

# 74HC154; 74HCT154

## 4-to-16 line decoder/demultiplexer

Rev. 10 — 5 August 2024

Product data sheet

## 1. General description

The 74HC154; 74HCT154 is a 4-to-16 line decoder/demultiplexer. It decodes four binary weighted address inputs (A0 to A3) to sixteen mutually exclusive outputs (Y0 to Y15). The device features two input enable ( $\overline{E0}$  and  $\overline{E1}$ ) inputs. A HIGH on either of the input enables forces the outputs HIGH. The device can be used as a 1-to-16 demultiplexer by using one of the enable inputs as the multiplexed data input. When the other enable input is LOW the addressed output will follow the state of the applied data. 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

- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- 16-line demultiplexing capability
- Decodes 4 binary-coded inputs into 16 mutually-exclusive outputs
- Input levels:
  - For 74HC154: CMOS level
  - For 74HCT154: TTL level
- 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 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

## 3. Ordering information

Table 1. Ordering information

| Type number   | Package           |          |  |                          |
|---|-------------------|----------|--|--------------------------|
|   | Temperature range | Name     | Description  | Version                  |
| <a href="#">74HC154D</a><br><a href="#">74HCT154D</a>   | -40 °C to +125 °C | SO24     | plastic small outline package; 24 leads; body width 7.5 mm   | <a href="#">SOT137-1</a> |
| <a href="#">74HC154PW</a><br><a href="#">74HCT154PW</a> | -40 °C to +125 °C | TSSOP24  | plastic thin shrink small outline package; 24 leads; body width 4.4 mm   | <a href="#">SOT355-1</a> |
| <a href="#">74HC154BQ</a><br><a href="#">74HCT154BQ</a> | -40 °C to +125 °C | DHVQFN24 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 24 terminals; body 3.5 × 5.5 × 0.85 mm | <a href="#">SOT815-1</a> |

