



## High-Sensitive Unipolar Hall Effect Switch CYD509

### Applications

- Automotive brake pedal position detection
- Proximity detection
- Speed measurement
- Weak magnetic field applications
- Solid state switches etc.

### Features

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

### Order Information

- CYD509-PA  
Package (PA): UA, LH

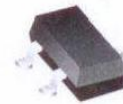
#### Package Type

P/N: CYD509-XX

TO92S (UA)



SOT23-3L (LH)



### Specifications

#### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ )

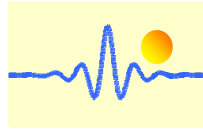
Parameter	Symbol	Conditions	Rating	Unit
Maximum supply voltage	$V_{DDMAX}$		30	V
Operating temperature	$T_A$		-40~+150	$^\circ\text{C}$
Storage temperature	$T_S$		-40~+165	$^\circ\text{C}$
Maximum output current	$I_{OMAX}$		25	mA

#### Electrical Characteristics ( $T_A=25^\circ\text{C}$ , $V_{DD}=12\text{VDC}$ )

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	$V_{OL(ON)}$	@ $I_{OUT} = 20\text{mA}$		130	400	mV
Output leakage current	$I_{OH}$	Output switch off			0.1	$\mu\text{A}$
Output voltage	$V_{OUT}$				30	V
Output voltage fall time	$t_f$	$V_{DD}=12\text{V}$ ; $R_L=820\Omega$ ; $C_L=20\text{pF}$			1	$\mu\text{s}$
Output voltage rise time	$t_r$				1	$\mu\text{s}$
Delay time	$t_d$			18		$\mu\text{s}$

#### Magnetic Characteristics ( $T_A=25^\circ\text{C}$ , $V_{DD}=12\text{VDC}$ )

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operating point (On point)	$B_{OP}$	Pullup resistor $R_L=1\text{k}\Omega$ , Load capacitor $C_L=20\text{pF}$	20	35	50	G
Release point (Off point)	$B_{RP}$		38	55	72	G
Hysteresis	$B_{HYS}$		15	20	27	G
Temperature coefficient	$T_C$			-1000		ppm/ $^\circ\text{C}$



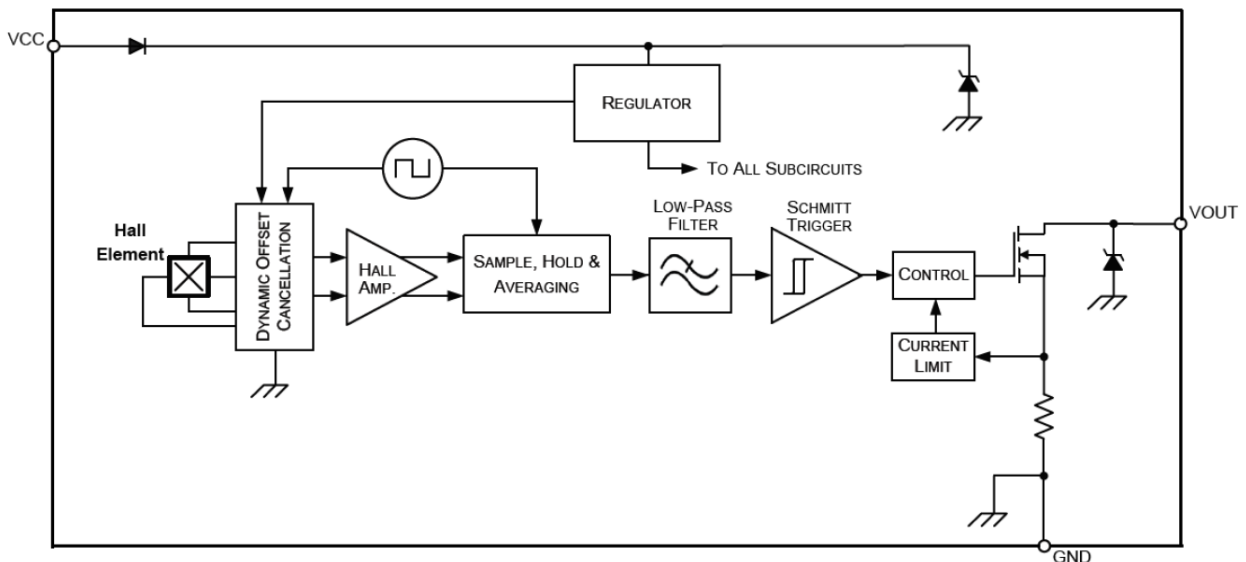
## General Specifications

CYD509 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.

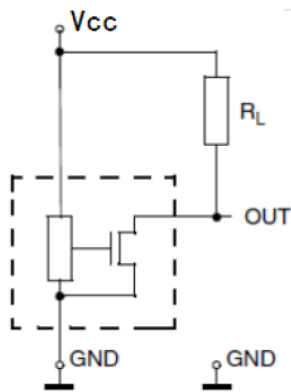
Magnetic offset caused by mechanical stress is compensated by using the chopping offset compensation technique. A series resistor or diode on the supply line is not required thanks to the built-in reverse voltage protection.

