# Voltage Detectors With Delay Circuit Built-In

## ■ General Description

The LN61F is a micro-power voltage detector supervising the power supply voltage level for microprocessors or digital systems, which is extremely accurate with minimal temperature drift.

It provides internally fixed threshold levels with 0.1V per step ranging from 1.5V to 5V, which covers most digital applications. It features low supply current.Both CMOS and N-channel open drain output configurations are available.Since the delay circuit is built-in, peripherals are unnecessary and high density mounting is possible.

## ■ Features

- Highly Accurate    ± 2%
- Low Power Consumption    lower than 1.5μA
- Detect Voltage Range 1.5V ~ 5.0V in 0.1V increments
- Operating Voltage Range    0.7V ~ 7.0V
- Detect Voltage Temperature Characteristics: ± 100ppm/℃(TYP.)

- Built-In Delay Circuit

  The option items include:50ms,100ms,200ms and 400ms
- Output Configuration: N-channel open drain or CMOS

## ■ Applications

- Microprocessor reset circuitry
- Memory battery back-up circuits
- Power-on reset circuits
- Power failure detection
- System battery life and charge voltage monitors
- Delay circuitry

## ■ Package

- SOT-23-3L
- SOT-89-3L
- TO-92

## ■ Ordering Information

LN61F ①②③④⑤⑥⑦

| Designator | Description | Symbol | Description |
|---|---|---|---|
| ① | Output Configuration | C | CMOS output |
| | | N | N-ch open drain output |
| ② ③ | Detect Voltage | 15~50 | e.g. 2.5V → ②2 , ③5 |
| | | | e.g. 3.8V → ②3, ③8 |
| ④ | Output Delay | 1 | 70ms-150ms |
| | | 2 | 330ms-500ms |
| | | 4 | 150ms-270ms |
| | | 5 | 30ms-80ms |
| ⑤ | Detect Accuracy | 2 | Within ± 2.0% |
| ⑥ | Package | M | SOT-23 |
| | | P | SOT-89 |
| | | T | TO-92 (Standard) |
| | | L | TO-92 (Custom pin configuration) |
| ⑦ | Device Orientation | R | Embossed tape, standard feed |
| | | L | Embossed tape, reverse feed |
| | | H | Paper type (TO-92) |
| | | B | Bag (TO-92) |

## ■ Pin Configurations



VIN
3

1          2
VOUT      VSS

SOT-23-3L
(TOP VIEW)

VOUT   VIN   VSS

1    2    3

SOT-89-3L
(TOP VIEW)

1    2    3
VOUT  VIN  VSS

TO-92 (T Type)
(Front View)

1    2    3
VIN   VSS  VOUT

TO-92 (L Type)
(Front View)
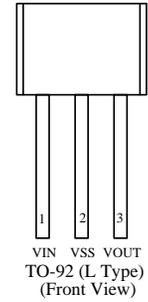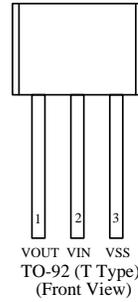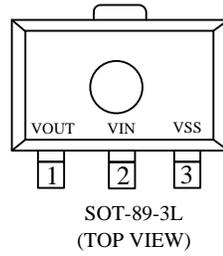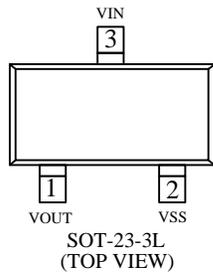
## ■  Pin Assignment

| Pin Number | | | | Pin Name | Function |
|---|---|---|---|---|---|
| SOT-23-3L | SOT-89-3L | TO-92(T) | TO-92(L) | | |
| 3 | 2 | 2 | 1 | VIN | Supply Voltage Input |
| 2 | 3 | 3 | 2 | VSS | Ground |
| 1 | 1 | 1 | 3 | VOUT | Output |

