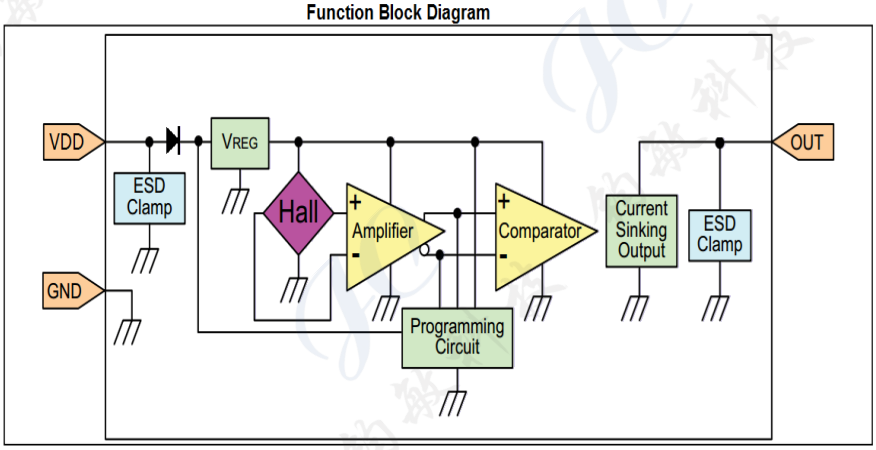
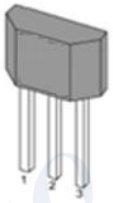
FEATURES and FUNCTIONAL DIAGRAM

- Unipolar respond to a single pole: North (CH952S) or South (CH952T and CH952E), making these products well-suited for shift selectors, wiper end/home position, door ajar/open, and vane-interrupt systems etc.
- Enhanced sensitivity: will operate from Brp 250 Gauss to Bop 330 Gauss typical with very good temperature-stable and stress-resistant, allowing the use of smaller, potentially lower-cost magnets or high robust application
- Subminiature, SOT-23-3L(CH952S) or SOT-89-3L(CH952E) surface mount package supplied on tape and reel allows for a compact design with automated component placement, helping to reduce manufacturing costs
- Small, leaded, flat, TO-92S package (CH952T) allows for a compact PCB layout
- Wide operating voltage range of 3.3V to 30V makes these sensors useable in a wide range of applications
- Built-in reverse voltage capability enhances the protection of the sensor and the circuits with which it is used
- Robust design: will operate up to 150 °C
- RoHS-compliant material meets directive 2002/95

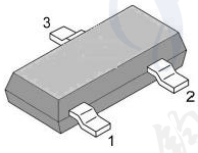
Function Block Diagram



PACKAGE



TO-92S



SOT-23 -3L

SOT-89-3L

APPLICATIONS

Commercial:

-Door or lid closure detection i n appliances

-Speed and RPM sensing in fitness equipment

-Flow rate sensing in appliances and water softeners

-Damper or valve position control in HVAC equipment

-Printer head position sensing

Industrial

-Flow rate sensing in industrial processes

-Robotic control (cylinder position monitoring)

-Float-based fluid level sensing

Medical

-Displacement sensor in hospital beds and medical equipment

-Medication bin monitor on portable drug carts

DESCRIPTION

The CH952S, CH952E and CH952T are small, versatile digital Hall-effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet.

This unipolar sensors are designed to meet the requirements of a wide range of potential applications. These economical unipolar sensors are well suited for simple, high-volume, cost-sensitive position and motion sensing applications.

The 3.3Vdc to 30 Vdc supply voltage range allows this device to be used in very wide voltage applications.

These sensors are available in two package styles: the CH952S in the subminiature SOT-23-3L surface mount package, the CH952E in the subminiature SOT-89-3L surface mount package, the CH952T is available in the leaded, flat TO-92-style package.

The CH952S and CH952E are available on tape and reel (CH952S 3000 units per reel, CH952E 1000 units per reel), the CH952T is available in a bulk package (1000 units per bag).

