Low Power Linear Hall Sensor XL46S

Features

- Wide Operating Voltage Range：3V~8V
- Low Operation Current：1.8mA@V_{DD}=3.3V
- Linearity：±1%
- Sensitivity: -2.25mV/Gs@V_{DD}=3.3V
- Rail to Rail Linear Range: 0.2V ~ 3.1V@V_{DD}=3.3V
- Low Noise Output Without External Capacitor Filtering
- Temperature Grade 1：-40℃ to 125℃ Ambient Operating Temperature Range
- Device HBM ESD Classification Level Class2
- SOT23-3 package

Applications

- Game Handle Trigger / Joystick
- Position / Liquid Level Sensing
- Motor Control
- Magnetic Axis Keyboards

General Description

XL46S is a low-power, wide voltage, wide linear range, and wide temperature range rail to rail linear Hall sensor optimized for gaming controller applications. Its output voltage varies proportionally with the induced magnetic field strength, and its linear output voltage range follows the power supply voltage variation. The zero point output voltage (without magnetic field) of XL46S defaults to half of the power supply voltage. The typical operating voltage of the chip is 3.3V, with low operating current and a working temperature range of -40 ℃~125 ℃. It is widely used in consumer electronics and industrial control fields.

The XL46S 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

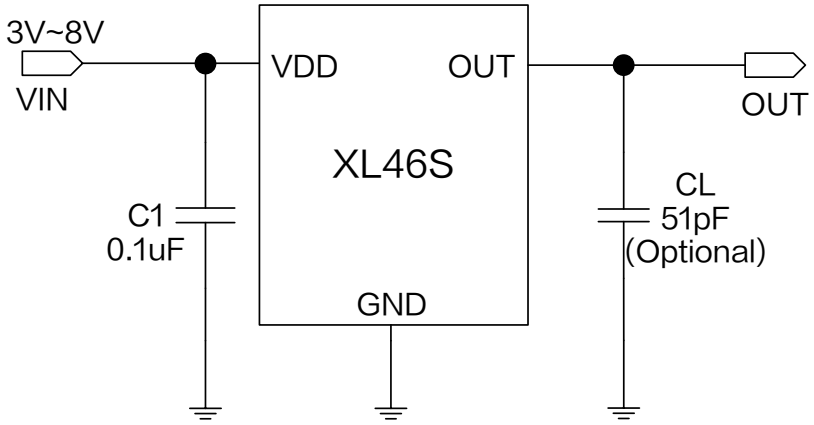


Figure1.XL46S Typical application schematic

Pin Configurations

Figure2.Pin Configuration of XL46S

Table1. XL46S Pin Description

Pin Name	Description
VDD	Supply Voltage Input Pin，XL46S operates from 3V to 8V DC voltage.
GND	Ground Pin.
OUT	Output Pin.

Ordering Information

Order Information	Marking ID	Package Type	Eco Plan	Packing Type Supplied As
XL46S	XL46S	SOT23-3	RoHS & HF	3000 Units Per Reel

