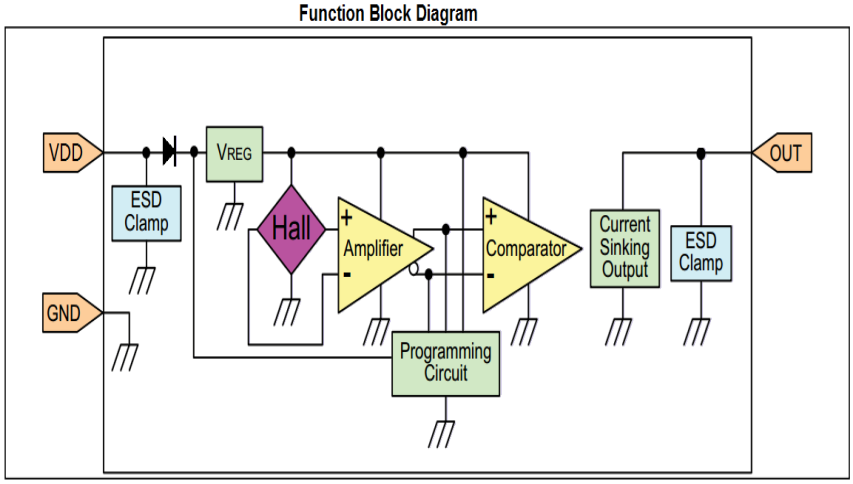
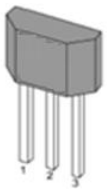
## FEATURES and FUNCTIONAL DIAGRAM

- Enhanced sensitivity: will operate from only 45 Gauss typical, at 25°C allowing the use of smaller, potentially lower-cost magnets or wider air gaps
- Subminiature, SOT-23-3L(CH426S/426NS) or SOT-89-3L(CH426E/426NE) 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 (CH426T/426NT) 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

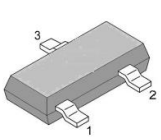
Function Block Diagram



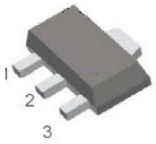

## PACKAGE



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 CH426/426N 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 CH426S/426NS in the subminiature SOT-23-3L surface mount package, the CH426E/426NE in the subminiature SOT-89-3L surface mount package, and the CH426T/426NT in the leaded, flat TO-92S package.

The CH426S/426NSôs and CH426E/426NEôs small size requires less PC board space, allowing it to be used in smaller assemblies. Its 3V capability allows for use in low voltage applications, promoting energy efficiency.

The CH426S/426NS and CH426E/426NE are available on tape and reel; the CH426T/426NT is available in a bulk package (1000 units per bag).

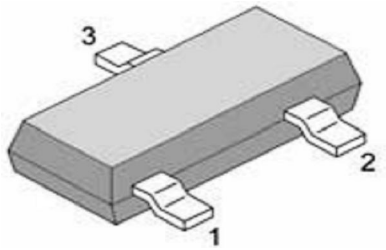
# Table of Contents

## 1. Product Family Members

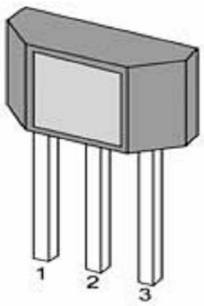
| Part Number | Marking ID | Description |
|---|---|---|
| CH426SR | C426 | Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel) |
| CH426TB | C426 | Bipolar latching, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag) |
| CH426ER | C426 | Bipolar latching, Hall-effect digital sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel) |
| CH426NSR | 426N | Bipolar latching, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel) |
| CH426NTB | 426N | Bipolar latching, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag) |
| CH426NER | 426N | Bipolar latching, Hall-effect digital sensor IC, SOT-89-3L package, tape and reel packing (1000 units per reel) |

## 2. Pin Definitions and Descriptions

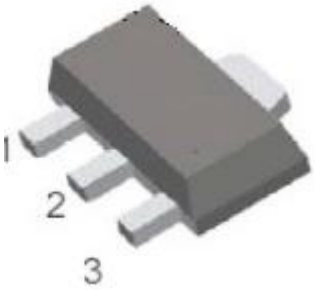
| SOT-23-3L (S) | TO-92S (T) | SOT-89-3L (E) | Name | Type | Function |
|---|---|---|---|---|---|
| 1 | 1 | 1 | VDD | Supply | Supply Voltage pin |
| 2 | 3 | 3 | OUT | Output | Open Collector Output pin |
| 3 | 2 | 2 | GND | Ground | Ground pin |




**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=0Ý) according to JEDEC EIA/JESD22-A115
3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

