

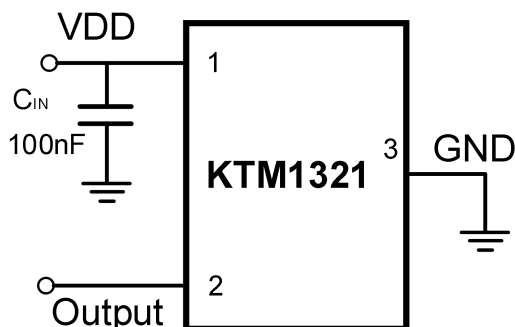
Features

- TMR+CMOS Monolithic Structure
- Low power Consumption
 - 50Hz Version: 160nA@3.0V (typical)
 - Continuous Version: 1.9uA@3.0V (typical)
- Supply Voltage: 1.8V~5.5V
- High Magnetic Sensitivity
 - $B_{OPN}=-45Gs$ $B_{RPN}=-36Gs$
 - $B_{OPN}=-30Gs$ $B_{RPN}=-21Gs$
 - $B_{OPN}=-18Gs$ $B_{RPN}=-12Gs$
 - $B_{OPN}=-9Gs$ $B_{RPN}=-6Gs$
- Magnetic Type: Unipolar (North-Pole)
- Push-Pull CMOS Output
- Package: SOT-23-3L (MSL1)
TO-92S
- Operating Temperature: $-40^{\circ}C \sim 125^{\circ}C$
- High ESD Rating: HBM 8KV
- RoHS Compliant

Application

- Water, Electric and Gas Utility Meters
- Non-Contact Detection
- Door, Lids and Tray Position Switches

Typical Application Circuit

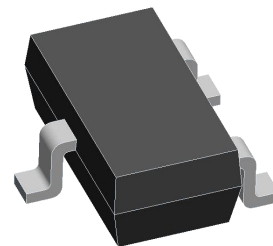


Note: C_{IN} is for stabilization and to strengthen the noise immunity, the recommended capacitance is 100nF typical and should be placed as close to the supply pin as possible.

Descriptions

The KTM1321 is an unipolar(North-pole) magnetic switch integrated with Tunneling Magnetoresistance (TMR) technology and CMOS process for use in industrial and consumer switch applications. The IC internally includes a TMR bridge, a voltage regulator for operation with supply voltage from 1.8V to 5.5V, digital logic control module, threshold adjustment module, Schmitt trigger and a push-pull output. If the magnetic flux density parallel to the part marking surface is larger than operating point (B_{OPN}), the output will be turned on; if it is less than releasing point (B_{RPN}), the output will be turned off.

The KTM1321 family provides a variety of package to customers: SOT-23-3L for surface mount and TO-92S flat for through-hole mount. All package are RoHS compliant.



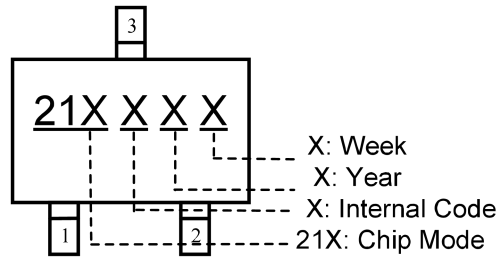
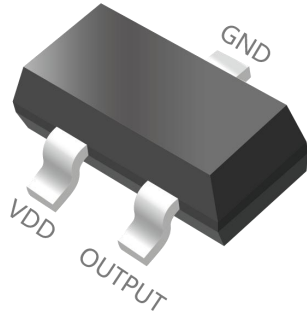
SOT-23-3L