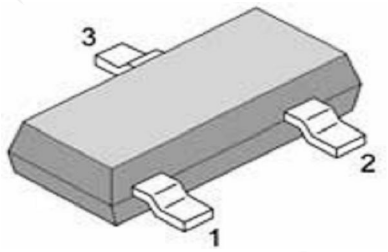
Table of Contents

1. Product Family Members

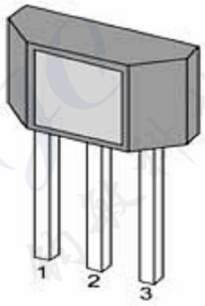
Part Number	Marking ID	Description
CH952SR	C951	Uni-polar, Open Collector Output, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH952TB	C951	Uni-polar, Open Collector Output, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH952ER	C951	Uni-polar, Open Collector Output, Hall-effect digital sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)

2. Pin Definitions and Descriptions

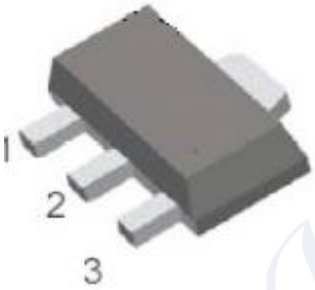
SOT-23-3L(S)	TO-92S(T)	Name	Type	Function
1	1	VDD	Supply	Supply Voltage pin
2	3	OUT	Output	Open Collector Output pin
3	2	GND	Ground	Ground pin



SOT-23-3L



TO-92S



SOT-89-3L

3. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Units
Supply Voltage	V_{DD}	-	40	V
Reverse Voltage	V_{RDD}	-	-40	V
Supply Current	I_{DD}	-	20	mA
Output Voltage	V_{OUT}	-	40	V
Output Current	I_{OUT}	-	20	mA
Operating Ambient Temperature	T_A	-40	150	°C
Storage Temperature	T_S	-50	150	°C
Junction temperature	T_J	-50	165	°C
Magnetic Flux	B	No Limit		Gauss

Note: Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum- rated conditions for extended periods may affect device reliability.

4. ESD Protections

Parameter	Value	Unit
All pins 1)	+/-3000	V
All pins 2)	+/-200	V
All pins 3)	+/-750	V

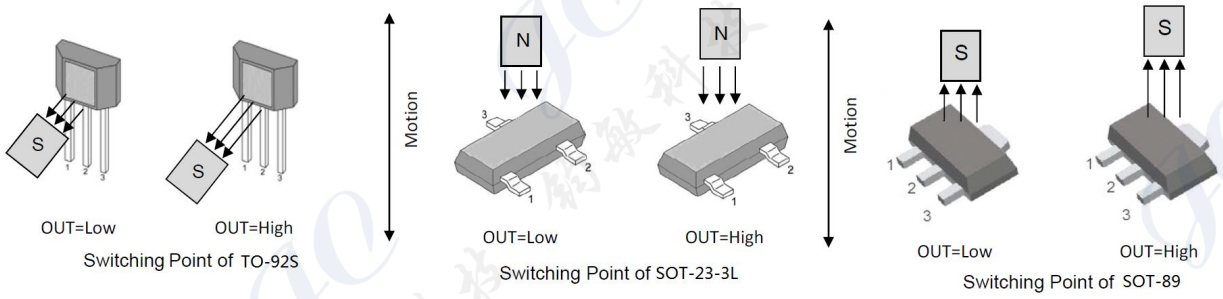
1) HBM (human body mode, 100pF, 1.5 kohm) according to MIL-STD-883H Method 3015.8
2) MM (Machine Mode C=200pF, R=0Ý) according to JEDEC EIA/JESD22-A115
3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

