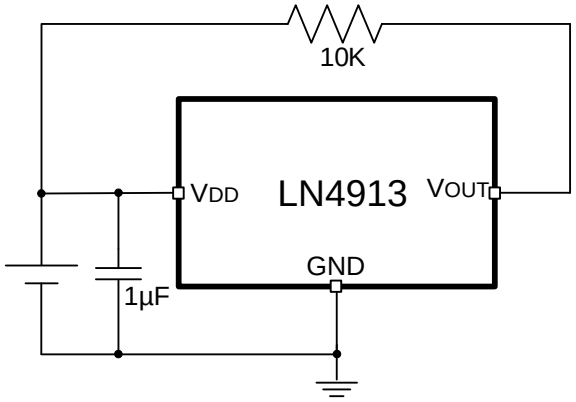
# Low Current Consumption, High Sensitivity CMOS Hall IC

## General Description

The LN4913 is an integrated hall-effect sensor designed specifically to meet the requirements of low-power devices. e.g. as an On/Off switch in Cellular Flip-Phones, with battery operating voltages of 1.65V-5.5V. Precise magnetic switching points and high temperature stability are achieved through the unique design of the internal circuit. An onboard clock scheme is used to reduce the average operating current of the IC. During the operate phase the IC compares the actual magnetic field detected with the internally compensated switching points. The output Voltage is switched at the end of each operating phase. During the Stand-by phase the output stage is latched and the current consumption of the device reduced to some µA.

The IC switching behavior is Omni polar; it can be switched on with either the North or South pole of a magnet.

## Typical Application Circuit




## Applications

- Cover switch in clam-shell cellular phones
- Cover switch in Notebook PC/PDA
- Contact-less switch in consumer products

## Features

- Micro power design
- 1.65 V to 5.5 V battery operation
- High sensitivity and high stability of the magnetic switching points
- High resistance to mechanical stress
- Digital output signal
- Switching for both poles of a magnet (omnipolar)
- Not suitable for automotive application

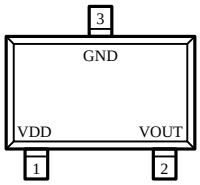
## Package

- SOT23-3L
- TSOT23-3L
- TO-92S
- DFN1520-6L
- DFN2020-3L

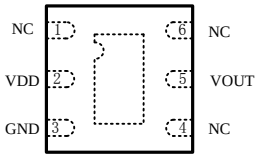
## Ordering Information

| Part Number | Package Code | Package | Lot Number | Part Number | Package Code | Package | Lot Number |
|---|---|---|---|---|---|---|---|
| LN4913MR | M | SOT23-3L | 13XY | LN4913SRB | S | TO-92S | XXXX |
| LN4913NR | N | TSOT23-3L | 13XY | LN4913ZRA | Z | DFN1520-6L | 13XY |
| LN4913TR | T | TO-92S | XXXX | LN4913LR | L | DFN2020-3L | 13XY |
| LN4913SRA | S | TO-92S | XXXX | | | | |

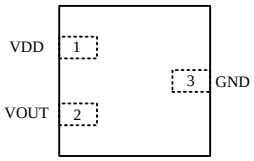
## ■ Pin Configuration




SOT23-3L/TSOT23-3L
(TOP VIEW)



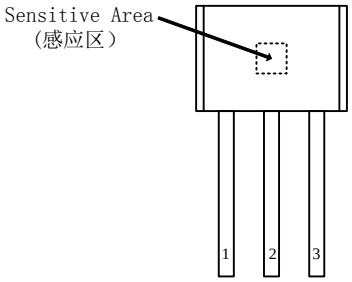

DFN1520-6L
(TOP VIEW)




DFN2020-3L
(TOP VIEW)

