EVVOSEMI®
THINK CHANGE DO

ESD TVS MOS LDO Diode Sensor DC-DC

# Product Specification

| | |
|---|---|
| Domestic Part Number | 74HC132 / 74HCT132 Series |
| Overseas Part Number | 74HC132 / 74HCT132 Series |
| Equivalent Part Number | 74HC132 / 74HCT132 Series |

# 1. General Description

The 74HC132; 74HCT132 is a quad 2-input NAND gate with Schmitt-trigger inputs. Schmitt trigger inputs transform slowly changing input signals into sharply defined jitter-free output signals.

# 2. Features and Benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- High noise immunity
- CMOS low power dissipation
- Latch-up performance exceeds 250 mA
- Unlimited rise and fall times
- Complies with JEDEC standards:
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- ESD protection:
  - HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3500 V
  - CDM ANSI/ESDA/JEDEC JS-002 Class C3 exceeds 2000 V
- Multiple package options

# 3. Ordering Information

**Table 1. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Quantity |
| 74HC132D | SOP-14L | plastic small outline package; 14 leads; body width 3.9 mm | 2500 |
| 74HCT132D | | | |
| 74HC132PW | TSSOP-14L | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | 2500 |
| 74HCT132PW | | | |

# 4. Function Diagram

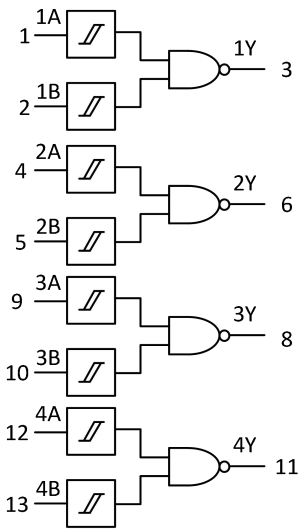



Fig. 1. Logic symbol

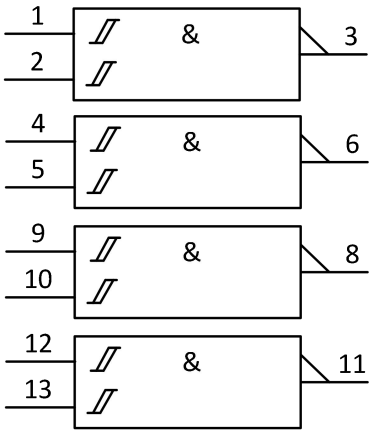



Fig. 2. IEC logic symbol

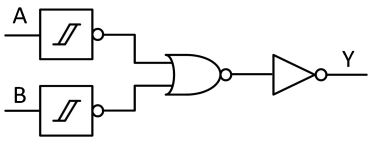



Fig. 3. Logic diagram for one Schmitt trigger

# 5. Pinning Information

## 5.1. Pinning

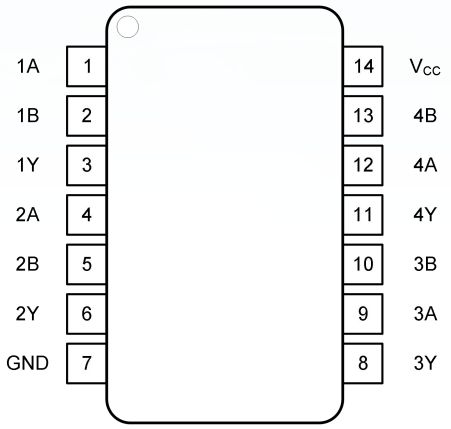



Fig. 4. Top view pin configuration SOP and TSSOP

## 5.2. Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| 1A, 2A, 3A, 4A | 1, 4, 9, 12 | Data input |
| 1B, 2B, 3B, 4B | 2, 5, 10, 13 | Data input |
| 1Y, 2Y, 3Y, 4Y | 3, 6, 8, 11 | Data output |
| GND | 7 | Ground (0V) |
| $V_{CC}$ | 14 | Supply voltage |

# 6. Functional Description

**Table 3. Function table**

H = HIGH voltage level; L = LOW voltage level.

