

74HC30; 74HCT30

8-input NAND gate

Rev. 7 — 2 December 2015

Product data sheet

1. General description

The 74HC30; 74HCT30 is an 8-input NAND gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

- Complies with JEDEC standard JESD7A
- Input levels:
 - ◆ For 74HC30: CMOS level
 - ◆ For 74HCT30: TTL level
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to $+85\text{ °C}$ and from -40 °C to $+125\text{ °C}$

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|-------------|-------------------------------------|---------|---|----------|
| | Temperature range | Name | Description | Version |
| 74HC30D | -40 °C to $+125\text{ °C}$ | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74HCT30D | | | | |
| 74HC30DB | -40 °C to $+125\text{ °C}$ | SSOP14 | plastic shrink small outline package; 14 leads; body width 5.3 mm | SOT337-1 |
| 74HCT30DB | | | | |
| 74HC30PW | -40 °C to $+125\text{ °C}$ | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |
| 74HCT30PW | | | | |



4. Functional diagram

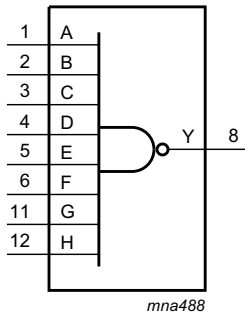


Fig 1. Logic symbol

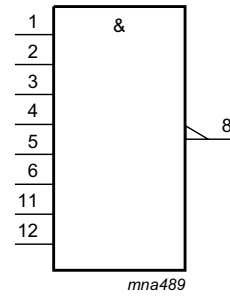


Fig 2. IEC logic symbol

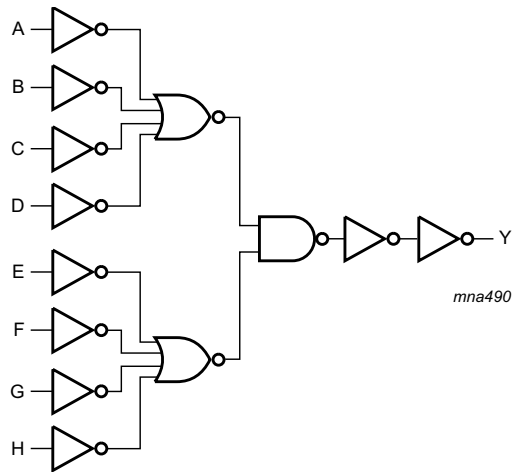


Fig 3. Logic diagram

5. Pinning information

5.1 Pinning

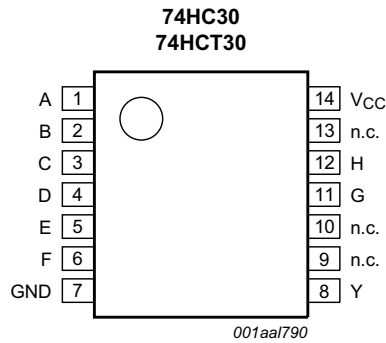


Fig 4. Pin configuration SO14 and (T)SSOP14

5.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|-----------------|-----|----------------|
| A | 1 | data input |
| B | 2 | data input |
| C | 3 | data input |
| D | 4 | data input |
| E | 5 | data input |
| F | 6 | data input |
| GND | 7 | ground (0 V) |
| Y | 8 | data output |
| n.c. | 9 | not connected |
| n.c. | 10 | not connected |
| G | 11 | data input |
| H | 12 | data input |
| n.c. | 13 | not connected |
| V _{CC} | 14 | supply voltage |

6. Functional description

Table 3. Function table^[1]

| Input | | | | | | | | Output |
|-------|---|---|---|---|---|---|---|--------|
| A | B | C | D | E | F | G | H | Y |
| L | X | X | X | X | X | X | X | H |
| X | L | X | X | X | X | X | X | H |
| X | X | L | X | X | X | X | X | H |
| X | X | X | L | X | X | X | X | H |
| X | X | X | X | L | X | X | X | H |
| X | X | X | X | X | L | X | X | H |
| X | X | X | X | X | X | L | X | H |
| X | X | X | X | X | X | X | L | H |
| H | H | H | H | H | H | H | H | L |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care.