## ■  Typical Application Circuit
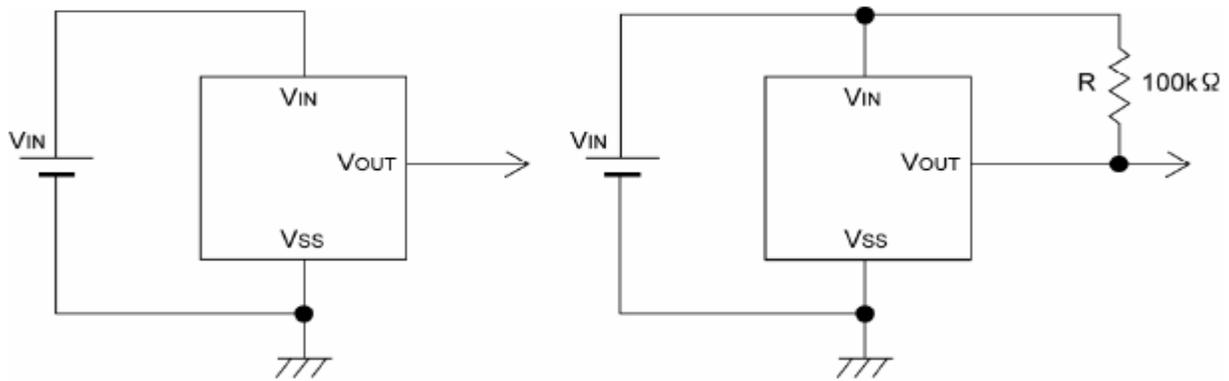


CMOS output

N-channel open drain output

# ■ Marking Rule

● SOT-23-3L,SOT-89-3L

SOT-23-3L
(TOP VIEW)

SOT-89-3L
(Top View)
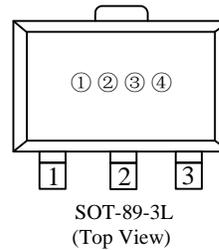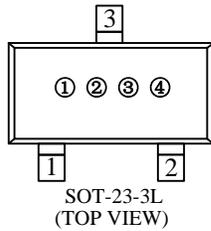
① Represents integer of detect voltage and output configuration

**CMOS output (LN61FC series)**

| Mark | Configuration | Voltage(V) |
|---|---|---|
| A | CMOS | 0.X |
| B | CMOS | 1.X |
| C | CMOS | 2.X |
| D | CMOS | 3.X |
| E | CMOS | 4.X |
| F | CMOS | 5.X |

**N-channel open drain (LN61FN series)**

| Mark | Configuration | Voltage(V) |
|---|---|---|
| K | N-ch | 0.X |
| L | N-ch | 1.X |
| M | N-ch | 2.X |
| N | N-ch | 3.X |
| P | N-ch | 4.X |
| R | N-ch | 5.X |

② Represents decimal number of detect voltage

| Mark | Voltage(V) | Mark | Voltage(V) |
|---|---|---|---|
| 0 | X.0 | 5 | X.5 |
| 1 | X.1 | 6 | X.6 |
| 2 | X.2 | 7 | X.7 |
| 3 | X.3 | 8 | X.8 |
| 4 | X.4 | 9 | X.9 |

③ Represents delay time

| Mark | Delay Time |
|---|---|
| 5 | 70ms-150ms |
| 6 | 330ms-500ms |
| 8 | 150ms-270ms |
| 7 | 30ms-80ms |

④ Represents assembly lot number (Based on internal standards)

- TO-92
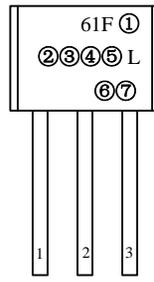


TO-92 (L Type)
(Front View)
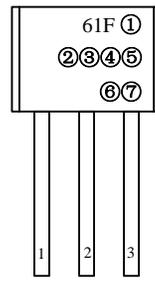
TO-92 (T Type)
(Front View)

① **Represents the output configuration**

| Designator | Output Configuration |
|---|---|
| C | CMOS |
| T | N-ch open drain |

② ③ **Represents the detect voltage**

| Designator | | Detect Voltage（V） |
|---|---|---|
| ② | ③ | |
| 3 | 3 | 3.3 |
| 5 | 0 | 5.0 |

④ **Represents delay time**

| Mark | Delay Time |
|---|---|
| 1 | 50ms ~ 200ms |
| 4 | 80ms ~ 400ms |
| 5 | 1ms ~ 50ms |