## 5. Function Description

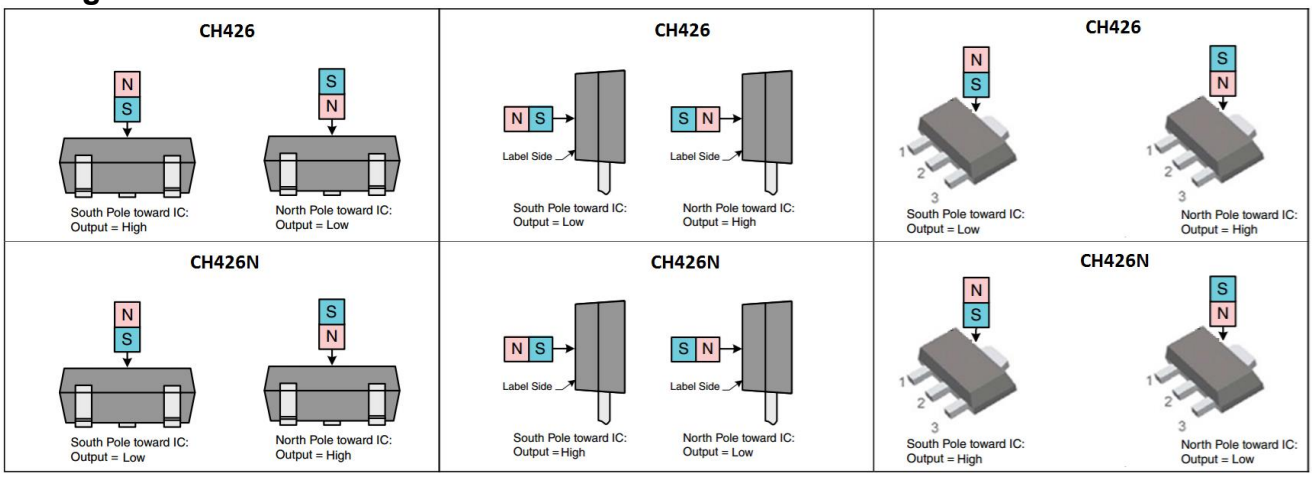
The CH426/426N exhibits latch magnetic switching characteristics. Therefore, it requires both south and north poles to operate properly.

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.

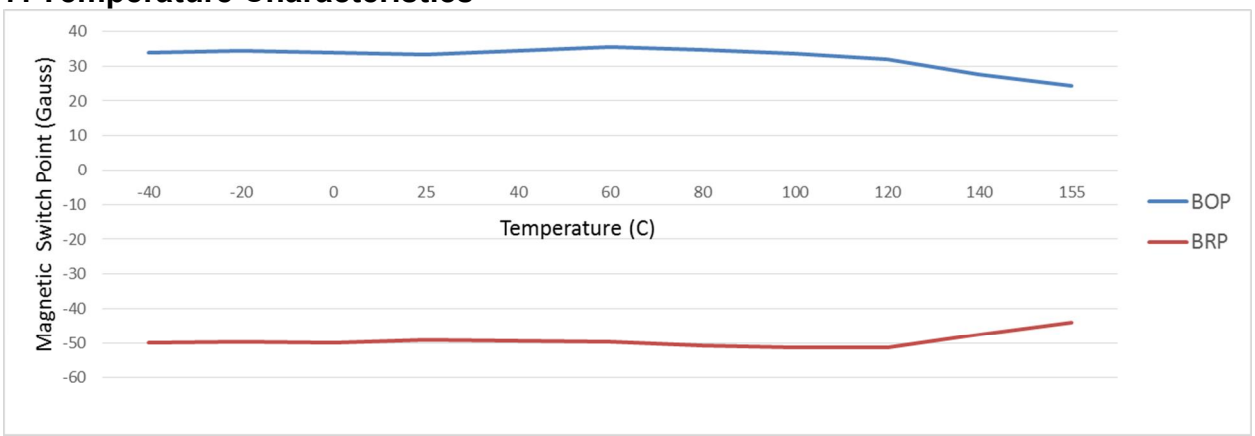
Removing the magnetic field (BŸ 0) keeps the output in its previous state. This latching property defines the device as a magnetic memory.