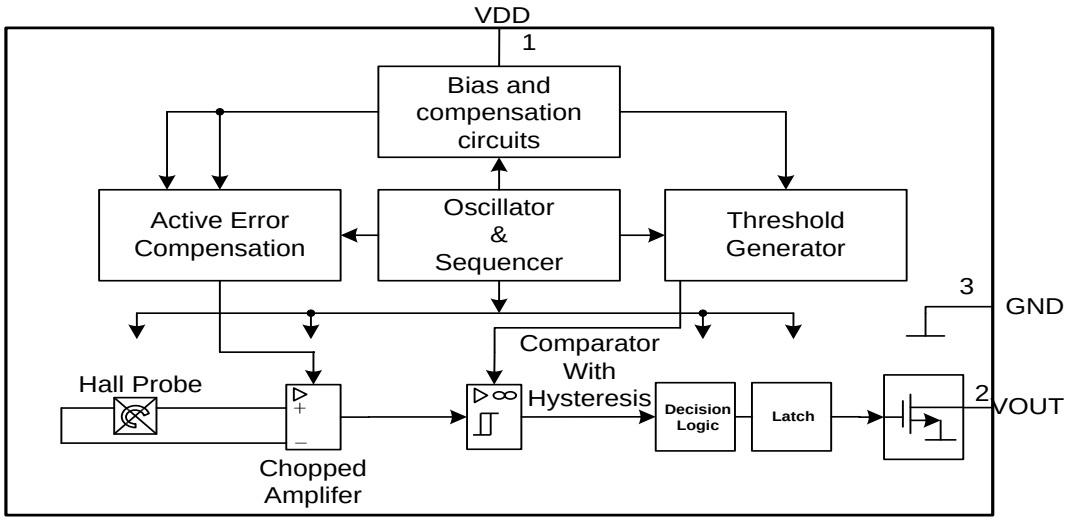
| Pin Number | | | Pin Name | Function Description |
|---|---|---|---|---|
| SOT-23-3/TSOT-23-3 | DFN2015-6 | DFNWB2×2-3L | | |
| 2 | 5 | 2 | VOUT | Output Pin |
| 3 | 3 | 3 | GND | Ground |
| 1 | 2 | 1 | VDD | Supply Voltage |
| - | 1,4,6 | - | NC | No Connection |

TO-92S
(Front View)




| Ordering Name | Package | Pin Name | | | Marking |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | |
| LN4913TR | TO-92S | VDD | VOUT | GND | 4913 |
| LN4913SRA | TO-92S | VOUT | GND | VDD | 4913A |
| LN4913SRB | TO-92S | VDD | GND | VOUT | 4913B |

## Function Block Diagram




## Absolute Maximum Ratings

| Symbol | Characteristics | Values | Unit |
|---|---|---|---|
| $V_{DD}$ | Supply voltage | -0.3-6.0 | V |
| $I_{DD}$ | Operating current | -1-4.5 | mA |
| $V_{OUT}$ | Output voltage | -0.3-6.0 | V |
| $I_{OUT}$ | Output current | -1-2.0 | mA |
| $T_S$ | Storage temperature range | -40～+150 | °C |
| $T_J$ | Maximum junction temperature | 150 | °C |
| - | ESD Protection | 4000 | V |

## Electrical Characteristics

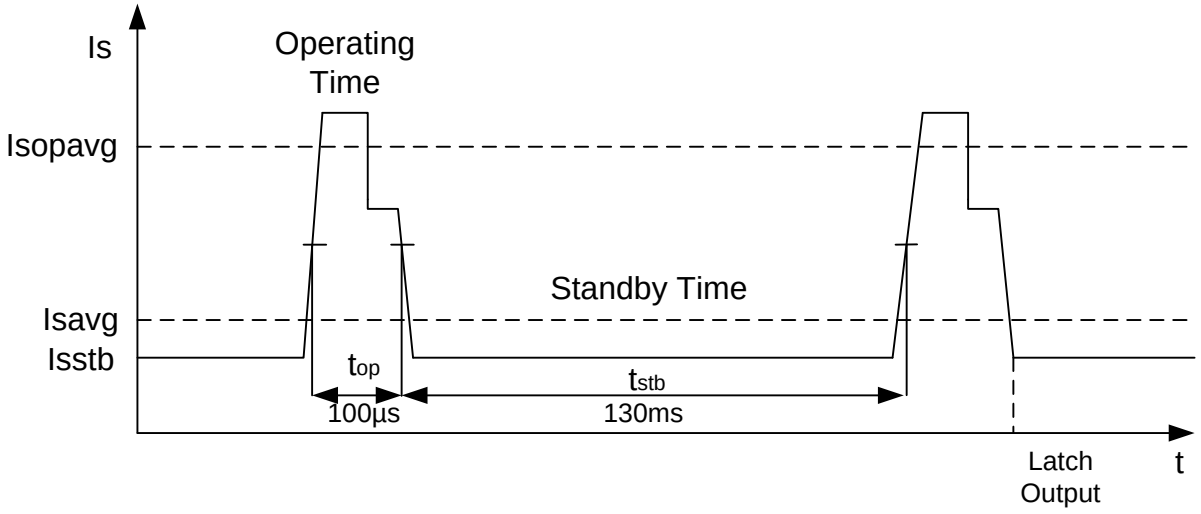
AC/DC Characteristics ($T_A$=+25℃,$V_{DD}$=3.0V,Unless otherwise specified)

