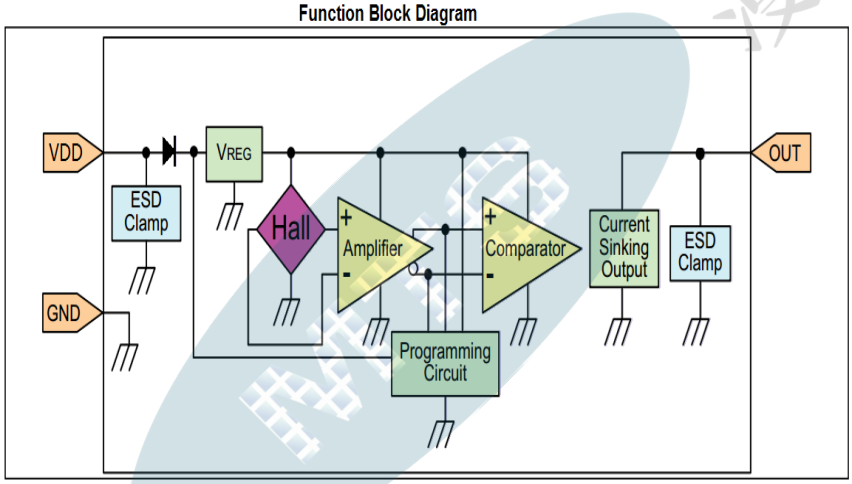
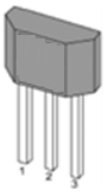
FEATURES and FUNCTIONAL DIAGRAM

- Enhanced sensitivity: will operate from only 30 Gauss typical, at 25°C allowing the use of smaller, potentially lower-cost magnets or wider air gaps
- Subminiature, SOT-23-3L(CH423S/CH423NS) or SOT-89-3L(CH423E/CH423NE) 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 (CH423T/CH423NT) allows for a compact PCB layout
- Bipolar latching magnetics respond to alternating North and South poles, making these products well-suited for accurate speed sensing and RPM (revolutions per minute) measurement
- 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 2011/65/EU

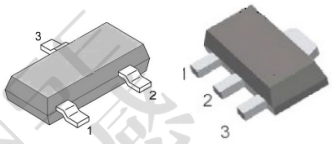
Function Block Diagram



PACKAGE



TO-92S



SOT-23-3L SOT-89-3L

APPLICATIONS

Transportation
- Speed and RPM (revolutions per minute) sensing
- Tachometer, counter pickup
- Motor and fan control
- Electric window lift
- Convertible roof position
- Automotive transmission position

Industrial
- Speed and RPM sensing
- Tachometer, counter pickup
- Flow-rate sensing
- Brushless dc (direct current) motor commutation
- Motor and fan control
- Robotics control

Medical
- Motor assemblies
- Medication dispense control

DESCRIPTION

The CH423 and CH423N are small, versatile digital Hall effect devices that are operated by the magnetic field from a permanent magnet or an electromagnet, designed to respond to alternating North and South poles.

These bipolar latching sensor ICs have enhanced sensitivity, which often allows for the use of less expensive magnets.

These sensor ICs are available in three package styles, the CH423S/CH423NS in the subminiature SOT-23-3L surface mount package, the CH423E/CH423NE in the subminiature SOT-89-3L surface mount package, and the CH423T/CH423NT in the leaded, flat TO-92S package.

The CH423S/CH423NS's and CH423E/CH423NE's small size requires less PC board space, allowing it to be used in smaller assemblies. Its 3.3V capability allows for use in low voltage applications, promoting energy efficiency.

The CH423S/CH423NS and CH423E/CH423NE are available on tape and reel; the CH423T/CH423NT is available in a bulk package (1000 units per bag).