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).

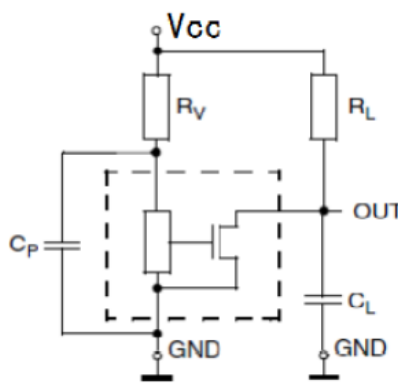
The device is able to withstand a maximum supply voltage of 28 V for unlimited time and features overvoltage capability (40V load dump). The architecture block diagram is shown in the following Fig.



## Application Circuits



Circuit 1



Circuit 2

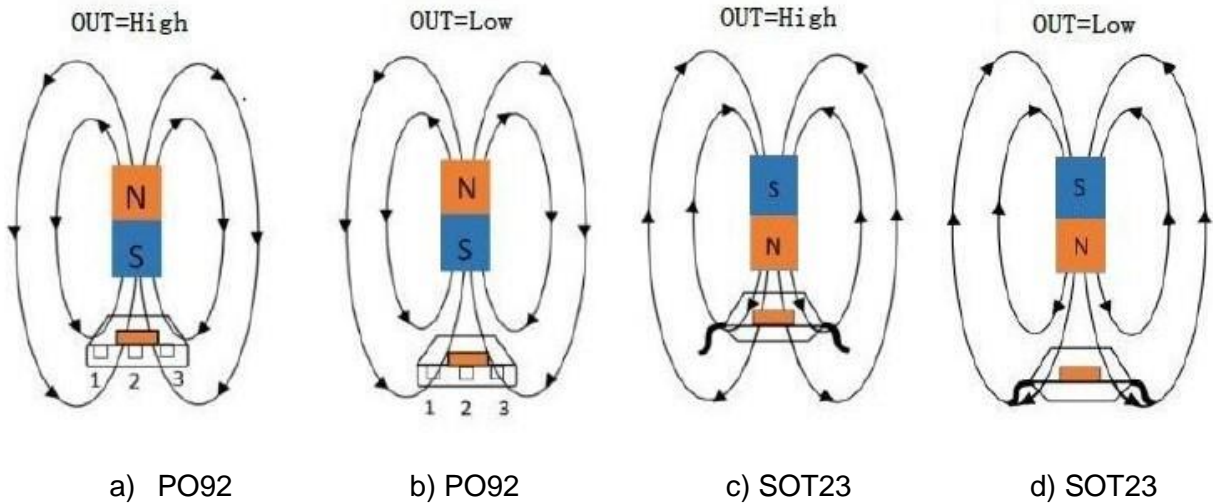
For applications with disturbances on the supply line or radiated disturbances, a series resistor  $R_V$  and two capacitors  $C_P$  and  $C_L$ , all placed close to the sensor, are recommended.

For example:  
 $R_V = 100\Omega$   
 $C_P = 4.7 \text{ nF}$   
 $C_L = 1 \text{ nF}$   
 $R_L = 1\text{k} \sim 10\text{k} \Omega$

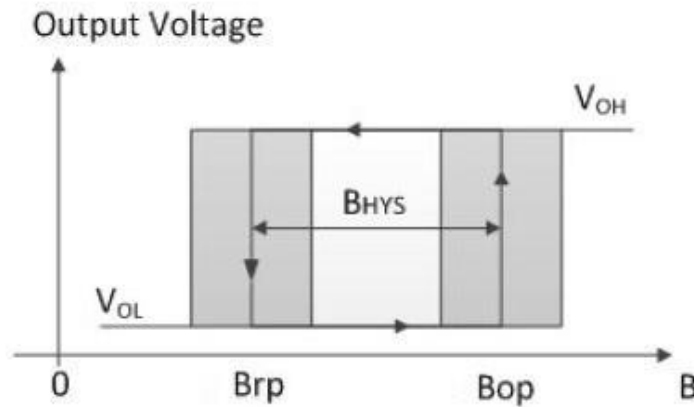


## Application Example

A positive magnetic field is defined as a South Pole near to the marked side of the TO92S package. For the SOT23 package the positive magnetic field is defined as a North Pole near to the marked side.



Output is low at a small sensing distance between magnet and sensor, for case a) and c)  
Output is high at a large sensing distance between magnet and sensor, for case b) and d)