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|-------------------------|---|------|----------|------|
| V_{CC} | supply voltage | | -0.5 | +7 | V |
| I_{IK} | input clamping current | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ ^[1] | - | ± 20 | mA |
| I_{OK} | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ ^[1] | - | ± 20 | mA |
| I_O | output current | $-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$ | - | ± 25 | mA |
| I_{CC} | supply current | | - | 50 | mA |
| I_{GND} | ground current | | -50 | - | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | SO14, (T)SSOP14 packages ^[2] | - | 500 | mW |

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

[2] For SO14 package: P_{tot} derates linearly with 8 mW/K above 70 °C.
For (T)SSOP14 packages: P_{tot} derates linearly with 5.5 mW/K above 60 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

| Symbol | Parameter | Conditions | 74HC30 | | | 74HCT30 | | | 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 |
| Δt/ΔV | input transition rise and fall rate | V _{CC} = 2.0 V | - | - | 625 | - | - | - | ns/V |
| | | V _{CC} = 4.5 V | - | 1.67 | 139 | - | 1.67 | 139 | ns/V |
| | | V _{CC} = 6.0 V | - | - | 83 | - | - | - | ns/V |

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-----------------|---------------------------|--|-------|------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC30 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 2.0 V | 1.5 | 1.2 | - | 1.5 | - | 1.5 | - | V |
| | | V _{CC} = 4.5 V | 3.15 | 2.4 | - | 3.15 | - | 3.15 | - | V |
| | | V _{CC} = 6.0 V | 4.2 | 3.2 | - | 4.2 | - | 4.2 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 2.0 V | - | 0.8 | 0.5 | - | 0.5 | - | 0.5 | V |
| | | V _{CC} = 4.5 V | - | 2.1 | 1.35 | - | 1.35 | - | 1.35 | V |
| | | V _{CC} = 6.0 V | - | 2.8 | 1.8 | - | 1.8 | - | 1.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = -20 μA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -20 μA; V _{CC} = 6.0 V | 5.9 | 6.0 | - | 5.9 | - | 5.9 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 4.5 V | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 20 μA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 6.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _l | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.1 | - | ±1 | - | ±1 | μA |
| | | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V | - | - | 2.0 | - | 20 | - | 40 | μA |

Table 6. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------|---------------------------|---|-------|------|------|------------------|------|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |
| 74HCT30 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 4.5 V to 5.5 V | 2.0 | 1.6 | - | 2.0 | - | 2.0 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 4.5 V to 5.5 V | - | 1.2 | 0.8 | - | 0.8 | - | 0.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = -20 µA | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -4.0 mA | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = 20 µA | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.1 | - | ±1 | - | ±1 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 2.0 | - | 20 | - | 40 | µA |
| ΔI _{CC} | additional supply current | per input pin; V _I = V _{CC} - 2.4 V; I _O = 0 A; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V | - | 60 | 216 | - | 275 | - | 294 | µA |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

10. Dynamic characteristics

Table 7. Dynamic characteristics

GND = 0 V; C_L = 50 pF; for test circuit see [Figure 6](#).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | Unit | |
|-----------------|-------------------|---|-------|---------------------|-----|-------------------|--------------|------|--|
| | | | Min | Typ | Max | Max (85 °C) | Max (125 °C) | | |
| 74HC30 | | | | | | | | | |
| t _{pd} | propagation delay | A, B, C, D, E, F, G, H to Y; see Figure 5 | | [1] | | | | | |
| | | V _{CC} = 2.0 V | - | 41 | 130 | 165 | 195 | ns | |
| | | V _{CC} = 4.5 V | - | 15 | 26 | 33 | 39 | ns | |
| | | V _{CC} = 5.0 V; C _L = 15 pF | - | 12 | - | - | - | ns | |
| | | V _{CC} = 6.0 V | - | 12 | 22 | 28 | 33 | ns | |
| t _t | transition time | see Figure 5 | | [2] | | | | | |
| | | V _{CC} = 2.0 V | - | 19 | 75 | 95 | 110 | ns | |
| | | V _{CC} = 4.5 V | - | 7 | 15 | 19 | 22 | ns | |
| | | V _{CC} = 6.0 V | - | 6 | 13 | 16 | 19 | ns | |

