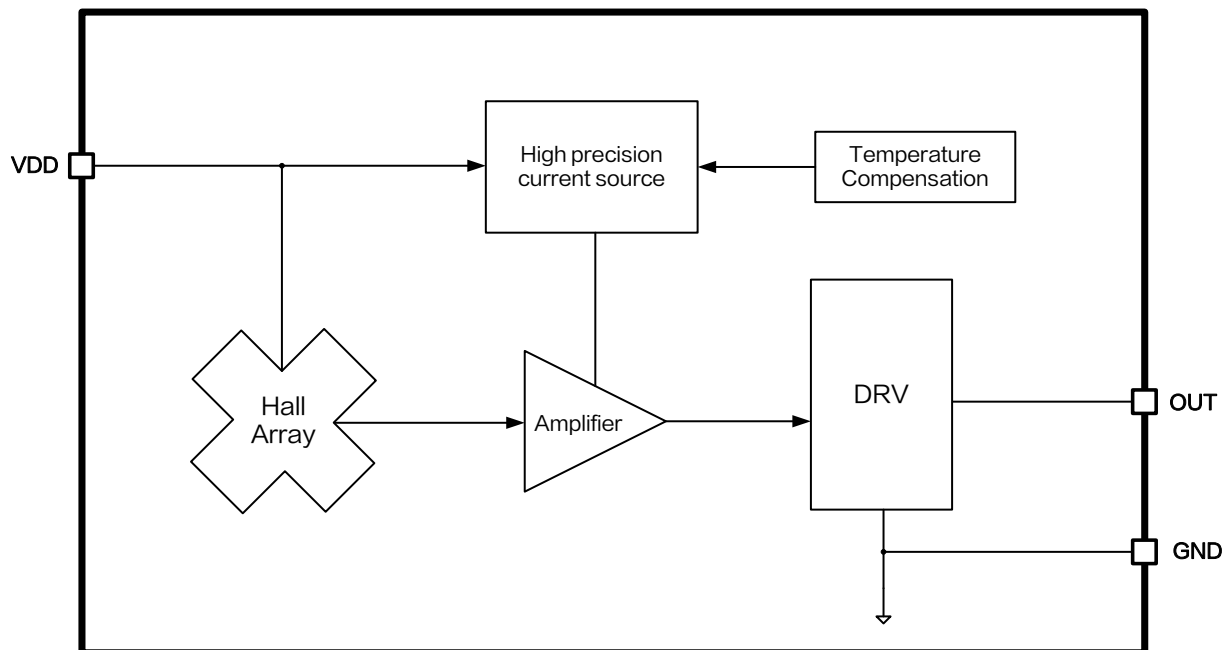


Figure3. Function Block Diagram of XL49

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
Output Current	I_{OUT}	2	mA
Thermal Resistance (SOT23-3) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	200	°C/W
Operating Temperature	T_A	-40 ~ 105	°C
Operating Junction Temperature	T_J	-40 ~ 150	°C
Storage Temperature	T_{STG}	-65 ~ 150	°C
Lead Temperature (Soldering, 10 sec)	T_{LEAD}	260	°C
ESD (HBM)	-	≥2500	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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XL49 Electrical Characteristics

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

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operation Voltage	V_{DD}	–	2.7	3.3	8	V
Operation Current	I_{DD}	$V_{DD}=3.3\text{V}$	–	1.4	1.6	mA
Output Load Resistance	R_L	$B=+1000\text{Gs}$	20	–	–	$k\Omega$
Output Voltage Range	$V_{OUT(H)}$	$B=+1000\text{Gs}$	2.45	2.5	–	V
	$V_{OUT(L)}$	$B=-1000\text{Gs}$	–	0.8	0.85	V
	$V_{OUT(Q)}$	$B=0\text{Gs}$	1.886	2.05	2.214	V
Linearity	Lin	–	–4	–	4	%
Power on start-up time	–	$B=0\text{Gs}$	–	6	–	μS
Response time	–	$B=-1000\text{Gs}$	–	0.7	–	μS
Output Noise	–	Bandwidth= 10Hz to 10kHz	–	0.8	–	mV

XL49 Magnetic Characteristics (Note2)

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Sensitivity	Sens	$V_{DD}=3.3\text{V}$	2.0	2.2	2.4	mV/Gs

Note2: XL49 is optimized for unipolar applications of magnetic axis keyboards, with sensitivity corresponding to output voltage in the linear range of $1.0\text{V} \sim 0.62 * V_{DD}$ as shown in the table.

