Version 1
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Bipolar Lathing Hall Effect Switch CYD505

Applications

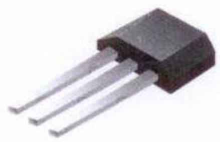
- Brushless DC motors
- Speed measurement
- Counting
- Angle position detection
- Proximity detection
- Home applications
- Home safety etc.

Features

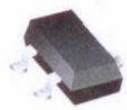
- 2.7V to 30V operation voltage
- Overvoltage protection capability up to 40 V
- High accuracy bipolar switch
- Built-in dynamic offset cancellation
- Open drain output
- Low thermal drift of magnetic sensing
- Qualified according to AEC-Q100 test standard

Package Type
P/N: CYD505-XX

TO92S (UA)



SOT23-3L (LH)



Order Information

- CYD505-PA
  Package (PA): UA, LH

Specifications

Absolute Maximum Ratings (T_A=25°C)

Parameter	Symbol	Conditions	Rating	Unit
Maximum supply voltage	V_{DDMAX}		30	V
Operating temperature	T_A		-40~+150	°C
Storage temperature	T_S		-40~+165	°C
Maximum output current	I_{OMAX}		25	mA

Electrical Characteristics (T_A=25°C, V_{DD}=12VDC)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{DD}		2.7		30	V
Supply current	I_{DD}	Output open		2.5	3.2	mA
Low output voltage	$V_{OL(ON)}$	@I_{OUT} = 20mA		130	400	mV
Output leakage current	I_{OH}	Output switch off			0.1	µA
Output voltage	V_{OUT}				30	V
Output voltage fall time	t_f	V_{DD}=12V; R_L=820Ω;			1	µs
Output voltage rise time	t_r	C_L=20pF			1	µs
Delay time	t_d			18		µs

Magnetic Characteristics (T_A=25°C, V_{DD}=12VDC)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operating point (On point)	B_{OP}	Pullup resistor		13.5		mT
Release point (Off point)	B_{RP}	R_L=1kΩ,		-13.5		mT
Hysteresis	B_{HYS}	Load capacitor		27		mT
Temperature coefficient	Tc	C_L=20pF		-1000		ppm/°C

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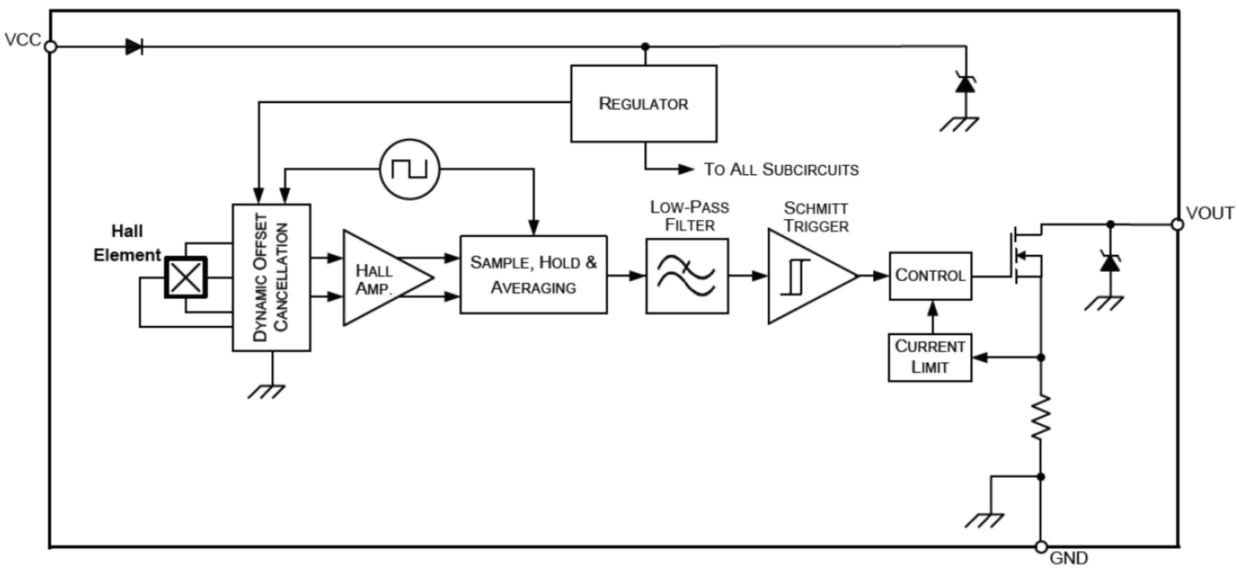
General Specifications