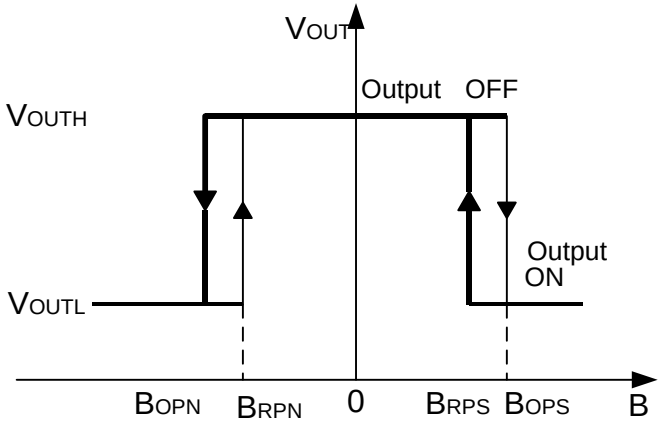
| Symbol | Characteristic | Conditions | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DD}$ | Supply voltage | - | 1.65 | - | 6.0 | V |
| $I_{SAVG}$ | Averaged supply current | - | 1 | 3 | 10 | uA |
| $I_{SOPAVG}$ | Averaged current during operating time | - | 0.5 | 2.0 | 3.5 | mA |
| $I_{SOPT}$ | Peak current during operating time | - | - | - | 4.5 | mA |
| $I_{SSTB}$ | Supply current during standby time | - | 1 | 1.9 | 8 | uA |
| $V_{QSAT}$ | Output Saturation Voltage | IQ=1mA | - | 0.13 | 0.4 | V |
| $I_{QLEAK}$ | Output on Leakage Current | - | - | 0.01 | 1 | uA |
| $t_r$ | Output rise time | $R_L$=2.7KΩ $C_L$=10pF | - | 0.5 | 1 | us |
| $r_f$ | Output fall time | $R_L$=2.7KΩ $C_L$=10pF | - | 0.1 | 1 | us |
| $t_{op}$ | Operating time | - | 25 | 100 | 160 | us |
| $t_{stb}$ | Standby time | - | 60 | 140 | 240 | ms |
| $t_{op}/t_{stb}$ | Duty cycle | - | - | 0.071 | - | % |
| $t_{stu}$ | Start-up time of IC | - | - | 12 | 20 | us |

## ■ Magnetic Characteristics

($T_A$=+25℃,$V_{DD}$=2.7V, Unless otherwise specified)

| Symbol | Min | Type | Max | Unit |
|---|---|---|---|---|
| BOPS | 2 | 3.5 | 5 | mT |
| BOPN | -5 | -3.5 | -2 | mT |
| BRPS | 1.2 | 2.7 | 4.2 | mT |
| BRPN | -4.2 | -2.6 | -1.2 | mT |
| BHYS | 0.2 | 0.8 | 1.6 | mT |