### 4. Functional diagram

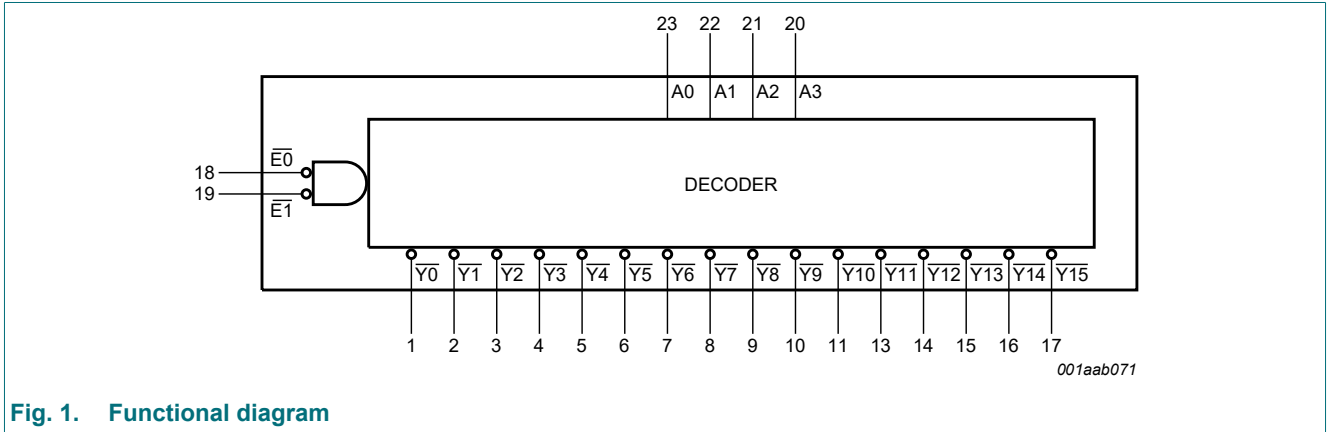


Fig. 1. Functional diagram