⑤ **represents the detect voltage accuracy**

| Designator | Output Accuracy |
|---|---|
| 1 | Within ±1% |
| 2 | Within ±2% |

⑥ **Represents a least significant digit of the produced year**

| Designator | Produced Year |
|---|---|
| 8 | 2008 |
| 9 | 2009 |

⑦ **Represents   production lot number**

0～9，A～Z repeated （G，I，J，O，Q，W excepted）

## ■ Function Block Diagram

(1) CMOS output
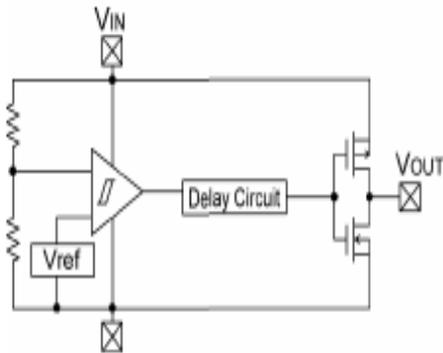


(2) N-channel open drain output
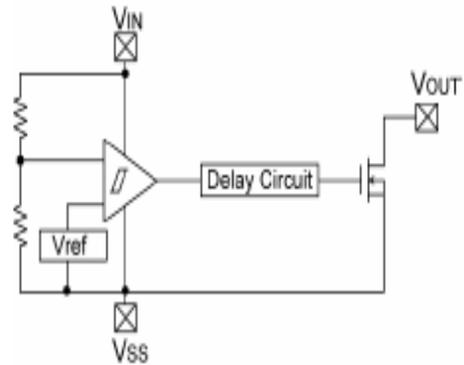


## ■ Absolute Maximum Ratings

| Parameter | | Symbol | Maximum Rating | Unit |
|---|---|---|---|---|
| Input Supply Voltage | | $V_{IN}$ | 12 | V |
| Output Current | | IOUT | 30 | mA |
| Output Voltage | CMOS | VOUT | VSS -0.3 ~ VIN + 0.3 | V |
| | N-ch open drain | | VSS -0.3 ~ 9 | |
| Power Dissipation | SOT-23 | Pd | 150 | mW |
| | SOT-89 | | 500 | |
| | TO-92 | | 300 | |
| Operating Temperature Range | | Topr | -30~+85 | ℃ |
| Storage Temperature Range | | Tstg | -40~+125 | ℃ |

## ■ Electrical Characteristics

**Ta=25℃**

| Parameter | Symbol | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Detect Voltage | VDF | | | VDF(T) x 0.98 | VDF(T) | VDF(T) x 1.02 | V |
| Hysteresis Range | VHYS | | | VDF x 0.02 | VDF x 0.05 | VDF x 0.08 | V |
| Supply Current | ISS | VIN = 1.5V | | | 1.2 | 2.0 | μA |
| | | VIN = 2.0V | | | 1.3 | 2.5 | |
| | | VIN = 3.0V | | | 1.3 | 3.0 | |
| | | VIN = 4.0V | | | 1.4 | 3.5 | |
| | | VIN = 5.0V | | | 1.6 | 4 | |
| Operating Voltage | VIN | VDF= 1.6V to 6.0V | | 0.7 | | 7 | V |
| Output Current | IOUT | N-ch VDF =0.5V | VIN = 1.5V | | 2 | | mA |
| | | | VIN = 2.0V | | 7 | | |
| | | | VIN = 3.0V | | 10 | | |
| | | | VIN = 4.0V | | 11 | | |
| | | | VIN = 5.0V | | 13 | | |
| | | CMOS, P-ch VDF=2.1V VIN = 8.0V | | | -10 | | |
| Detect Voltage Temperature Characteristics | Δ VDF Δ Topr· VDF | | | | ±100 | | ppm/℃ |
| Transient Delay Time (VDR → VOUT inversion) | TDLY | LN61F***1*** | | 70 | | 150 | ms |
| | | LN61F***2*** | | 330 | | 500 | ms |
| | | LN61F***4*** | | 150 | | 270 | ms |
| | | LN61F***5*** | | 30 | | 80 | ms |

VDF (T): Setting detect voltage value

Release Voltage: VDR = VDF + VHYS

* Transient Delay Time: 1ms to 50ms & 80ms to 400ms versions are also available.

**Note:** The power consumption during power-start to output being stable (release operation) is 2μA greater than it is after that period (completion of release operation) because of delay circuit through current.