TO-92S

Pin Descriptions

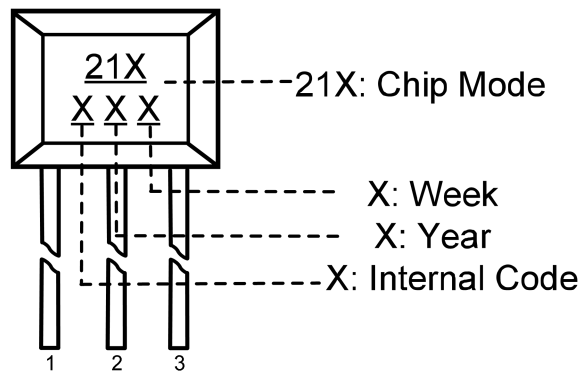
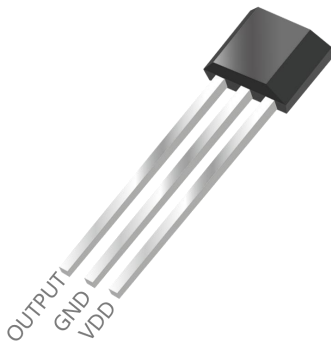
SOT-23-3L



Top view

| Pin Name | Pin Number | Function |
|----------|------------|--------------------|
| VDD | 1 | Power Supply Input |
| OUTPUT | 2 | Output Ground Pin |
| GND | 3 | Ground Pin |