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<br>$C_L$= 20 pF | - | - | 1.5 | uS |
| $T_F$ | Output fall time | $V_{DD}$ =12V at 25 °C<br>$C_L$= 20 pF | - | - | 1.5 | uS |
| $R_{TH}$ | Thermal resistance:<br>CH426 (SOT-23-3L)<br>CH426 (TO-92S)<br>CH426 (SOT-89-3L) | - | -<br>-<br>- | 303<br>203<br>230 | -<br>-<br>- | °C /W<br>°C/W<br>°C/W |
| $B_{OP}$ | CH426 Magnetic operating point | $T_A$=25ºC | 10 | 45 | 80 | Gauss |
| | CH426N Magnetic operating point | $T_A$=25ºC | -80 | -45 | -10 | Gauss |
| $B_{RP}$ | CH426 Magnetic release point | $T_A$=25ºC | -80 | -45 | -10 | Gauss |
| | CH26N Magnetic release point | $T_A$=25ºC | 10 | 45 | 80 | Gauss |
| $B_{HYST}$ | CH426 Magnetic hysteresis window | $T_A$=25ºC $\lvert B_{OP}-B_{RP}\rvert$ | 70 | 90 | 110 | Gauss |
| | CH426N Magnetic hysteresis window | $T_A$=25ºC $\lvert B_{OP}-B_{RP}\rvert$ | 70 | 90 | 110 | Gauss |
| $F_{SW}$ | Maximum Switching Frequency | | | | 100 | KHz |
| T | Operating temperature | - | -40 | - | 150 | °C |
| $T_S$ | Storage temperature: | - | -40 | - | 150 | °C |

.

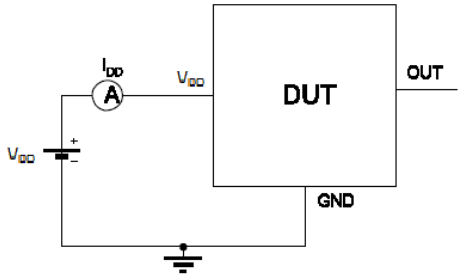
NOTICE
Bipolar Hall-effect sensor ICs may have an initial output in either the ON or OFF state if powered up with an applied magnetic field in the differential zone (applied magnetic field >Brp and <Bop). Cosemitech recommends allowing 10 µs for output voltage to stabilize after supply voltage has reached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

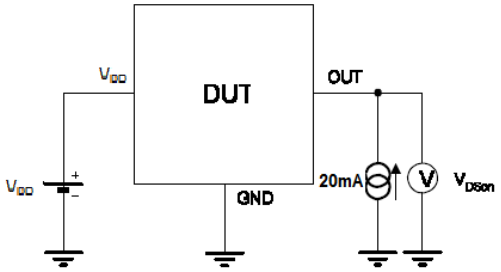
### Supply Current




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 $B<B_{RP}$

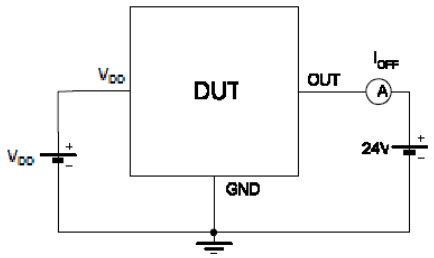
### Output Saturation Voltage




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

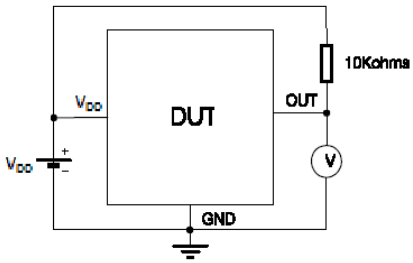
Note 2 - The device is put under magnetic field with $B>B_{OP}$

### Output Leakage Current




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

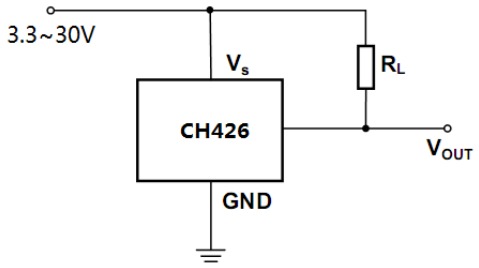
### Magenetic Thresholds



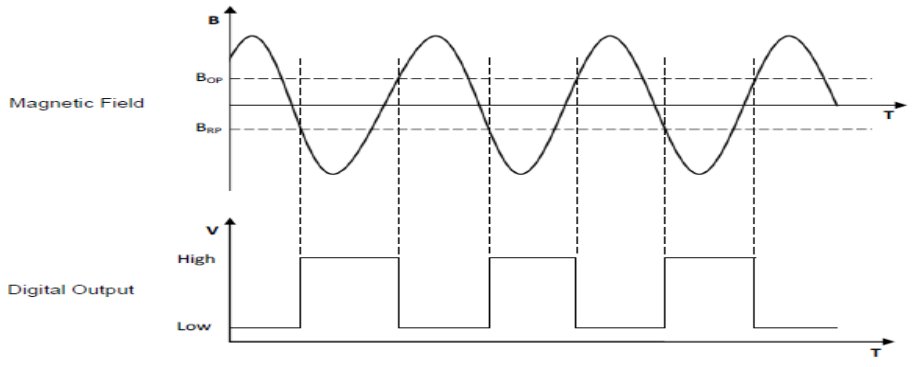

Note 1 - $B_{OP}$ is determined by putting the device under magnetic field swept from $B_{RPmin}$ up to $B_{OPmax}$ until the output is switched on.