# ■ Typical Performance Characteristics

**Product for Test: VDF=2.5V**

| Supply Current vs. Input Voltage | Detect Voltage, Release Voltage vs. Ambient Temperature | Output Voltage vs. Input Voltage |
|---|---|---|



| N-Channel Driver Output Current vs. VDS | N-Channel Driver Output Current vs. Input Voltage | Ambient Temperature vs. Transient Delay Time |
|---|---|---|
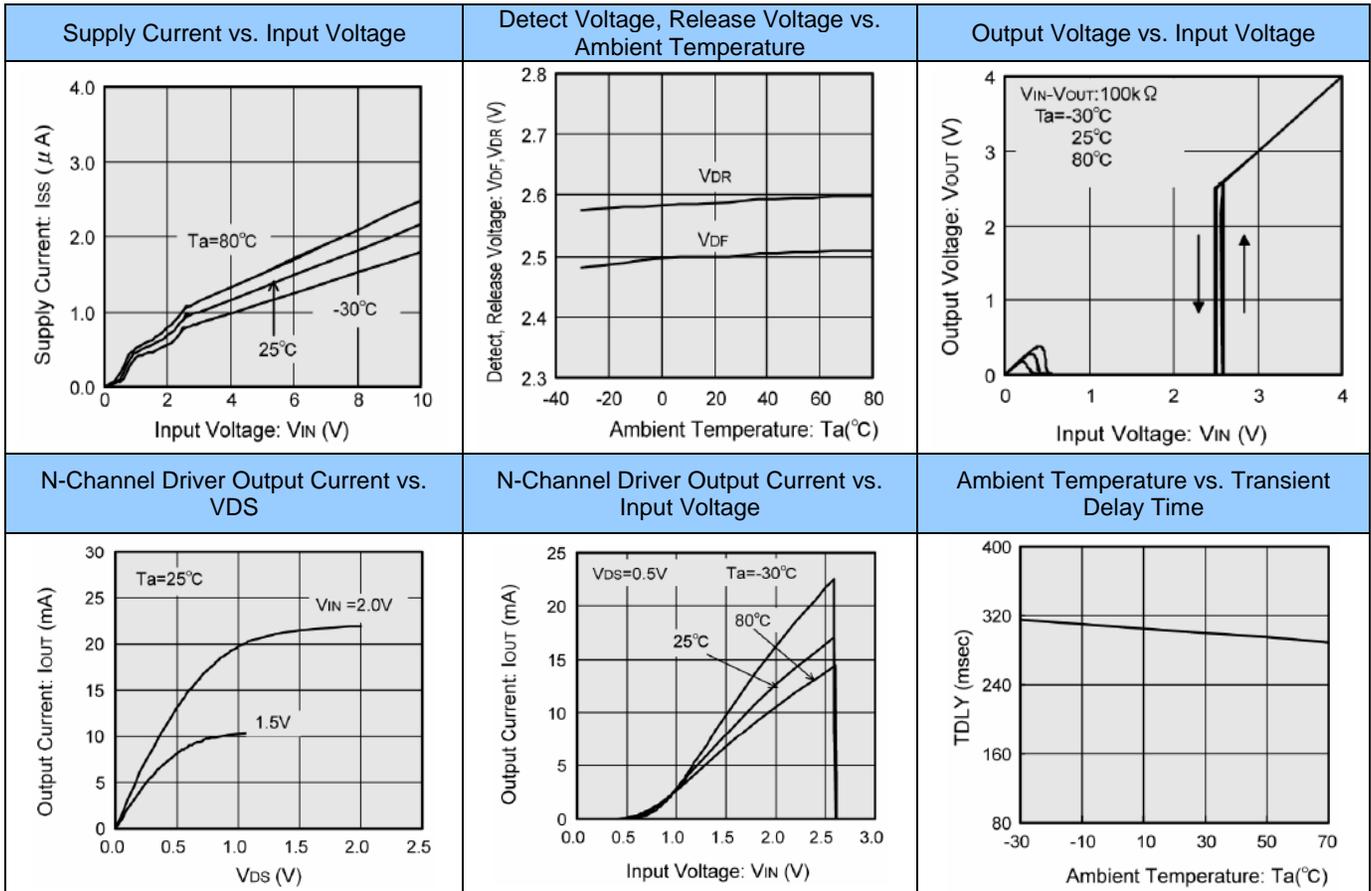
## ■ Package Information

