

### 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

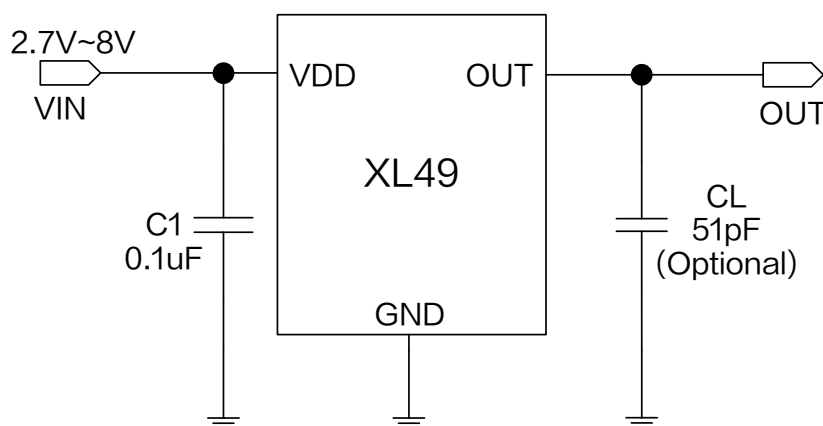


Figure1. XL49 Typical application schematic

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### Pin Configurations

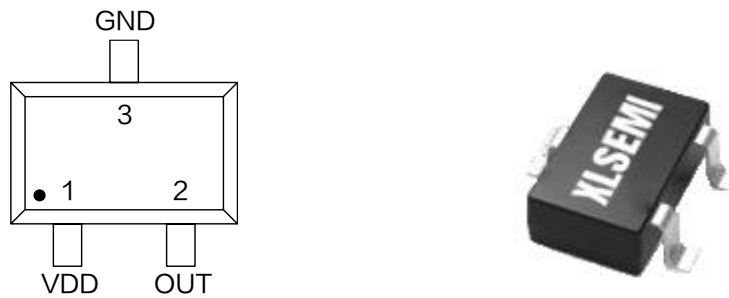


Figure2. Pin Configuration of XL49

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

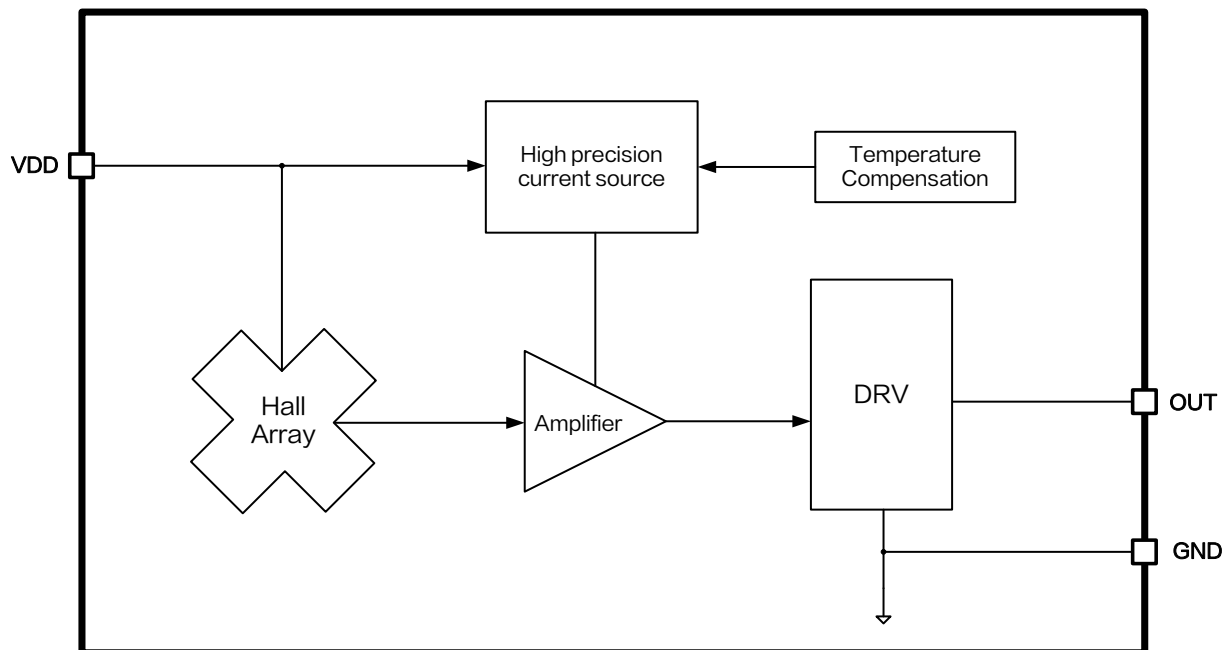


Figure3. Function Block Diagram of XL49

#### 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)<br>(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             |
| Static Output Voltage  | $V_{OUT(Q)}$ | $B = 0\text{Gs}$             | 1.886 | 2.05 | 2.214 | V             |
| Linearity              | Lin          | –                            | –4    | –    | 4     | %             |
| Power on start-up time | –            | $B = 0\text{Gs}$             | –     | 6    | –     | $\mu\text{S}$ |
| Response time          | –            | $B = -1000\text{Gs}$         | –     | 0.7  | –     | $\mu\text{S}$ |
| Output Noise           | –            | Bandwidth =<br>10Hz to 10kHz | –     | 0.8  | –     | mV            |

## XL49 Magnetic Characteristics ( Note2 )

| Parameters  | Symbol | Test Condition         | Min. | Typ. | Max. | Unit  |
|-------------|--------|------------------------|------|------|------|-------|
| Sensitivity | Sens   | $V_{DD} = 3.3\text{V}$ | 1.98 | 2.2  | 2.42 | 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.