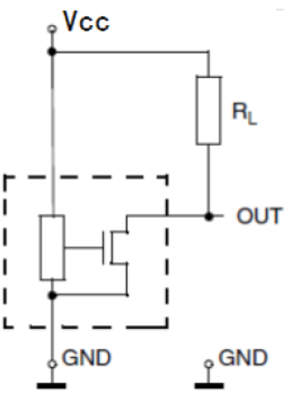
CYD505 Hall Effect Switch is a monolithic integrated circuit which switches in response to magnetic field. If a magnetic field with flux lines perpendicular to the sensitive area is applied to the sensor, the biased Hall plate forces a Hall voltage proportional to this field. The Hall voltage is compared with the actual threshold level in the comparator. If the magnetic field exceeds the threshold levels, the output stage is switched to the appropriate state. The built-in hysteresis eliminates oscillation and provides switching behavior of output without bouncing.

Magnetic offset caused by mechanical stress is compensated by using the chopping offset compensation technique. A serial resistor or diode on the supply line is not required thanks to the built-in reverse voltage protection.

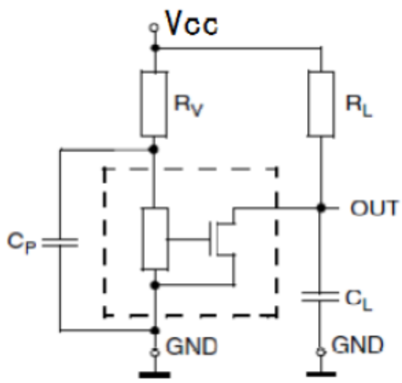
The open drain output is forced to a safe, high-impedance state (tri-state), in any of the following fault conditions: overtemperature, and undervoltage. In addition, the output current is limited (short-circuit protection).
The device is able to withstand a maximum supply voltage of 28 V for unlimited time and features overvoltage capability (40V load dump). The architecture block diagram is shown in the following Fig.



Application Circuits



Circuit 1



Circuit 2

For applications with disturbances on the supply line or radiated disturbances, a series resistor R_V and two capacitors C_P and C_L, all placed close to the sensor, are recommended.

For example:
R_V =100Ω
C_P = 4.7 nF
C_L = 1 nF.
R_L= 1k~10k Ω

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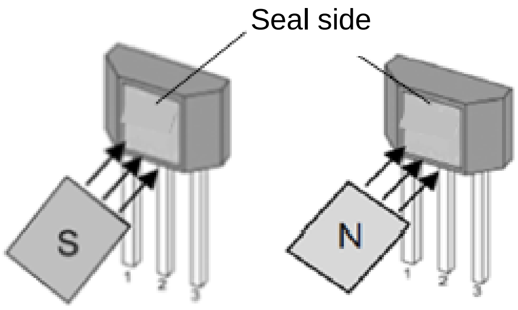
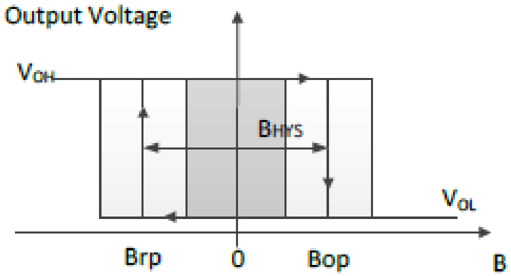
Magnetic conversion instructions

Applying a South Pole magnetic field greater than Bop (Antarctic proximity) to the seal side of the TO92S package, the output becomes low; while a North Pole field near to the seal side the output becomes high. The output does not change if the magnetic field is removed. For changing the output state, the opposite magnetic field polarity must be applied. When the IC is first powered on, if the magnetic field is between Bop and Brp, the output state will be in an undefined state (high or low).

