

Unipolar Hall Effect Switch CYD510

Features

- AEC Q100 Grade 0 Automotive Grade Certification
- Operating voltage: 2.7V~ 30V
- Anti-static up to: $\pm 12\text{KV}$
- Strong mechanical stress suppression capability
- Temperature range: $-40^{\circ}\text{C}\sim 150^{\circ}\text{C}$
- Lower flux density due to temperature increase is compensated by built-in negative temperature coefficient
- Power pins are voltage protected
- Suitable for automotive and industrial applications

Applications

- Speed and RPM Sensors
- Tachometer sensors, flow sensors
- DC motors, motor and fan control, robot control
- Proximity sensors, position sensors
- Safety harnesses, hood, trunk door locks
- Sunroof / Live Top / Rear Fascia / Liftgate Activation
- Brake/clutch pedal
- Electric power steering (EPS)
- Transmission shift
- Wiper motor

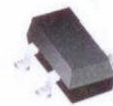
Package Type

P/N: CYD502-XX

TO92S (UA)



SOT23-3L (LH)



SOT23 (LH)



Order Information

- CYD510-PA
Package (PA): UA, SU, LH

Specifications

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

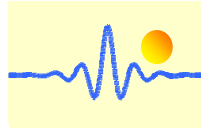
Parameter	Symbol	Conditions	Rating	Unit
Supply voltage	V_{CC}	$t < 1000\text{h}$	-20 ~30	V
Output voltage	V_{out}	$t < 1000\text{h}$	-0.5~30	
Operating temperature	T_A		-40~+150	$^{\circ}\text{C}$
Storage temperature	T_S		-40~+165	$^{\circ}\text{C}$
Maximum output current	I_{OMAX}		25	mA

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

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}		2.7		30	V
Supply current	I_{CC}	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	μA
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	μs
Output voltage rise time	t_r				1	μs
Delay time	t_d			16		μs

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

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operating point (On point)	B_{OP}	Pullup resistor		12.1		mT
Release point (Off point)	B_{RP}	$R_L=1\text{k}\Omega$,		7.1		mT
Hysteresis	B_{HYS}	Load capacitor		5		mT
Temperature coefficient	T_C	$C_L=20\text{pF}$		-1000		ppm/ $^{\circ}\text{C}$



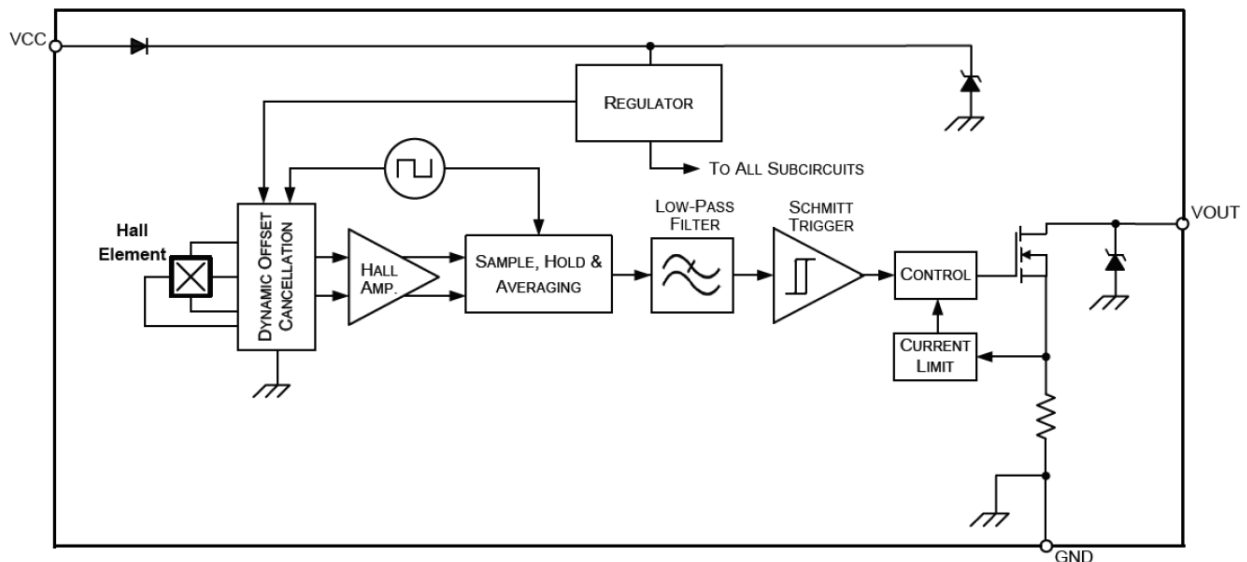
General Specifications

CYD510 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.

