

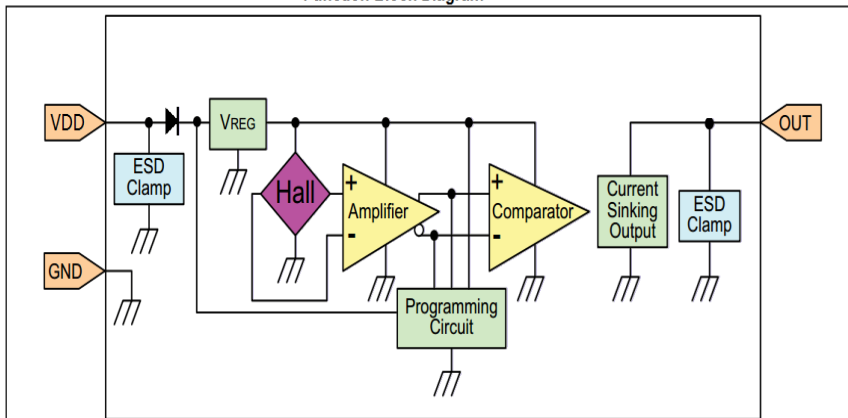
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|  | Cosemitech | CH951 |
| | Automotive Product Group | <small>This is advanced information on a new product now in development or undergoing evaluation. Details are subject to change without notice and Cosemitech assumes no obligation for future manufacture of this product. Contact Cosemitech for the latest status.</small> |

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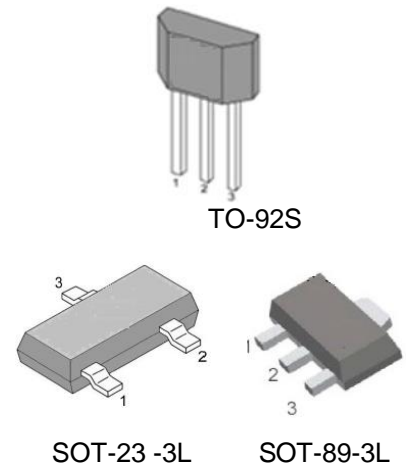
FEATURES and FUNCTIONAL DIAGRAM

- Unipolar respond to a single pole: North (CH951S) or South (CH951T and CH951E), 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 200 Gauss to Bop 250 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(CH951S) or SOT-89-3L(CH951E) 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 (CH951T) 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



APPLICATIONS

Commercial:

- Door or lid closure detection in 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 CH951S, CH951E and CH951T 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 CH951S in the subminiature SOT-23-3L surface mount package, the CH951E in the subminiature SOT-89-3L surface mount package, the CH951T is available in the leaded, flat TO-92-style package.


The CH951S and CH951E are available on tape and reel (CH951S 3000 units per reel, CH951E 1000 units per reel), the CH951T is available in a bulk package (1000 units per bag).

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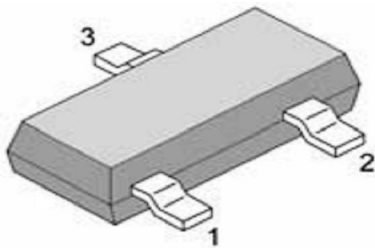
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1. Product Family Members

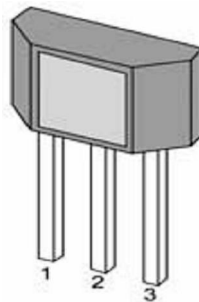
| Part Number | Marking ID | Description |
|-------------|------------|---|
| CH951SR | C951 | Uni-polar, Open Collector Output, Hall-effect digital sensor IC, SOT-23-3L package, tape and reel packing (3000 units per reel) |
| CH951TB | C951 | Uni-polar, Open Collector Output, Hall-effect digital sensor IC, flat, TO-92S package, bulk packing (1000 units per bag) |
| CH951ER | 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

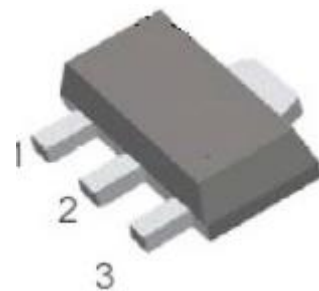
| SOT-23-3L(S) | TO-92S(T) | Name | Type | Function |
|--------------|-----------|------|--------|---------------------------|
| 1 | 1 | VDD | Supply | Supply Voltage pin |
| 2 | 3 | OUT | Output | Open Collector Output pin |
| 3 | 2 | GND | Ground | Ground pin |



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.