Table 7. Dynamic characteristics ...continued
GND = 0 V; C_L = 50 pF; for test circuit see Figure 6.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | Unit |
|-----------------|-------------------------------|--|-------|-----|-----|-------------------|--------------|------|
| | | | Min | Typ | Max | Max (85 °C) | Max (125 °C) | |
| C _{PD} | power dissipation capacitance | per package; V _I = GND to V _{CC} [3] | - | 15 | - | - | - | pF |
| 74HCT30 | | | | | | | | |
| t _{pd} | propagation delay | A, B, C, D, E, F, G, H to Y; see Figure 5 [1] | | | | | | |
| | | V _{CC} = 4.5 V | - | 16 | 28 | 35 | 42 | ns |
| | | V _{CC} = 5.0 V; C _L = 15 pF | - | 12 | - | - | - | ns |
| t _t | transition time | V _{CC} = 4.5 V; see Figure 5 [2] | - | 7 | 15 | 19 | 22 | ns |
| C _{PD} | power dissipation capacitance | per package; V _I = GND to V _{CC} - 1.5 V [3] | - | 15 | - | - | - | 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):
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$ 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;
 $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

11. Waveforms

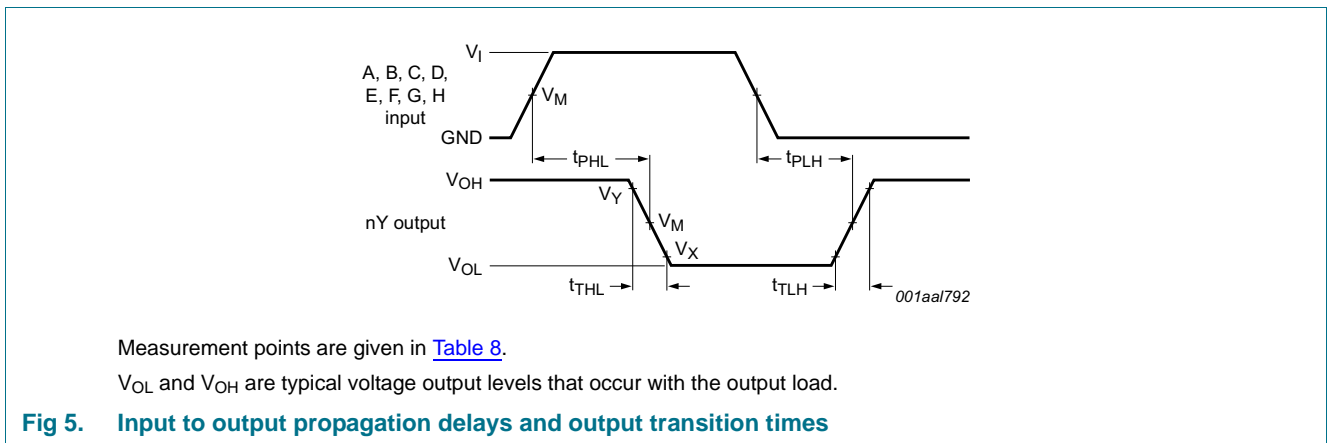


Table 8. Measurement points

| Type | Input | Output | | |
|---------|--------------------|--------------------|--------------------|--------------------|
| | V _M | V _M | V _X | V _Y |
| 74HC30 | 0.5V _{CC} | 0.5V _{CC} | 0.1V _{CC} | 0.9V _{CC} |
| 74HCT30 | 1.3 V | 1.3 V | 0.1V _{CC} | 0.9V _{CC} |



Test data is given in [Table 9](#).

Definitions for test circuit:

R_T = termination resistance should be equal to the output impedance Z_o of the pulse generator.

C_L = load capacitance including jig and probe capacitance.

Fig 6. Test circuit for measuring switching times

Table 9. Test data

| Type | Input | | Load | Test |
|---------|----------|------------|--------------|--------------------|
| | V_I | t_r, t_f | C_L | |
| 74HC30 | V_{CC} | 6.0 ns | 15 pF, 50 pF | t_{PLH}, t_{PHL} |
| 74HCT30 | 3.0 V | 6.0 ns | 15 pF, 50 pF | t_{PLH}, t_{PHL} |

12. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



Fig 7. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

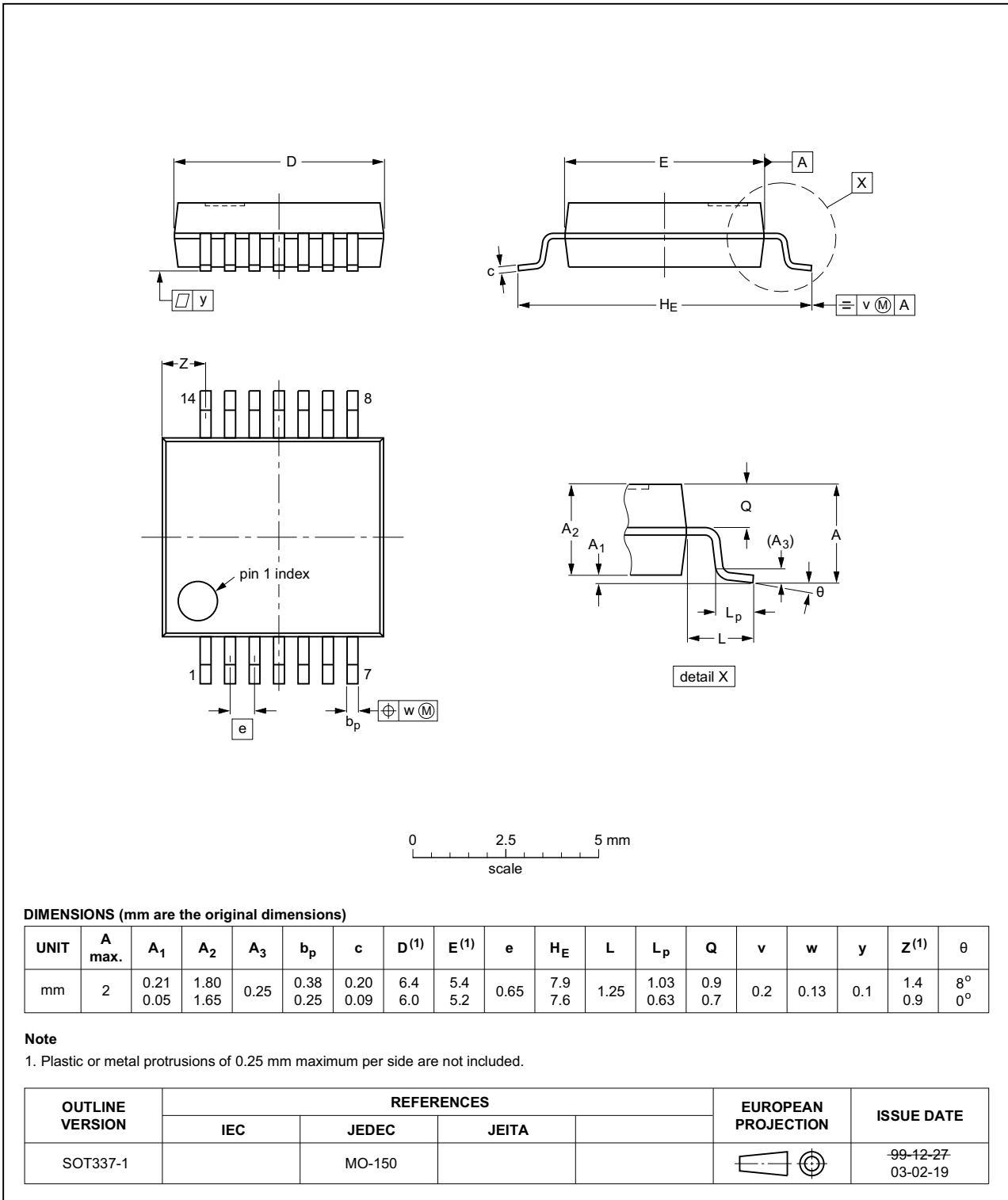


Fig 8. Package outline SOT337-1 (SSOP14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1