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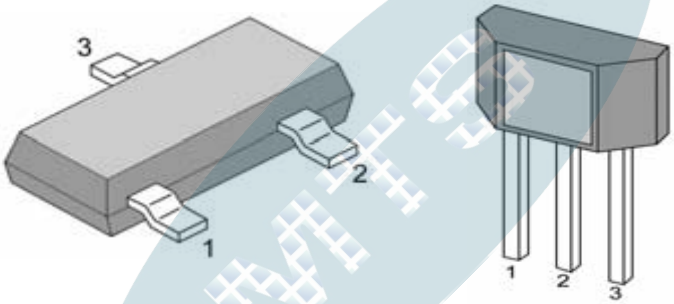
MTSENSE 漫途传感

1. Product Family Members

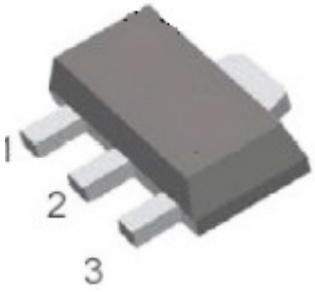
Part Number	Marking ID	Description
CH423SR	C423	Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH423TB	C423	Bipolar latching, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH423ER	C423	Bipolar latching, Hall-effect digital sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel)
CH423NSR	423N	Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel)
CH423NTB	423N	Bipolar latching, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag)
CH423NER	423N	Bipolar latching, 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)	SOT-89-3L (E)	Name	Type	Function
1	1	1	VDD	Supply	Supply Voltage pin
2	3	3	OUT	Output	Open Collector Output pin
3	2	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
VDD Reverse Voltage VDD	V_{RDD}	-	-40	V
Supply Current	I_{DD}	-	20	mA
Output Voltage	V_{OUT}	-0.3	40	V
Output Current	I_{OUT}	-	25	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)	+/-4000	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=0Ω) according to JEDEC EIA/JESD22-A115
3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

5. Function Description

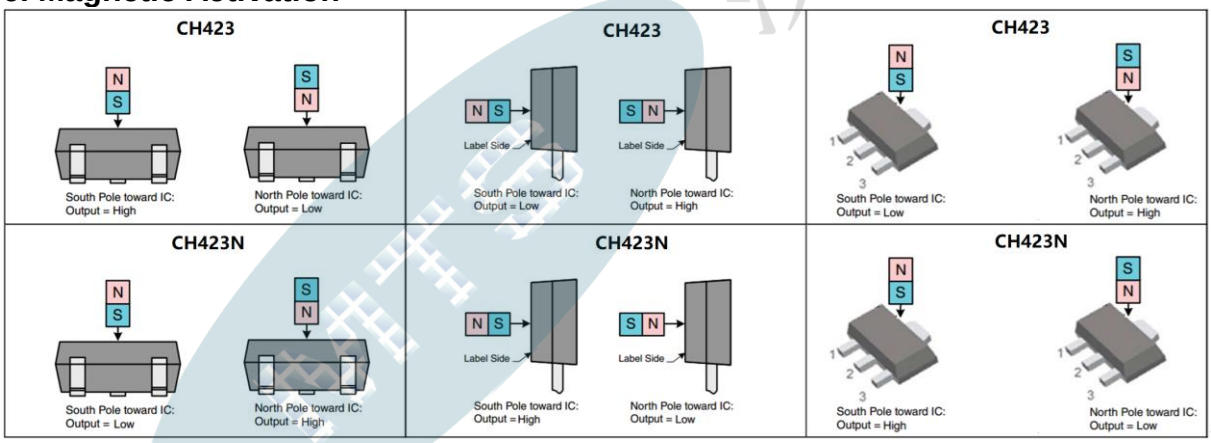
The CH423/CH423N exhibits latch magnetic switching characteristics. Therefore, it requires both south and north poles to operate properly.

The device behaves as a latch with symmetric operating and release switching points (BOP=|BRP|). This means magnetic fields with equivalent strength and opposite direction drive the output high and low.