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



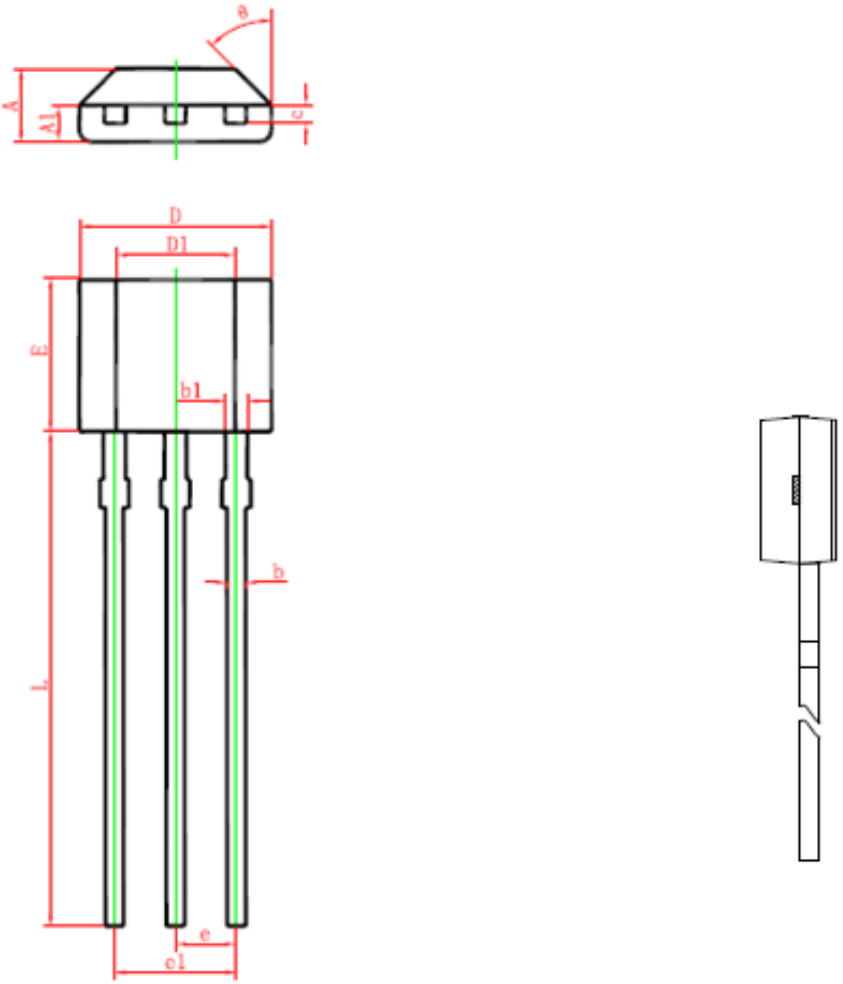

## 11. Typical Output Waveform (The TO-92S package as an example )



## 12. Package Information:

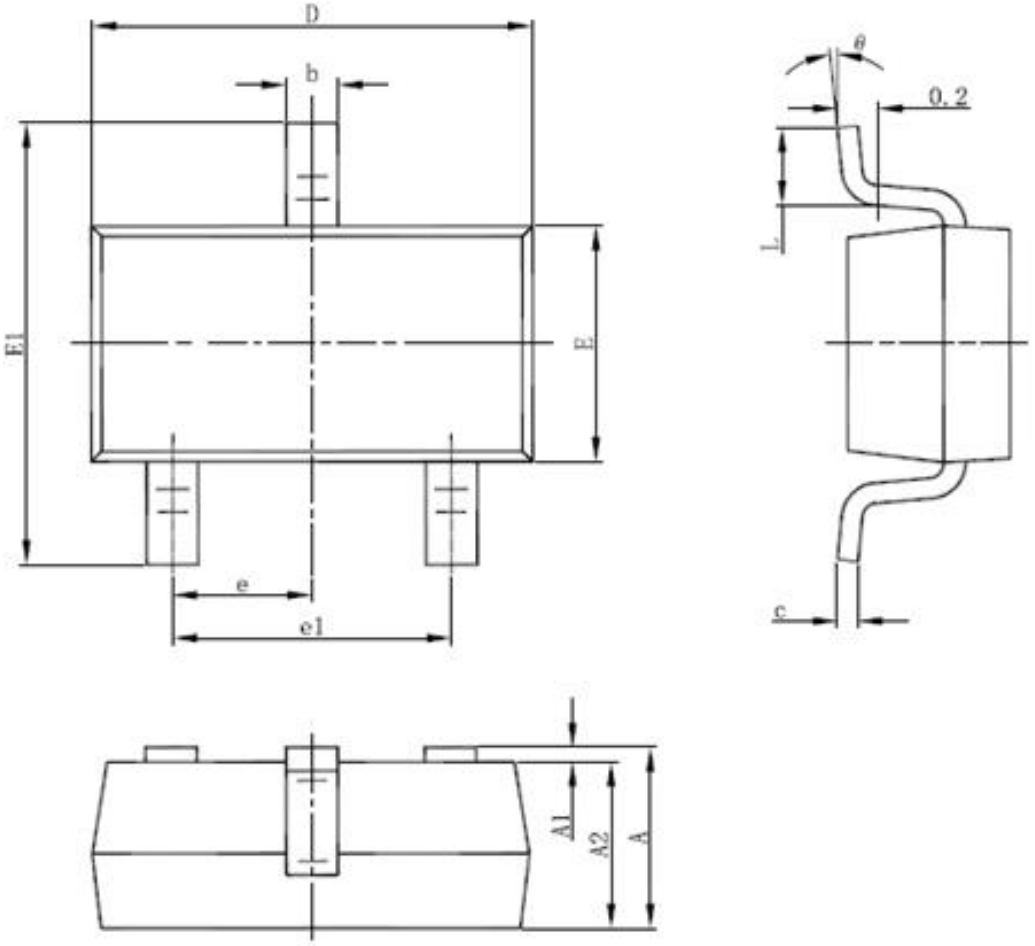