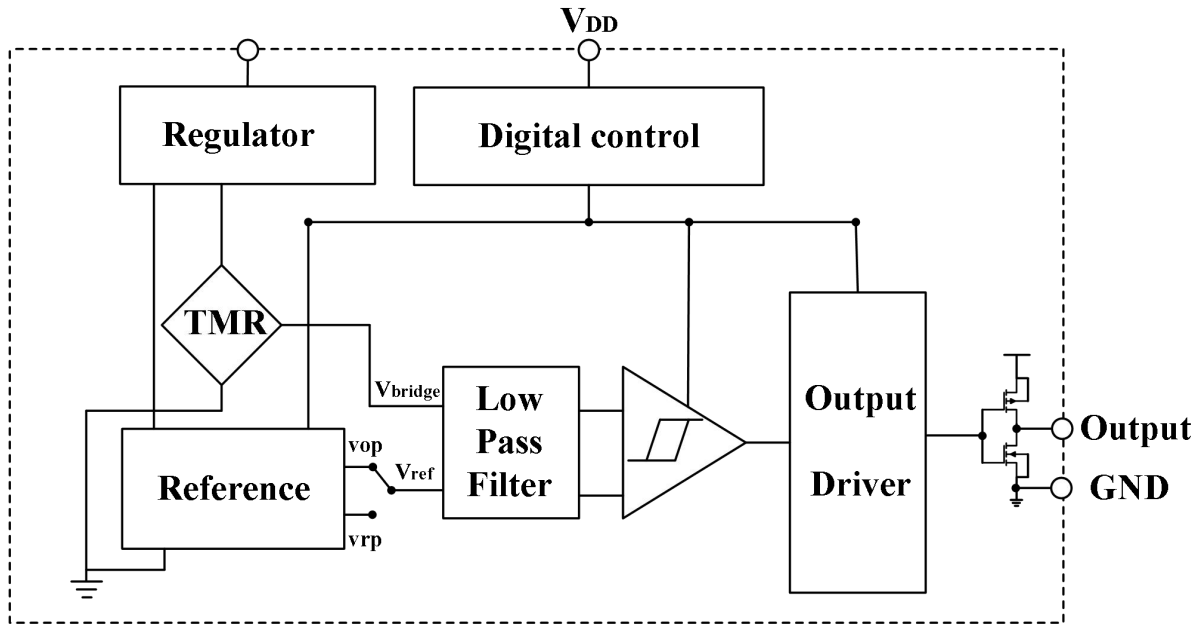
TO-92S



Top view

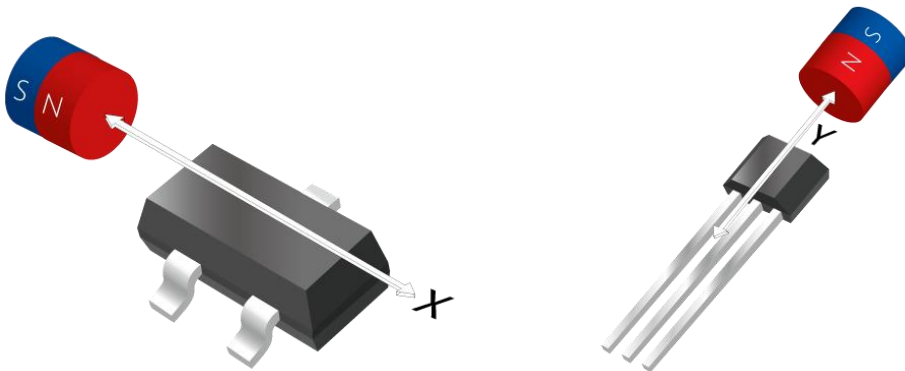
| Pin Name | Pin Number | Function |
|----------|------------|--------------------|
| VDD | 3 | Power Supply Input |
| GND | 2 | Ground Pin |
| OUTPUT | 1 | Output Pin |

Block Diagram

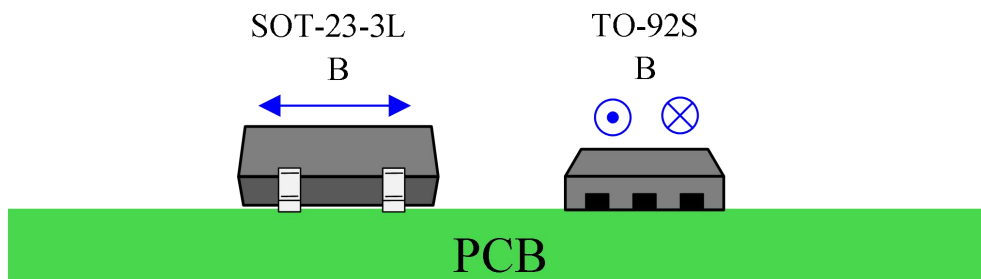


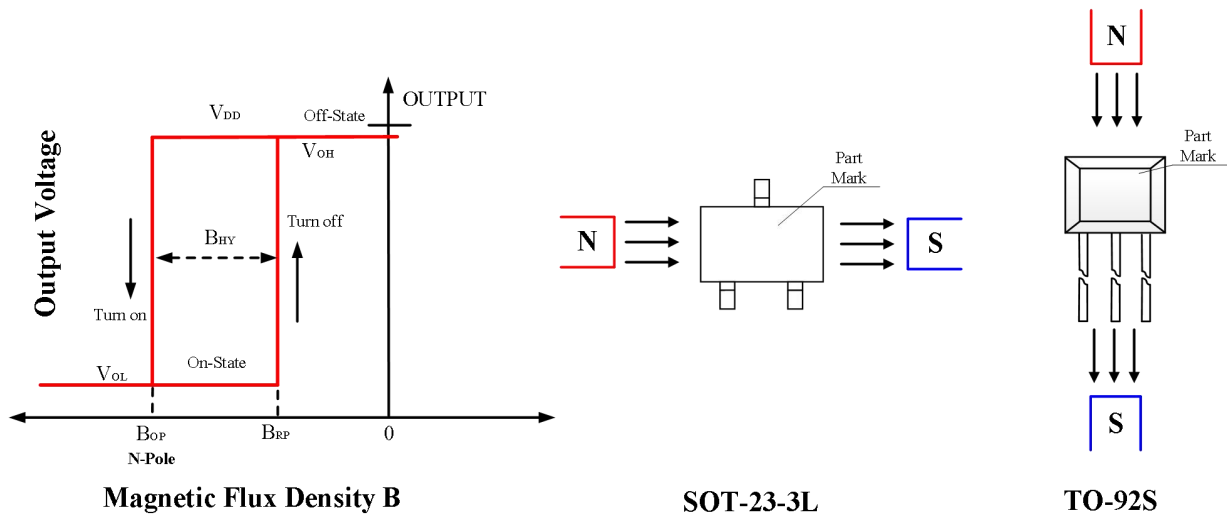
Output Switching Characteristics

To operate the TMR switch, the magnetic field should be applied to the sensor with sufficient magnetic flux density and correct direction.