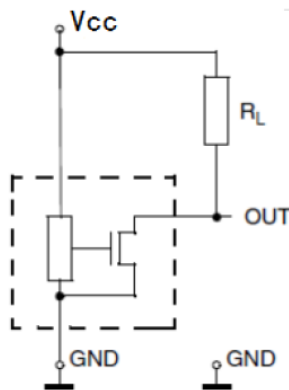
Magnetic offset caused by mechanical stress is compensated by using the chopping offset compensation technique. A series resistor or diode on the supply line is not required thanks to the built-in reverse voltage protection.

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).

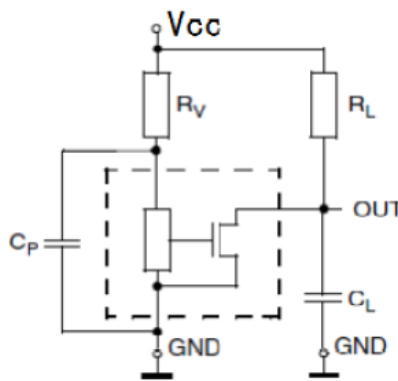
The device is able to withstand a maximum supply voltage of 30 V for unlimited time and features overvoltage capability (40V load dump). The architecture block diagram is shown in the following Fig.



Application Circuits



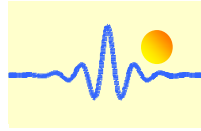
Circuit 1



Circuit 2

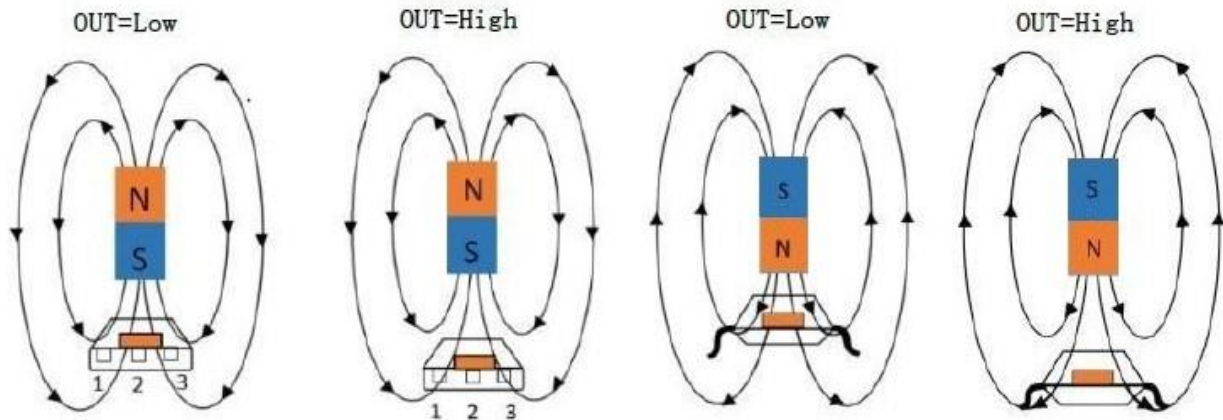
For applications with disturbances on the supply line or radiated disturbances, a series resistor R_V and two capacitors C_P and C_L , all placed close to the sensor, are recommended.

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 (SOT23) package. For the SOT23 package the positive magnetic field is defined as a North Pole near to the marked side.



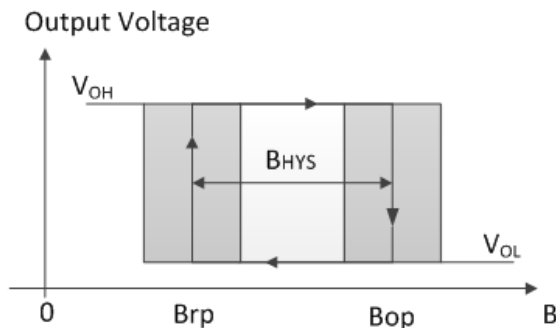
a) PO92S(SOT23)

b) PO92S(SOT23)

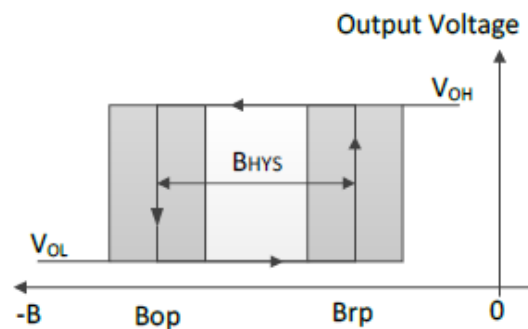
c) SOT23-3L

d) SOT23-3L

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)