| Control | | Output |
|---|---|---|
| **nA** | **nB** | **nY** |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

# 7.Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

**Table 4. Absolute Maximum Ratings**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND.

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | -0.5 | 7.0 | V |
| $I_{IK}$ | input clamping current | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V [1] | | ±20 | mA |
| $I_{OK}$ | output clamping current | $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V [1] | | ±20 | mA |
| $I_O$ | output current | $V_O = -0.5$ V to $(V_{CC} + 0.5$ V) | | ±25 | mA |
| $I_{CC}$ | supply current | | | 50 | mA |
| $I_{GND}$ | ground current | | -50 | | mA |
| $P_{tot}$ | total power dissipation | | | 500 | mW |
| $T_{stg}$ | storage temperature | | -65 | 150 | °C |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

# 8.Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. MDD does not recommend exceeding them or designing to Absolute Maximum Ratings.

**Table 5. Recommended Operating Conditions**

| Symbol | Parameter | Conditions | 74HC132 | | | 74HCT132 | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $V_{CC}$ | supply voltage | | 2.0 | 5.0 | 6.0 | 4.5 | 5.0 | 5.5 | V |
| $V_I$ | input voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $V_O$ | output voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | -40 | | 125 | -40 | | 125 | °C |

# 9.Static Characteristics

**Table 6. Static characteristics**

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V). Typical values measured at $T_{amb}$ = 25°C (unless otherwise noted).

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| **74HC132** | | | | | | | | |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{T+}$ or $V_{T-}$ | | | | | | |
| | | $I_O$ = -20 µA; $V_{CC}$ = 2.0 V | 1.9 | | | 1.9 | | V |
| | | $I_O$ = -20 µA; $V_{CC}$ = 4.5 V | 4.4 | | | 4.4 | | V |
| | | $I_O$ = -20 µA; $V_{CC}$ = 6.0 V | 5.9 | | | 5.9 | | V |
| | | $I_O$ = -4.0 mA; $V_{CC}$ = 4.5 V | 3.84 | | | 3.7 | | V |
| | | $I_O$ = -5.2 mA; $V_{CC}$ = 6.0 V | 5.34 | | | 5.2 | | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{T+}$ or $V_{T-}$ | | | | | | |
| | | $I_O$ = 20 µA; $V_{CC}$ = 2.0 V | | | 0.1 | | 0.1 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 4.5 V | | | 0.1 | | 0.1 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 6.0 V | | | 0.1 | | 0.1 | V |
| | | $I_O$ = 4.0 mA; $V_{CC}$ = 4.5 V | | | 0.33 | | 0.4 | V |
| | | $I_O$ = 5.2 mA; $V_{CC}$ = 6.0 V | | | 0.33 | | 0.4 | V |
| $I_I$ | input leakage current | $V_I$ = $V_{CC}$ or GND ; $V_{CC}$ = 6.0 V | | | ±1 | | ±1 | µA |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND ; $I_O$ = 0 A ; $V_{CC}$ = 6.0 V | | | 20 | | 40 | µA |
| $C_I$ | input capacitance | | | 7 | | | | pF |

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| **74HCT132** | | | | | | | | |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{T+}$ or $V_{T-}$; $V_{CC}$ = 4.5 V | | | | | | |
| | | $I_O$ = -20 µA; | 4.4 | | | 4.4 | | V |
| | | $I_O$ = -4.0 mA; | 3.84 | | | 3.7 | | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{T+}$ or $V_{T-}$; $V_{CC}$ = 4.5 V | | | | | | |
| | | $I_O$ = 20 µA; | | | 0.1 | | 0.1 | V |
| | | $I_O$ = 4.0 mA; | | | 0.33 | | 0.4 | V |
| $I_I$ | input leakage current | $V_I$ = $V_{CC}$ or GND ; $V_{CC}$ = 5.5 V | | | ±1 | | ±1 | µA |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | | | 20 | | 40 | µA |
| $\Delta I_{CC}$ | additional supply current | per pin ; $V_I$ = $V_{CC}$ - 2.1 V; $I_O$ = 0 A; other inputs at $V_{CC}$ or GND; $V_{CC}$ = 4.5 V to 5.5 V | | | 1.55 | | 1.85 | mA |
| $C_I$ | input capacitance | | | 10 | | | | pF |