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4. ESD Protections

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

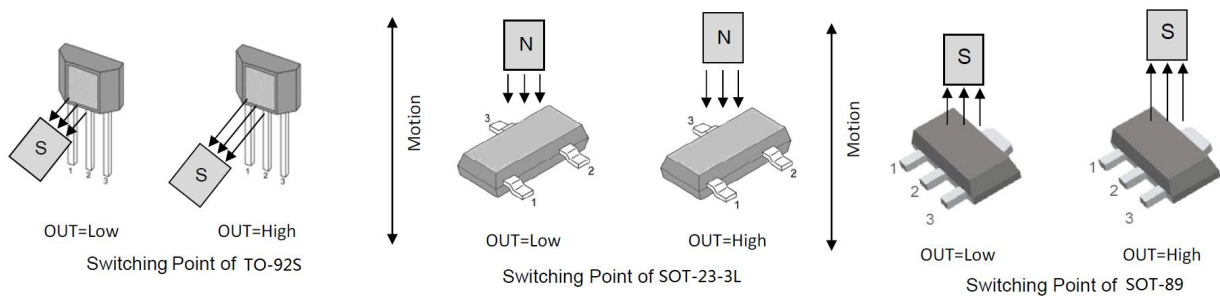
- 1) HBM (human body mode, 100pF, 1.5 kohm) according to MIL-STD-883H Method 3015.8
2) MM (Machine Mode C=200pF, R=0Ω) according to JEDEC EIA/JESD22-A115
3) CDM (charged device mode) according to JEDEC EIA/JESD22-C101F

5. Function Description

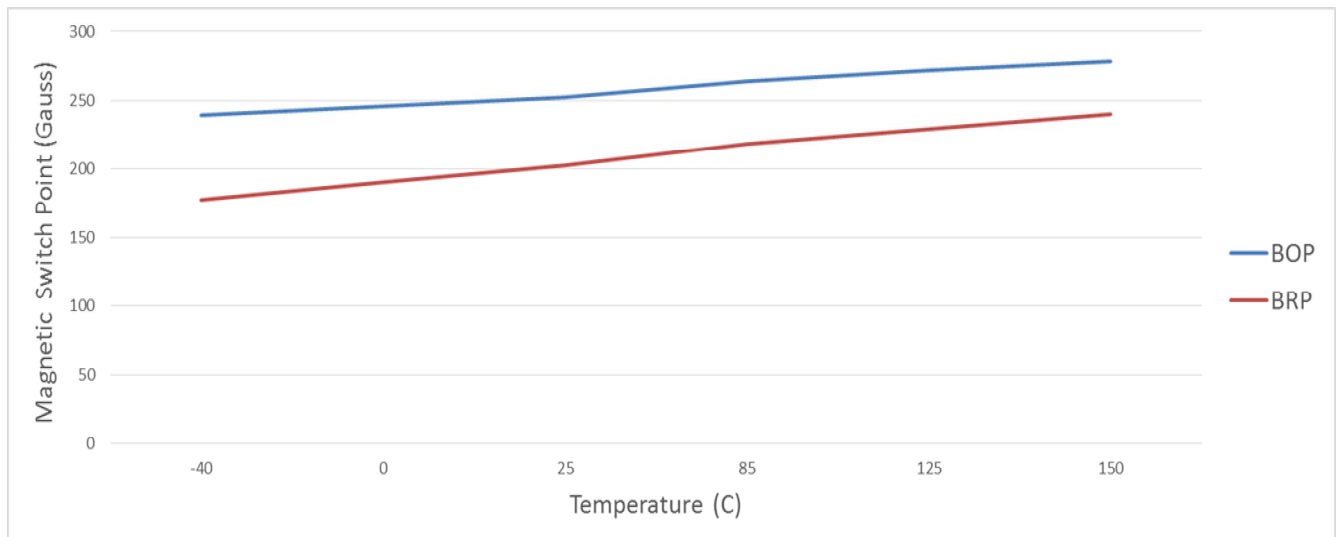
The CH951S/CH951T/CH951E exhibits unipolar magnetic switching characteristics. Therefore, it requires south or north poles to operate properly.