5. Function Description

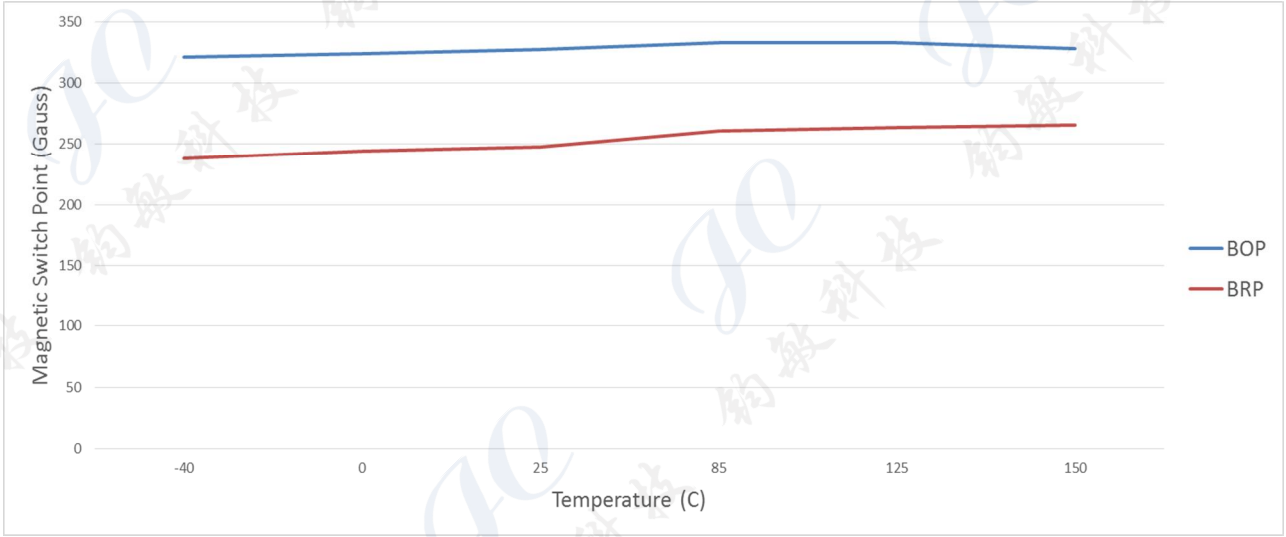
The CH952S/CH952T/CH952E exhibits unipolar magnetic switching characteristics. Therefore, it requires south or north poles to operate properly.

The device behaves as a unipolar with asymmetric operating and release switching points. This means While the magnetic flux density(B) is larger than operate point (Bop), the output will be turned on (Low), while the magnetic flux density(B) is lower than release point (Brp), then turn off (High).

6. Magnetic Activation



7. Temperature Characteristics



8. Parameters Specification (At 3.3V to 30V supply, 20mA load, TA= -40 ºC to 150 ºC except where otherwise specified.)

Symbol	Parameter	Test Condition	Min	Typ.	Max	Units
V_{DD}	Supply voltage	-40 °C to 150 °C	3.3	-	30	V
I_{DD}	Supply Current	V_{DD} = 5V	-	3.5	8	mA
V_{DSon}	Output saturation voltage	at 20mA, Gauss >200	-	-	0.4	V
I_{OFF}	Output Leakage Current	B<50GS	-	-	10	uA
T_R	Output rise time	V_{DD} =12V at 25 °C C_L= 20 pF	-	-	1.5	uS
T_F	Output fall time	V_{DD} =12V at 25 °C C_L= 20 pF	-	-	1.5	uS
R_{TH}	Thermal resistance: CH952S (SOT-23-3L) CH952T (TO-92S) CH952E(SOT-89-3L)	-	- - -	303 203 230	- - -	°C /W °C/W °C/W
B_{OP}	Magnetic operating point	TA=25°C	270	330	380	Gauss
B_{RP}	Magnetic release point	TA=25°C	200	250	300	Gauss
B_{HYST}	Magnetic hysteresis window	T_A=25ºC $\lvert B_{OP}-B_{RP}\rvert$	55	80	115	Gauss
F_{SW}	Maximum Switching Frequency				100	KHz
T	Operating temperature		-40	-	150	°C
T_S	Storage temperature:	-	-40	-	150	°C

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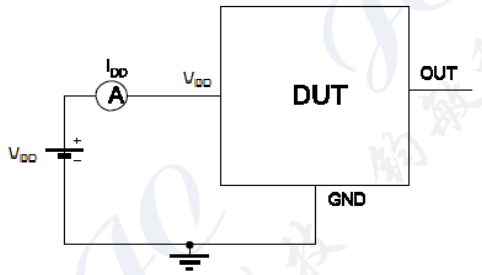
NOTICE
Bipolar Hall-effect sensor ICs may have an initial output in either the ON or OFF state if powered up with an applied magnetic field in the differential zone (applied magnetic field >Brp and <Bop). Cosemitech recommends allowing 10 µs for output voltage to stabilize after supply voltage has reached 5V.

NOTICE
The magnetic field strength (Gauss) required to cause the switch to change state (operate and release) will be as specified in the magnetic characteristics. To test the switch against the specified magnetic characteristics, the switch must be placed in a uniform magnetic field.