● SOT-23-3L
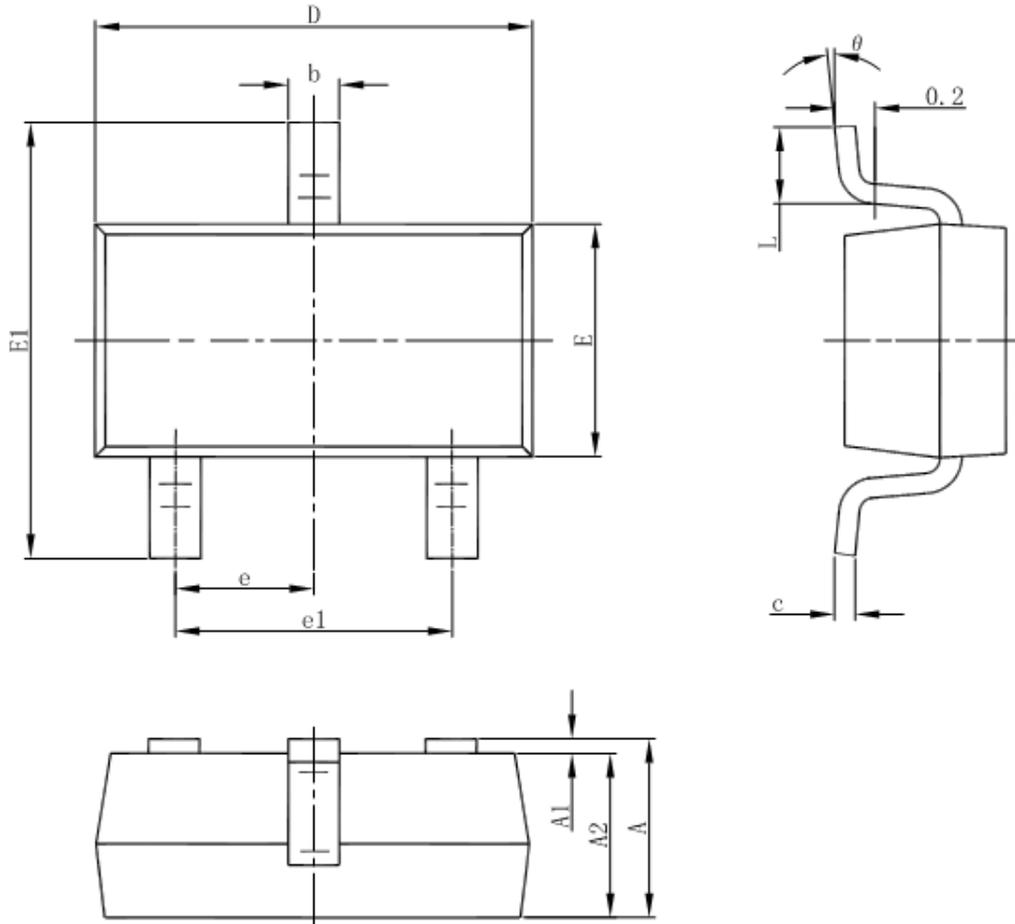
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| 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° |