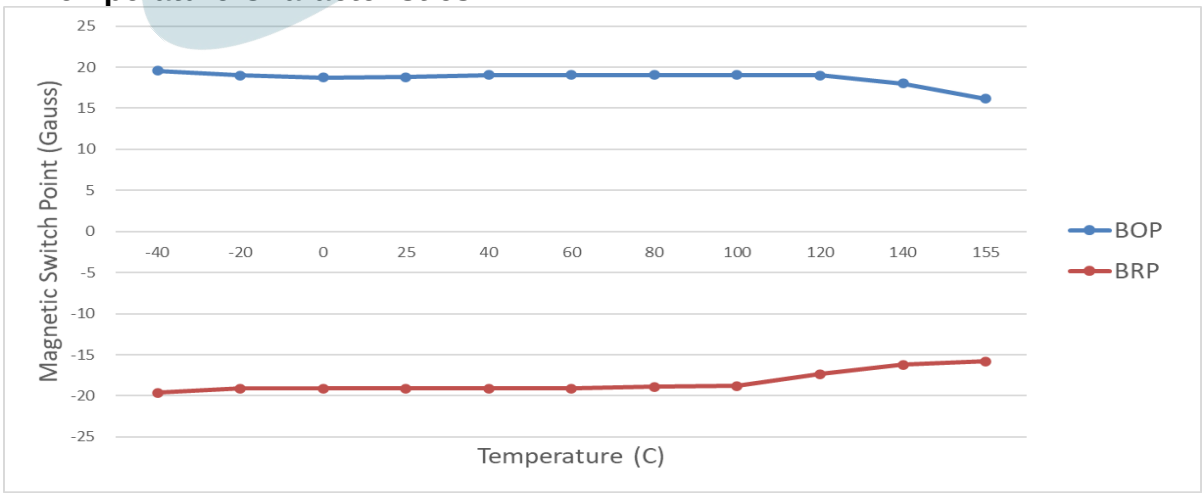
Removing the magnetic field (B→0) keeps the output in its previous state. This latching property defines the device as a magnetic memory.

A magnetic hysteresis BHYST keeps BOP and BRP separated by a minimal value. This hysteresis prevents output oscillation near the switching point.

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 >120	-	-	0.4	V
I_{OFF}	Output Leakage Current	B<-120GS	-	-	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: CH423S/CH423NS CH423T/CH423NT CH423E/ CH423NE	-	- - -	303 203 230	- - -	°C /W °C/W °C/W
B_{OP}	CH423 Magnetic operating point	T_A=25ºC	5	18	36	Gauss
	CH423N Magnetic operating point	T_A=25ºC	-36	-18	-5	Gauss
B_{RP}	CH423 Magnetic release point	T_A=25ºC	-36	-18	-5	Gauss
	CH423N Magnetic release point	T_A=25ºC	5	18	36	Gauss
B_{HYST}	CH423 Magnetic hysteresis window	T_A=25ºC $\lvert B_{OP}-B_{RP}\rvert$	16	36	56	Gauss
	CH423N Magnetic hysteresis window	T_A=25ºC $\lvert B_{OP}-B_{RP}\rvert$	16	36	56	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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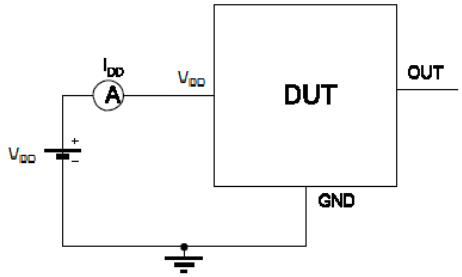
NOTICE
Bipolar Hall-effect sensor ICs may have an initial output in either the ON or OFF state if powered up with an applied magnetic field in the differential zone (applied magnetic field >Brp and <Bop). Cosemitech recommends allowing 10 µs for output voltage to stabilize after supply voltage has reached 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

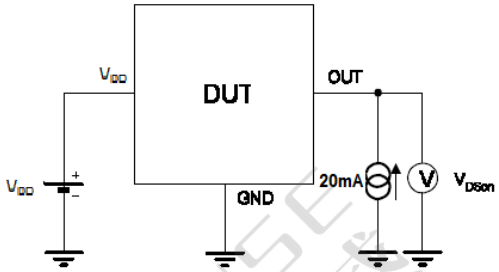
Supply Current



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 $B<B_{RP}$

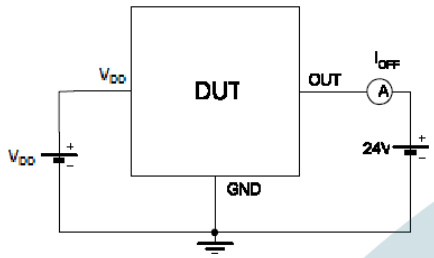
Output Saturation Voltage



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

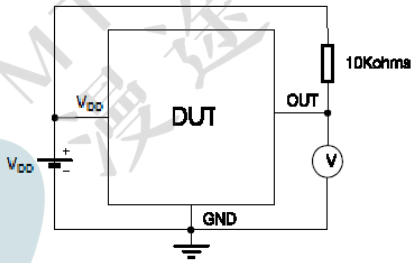
Note 2 - The device is put under magnetic field with $B>B_{OP}$