9. Test Conditions

Note: DUT=Device Under Test

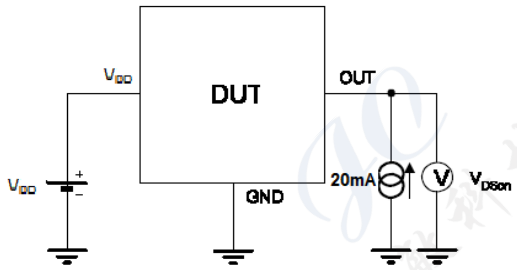
Supply Current



Note 1 - The supply current I_{DD} represents the static supply current. OUT is left open during measurement

Note 2 - The device is put under magnetic field with B<B_{RP}

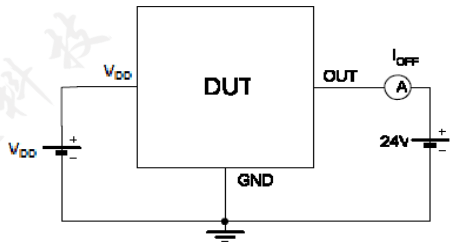
Output Saturation Voltage



Note 1 - The output saturation voltage V_{DSon} is measeured at V_{DD}=3.8V and V_{DD}=24V

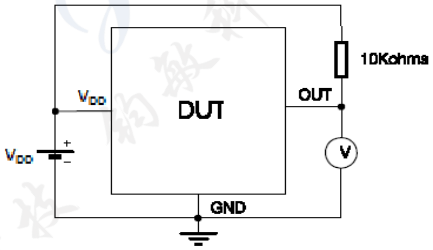
Note 2 - The device is put under magnetic field with B>B_{OP}

Output Leakage Current



Note 1 - The device is put under magnetci field with B<B_{RP}

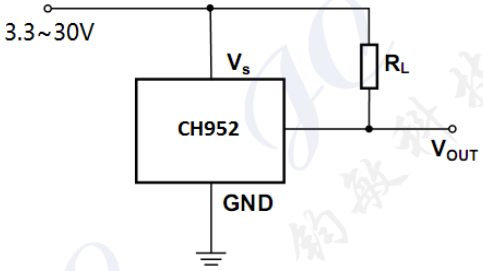
Magenetic Thresholds



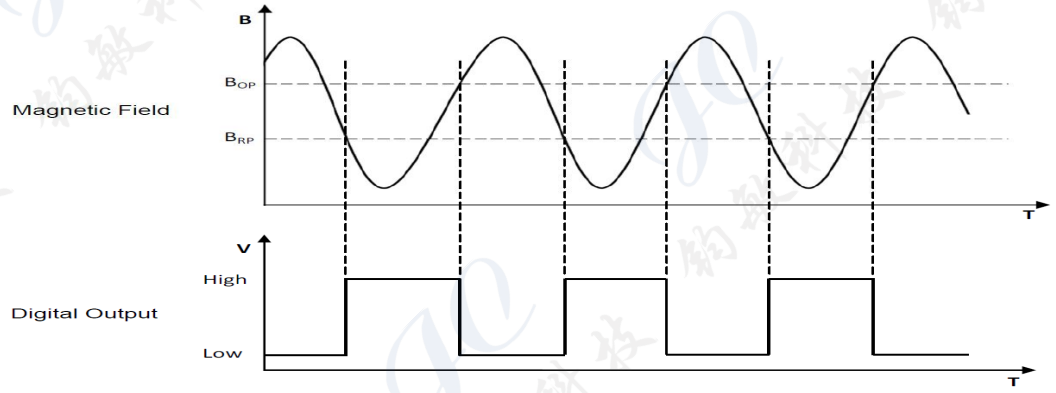
Note 1 - B_{OP} is determined by putting the device under magnetic field swept from B_{RPmin} up to B_{OPmax} until the output is switched on.

Note 2 - B_{RP} is determined by putting the device under magnetic field swept from B_{OPmax} down to B_{RPmin} until the output is switched off.