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Output Characteristics

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

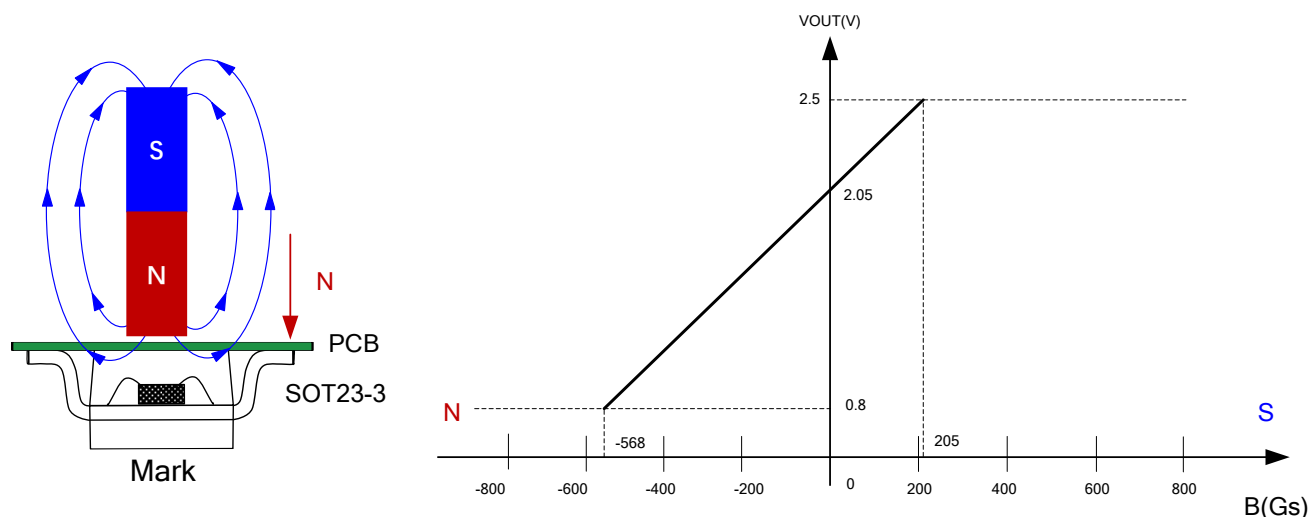


Figure4. XL49 Output characteristic curve

Note3: At room temperature, the maximum output voltage of the chip is $V_{DD} - 0.8\text{V}$, and the minimum output voltage is 0.8V , with a linear range of 1.0V to $V_{DD} - 1.0\text{V}$.

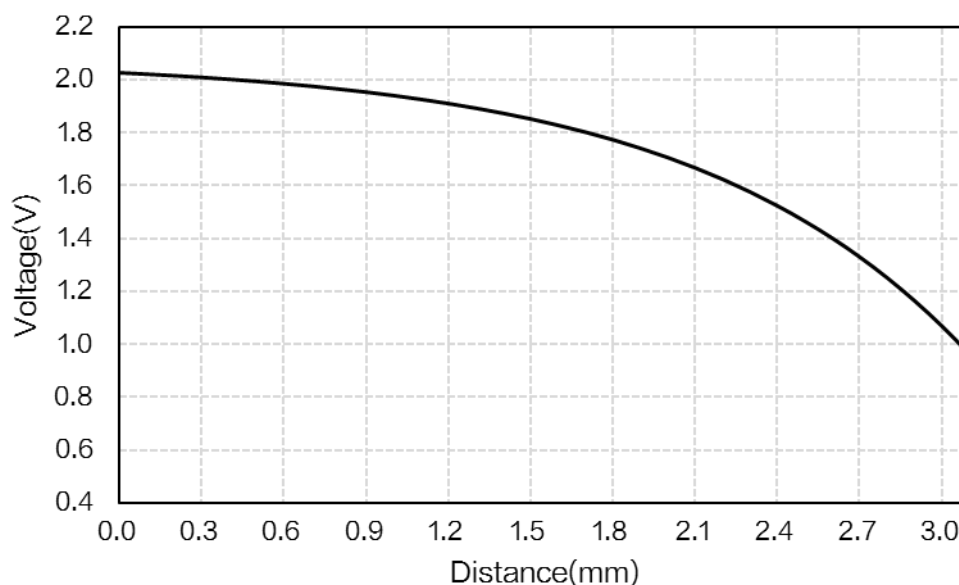


Figure5. Magnetic field axis application curve

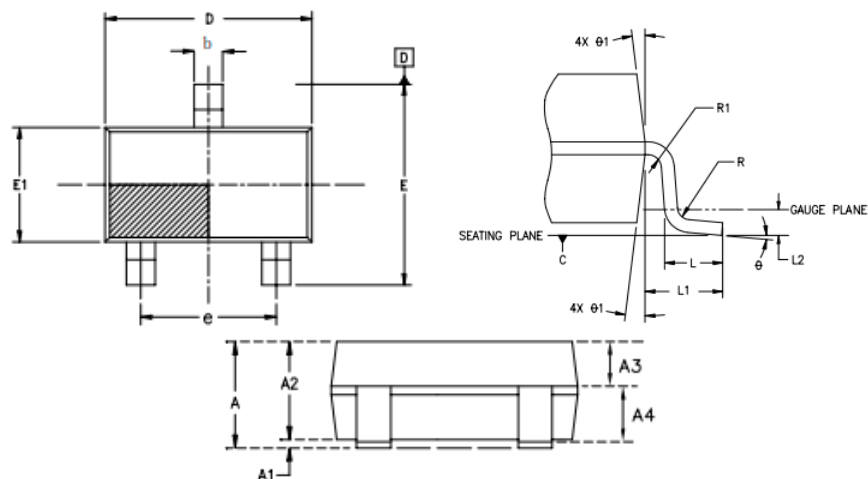
Note4: The test results change depending on the testing method and axis configuration used!

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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	0.35	0.45	0.014	0.018
b1	0.32	0.38	0.013	0.015
c	0.14	0.20	0.006	0.008
c1	0.14	0.16	0.006	0.006
D	2.82	3.02	0.111	0.119
E	2.60	3.00	0.102	0.118
E1	1.526	1.726	0.060	0.068
e	1.80	2.00	0.071	0.079
L	0.35	0.60	0.014	0.024
L1	0.6REF.		0.6REF.	
L2	0.25REF.		0.25REF.	
R	0.1	—	0.004	—
R1	0.1	0.25	0.004	0.010
θ	0°	8°	0°	8°
θ1	5°	15°	0°	8°

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