Function Block

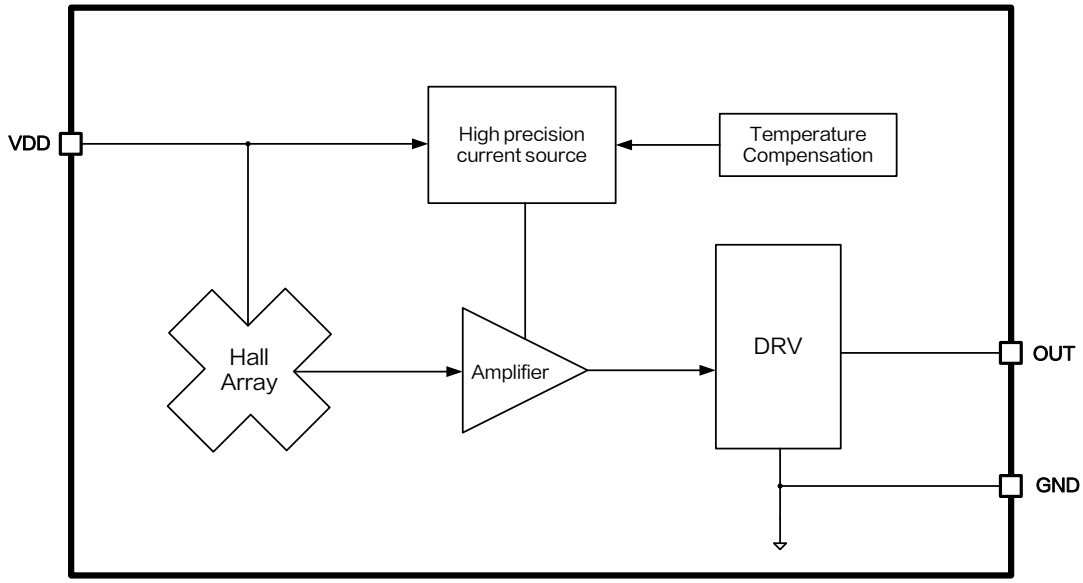


Figure3.Function Block Diagram of XL46S

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)	−	≥2000	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.

XL46S Electrical Characteristics（Note2）

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}	–	3	3.3	8	V
Operation Current	I_{DD}	–	1.2	1.8	2.4	mA
Output Load Resistance	R_L	B=+1000Gs	–	15	–	kΩ
Output Voltage Range	$V_{OUT(H)}$	B=−1000Gs	3.05	3.1	–	V
	$V_{OUT(L)}$	B=+1000Gs	–	0.2	0.25	V
Static Output Voltage	$V_{OUT(Q)}$	B=0Gs	1.518	1.65	1.782	V
Linearity	Lin	–	−1	–	1	%
Output Settling Time	–	B=0Gs	–	20	–	μs
Output Noise	–	Bandwidth= 10Hz to 10kHz	–	1.5	–	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 difference between the establishment and stabilization of the output voltage to the static output voltage.

XL46S Magnetic Characteristics（Note3）

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Sensitivity	Sens	V_{DD}=3.3V	−2.43	−2.25	−2.07	mV/Gs

Note3:

(1) XL46S is optimized for game handles, with sensitivity corresponding to output voltage in the linear range of 0.2V~3.1V as shown in the table;

(2) Sensitivity varies linearly with input voltage.

XL46S Output Characteristics

T_A = 25℃,V_{DD} =3.3V, system parameters test circuit figure1, test methods figure4, unless otherwise specified.