PO92S (SOT23)

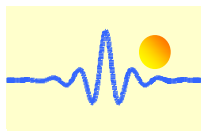


SOT23-3L

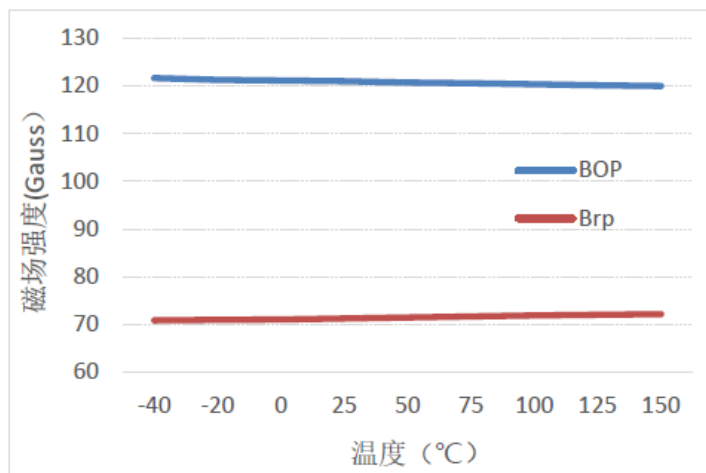
ESD Test

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

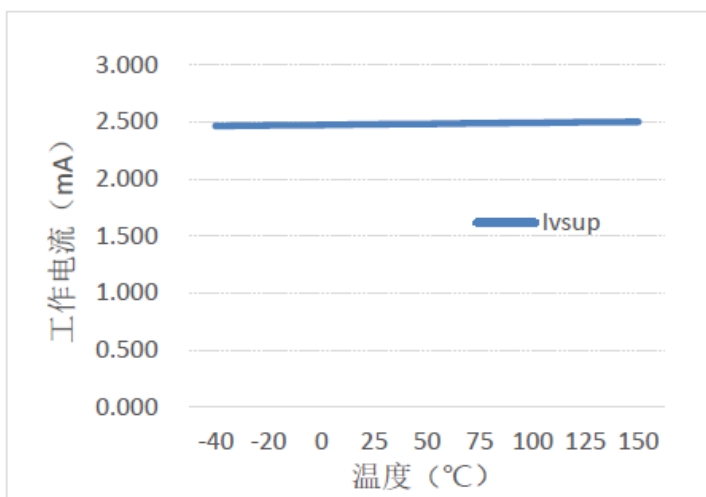
Symbol	Parameter	Min	Max	Unit
V_{HBM}	Human body model (according to AEC Q100-002)	-12	12	kV



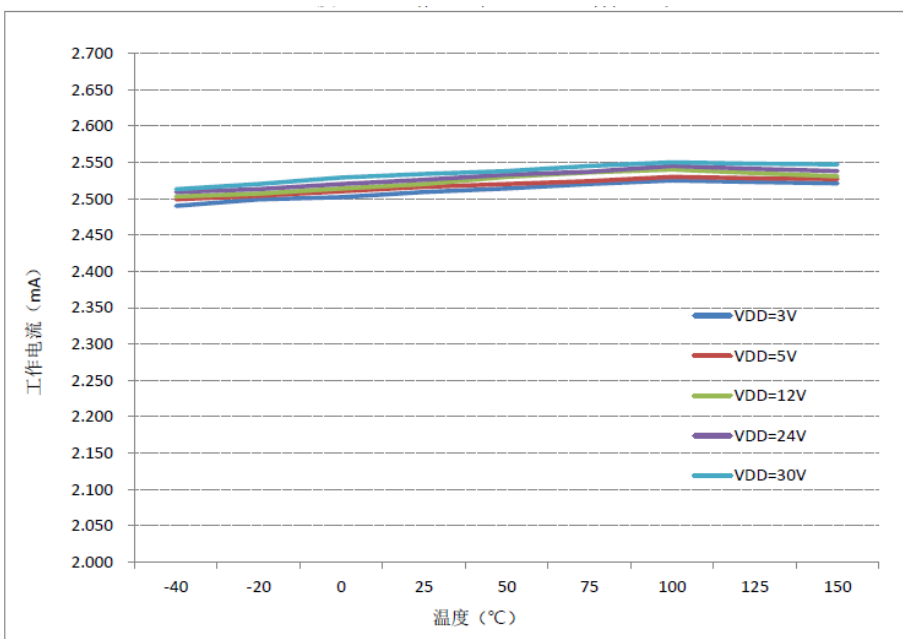
Characteristic Curves



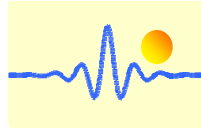
$V_{CC}=5V$, Characteristic curve of operating point and release point as function of working temperature