Output behavior of CYD509

## 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



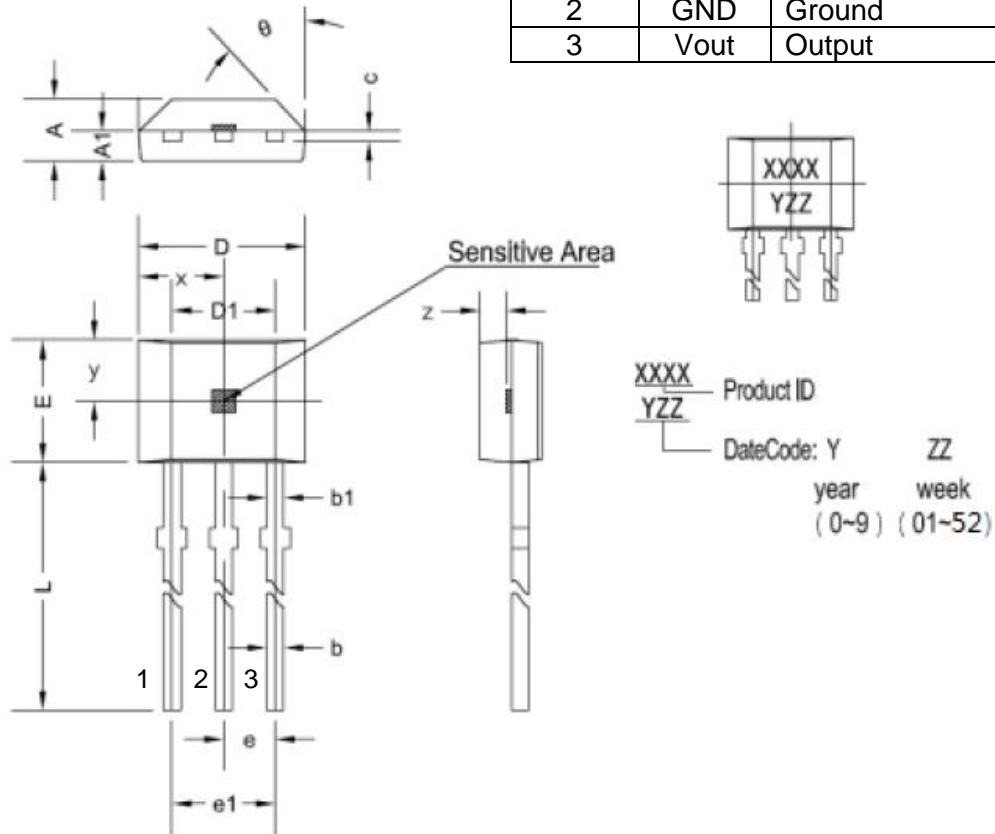
## Package Outline

### T092S (UA)

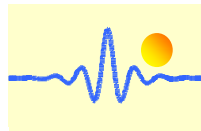
(Packing: bulk, 1000pcs/bag)

### Pin Assignment

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



Symbol	Size (mm)		Size (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.	
theta	45° typ.		45° typ.	

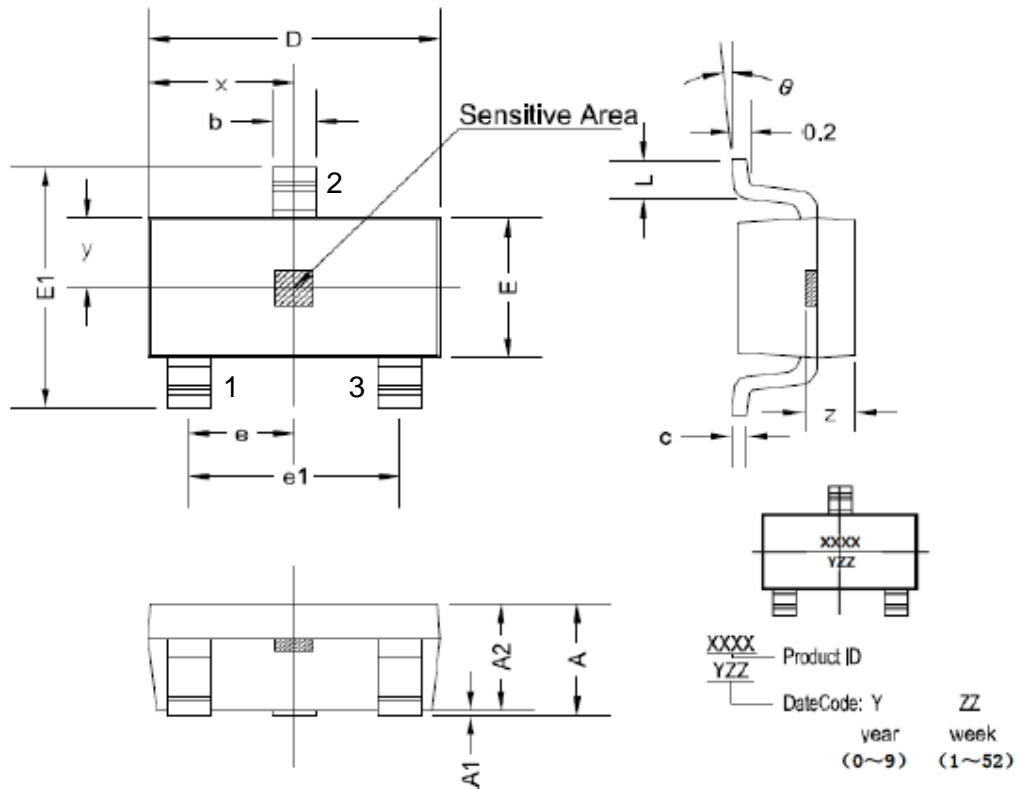


**Package Outline**  
**SOT23-3L(LH)**

(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°