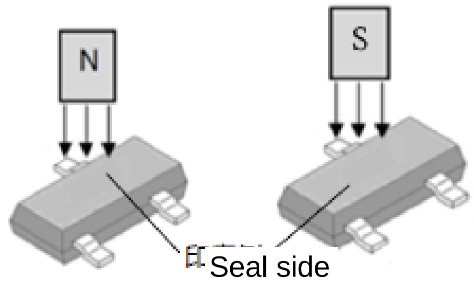
The magnetic field polarity of the SOT23-3L package is the opposite of that of the TO92S. See figure below.



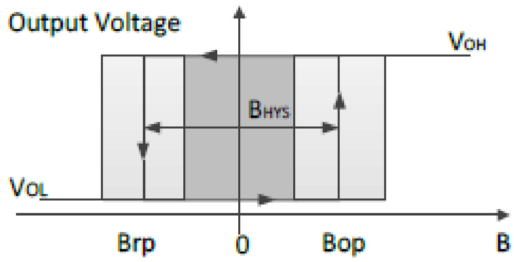
V_{OUT} = Low V_{OUT} = High



Output of TO92S package



V_{OUT} = Low V_{OUT} = High



Output of SOT23-3L package

Note:

Hall switch IC is a sensitive device and should be used and stored with care for electrostatic protection. The mechanical stress applied to the device housing and leads should be minimized during installation and use. It is recommended that the welding temperature should not exceed 350°C and the duration should not exceed 5 seconds. In order to ensure the safety and stability of Hall IC, it is not recommended to use out of parameter range for a long time.

ESD Test

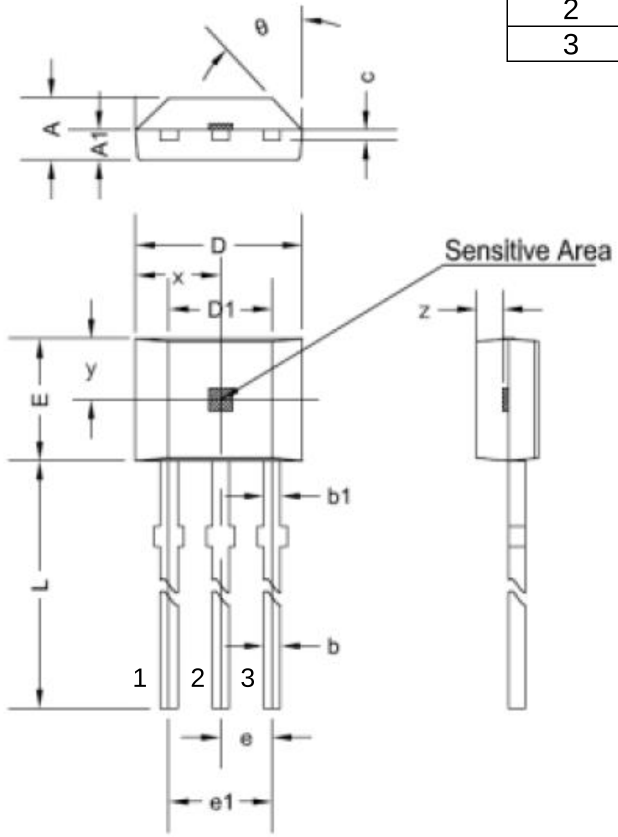
The output pin has to be in tri-state (high impedance) for ESD measurements

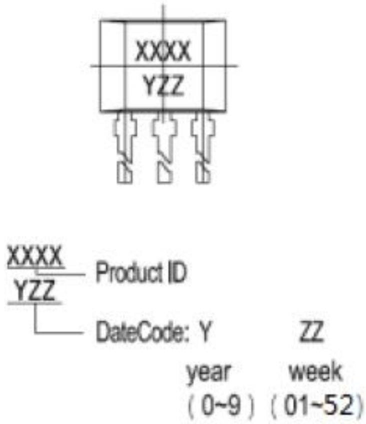
Symbol	Parameter	Min	Max	Unit
V_{HBM}	Human body model (according to AEC Q100-002)	-12	12	kV

Package Outline
TO92S (UA)
(Packing: bulk, 1000pcs/bag)