# 10. Dynamic Characteristics

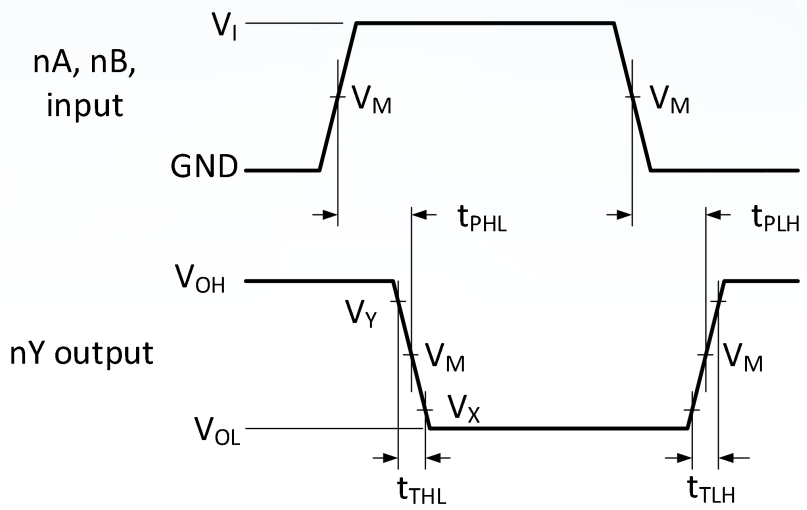
**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6. Typical values measured at $T_{amb}$ = 25°C (unless otherwise noted).

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| **74HC132** | | | | | | | | |
| $t_{pd}$ | propagation delay | nA, nB to nY; see Fig. 5 [1] | | | | | | |
| | | $V_{CC}$ = 2.0 V | | | 35 | | 40 | ns |
| | | $V_{CC}$ = 4.5 V | | | 20 | | 25 | ns |
| | | $V_{CC}$ = 6.0 V | | | 15 | | 20 | ns |
| $t_t$ | transition time | see Fig. 5 [2] | | | | | | |
| | | $V_{CC}$ = 2.0 V | | | 9 | | 11 | ns |
| | | $V_{CC}$ = 4.5 V | | | 6 | | 8 | ns |
| | | $V_{CC}$ = 6.0 V | | | 4 | | 5 | ns |
| $C_{PD}$ | power dissipation capacitance | $C_L$ = 15 pF; f = 1 MHz; $V_I$ = GND to $V_{CC}$ [3] | | 18 | | | | pF |
| **74HCT132** | | | | | | | | |
| $t_{pd}$ | propagation delay | nA, nB to nY; $V_{CC}$ = 4.5 V; see Fig. 5 [1] | | | 16 | | 19 | ns |
| $t_t$ | transition time | $V_{CC}$ = 4.5 V; see Fig. 5 [2] | | | 6 | | 8 | ns |
| $C_{PD}$ | power dissipation capacitance | $C_L$ = 15 pF; f = 1 MHz; $V_I$ = GND to ($V_{CC}$ -1.5 V) [3] | | 37 | | | | pF |

[1] $t_{pd}$ is the same as $t_{PHL}$ and $t_{PLH}$.
[2] $t_t$ is the same as $t_{THL}$ and $t_{TLH}$.
[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage in V;
N = number of inputs switching;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