**PACKAGE DESIGNATOR**

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. | |

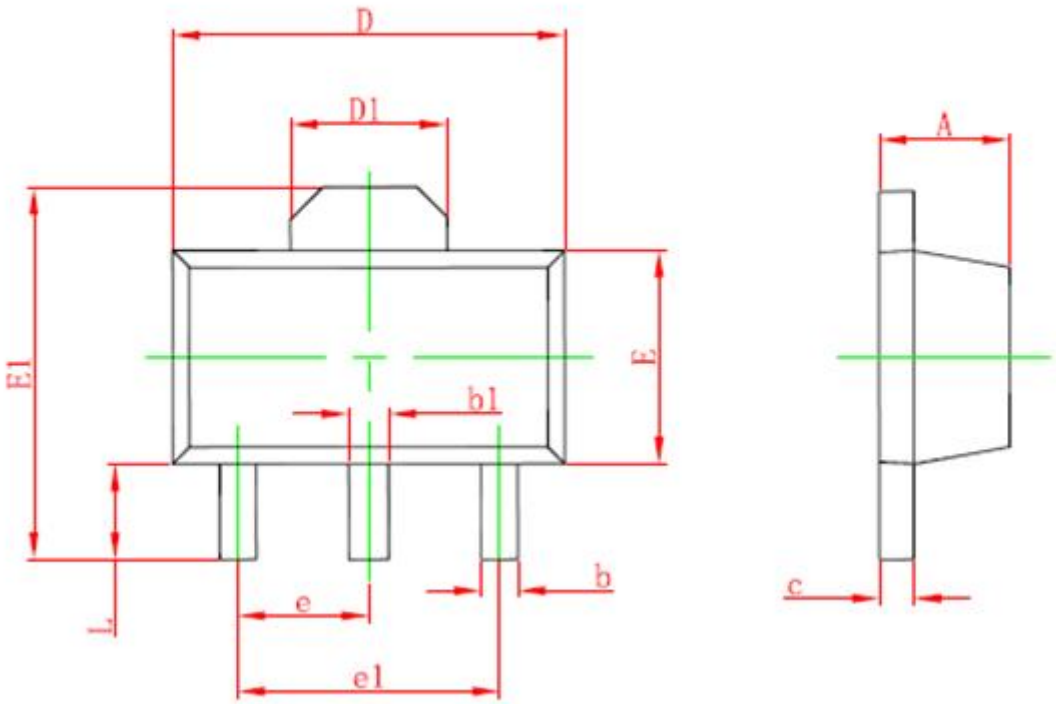
## PACKAGE DESIGNATOR
SOT-23-3L




| 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 |