$V_{CC}=5V$, Characteristic curve of power supply current as function of working temperature



Power supply current characteristics curve at different temperatures and



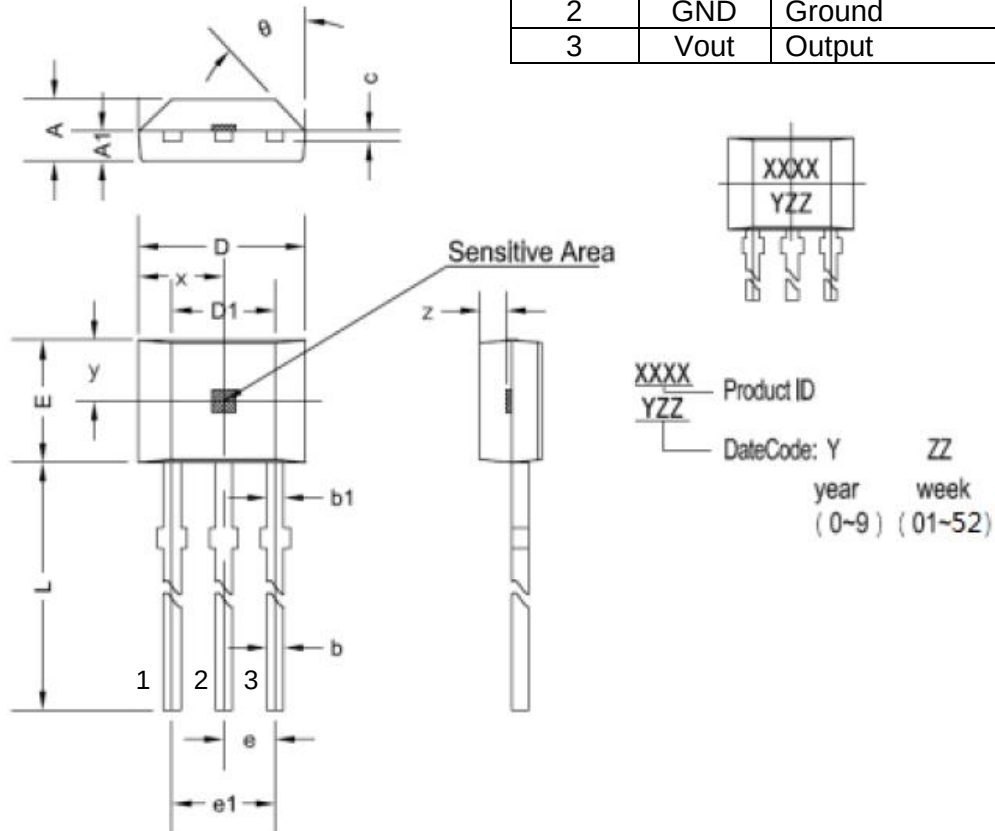
Package Outline

T092S (UA)

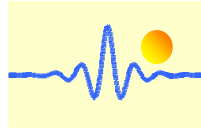
(Packing: bulk, 1000pcs/bag)

Pin Assignment

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



Symbol	Size (mm)		Size (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.	