Pin Assignment

Pin No.	Name	Function
1	Vcc	Power supply
2	GND	Ground
3	Vout	Output



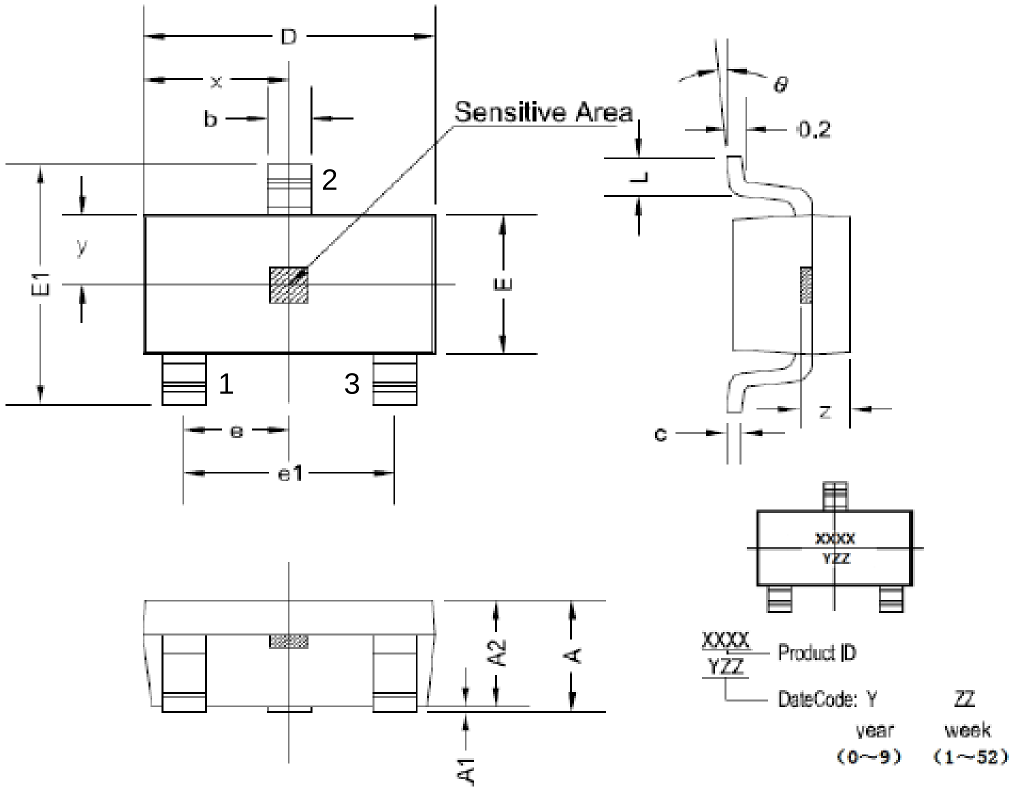


Symbol	Size (mm)		Size (in inches)	
	Min.	Max.	Min.	Max.
A	1.42	1.67	0.056	0.066
A1	0.66	0.86	0.026	0.034
b	0.35	0.56	0.014	0.022
b1	0.40	0.55	0.016	0.022
C	0.36	0.51	0.014	0.020
D	3.90	4.20	0.154	0.165
D1	2.97	3.27	0.117	0.129
E	2.90	3.28	0.114	0.129
e	1.27 typ.		0.050 typ.	
e1	2.44	2.64	0.096	0.104
L	13.5	15.5	0.531	0.610
x	2.03 typ.		0.080 typ.	
y	1.55 typ.		0.061 typ.	
z	0.50 typ.		0.020 typ.	
θ	45° typ.		45° typ.	

Package Outline
SOT23-3L(LH)
(Packing: Tape&Reel, 3000pcs/reel)

Pin Assignment

Pin No.	Name	Function
1	Vcc	Power supply
2	GND	Ground
3	Vout	Output



Symbol	Size (mm)		Size (in inches)	
	Min.	Max.	Min.	Max.
A	1.05	1.25	0.041	0.049
A1	0	0.10	0	0.004
A2	1.05	1.15	0.041	0.045
b	0.30	0.50	0.012	0.020
c	0.10	0.20	0.004	0.008
D	2.82	3.02	0.111	0.119
E	1.50	1.70	0.059	0.067
E1	2.65	2.95	0.104	0.116
e	0.95 typ.		0.037 typ.	
e1	1.80	2.00	0.071	0.079
L	0.30	0.60	0.012	0.024
x	1.46 typ.		0.057 typ.	
y	0.80 typ.		0.032 typ.	
z	0.60 typ.		0.024 typ.	
θ	0°	8°	0°	8°