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



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8. Parameters Specification (At 3.3V to 30V supply, 20mA load, TA= -40 °C to 150 °C 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: CH951S (SOT-23-3L) CH951T (TO-92S) CH951E(SOT-89-3L) | - | - | 303 203 230 | - | °C/W °C/W °C/W |
| B _{OP} | Magnetic operating point | TA=25°C | 210 | 250 | 300 | Gauss |
| B _{RP} | Magnetic release point | TA=25°C | 150 | 200 | 240 | Gauss |
| B _{HYST} | Magnetic hysteresis window | T _A =25°C B _{OP} -B _{RP} | 30 | 50 | 70 | 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.

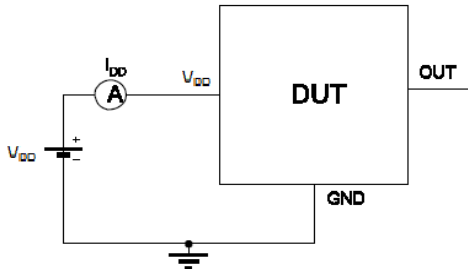
NOTICE

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

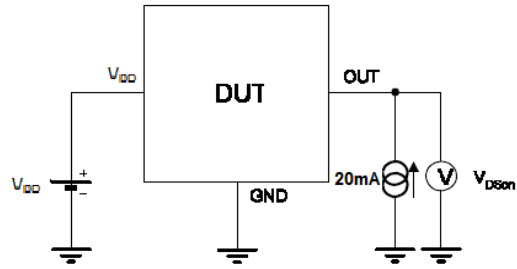
Supply Current



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 $B < B_{RP}$

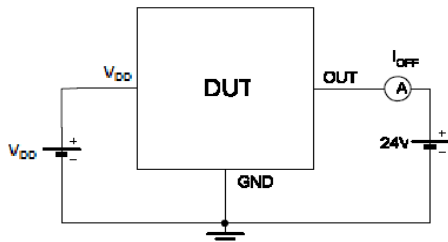
Output Saturation Voltage



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

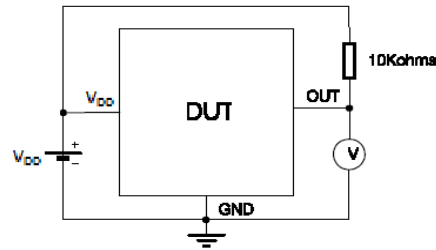
Note 2 - The device is put under magnetic field with $B > B_{OP}$

Output Leakage Current



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

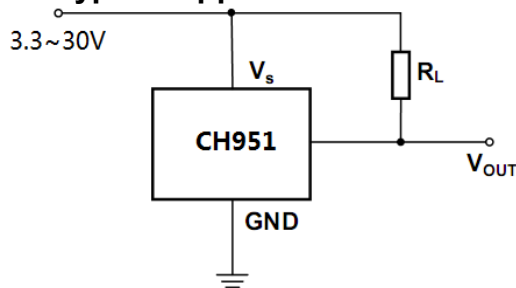
Magnetic Thresholds



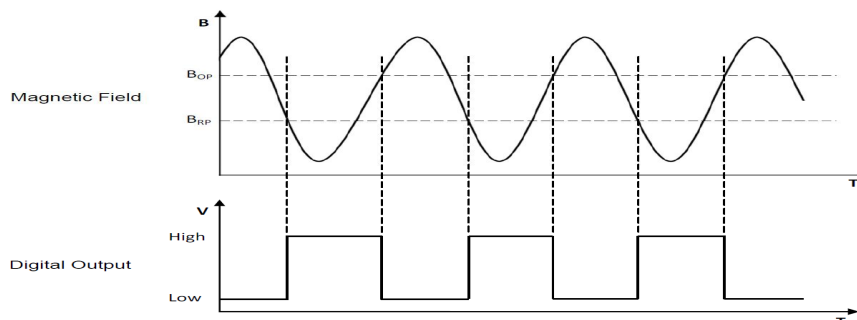
Note 1 - B_{OP} is determined by putting the device under magnetic field swept from B_{RPmin} up to B_{OPmax} until the output is switched on.