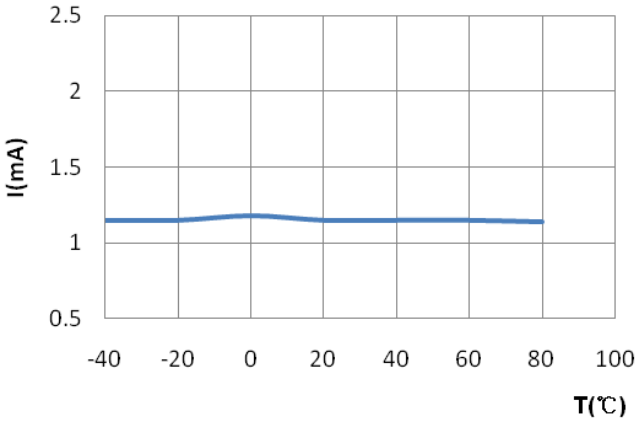


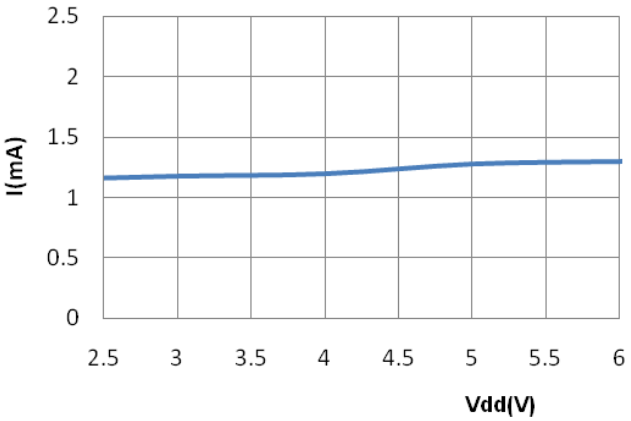

**VOUT as function of the applied B-Field**

## ■ Typical Operating Characteristics

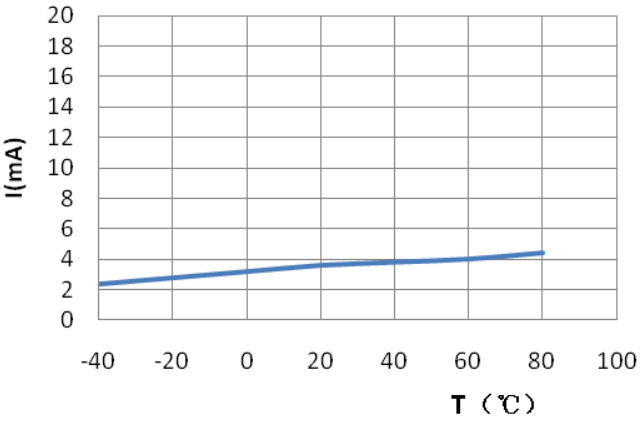
Vdd(V)=2.7V ， Isopavg—TA



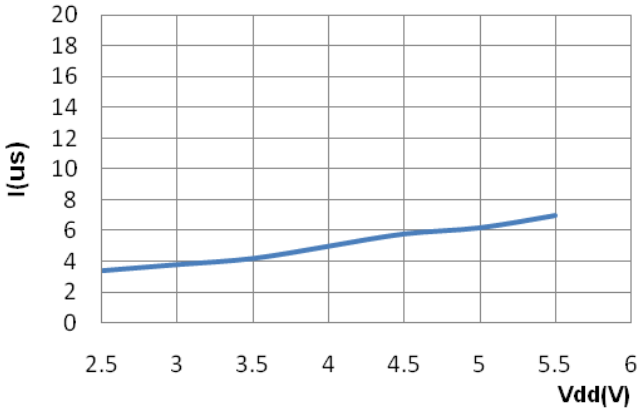

TA=20℃,Isopavg—Vdd



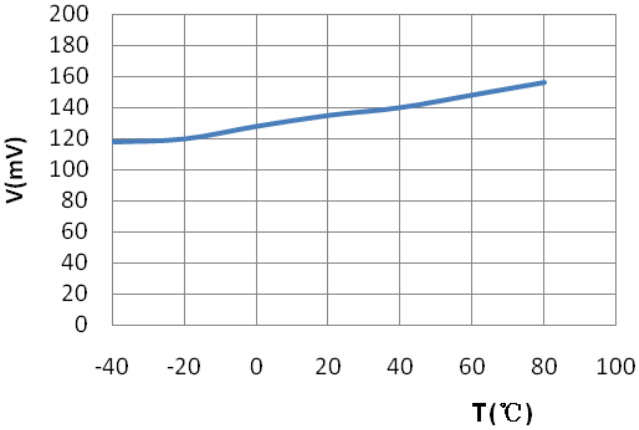