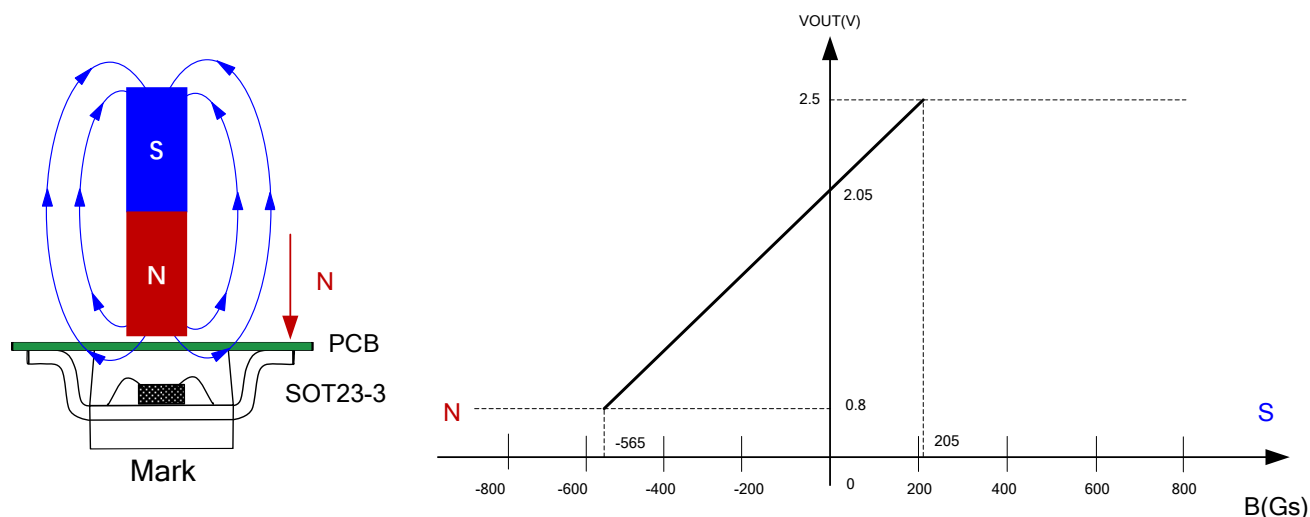


Figure4. XL49 Output characteristic curve

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

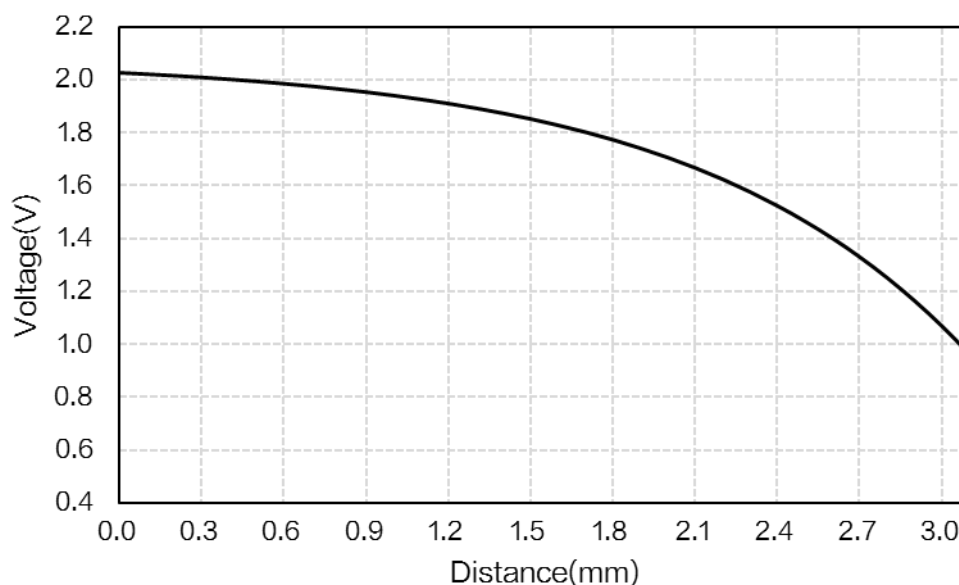


Figure5. Magnetic field axis application curve

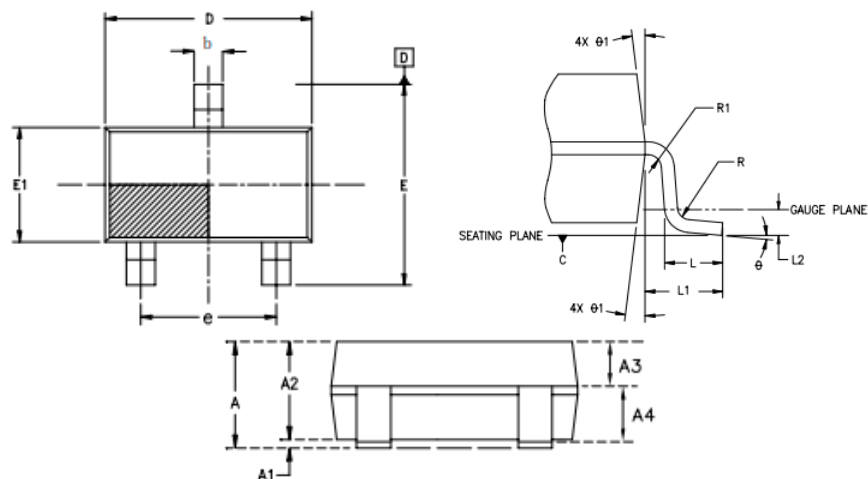
**Note4:** The test results change depending on the testing method and axis configuration used!

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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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