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

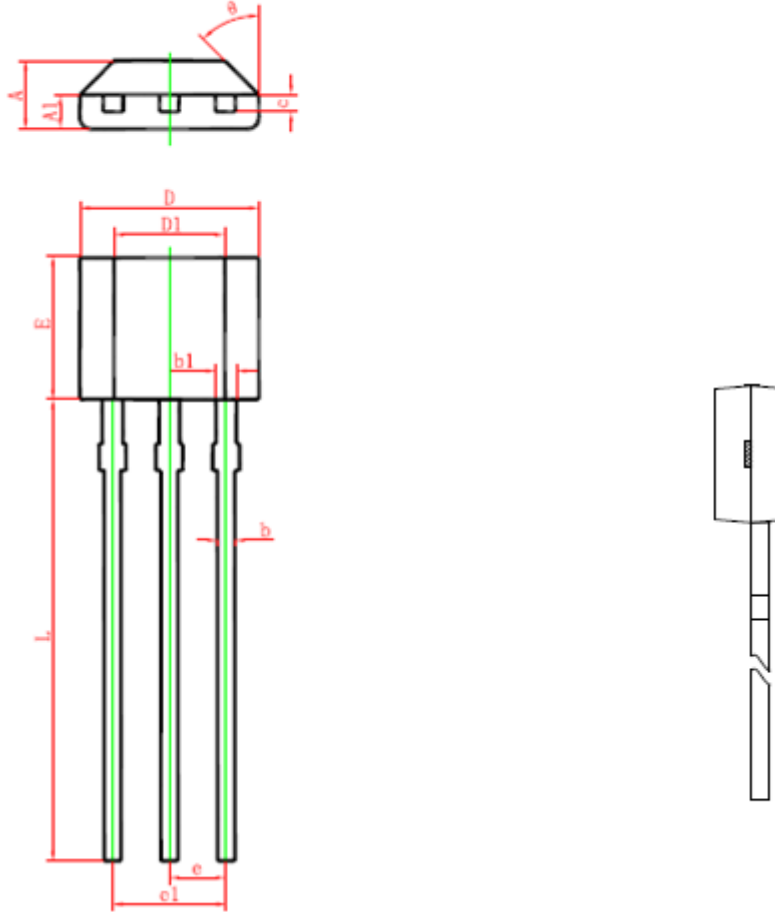


11. Typical Output Waveform (The TO-92S package as an example)



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. | |



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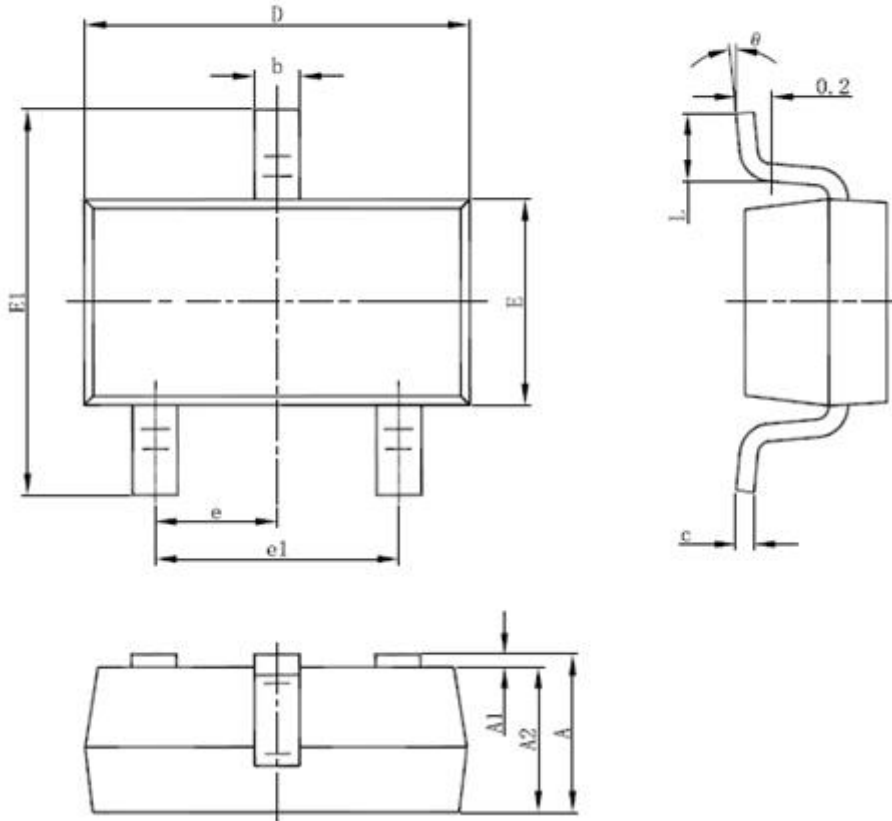
CH951