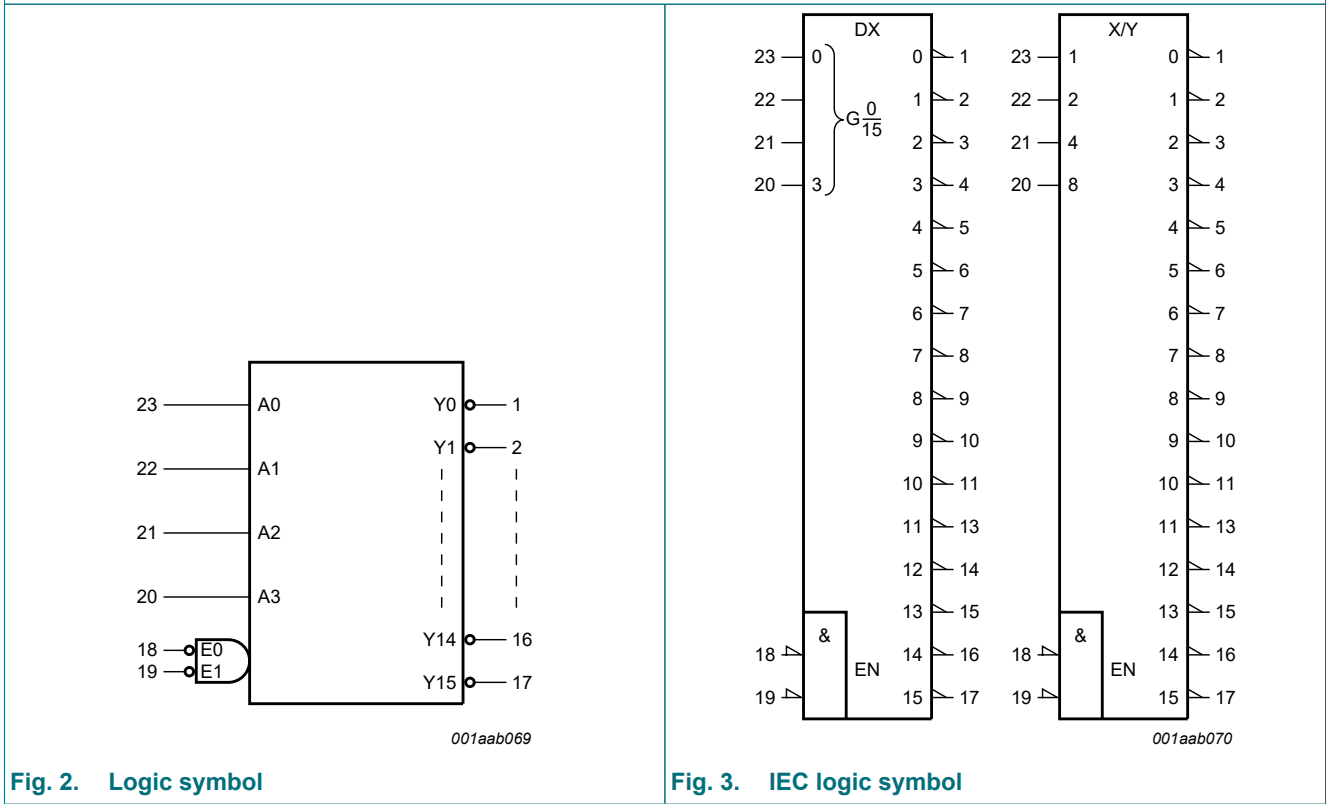


Fig. 2. Logic symbol

Fig. 3. IEC logic symbol