## 10.1. Waveforms and test circuit

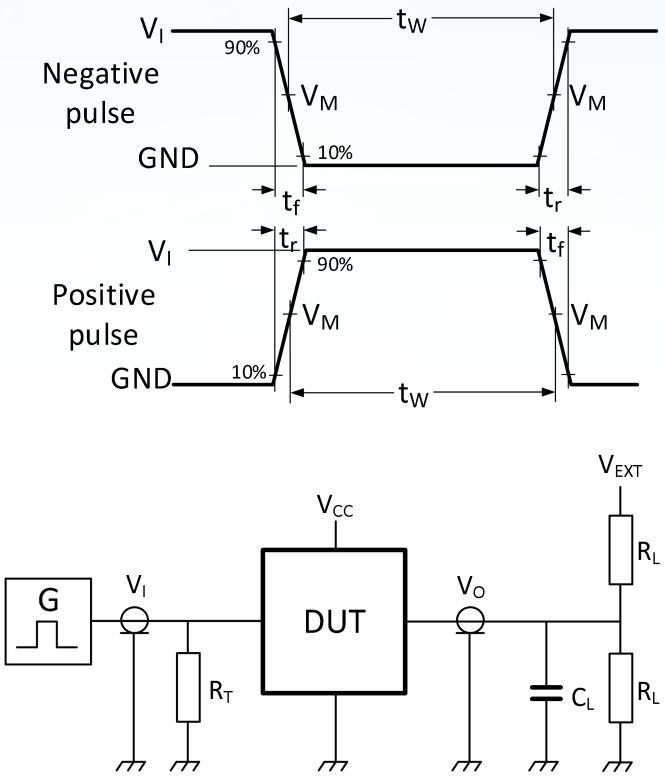



Measurement points are given in Table 8.
$V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

Fig. 5. The input to output propagation delays

**Table 8. Measurement points**

| Type | Input | Output | | |
|---|---|---|---|---|
| | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 74HC132 | $0.5V_{CC}$ | $0.5V_{CC}$ | $0.1V_{CC}$ | $0.9V_{CC}$ |
| 74HCT132 | 1.3 V | 1.3 V | $0.1V_{CC}$ | $0.9V_{CC}$ |




Test data is given in Table 9.
Definitions for test circuit:
$R_L$ = Load resistance.
$C_L$ = Load capacitance including jig and probe capacitance.
$R_T$ = Termination resistance should be equal to the output impedance $Z_o$ of the pulse generator.
$V_{EXT}$ = External voltage for measuring switching times.

Fig. 6. Test circuit for measuring switching times

**Table 9. Test data**

| Type | Input | | Load | | $V_{EXT}$ |
|---|---|---|---|---|---|
| | $V_I$ | $t_r = t_f$ | $C_L$ | $R_L$ | $t_{PLH}$, $t_{PHL}$ |
| 74HC132 | $V_{CC}$ | ≤ 2.5 ns | 15 pF | 500Ω | open |
| 74HCT132 | 3 V | ≤ 2.5 ns | 15 pF | 500Ω | open |

# 11. Transfer Characteristics

**Table 10. Transfer characteristics**

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V). Typical values are measured at $T_{amb}$ = 25°C.

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | |
| **74HC132** | | | | | | | | |
| $V_{T+}$ | positive-going threshold voltage | see Fig. 7 and Fig. 8 | | | | | | |
| | | $V_{CC}$ = 2.0 V | 0.7 | 1.21 | 1.5 | 0.7 | 1.5 | V |
| | | $V_{CC}$ = 4.5 V | 1.7 | 2.39 | 3.15 | 1.7 | 3.15 | V |
| | | $V_{CC}$ = 6.0 V | 2.1 | 3.05 | 4.2 | 2.1 | 4.2 | V |
| $V_{T-}$ | negative-going threshold voltage | see Fig. 7 and Fig. 8 | | | | | | |
| | | $V_{CC}$ = 2.0 V | 0.3 | 0.6 | 0.9 | 0.3 | 0.9 | V |
| | | $V_{CC}$ = 4.5 V | 0.9 | 1.41 | 2.0 | 0.9 | 2.0 | V |
| | | $V_{CC}$ = 6.0 V | 1.2 | 1.9 | 2.6 | 1.2 | 2.6 | V |
| $V_H$ | hysteresis voltage | see Fig. 7 and Fig. 8 | | | | | | |
| | | $V_{CC}$ = 2.0 V | 0.2 | 0.61 | 1.0 | 0.2 | 1.0 | V |
| | | $V_{CC}$ = 4.5 V | 0.4 | 0.97 | 1.4 | 0.4 | 1.4 | V |
| | | $V_{CC}$ = 6.0 V | 0.6 | 1.16 | 1.6 | 0.6 | 1.6 | V |
| **74HCT132** | | | | | | | | |
| $V_{T+}$ | positive-going threshold voltage | see Fig. 7 and Fig. 8 | | | | | | |
| | | $V_{CC}$ = 4.5 V | 1.2 | 1.45 | 1.9 | 1.2 | 1.9 | V |
| | | $V_{CC}$ = 5.5 V | 1.4 | 1.6 | 2.1 | 1.4 | 2.1 | V |
| $V_{T-}$ | negative-going threshold voltage | see Fig. 7 and Fig. 8 | | | | | | |
| | | $V_{CC}$ = 4.5 V | 0.5 | 0.88 | 1.2 | 0.5 | 1.2 | V |
| | | $V_{CC}$ = 5.5 V | 0.6 | 1.05 | 1.4 | 0.6 | 1.4 | V |
| $V_H$ | hysteresis voltage | see Fig. 7 and Fig. 8 | | | | | | |
| | | $V_{CC}$ = 4.5 V | 0.4 | 0.57 | | 0.4 | | V |
| | | $V_{CC}$ = 5.5 V | 0.4 | 0.55 | | 0.4 | | V |

