

Low Power Linear Hall Sensor

XL46T

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°C to 125°C
Ambient Operating Temperature Range
- Device HBM ESD Classification Level
Class2
- TO92S-3 package

Applications

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

General Description

XL46T 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 XL46T 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 °C~125 °C. It is widely used in consumer electronics and industrial control fields.

The XL46T 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

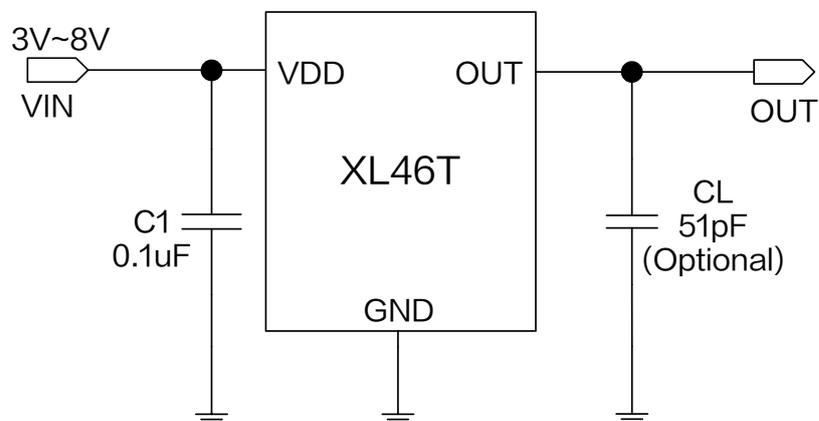


Figure1. XL46T Typical application schematic

Low Power Linear Hall Sensor

XL46T

Pin Configurations

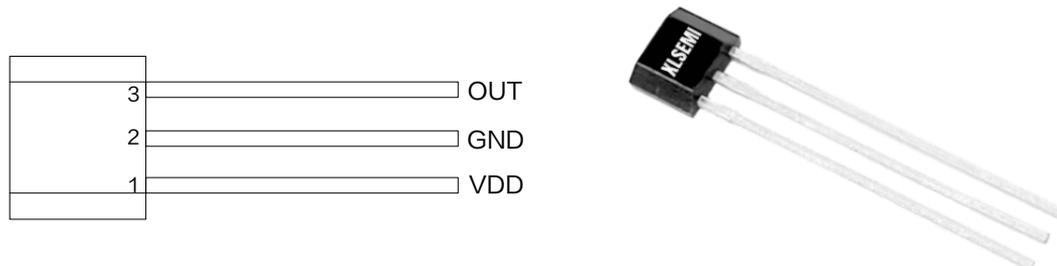


Figure2. Pin Configuration of XL46T

Table1. XL46T Pin Description

Pin Name	Description
VDD	Supply Voltage Input Pin, XL46T 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
XL46T	XL46T	TO92S-3	RoHS & HF	1000 Units Per Bag

Function Block

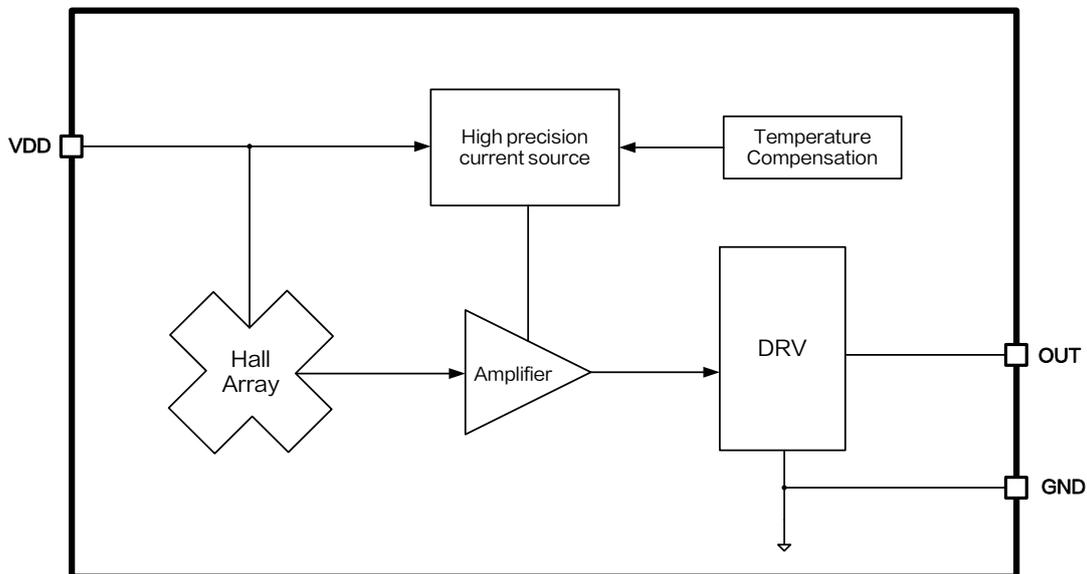


Figure3. Function Block Diagram of XL46T

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(TO92S-3) (Junction to Ambient, No Heatsink, Free Air)	R_{JA}	160	°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.