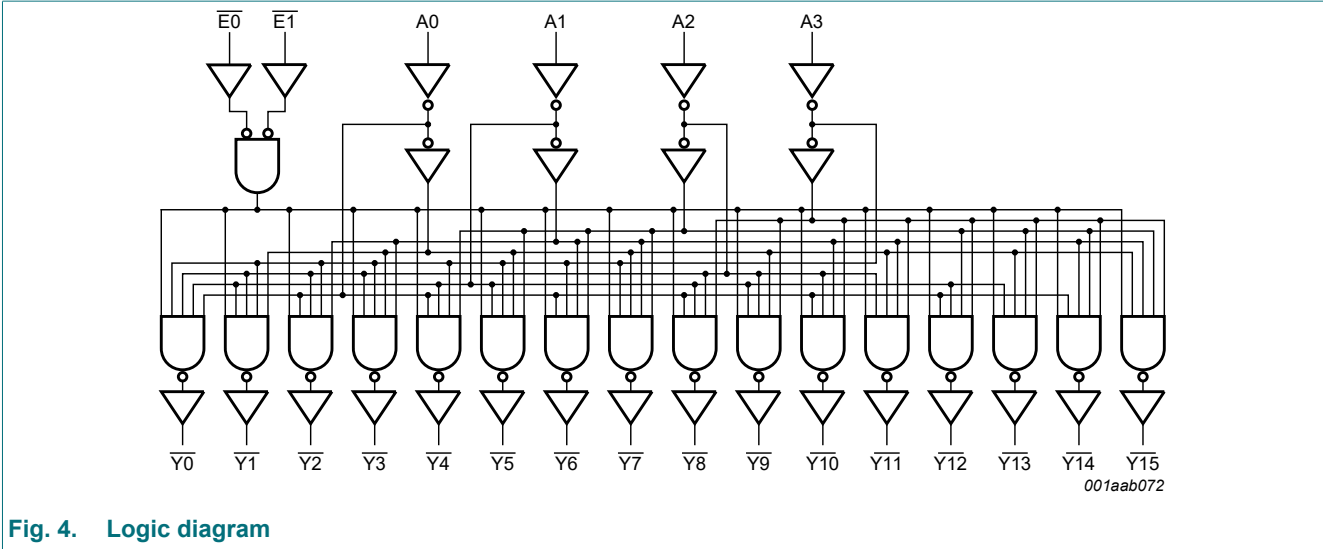
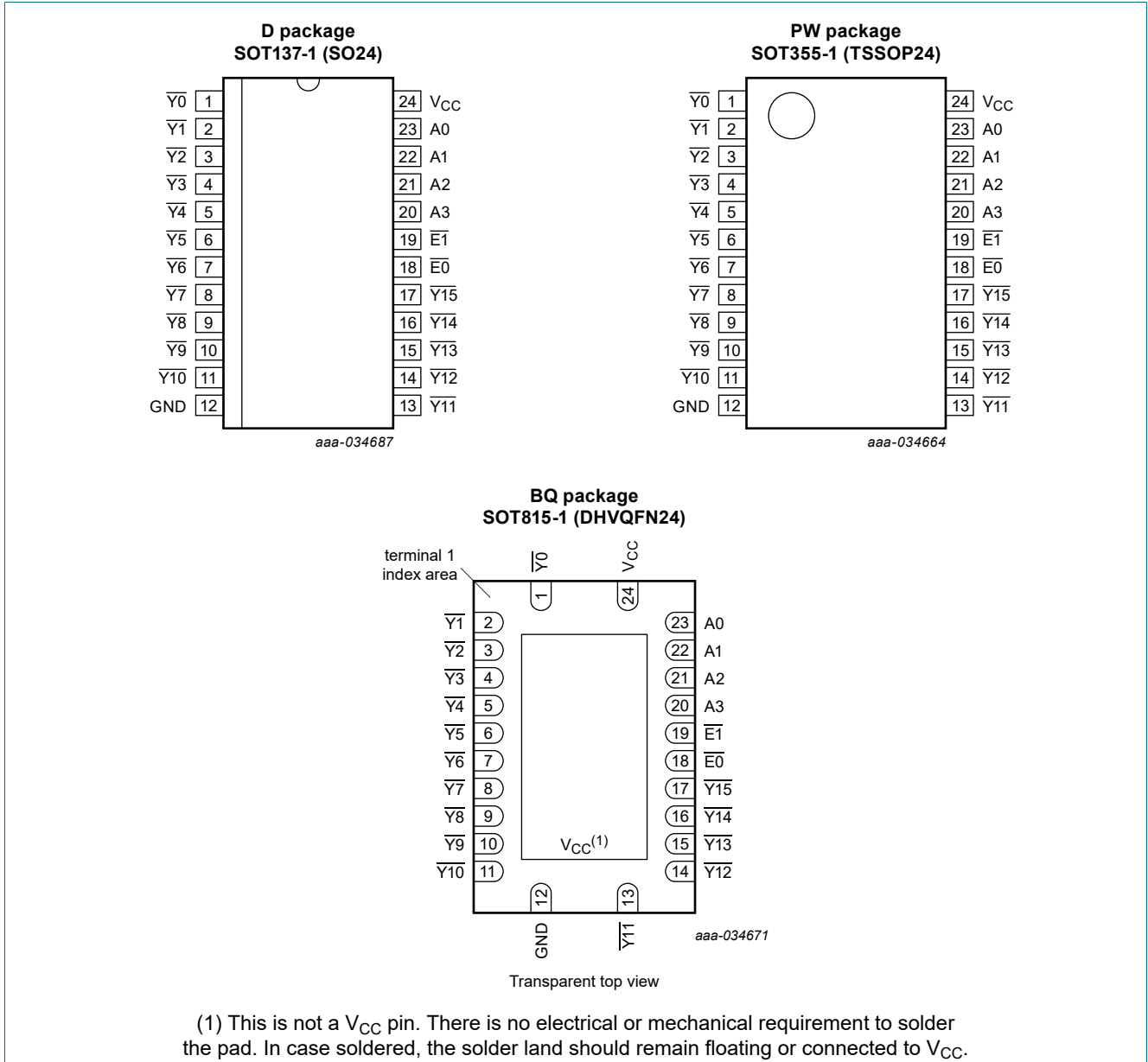