## 11.1. Waveforms transfer characteristics

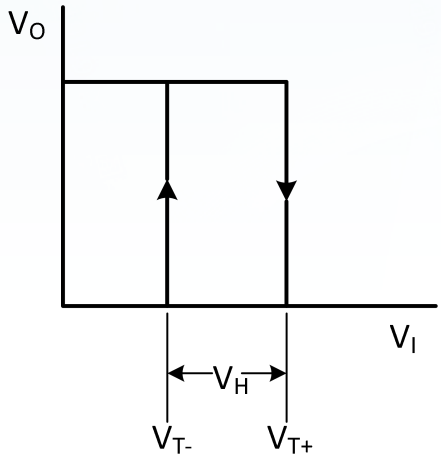
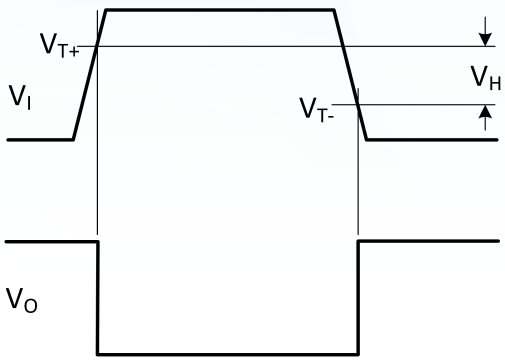



Fig. 7. Transfer characteristic

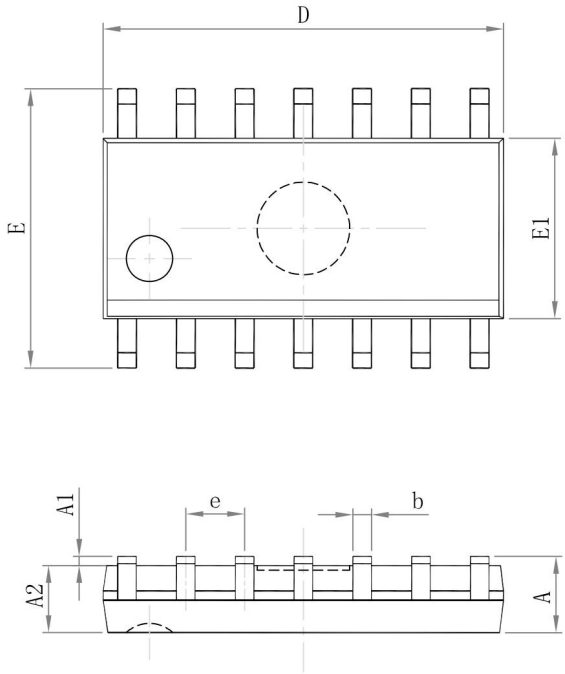



$V_{T+}$ and $V_{T-}$ limits at 70% and 20%.