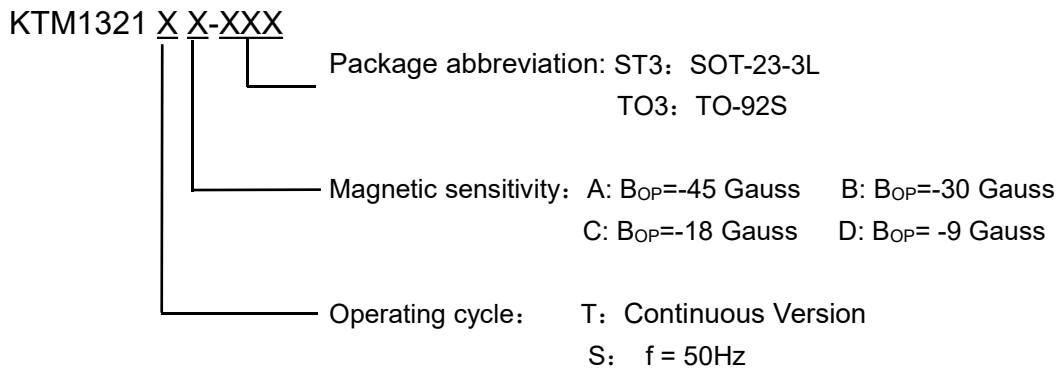


As shown in the figure below, a horizontal magnetic field parallel to the package can be detected.





Product Name Structure



Absolute Maximum Ratings (@ $T_A=+25^\circ\text{C}$, unless otherwise specified)

| Symbol | Parameter | Value | Unit |
|---------------|---------------------------------|------------|------------------|
| V_{DD} | Supply Voltage Dissipation | 6 | V |
| V_{DD_REV} | Reverse voltage (VDD) | -0.3 | V |
| I_{OUTPUT} | Output Current | 5 | mA |
| B | Magnetic Flux Density | 3000@<5min | Gauss |
| T_{STG} | Storage Temperature Range | -50~+150 | $^\circ\text{C}$ |
| T_J | Maximum Junction Temperature | +150 | $^\circ\text{C}$ |
| ESD HBM | Human Body Model ESD Capability | 8000 | V |
| T reflow | Reflow Temperature (MAX) | +260 | $^\circ\text{C}$ |

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

Recommended Operating Range (@T_A=+25°C, unless otherwise specified)

| Symbol | Parameter | Conditions | Value | Unit |
|-----------------|-----------------------------|------------|---------|------|
| V _{DD} | Supply Voltage | Operating | 1.8~5.5 | V |
| T _A | Operating temperature Range | Operating | -40~125 | °C |

Electronics Characteristics (@T_A=+25°C, V_{DD}=3.0V, unless otherwise specified)

| KTM1321SX Series | | | | | | |
|------------------------|---------------------------|--|-----------------------|------------------------|------|------|
| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
| V _{DD} | Supply Voltage | Operating | 1.8 | — | 5.5 | V |
| V _{OL} | Output Low Voltage (On) | I _{OUT} =1mA | — | 0.008 | 0.05 | V |
| V _{OH} | Output High Voltage (Off) | I _{OUT} =1mA | V _{DD} -0.05 | V _{DD} -0.015 | — | V |
| I _{DD(AVG)} | Average Supply Current | T _A =+25°C, V _{DD} =3.0V | — | 160 | — | nA |
| I _{DD(Awake)} | Awake Supply Current | T _A =+25°C, V _{DD} =3.0V | — | 1.9 | — | μA |
| I _{DD(Sleep)} | Sleep Supply Current | T _A =+25°C, V _{DD} =3.0V | — | 148 | — | nA |
| T _{AWAKE} | Awake Time | Operating | — | 40 | — | μs |
| T _{PERIOD} | Period | Operating | — | 20 | — | ms |