Low Power Linear Hall Sensor

XL46T

XL46T 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	8	V
Operation Current	I_{DD}	-	1.2	1.8	2.4	mA
Output Load Resistance	R_L	$B = -1000\text{Gs}$	-	15	-	$k\Omega$
Output Voltage Range	$V_{OUT(H)}$	$B = +1000\text{Gs}$	3.05	3.1	-	V
	$V_{OUT(L)}$	$B = -1000\text{Gs}$	-	0.2	0.25	V
Static Output Voltage	$V_{OUT(Q)}$	$B = 0\text{Gs}$	1.518	1.65	1.782	V
Linearity	Lin	-	-1	-	1	%
Output Settling Time	-	$B = 0\text{Gs}$	-	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 interval from when the output voltage begins to establish until it stabilizes at 90% of the steady-state output voltage.

XL46T Magnetic Characteristics (Note3)

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Sensitivity	Sens	$V_{DD} = 3.3\text{V}$	2.070	2.25	2.430	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 chip's marking surface.
- (2) XL46T 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;
- (3) Sensitivity varies linearly with input voltage.

XL46T Output Characteristics

$T_A = 25^\circ\text{C}$, $V_{DD} = 3.3\text{V}$, system parameters test circuit figure1, test methods figure4, unless otherwise specified.

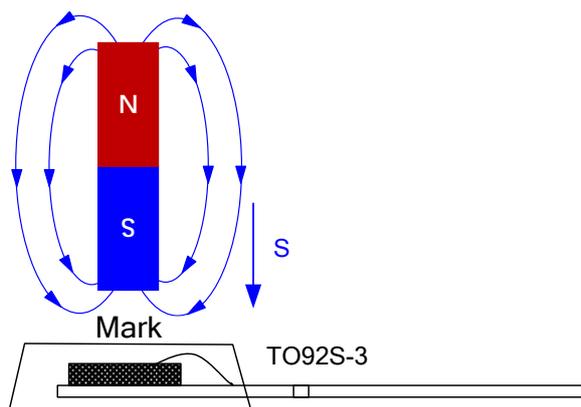


Figure4. Test Schematic of XL46T

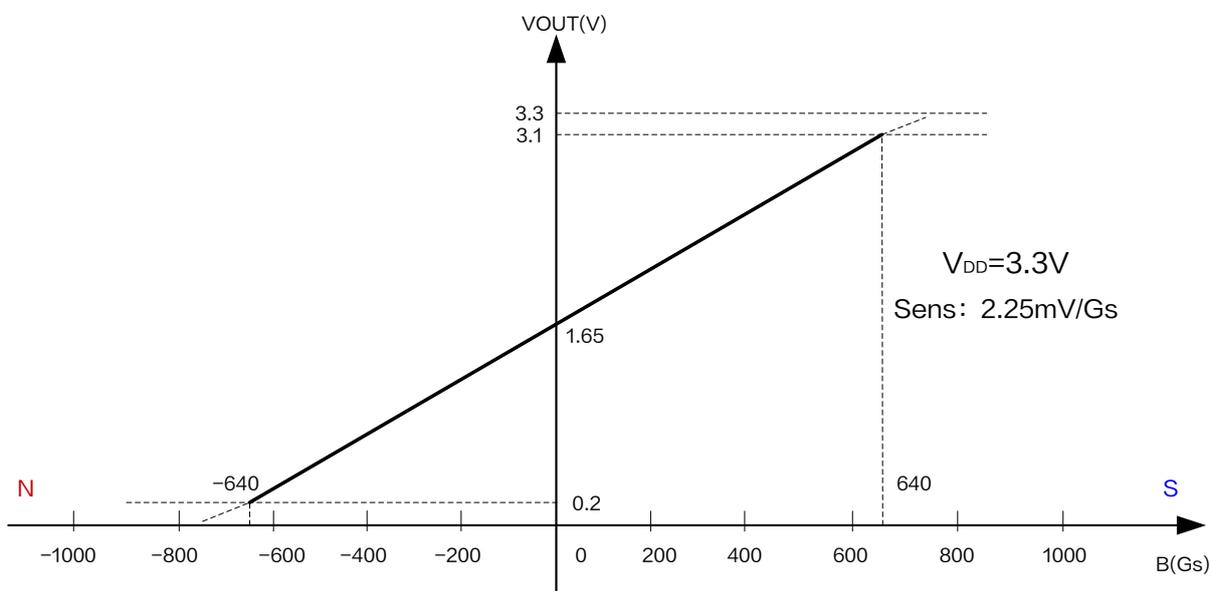


Figure5. Output Characteristic Curve of XL46T ($V_{DD}=3.3\text{V}$)

Linear variation of XL46T sensitivity with input voltage

$T_A = 25^\circ\text{C}$, $V_{DD} = 3.3\text{V}$, system parameters test circuit figure1, test methods figure4, unless otherwise specified.