Fig. 4. Logic diagram

5. Pinning information

5.1. Pinning



### 5.2. Pin description

Table 2. Pin description

| Symbol   | Pin   | Description               |
|--|---|---------------------------|
| $\overline{Y0}, \overline{Y1}, \overline{Y2}, \overline{Y3}, \overline{Y4}, \overline{Y5}, \overline{Y6}, \overline{Y7}, \overline{Y8}, \overline{Y9}, \overline{Y10}, \overline{Y11}, \overline{Y12}, \overline{Y13}, \overline{Y14}, \overline{Y15}$ | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17 | data output (active LOW)  |
| GND  | 12  | ground (0 V)              |
| $\overline{E0}, \overline{E1}$   | 18, 19  | enable input (active LOW) |
| A0, A1, A2, A3   | 23, 22, 21, 20  | address input             |
| V <sub>CC</sub>  | 24  | supply voltage            |

## 6. Functional description

Table 3. Function table

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

| Input           |                 |    |    |    |    | Output          |                 |                 |                 |                 |                 |                 |                 |                 |                 |                  |                  |                  |                  |                  |                  |   |   |   |
|-----------------|-----------------|----|----|----|----|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|---|---|---|
| $\overline{E0}$ | $\overline{E1}$ | A0 | A1 | A2 | A3 | $\overline{Y0}$ | $\overline{Y1}$ | $\overline{Y2}$ | $\overline{Y3}$ | $\overline{Y4}$ | $\overline{Y5}$ | $\overline{Y6}$ | $\overline{Y7}$ | $\overline{Y8}$ | $\overline{Y9}$ | $\overline{Y10}$ | $\overline{Y11}$ | $\overline{Y12}$ | $\overline{Y13}$ | $\overline{Y14}$ | $\overline{Y15}$ |   |   |   |
| H               | H               | X  | X  | X  | X  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H |   |   |
| H               | L               | X  | X  | X  | X  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H |   |   |
| L               | H               | X  | X  | X  | X  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H |   |   |
| L               | L               | L  | L  | L  | L  | L               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H |   |   |
|                 |                 | H  | L  | L  | L  | H               | L               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H | H |   |
|                 |                 | L  | H  | L  | L  | H               | H               | L               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H | H |   |
|                 |                 | H  | H  | L  | L  | H               | H               | H               | L               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H | H |   |
|                 |                 | L  | L  | H  | L  | H               | H               | H               | H               | L               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H | H |   |
|                 |                 | H  | L  | H  | L  | H               | H               | H               | H               | H               | L               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H | H | H |
|                 |                 | L  | H  | H  | L  | H               | H               | H               | H               | H               | H               | L               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H | H | H |
|                 |                 | H  | H  | H  | L  | H               | H               | H               | H               | H               | H               | H               | L               | H               | H               | H                | H                | H                | H                | H                | H                | H | H | H |
|                 |                 | L  | L  | L  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | L               | H                | H                | H                | H                | H                | H                | H | H | H |
|                 |                 | H  | L  | L  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | L                | H                | H                | H                | H                | H                | H | H | H |
|                 |                 | L  | H  | L  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | L                | H                | H                | H                | H                | H | H | H |
|                 |                 | H  | H  | L  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | L                | H                | H                | H                | H | H | H |
|                 |                 | L  | L  | H  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | L                | H                | H                | H | H | H |
|                 |                 | H  | L  | H  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | L                | H                | H | H | H |
|                 |                 | L  | H  | H  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | L | H | H |
|                 |                 | H  | H  | H  | H  | H               | H               | H               | H               | H               | H               | H               | H               | H               | H               | H                | H                | H                | H                | H                | H                | H | H | L |

## 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 | +7.0     | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ [1] | -    | $\pm 20$ | mA   |
| $I_{OK}$  | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ [1] | -    | $\pm 20$ | mA   |
| $I_O$     | output current          | $-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$ [1]          | -    | $\pm 25$ | mA   |
| $I_{CC}$  | supply current          | [1]  | -    | 50       | mA   |
| $I_{GND}$ | ground current          | [1]  | -    | -50      | mA   |
| $T_{stg}$ | storage temperature     |  | -65  | +150     | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [2]          | -    | 500      | mW   |

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

[2] For SOT137-1 (SO24) package:  $P_{tot}$  derates linearly with 16.2 mW/K above 119 °C.  
 For SOT355-1 (TSSOP24) package:  $P_{tot}$  derates linearly with 12.4 mW/K above 110 °C.  
 For SOT815-1 (DHVQFN24) package:  $P_{tot}$  derates linearly with 15.0 mW/K above 117 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V)

| Symbol              | Parameter                           | Conditions              | 74HC154 |      |          | 74HCT154 |      |          | 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     | +25  | +125     | -40      | +25  | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0\text{ V}$ | -       | -    | 625      | -        | -    | -        | ns/V |
|                     |                                     | $V_{CC} = 4.5\text{ V}$ | -       | 1.67 | 139      | -        | 1.67 | 139      | ns/V |
|                     |                                     | $V_{CC} = 6.0\text{ V}$ | -       | -    | 83       | -        | -    | -        | ns/V |