| KTM1321TX Series | | | | | | |
|----------------------|---------------------------|--|-----------------------|------------------------|------|------|
| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
| V _{DD} | Supply Voltage | Operating | 1.8 | — | 5.5 | V |
| V _{OL} | Output Low Voltage (On) | I _{OUT} =1mA | — | 0.008 | 0.05 | V |
| V _{OH} | Output High Voltage (Off) | I _{OUT} =1mA | V _{DD} -0.05 | V _{DD} -0.015 | — | V |
| I _{DD(AVG)} | Awake Supply Current | T _A =+25°C, V _{DD} =3.0V | — | 1.9 | — | μA |
| F _S | Sampling Frequency | Operating | — | 5000 | — | Hz |

Magnetic Characteristics (T_A=25°C, VDD=3.0V, unless otherwise noted)

| Symbol | Characteristics | Condition | Min. | Typ. | Max. | Unit |
|---|----------------------------------|--------------------|------|------|------|-------|
| KTM1321XA Series | | | | | | |
| B _{OPN} | Magnetic threshold operate point | TA=+25°C, VDD=3.0V | -50 | -45 | -40 | Gauss |
| B _{RPN} | Magnetic threshold release point | TA=+25°C, VDD=3.0V | -41 | -36 | -31 | |
| B _{HY} (B _{OPX} - B _{RPN}) | Magnetic hysteresis | | - | 9 | - | |

| Symbol | Characteristics | Condition | Min. | Typ. | Max. | Unit |
|---|----------------------------------|--------------------|------|------|------|-------|
| KTM1321XB Series | | | | | | |
| B _{OPN} | Magnetic threshold operate point | TA=+25°C, VDD=3.0V | -36 | -30 | -26 | Gauss |
| B _{RPN} | Magnetic threshold release point | TA=+25°C, VDD=3.0V | -26 | -21 | -16 | |
| B _{HY} (B _{OPX} - B _{RPN}) | Magnetic hysteresis | | - | 9 | - | |

| Symbol | Characteristics | Condition | Min. | Typ. | Max. | Unit |
|---|----------------------------------|--------------------|------|------|------|-------|
| KTM1321XC Series | | | | | | |
| B _{OPN} | Magnetic threshold operate point | TA=+25°C, VDD=3.0V | -24 | -18 | -15 | Gauss |
| B _{RPN} | Magnetic threshold release point | TA=+25°C, VDD=3.0V | -15 | -12 | -9 | |
| B _{HY} (B _{OPX} - B _{RPN}) | Magnetic hysteresis | | - | 6 | - | |