● SOT-89-3L
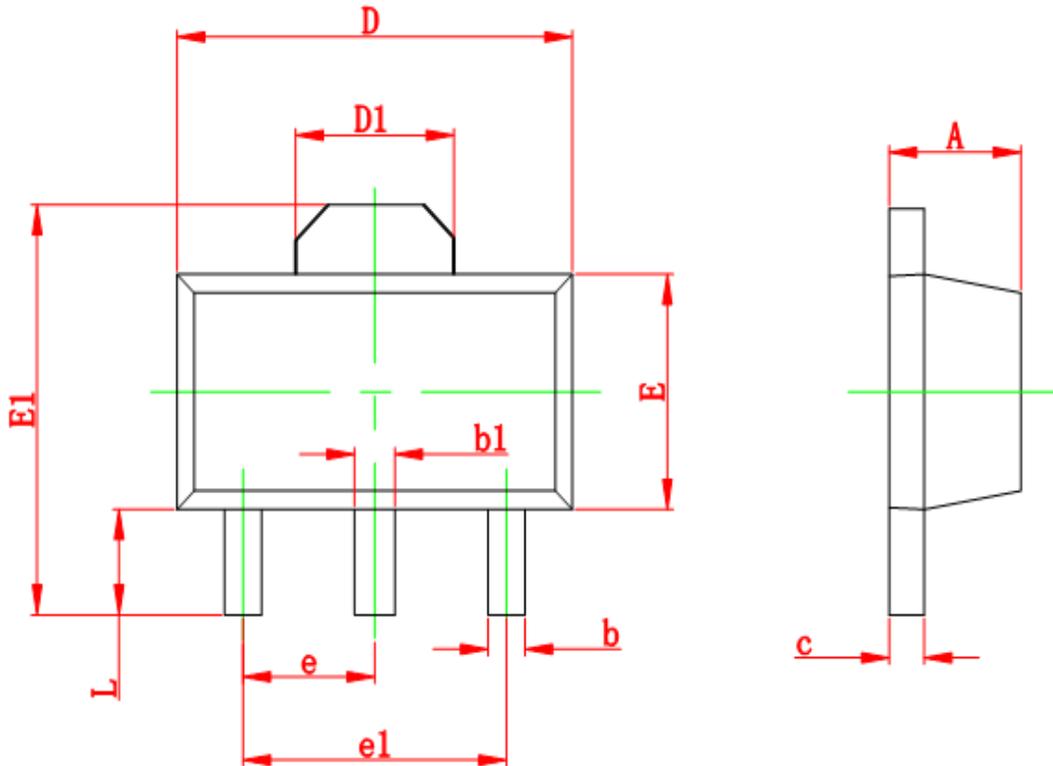
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------|------|------|------|
|        | Min  | Max  | Min  | Max  |
| A      | 1.400 | 1.600 | 0.055 | 0.063 |
| b      | 0.320 | 0.520 | 0.013 | 0.197 |
| b1     | 0.400 | 0.580 | 0.016 | 0.023 |
| c      | 0.350 | 0.440 | 0.014 | 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 |

- T0-92
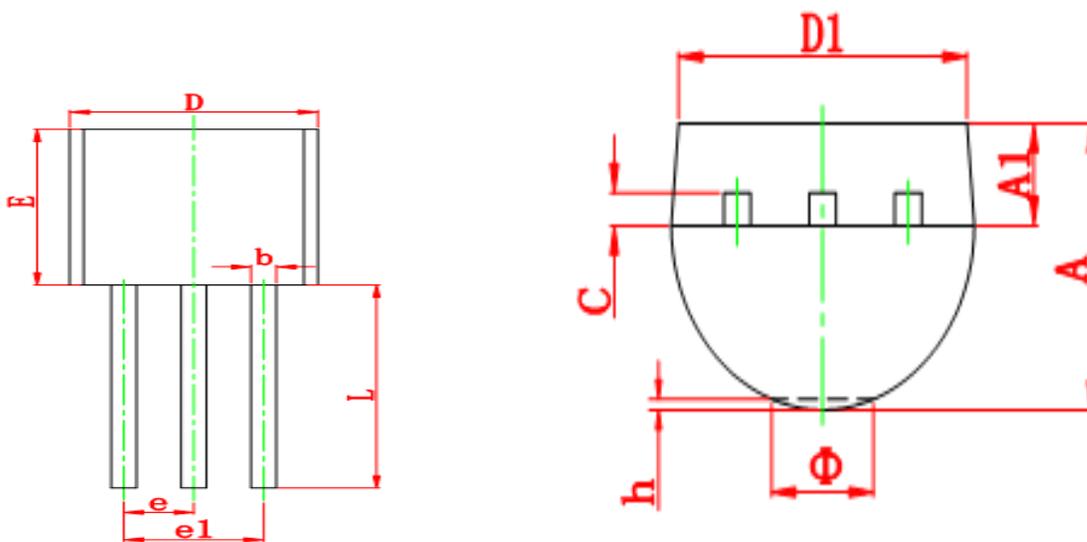
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------|------|------|------|
| | Min | Max | Min | Max |
| A | 3.300 | 3.700 | 0.130 | 0.146 |
| A1 | 1.100 | 1.400 | 0.043 | 0.055 |
| b | 0.380 | 0.550 | 0.015 | 0.022 |
| c | 0.360 | 0.510 | 0.014 | 0.020 |
| D | 4.400 | 4.700 | 0.173 | 0.185 |
| D1 | 3.430 | | 0.135 | |
| E | 4.300 | 4.700 | 0.169 | 0.185 |
| e | 1.270 TYP | | 0.050 TYP | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 14.100 | 14.500 | 0.555 | 0.571 |
| Φ | | 1.600 | | 0.063 |
| h | 0.000 | 0.380 | 0.000 | 0.015 |