Vdd=2.7V,Isstb—TA



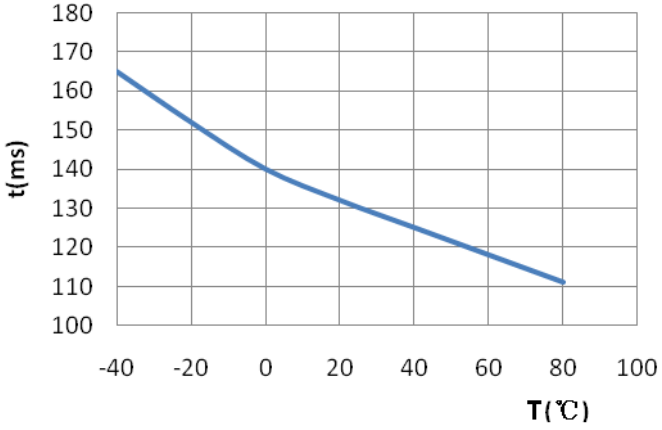

TA=20℃,Isstb—Vdd



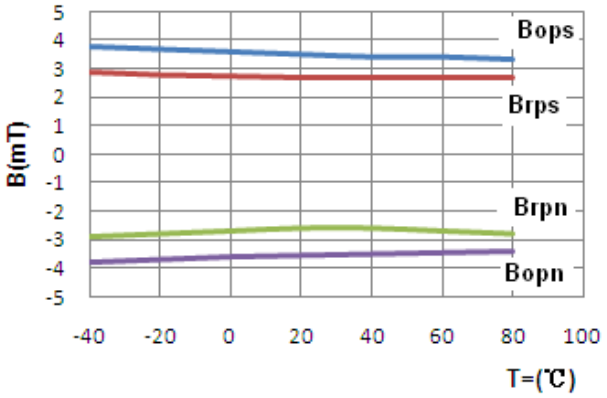

Iout =1mA ， VQSAT—TA



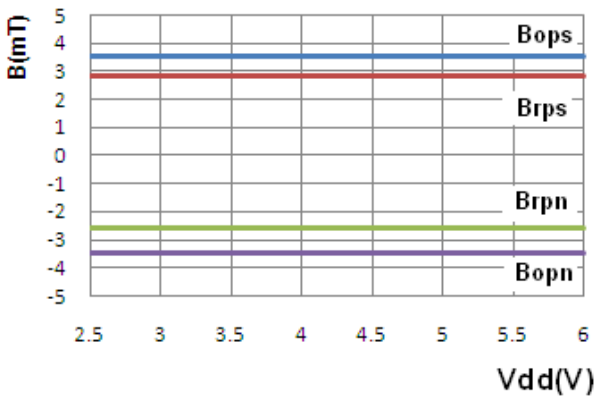

Vdd=2.7V,tstb—TA



Vdd=2.7V ，B—TA

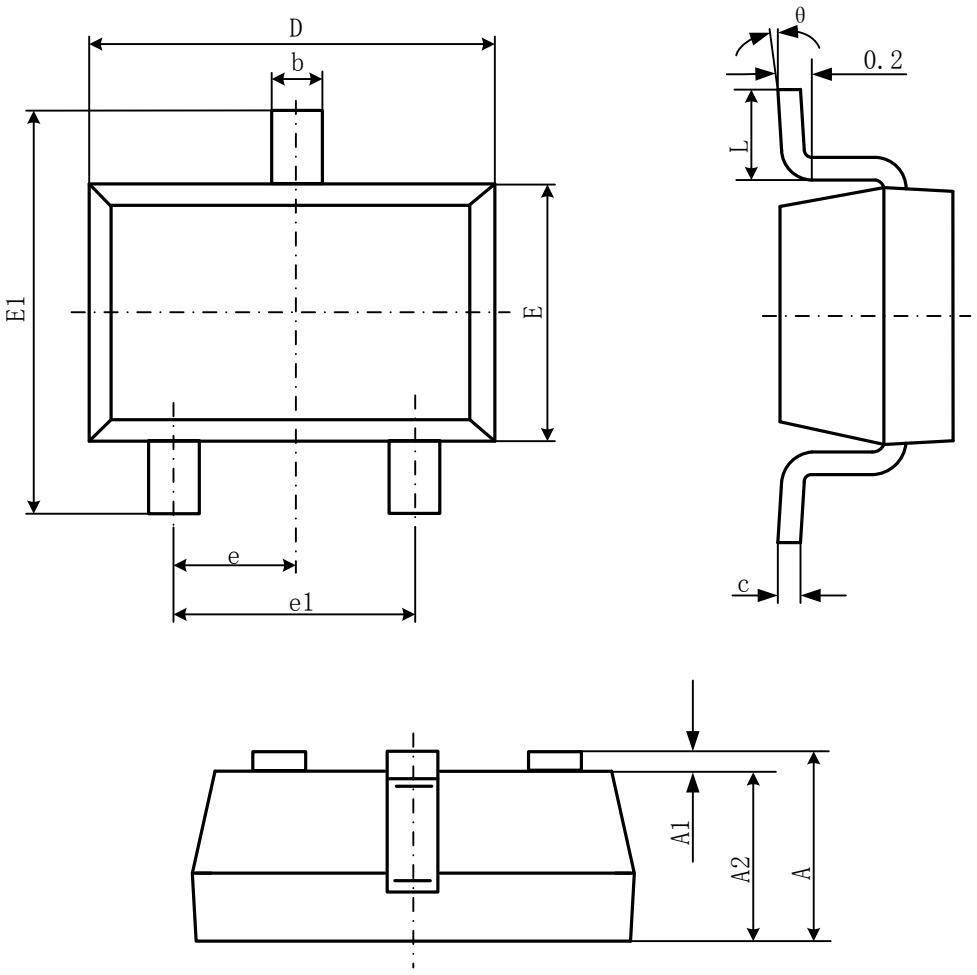



TA=20℃ ，B—Vdd



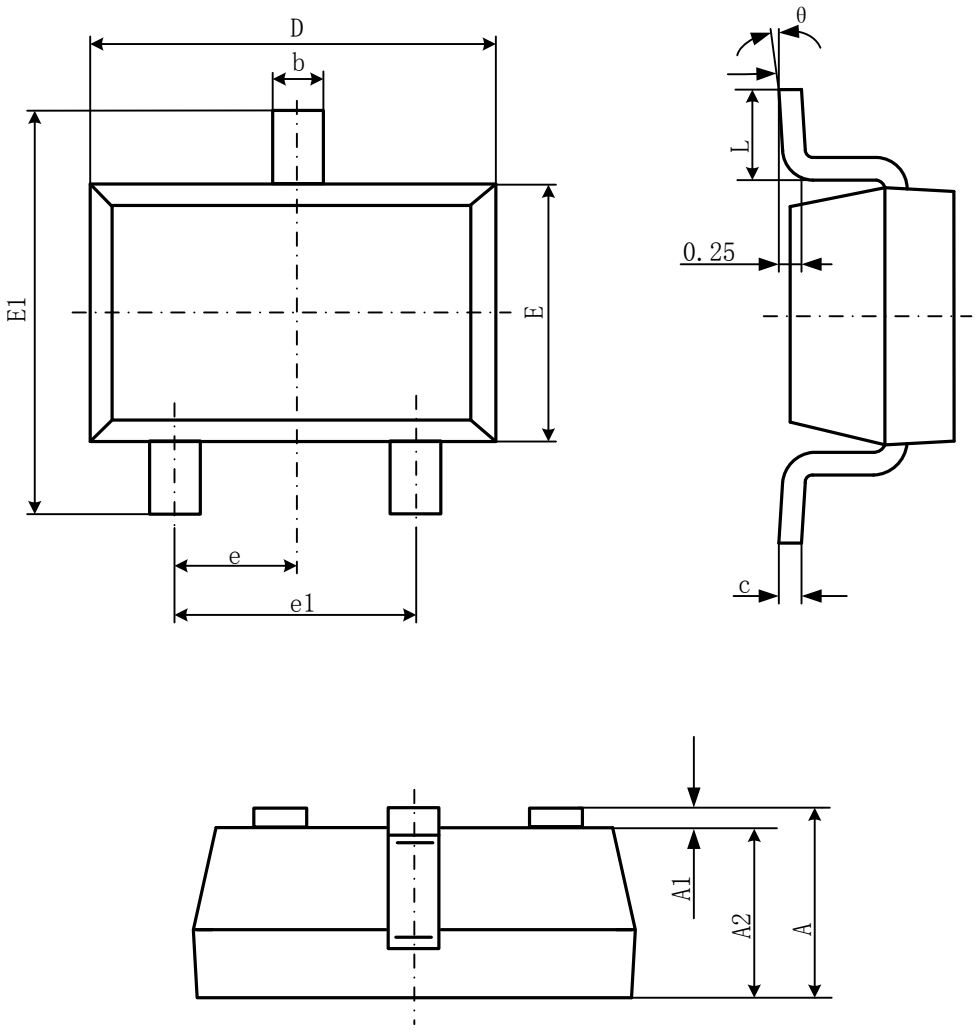