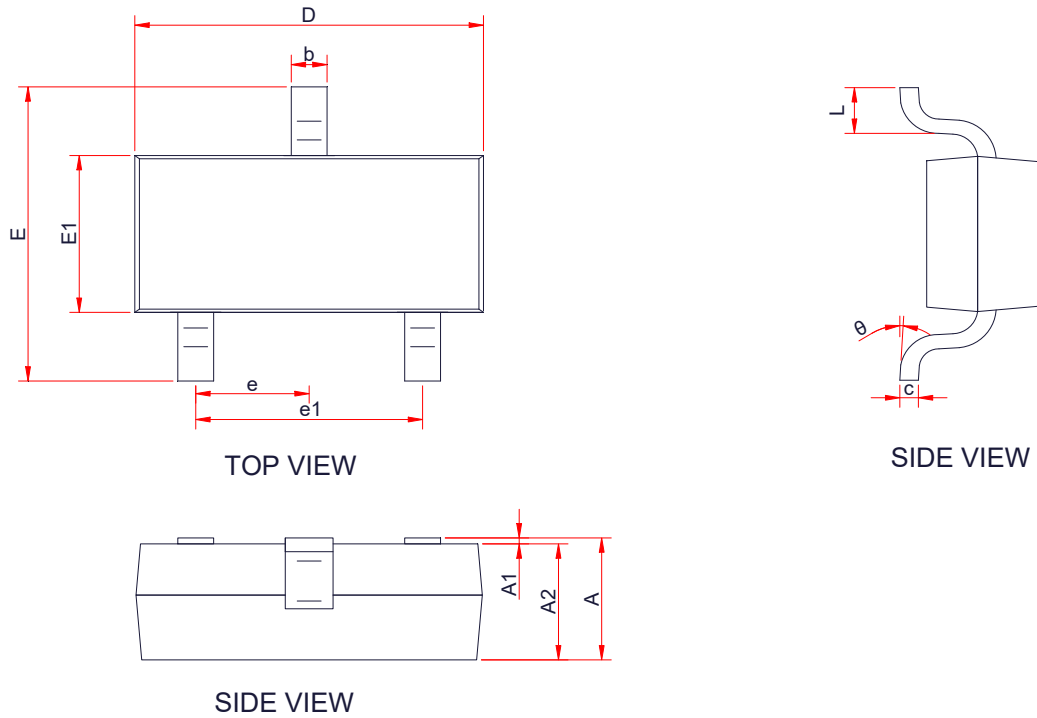
| Symbol | Characteristics | Condition | Min. | Typ. | Max. | Unit |
|---|----------------------------------|--------------------|------|------|------|-------|
| KTM1321XD Series | | | | | | |
| B _{OPN} | Magnetic threshold operate point | TA=+25°C, VDD=3.0V | -12 | -9 | -6 | Gauss |
| B _{RPN} | Magnetic threshold release point | TA=+25°C, VDD=3.0V | -9 | -6 | -3 | |
| B _{HY} (B _{OPX} - B _{RPN}) | Magnetic hysteresis | | - | 3 | - | |

Order Information

| Part Numbers | Package | Number of Pins | Bop | Operating Frequency | Temperature |
|---------------|-----------|----------------|---------|---------------------|-------------|
| KTM1321TA-ST3 | SOT-23-3L | 3 | 45Gauss | Continuous | -40°C~125°C |
| KTM1321TB-ST3 | SOT-23-3L | 3 | 30Gauss | Continuous | -40°C~125°C |
| KTM1321TC-ST3 | SOT-23-3L | 3 | 18Gauss | Continuous | -40°C~125°C |
| KTM1321TD-ST3 | SOT-23-3L | 3 | 9Gauss | Continuous | -40°C~125°C |
| KTM1321SA-ST3 | SOT-23-3L | 3 | 45Gauss | 50Hz | -40°C~125°C |
| KTM1321SB-ST3 | SOT-23-3L | 3 | 30Gauss | 50Hz | -40°C~125°C |
| KTM1321SC-ST3 | SOT-23-3L | 3 | 18Gauss | 50Hz | -40°C~125°C |
| KTM1321SD-ST3 | SOT-23-3L | 3 | 9Gauss | 50Hz | -40°C~125°C |
| KTM1321TA-TO3 | TO-92S | 3 | 45Gauss | Continuous | -40°C~125°C |
| KTM1321TB-TO3 | TO-92S | 3 | 30Gauss | Continuous | -40°C~125°C |
| KTM1321TC-TO3 | TO-92S | 3 | 18Gauss | Continuous | -40°C~125°C |
| KTM1321TD-TO3 | TO-92S | 3 | 9Gauss | Continuous | -40°C~125°C |
| KTM1321SA-TO3 | TO-92S | 3 | 45Gauss | 50Hz | -40°C~125°C |
| KTM1321SB-TO3 | TO-92S | 3 | 30Gauss | 50Hz | -40°C~125°C |
| KTM1321SC-TO3 | TO-92S | 3 | 18Gauss | 50Hz | -40°C~125°C |
| KTM1321SD-TO3 | TO-92S | 3 | 9Gauss | 50Hz | -40°C~125°C |