10. Typical Application Circuit



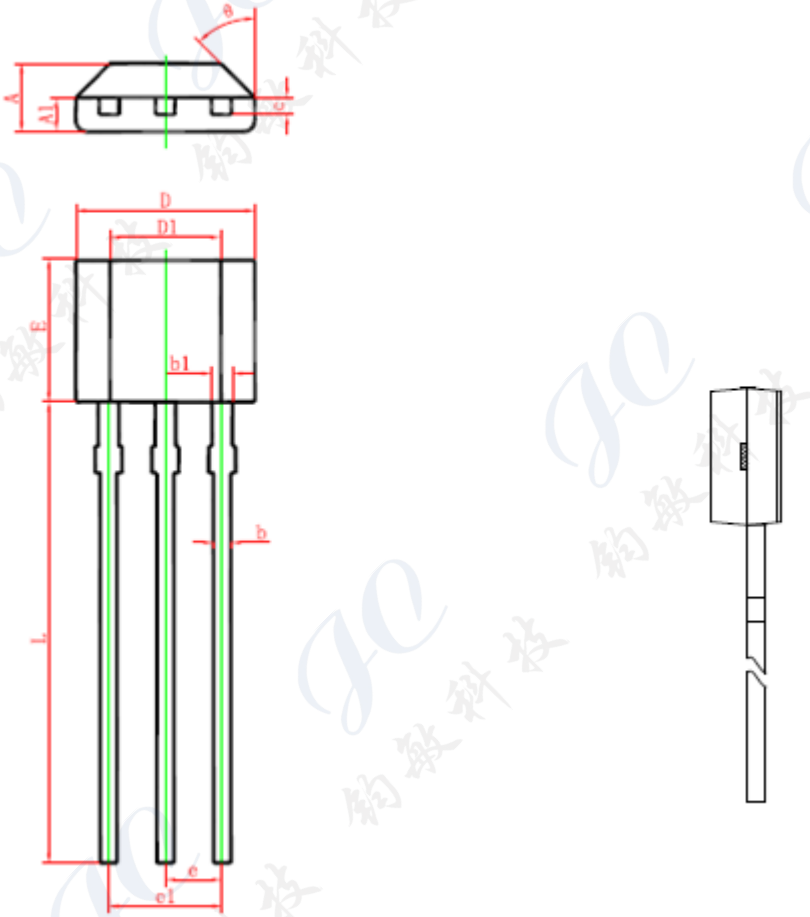
11. Typical Output Waveform (The TO-92S package as an example)