Fig. 8. Definition of $V_{T+}$, $V_{T-}$ and $V_H$

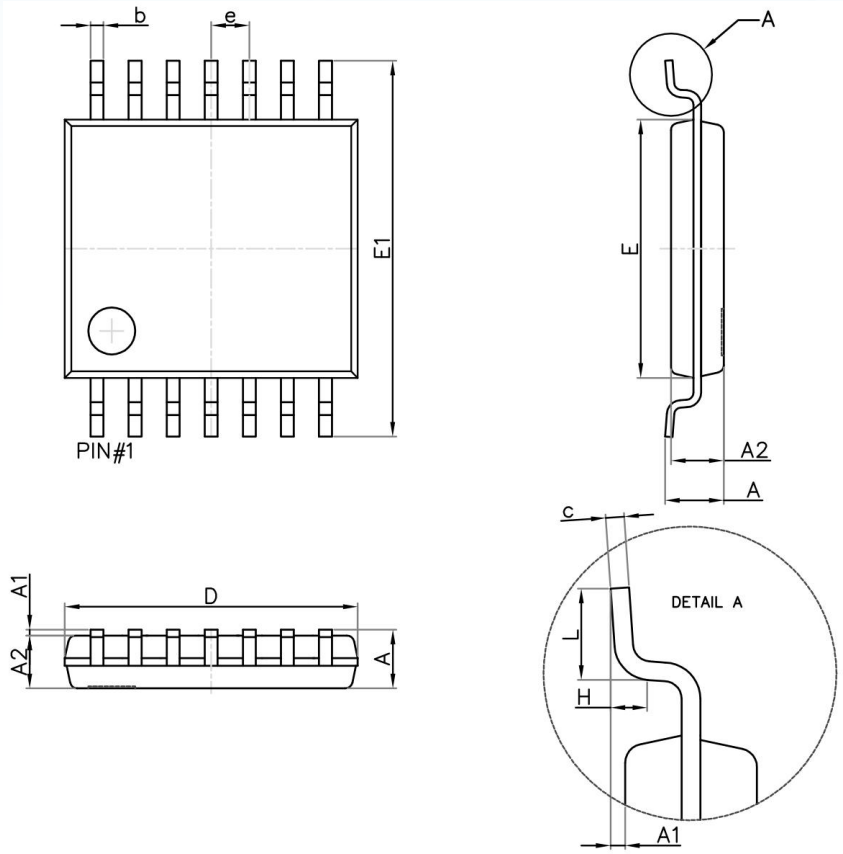
# 12. Package Outline

**SOP-14L**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | —— | 1.750 | —— | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.250 | —— | 0.049 | —— |
| b | 0.310 | 0.510 | 0.012 | 0.020 |
| c | 0.100 | 0.250 | 0.004 | 0.010 |
| D | 8.450 | 8.850 | 0.333 | 0.348 |
| E | 5.800 | 6.200 | 0.228 | 0.244 |
| E1 | 3.800 | 4.000 | 0.150 | 0.157 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

**TSSOP-14L**




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| D | 4.900 | 5.100 | 0.193 | 0.201 |
| E | 4.300 | 4.500 | 0.169 | 0.177 |
| b | 0.190 | 0.300 | 0.007 | 0.012 |
| c | 0.090 | 0.200 | 0.004 | 0.008 |
| E1 | 6.250 | 6.550 | 0.246 | 0.258 |
| A | — | 1.200 | — | 0.047 |
| A2 | 0.800 | 1.000 | 0.031 | 0.039 |
| A1 | 0.050 | 0.150 | 0.002 | 0.006 |
| e | 0.65 (BSC) | | 0.026 (BSC) | |
| L | 0.500 | 0.700 | 0.020 | 0.028 |
| H | 0.25(TYP) | | 0.01(TYP) | |
| θ | 1° | 7° | 1° | 7° |

# 13. Abbreviations

**Table 11. Abbreviations**

| Acronym | Description |
|---|---|
| CMOS | Complementary Metal-Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| CDM | Charged Device Model |
| TTL | Transistor-Transistor Logic |

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