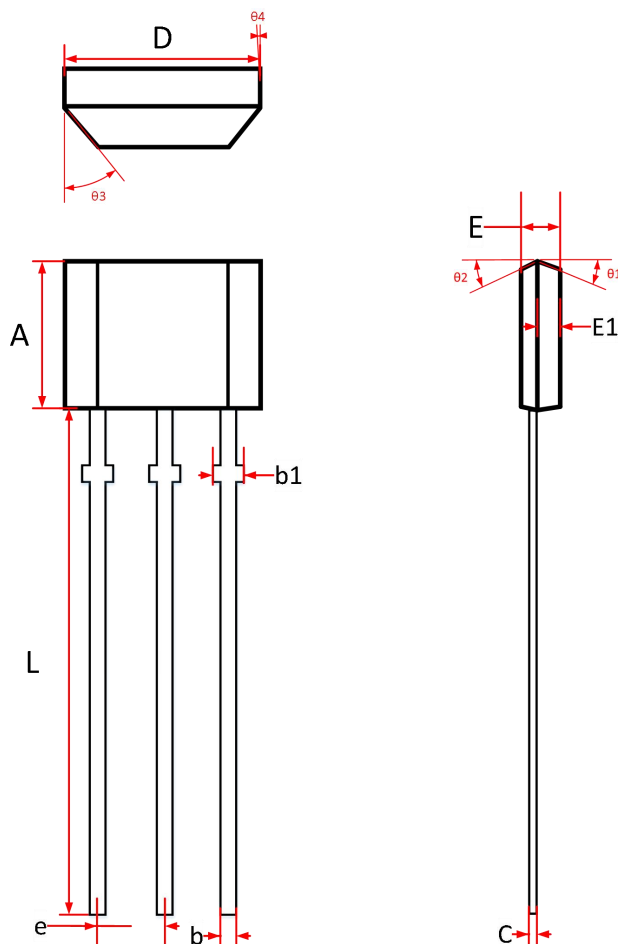
PACKAGE OUTLINE DIMENSIONS

SOT-23-3L



| Symbol | Dimensions in Millimeters | | |
|----------|---------------------------|------|------|
| | Min. | Typ. | Max. |
| A | - | - | 1.25 |
| A1 | 0.00 | - | 0.1 |
| A2 | 1.00 | 1.10 | 1.15 |
| b | 0.30 | - | 0.50 |
| c | 0.10 | - | 0.20 |
| D | 2.82 | 2.95 | 3.02 |
| E | 2.65 | 2.80 | 2.95 |
| E1 | 1.50 | 1.65 | 1.70 |
| e | 0.85 | 0.95 | 1.05 |
| e1 | 1.80 | 1.90 | 2.00 |
| L | 0.30 | 0.45 | 0.60 |
| θ | 0 ° | - | 8 ° |

TO-92S



| Symbol | Dimensions in Millimeters | | |
|------------|---------------------------|-------|-------|
| | Min. | Typ. | Max. |
| A | 2.90 | 3.00 | 3.10 |
| b | 0.35 | 0.39 | 0.50 |
| b1 | 0.40 | 0.44 | 0.55 |
| C | 0.36 | 0.38 | 0.45 |
| D | 3.90 | 4.00 | 4.10 |
| E | 1.42 | 1.52 | 1.62 |
| E1 | | 0.75 | |
| e | 1.27 TYP | | |
| L | 13.50 | 14.50 | 15.50 |
| $\theta 1$ | | 6° | |
| $\theta 2$ | | 3° | |
| $\theta 3$ | | 45° | |
| $\theta 4$ | | 3° | |