12. Package Information:

PACKAGE DESIGNATOR

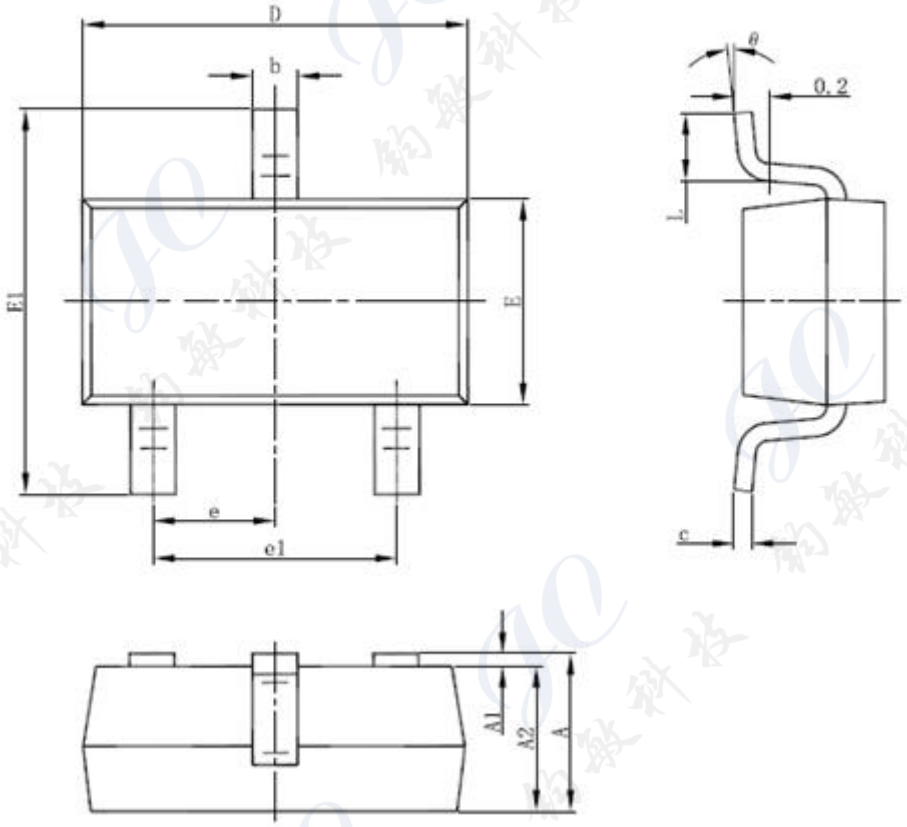
TO-92S



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.420	1.620	0.056	0.064
A1	0.660	0.860	0.026	0.034
b	0.350	0.480	0.014	0.019
b1	0.400	0.550	0.016	0.022
c	0.360	0.510	0.014	0.020
D	3.900	4.100	0.154	0.161
D1	2.280	2.680	0.090	0.106
E	3.050	3.250	0.120	0.128
e	1.270 TYP.		0.050 TYP.	
e1	2.440	2.640	0.096	0.104
L	15.100	15.500	0.594	0.610
θ	45° TYP.		45° TYP.	

PACKAGE DESIGNATOR

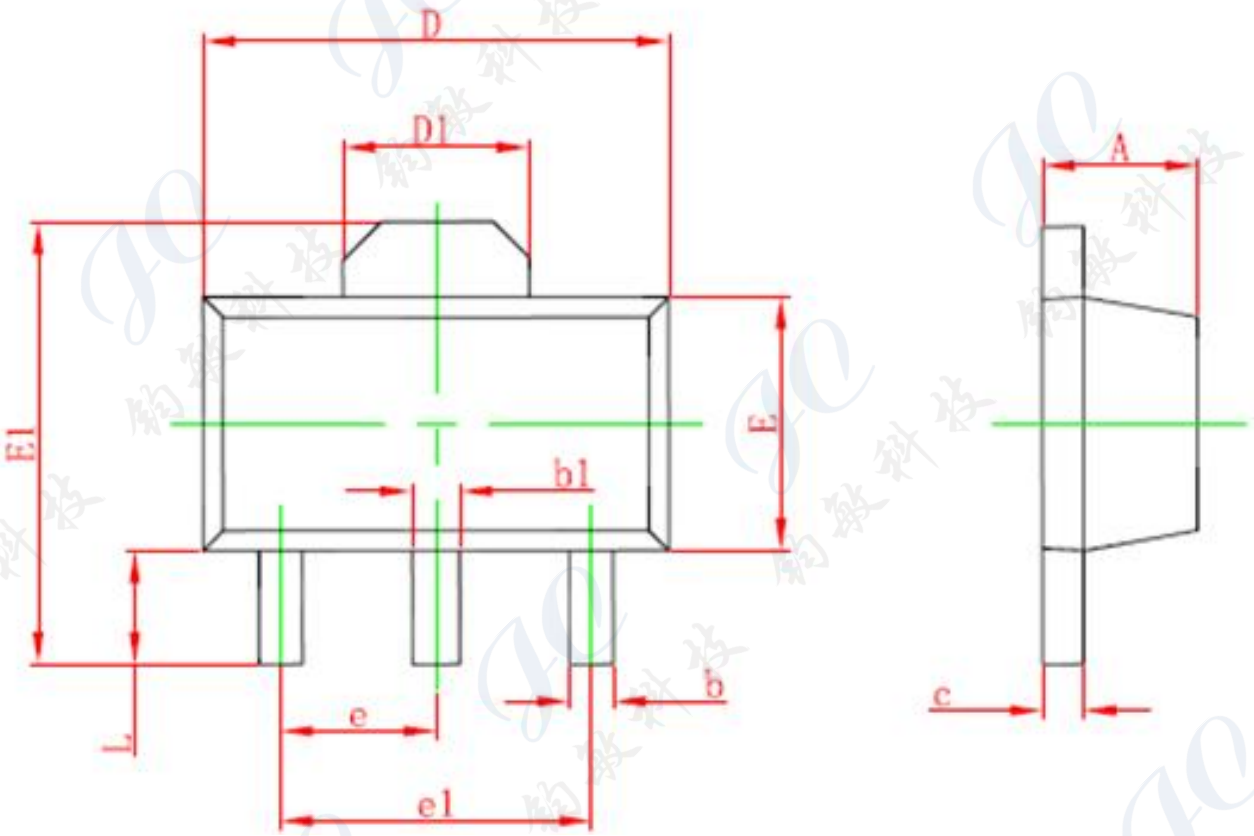
SOT-23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

PACKAGE DESIGNATOR

SOT-89-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047