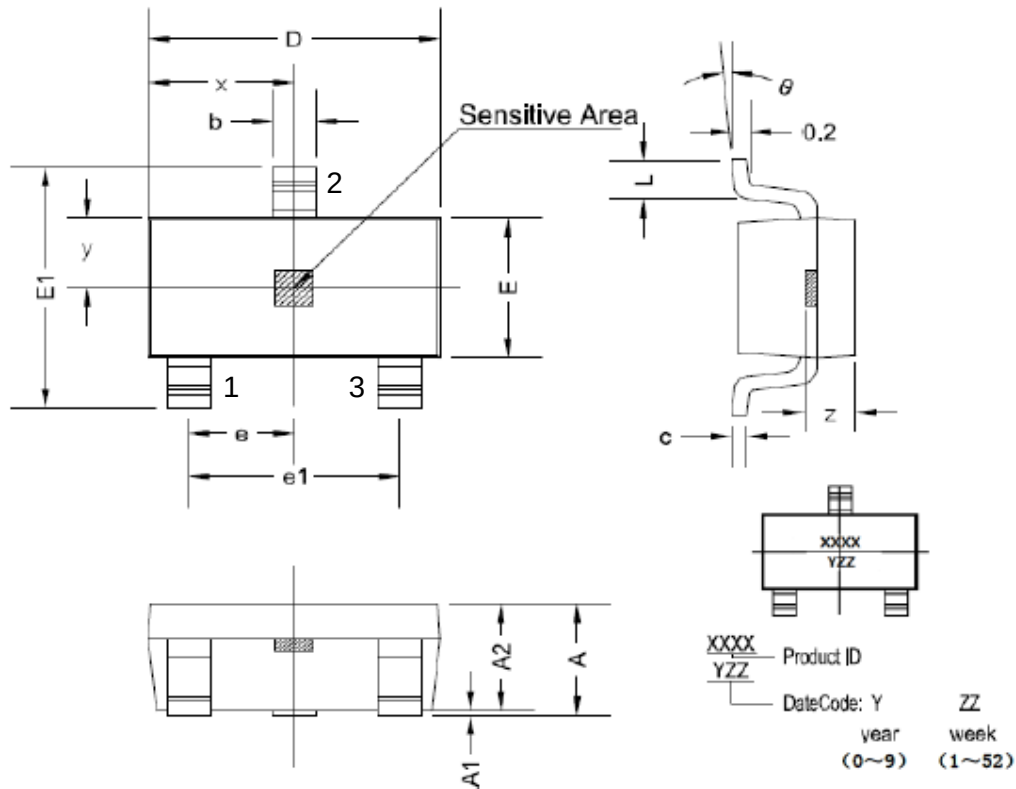


SOT23-3L(SU)

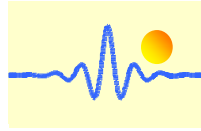
(Packing: Tape&Reel, 3000pcs/reel)

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	1.30	0.041	0.051
A1	0	0.15	0	0.006
A2	1.00	1.20	0.039	0.047
b	0.30	0.50	0.012	0.020
c	0.08	0.22	0.003	0.009
D	2.80	3.02	0.110	0.119
E	1.50	1.70	0.059	0.067
E1	2.60	3.00	0.102	0.118
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°

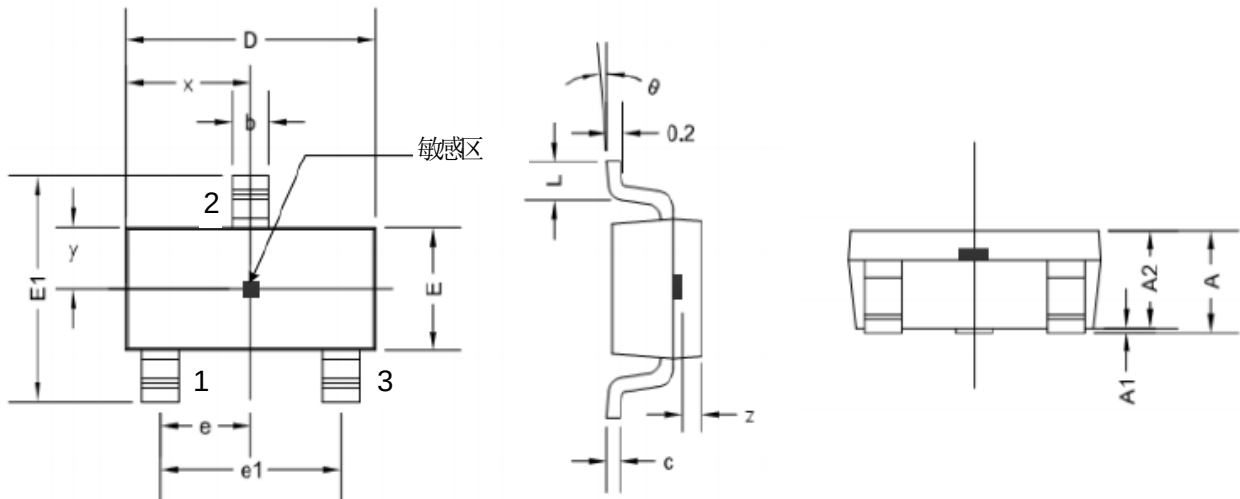


SOT23(LH)

(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.
A	0.90	1.15	0.035	0.045
A1	0	0.10	0	0.004
A2	0.90	1.10	0.035	0.043
b	0.30	0.50	0.012	0.020
c	0.132	0.202	0.005	0.008
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.95 typ.		0.037 typ.	
e1	1.80	2.00	0.071	0.079
L	0.30	0.50	0.012	0.020
x	1.46 typ.		0.057 typ.	
y	0.65 typ.		0.026 typ.	
z	0.50 typ.		0.020 typ.	
θ	0°	8°	0°	8°