## ■ Package

- **SOT23-3L**



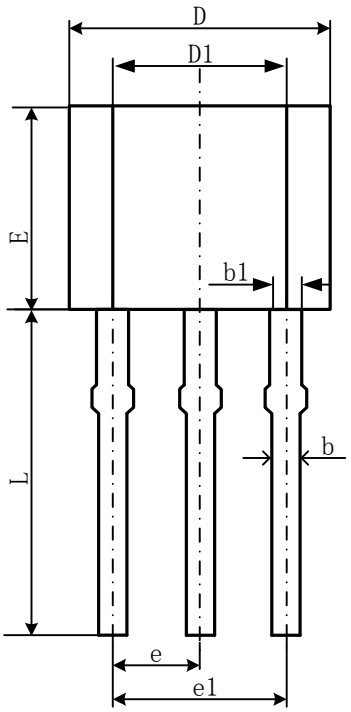

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| 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° |

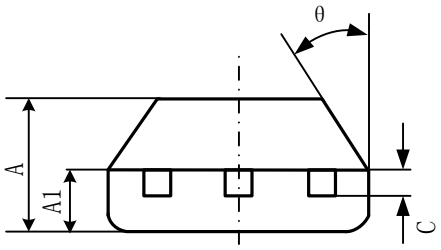
- **TSOT23-3L**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.700 | 0.900 | 0.028 | 0.035 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.700 | 0.800 | 0.028 | 0.031 |
| b | 0.350 | 0.500 | 0.014 | 0.020 |
| c | 0.080 | 0.200 | 0.003 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.600 | 1.700 | 0.063 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.90(BSC) | | 0.075(BSC) | |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