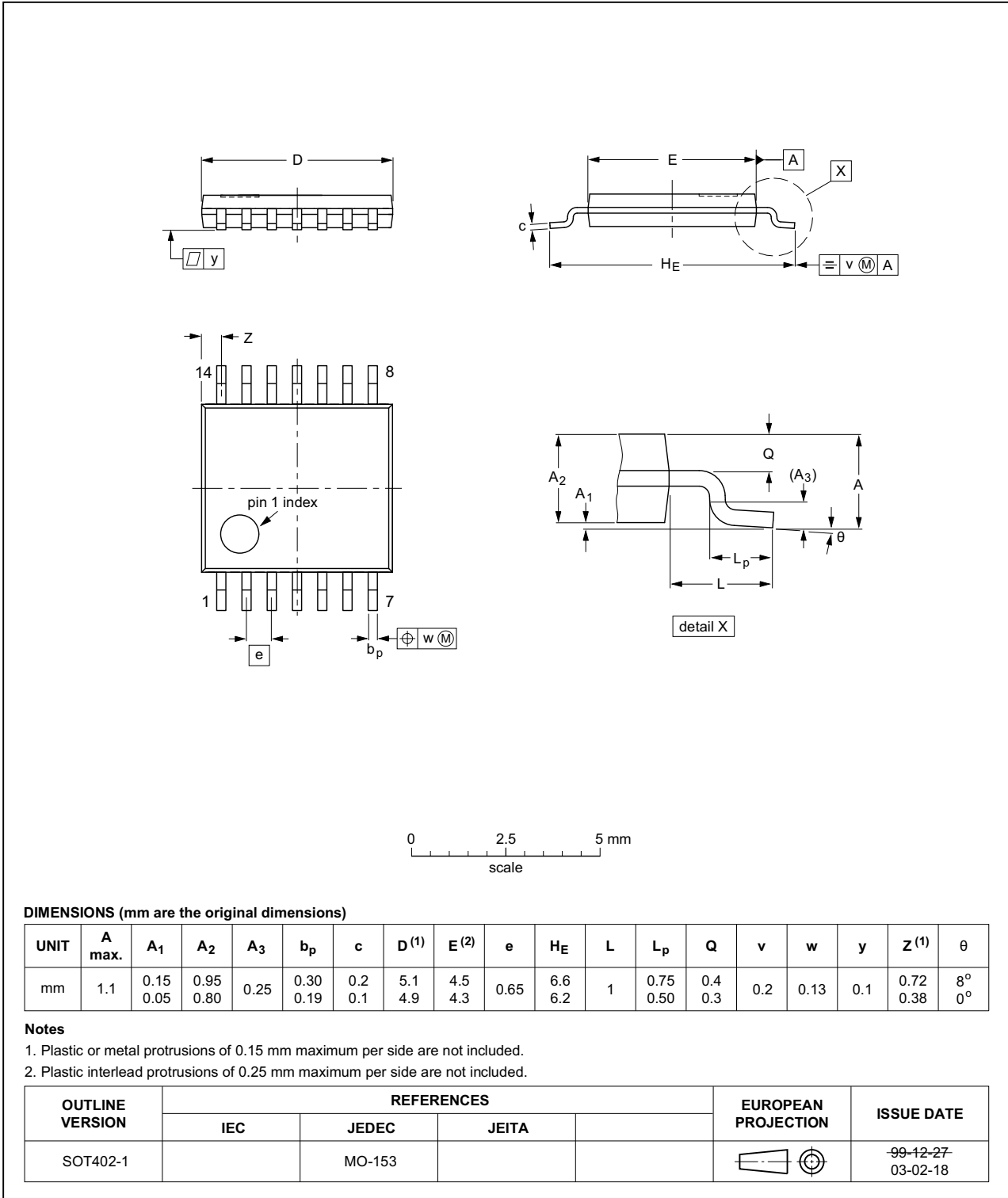


Fig 9. Package outline SOT402-1 (TSSOP14)

13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--|-----------------------|---------------|----------------|
| 74HC_HCT30 v.7 | 20151202 | Product data sheet | - | 74HC_HCT30 v.6 |
| Modifications: | <ul style="list-style-type: none"> Type numbers 74HC30N and 74HCT30N (SOT27-1) removed. | | | |
| 74HC_HCT30 v.6 | 20121227 | Product data sheet | - | 74HC_HCT30 v.5 |
| Modifications: | <ul style="list-style-type: none"> New general description. | | | |
| 74HC_HCT30 v.5 | 20111213 | Product data sheet | - | 74HC_HCT30 v.4 |
| Modifications: | <ul style="list-style-type: none"> Legal pages updated. | | | |
| 74HC_HCT30 v.4 | 20100504 | Product data sheet | - | 74HC_HCT30 v.3 |
| 74HC_HCT30 v.3 | 20100420 | Product data sheet | - | 74HC_HCT30 v.2 |
| 74HC_HCT30 v.2 | 19970829 | Product specification | - | - |

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