Output Leakage Current



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

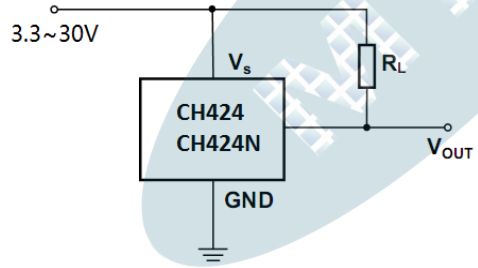
Magenetic Thresholds



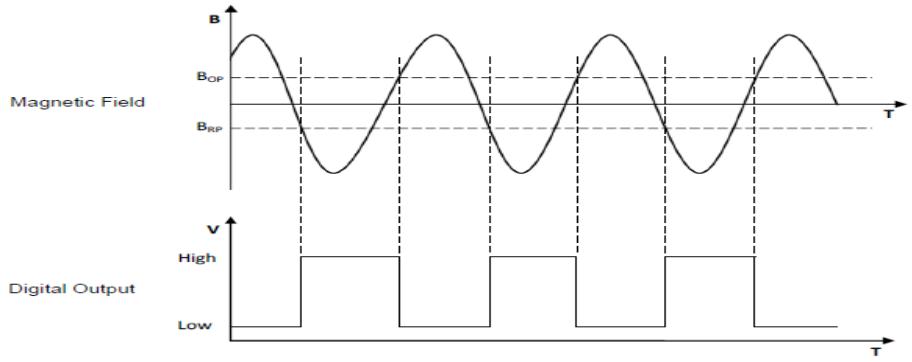
Note 1 - B_{OP} is determined by putting the device under magnetic field swept from B_{RPmin} up to B_{OPmax} until the output is switched on.

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

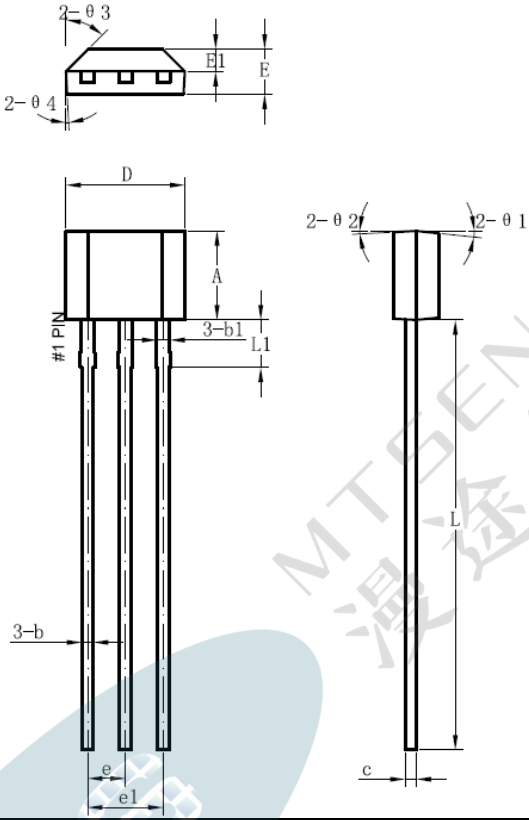


11. Typical Output Waveform (The CH423 TO-92S package as an example)



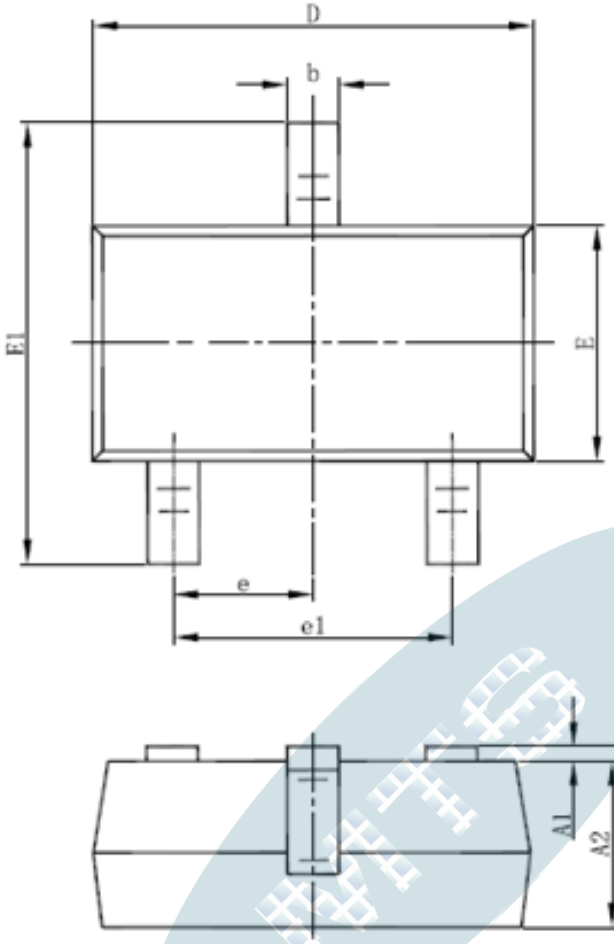
12. Package Information:

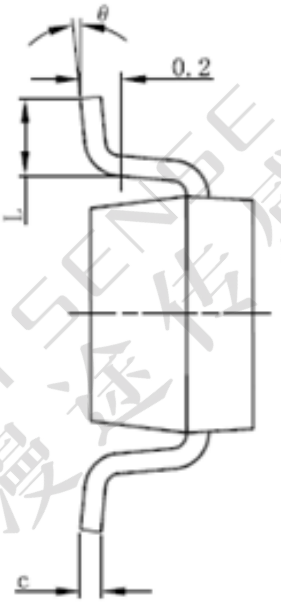
Package Designator
TO-92S



Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	2.9	3	3.1
b	0.35	0.39	0.56
b1		0.44	
c	0.36	0.38	0.51
D	3.9	4	4.1
E	1.42	1.52	1.62
E1		0.75	
e		1.27	
e1		2.54	
L	13.5	14.5	15.5
L1		1.6	
θ1		6°	
θ2		3°	
θ3		45°	
θ4		3°	

PACKAGE DESIGNATOR
SOT-23-3L

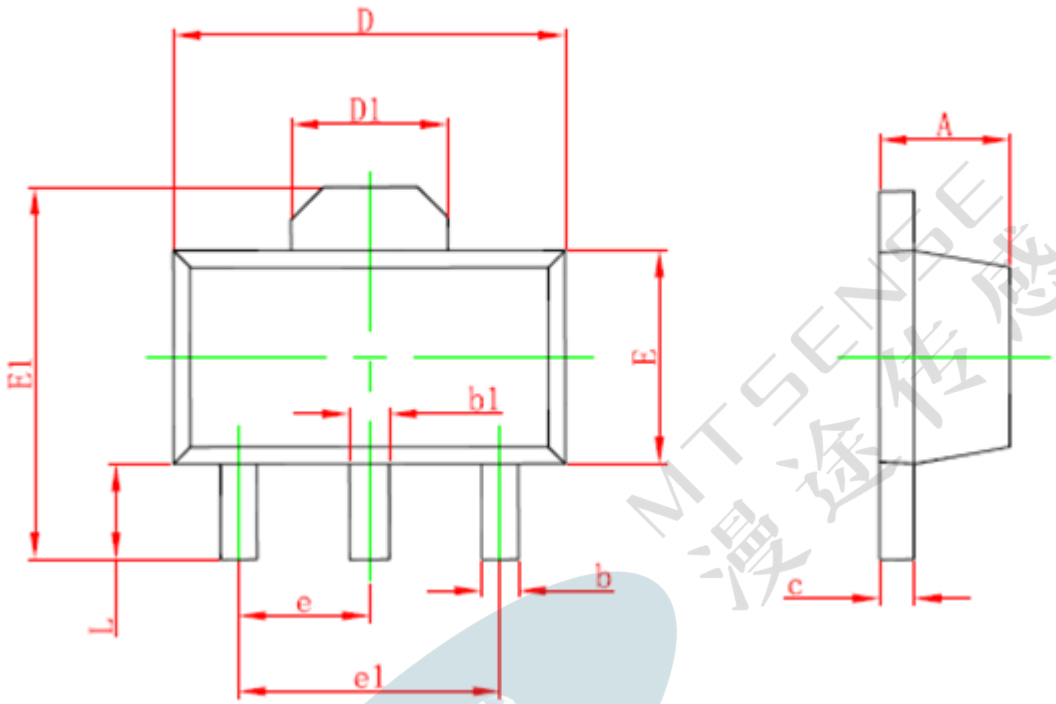




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

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