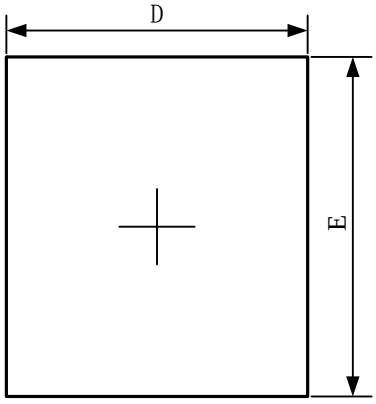
- **TO-92S**



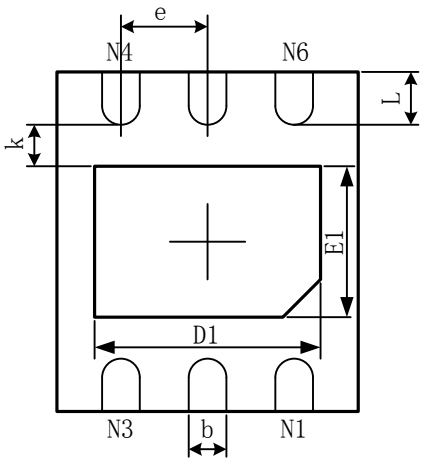




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.420 | 1.620 | 0.056 | 0.064 |
| A1 | 0.660 | 0.860 | 0.026 | 0.034 |
| b | 0.350 | 0.480 | 0.014 | 0.019 |
| b1 | 0.400 | 0.550 | 0.016 | 0.022 |
| c | 0.360 | 0.510 | 0.014 | 0.020 |
| 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 | 1.270TYP | | 0.050TYP | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 15.100 | 15.500 | 0.594 | 0.610 |
| θ | 45°TYP | | 45°TYP | |

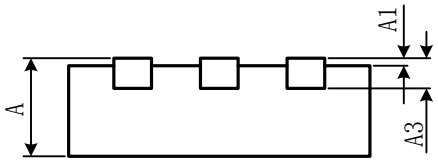
- **DFN1520-6L**




Top View



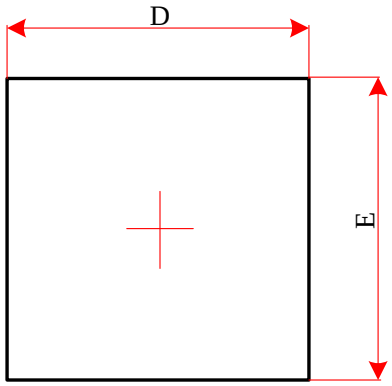

Bottom View



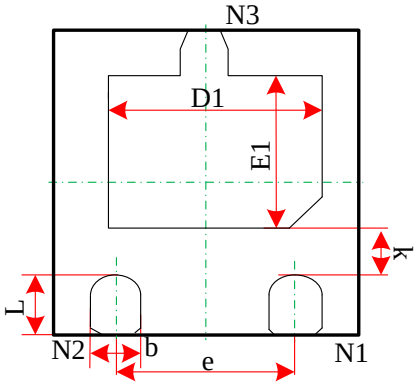

Side View

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.350 | 0.450 | 0.014 | 0.018 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.127REF | | 0.005REF | |
| D | 1.424 | 1.576 | 0.056 | 0.062 |
| E | 1.924 | 2.076 | 0.076 | 0.082 |
| D1 | 1.000 | 1.200 | 0.039 | 0.047 |
| E1 | 0.800 | 1.000 | 0.031 | 0.039 |
| k | 0.200MIN | | 0.008MIN | |
| b | 0.200 | 0.300 | 0.008 | 0.012 |
| e | 0.500TYP | | 0.020TYP | |
| L | 0.174 | 0.326 | 0.007 | 0.013 |

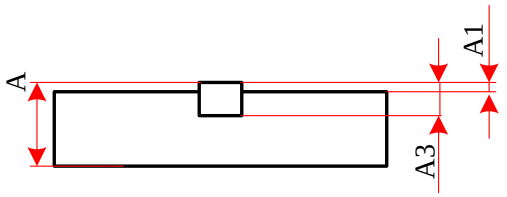
- **DFN2020-3L**




**Top View**




**Bottom View**




**Side View**

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.500 | 0.600 | 0.020 | 0.024 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.152 REF. | | 0.006 REF. | |
| D | 1.924 | 2.076 | 0.076 | 0.082 |
| E | 1.924 | 2.076 | 0.076 | 0.082 |
| D1 | 1.400 | 1.600 | 0.055 | 0.063 |
| E1 | 0.950 | 1.150 | 0.037 | 0.045 |
| k | 0.220 MIN. | | 0.009 MIN. | |
| b | 0.250 | 0.350 | 0.010 | 0.014 |
| e | 1.30(BSC) | | 0.050(BSC) | |
| L | 0.330 | 0.430 | 0.013 | 0.017 |