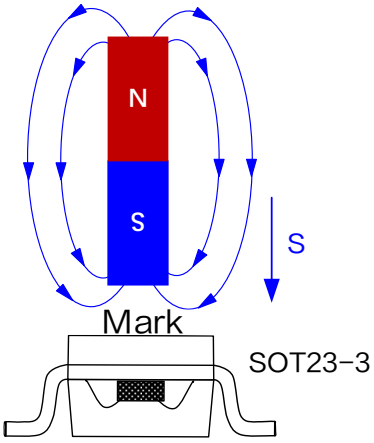


Figure4.Test Schematic of XL46S

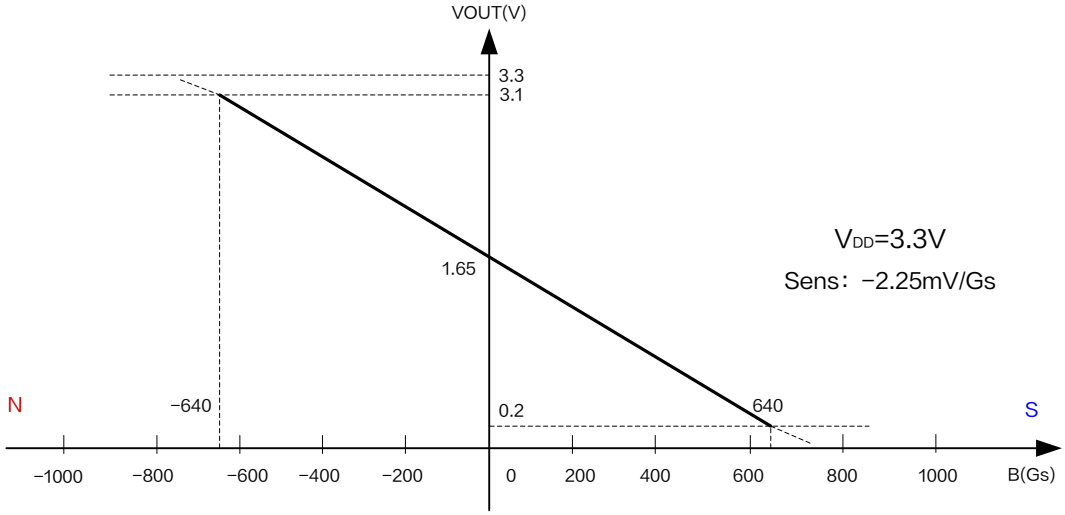


Figure5.Output Characteristic Curve of XL46S (V_{DD}=3.3V)

Linear variation of XL46S sensitivity with input voltage

T_A = 25℃,V_{DD} =3.3V, system parameters test circuit figure1, test methods figure4, unless otherwise specified.

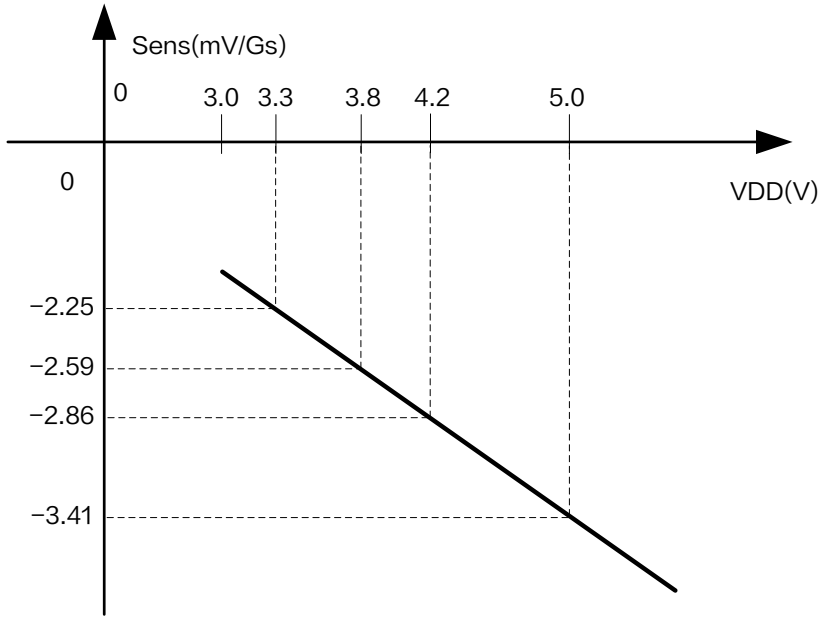
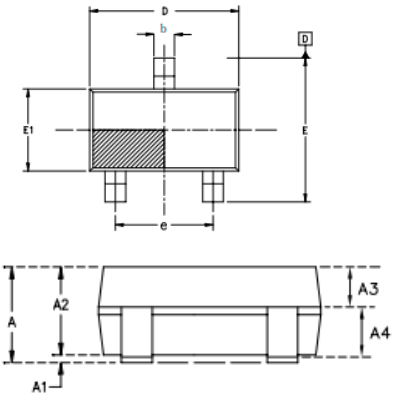
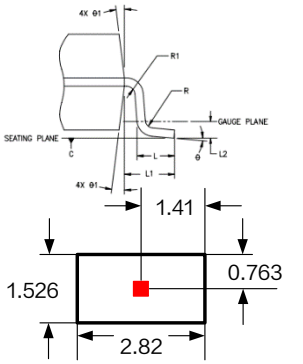


Figure6.Sensitivity Linear Curve of XL46S

Package Information

SOT23-3





单位：mm

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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