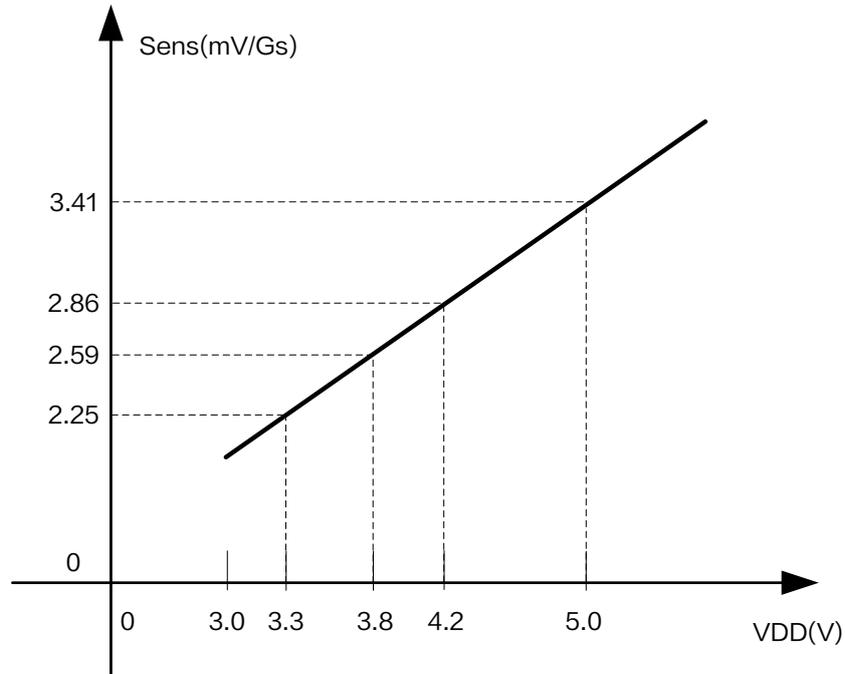


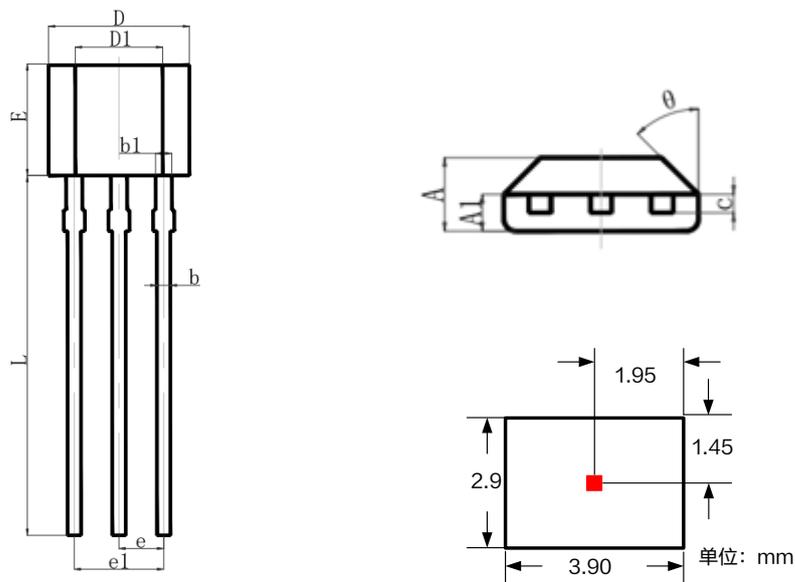
Figure6. Sensitivity Linear Curve of XL46T

Low Power Linear Hall Sensor

XL46T

Package Information

TO92S-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.42	1.62	0.056	0.064
A1	0.66	0.87	0.026	0.034
b	0.33	0.56	0.013	0.022
b1	0.40	0.51	0.016	0.020
c	0.33	0.51	0.013	0.020
D	3.90	4.10	0.154	0.161
D1	2.28	2.68	0.090	0.106
E	2.90	3.25	0.114	0.128
e	1.27 REF		0.050 REF	
e1	2.44	2.64	0.096	0.104
L	13.50	15.50	0.531	0.610
θ	45° REF		45° REF	

Low Power Linear Hall Sensor	XL46T
------------------------------	-------

Important Notice

XLSEMI reserve the right to make modifications, enhancements, improvements, corrections or other changes without notice at any time. XLSEMI does not assume any liability arising out of the application or use of any product described herein; neither does it convey any license under its patent rights, nor the rights of others. XLSEMI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using XLSEMI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards. XLSEMI warrants performance of its products to the specifications applicable at the time of sale, in accordance with the warranty in XLSEMI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent XLSEMI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

For the latest product information, go to www.xlsemi.com.