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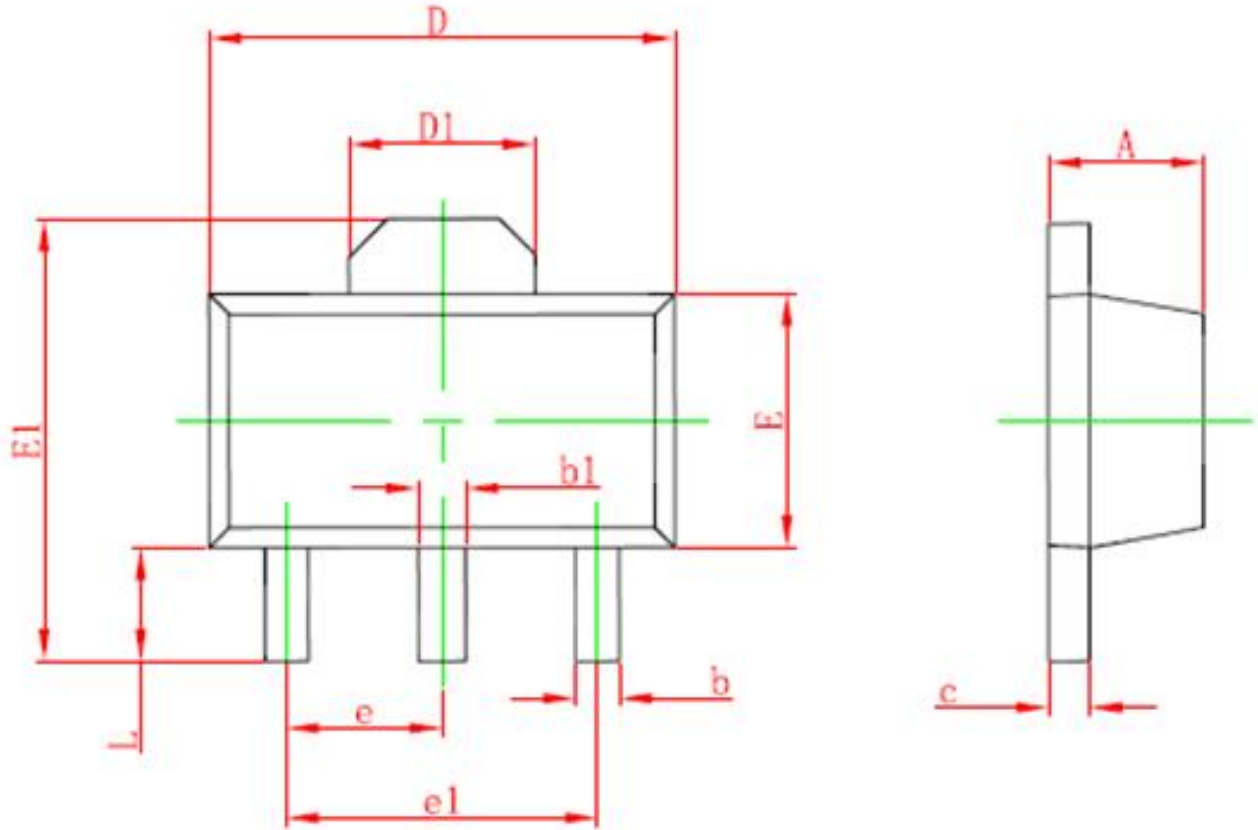
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**PACKAGE DESIGNATOR
SOT-23-3L**



| 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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