## 9. Static characteristics

**Table 6. Static characteristics 74HC154**

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

| Symbol                                    | Parameter                 | Conditions   | Min  | Typ  | Max  | Unit |
|---|---------------------------|--|------|------|------|------|
| <b>T<sub>amb</sub> = 25 °C</b>            |                           |  |      |      |      |      |
| V <sub>IH</sub>                           | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V  | 1.5  | 1.2  | -    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V  | 3.15 | 2.4  | -    | V    |
|   |                           | V <sub>CC</sub> = 6.0 V  | 4.2  | 3.2  | -    | V    |
| V <sub>IL</sub>                           | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V  | -    | 0.8  | 0.5  | V    |
|   |                           | V <sub>CC</sub> = 4.5 V  | -    | 2.1  | 1.35 | V    |
|   |                           | V <sub>CC</sub> = 6.0 V  | -    | 2.8  | 1.8  | V    |
| V <sub>OH</sub>                           | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |      |      |      |      |
|   |                           | V <sub>CC</sub> = 2.0 V; I <sub>O</sub> = -20 μA                                       | 1.9  | 2.0  | -    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -20 μA                                       | 4.4  | 4.5  | -    | V    |
|   |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = -20 μA                                       | 5.9  | 6.0  | -    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -4.0 mA                                      | 3.98 | 4.32 | -    | V    |
| V <sub>OL</sub>                           | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |      |      |      |      |
|   |                           | V <sub>CC</sub> = 2.0 V; I <sub>O</sub> = 20 μA  | -    | 0    | 0.1  | V    |
|   |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 20 μA  | -    | 0    | 0.1  | V    |
|   |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = 20 μA  | -    | 0    | 0.1  | V    |
|   |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 4.0 mA                                       | -    | 0.15 | 0.26 | V    |
| I <sub>I</sub>                            | input leakage current     | V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND                       | -    | -    | ±0.1 | μA   |
|   |                           | V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A | -    | -    | 8.0  | μA   |
| I <sub>CC</sub>                           | supply current            | V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A | -    | -    | 8.0  | μA   |
| C <sub>I</sub>                            | input capacitance         |  | -    | 3.5  | -    | pF   |
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b> |                           |  |      |      |      |      |
| V <sub>IH</sub>                           | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V  | 1.5  | -    | -    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V  | 3.15 | -    | -    | V    |
|   |                           | V <sub>CC</sub> = 6.0 V  | 4.2  | -    | -    | V    |
| V <sub>IL</sub>                           | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V  | -    | -    | 0.5  | V    |
|   |                           | V <sub>CC</sub> = 4.5 V  | -    | -    | 1.35 | V    |
|   |                           | V <sub>CC</sub> = 6.0 V  | -    | -    | 1.8  | V    |
| V <sub>OH</sub>                           | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |      |      |      |      |
|   |                           | V <sub>CC</sub> = 2.0 V; I <sub>O</sub> = -20 μA                                       | 1.9  | -    | -    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -20 μA                                       | 4.4  | -    | -    | V    |
|   |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = -20 μA                                       | 5.9  | -    | -    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -4.0 mA                                      | 3.84 | -    | -    | V    |
| V <sub>OL</sub>                           | LOW-level output voltage  | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = -5.2 mA                                      | 5.34 | -    | -    | V    |
|   |                           |  |      |      |      |      |

| Symbol                                     | Parameter                 | Conditions   | Min  | Typ | Max  | Unit |
|--|---------------------------|--|------|-----|------|------|
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |      |     |      |      |
|  |                           | V <sub>CC</sub> = 2.0 V; I <sub>O</sub> = 20 μA  | -    | -   | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 20 μA  | -    | -   | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = 20 μA  | -    | -   | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 4.0 mA                                       | -    | -   | 0.33 | V    |
|  |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = 5.2 mA                                       | -    | -   | 0.33 | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND                       | -    | -   | ±1.0 | μA   |
| I <sub>CC</sub>                            | supply current            | V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A | -    | -   | 80   | μA   |
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                           |  |      |     |      |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V  | 1.5  | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V  | 3.15 | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 6.0 V  | 4.2  | -   | -    | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V  | -    | -   | 0.5  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V  | -    | -   | 1.35 | V    |
|  |                           | V <sub>CC</sub> = 6.0 V  | -    | -   | 1.8  | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |      |     |      |      |
|  |                           | V <sub>CC</sub> = 2.0 V; I <sub>O</sub> = -20 μA                                       | 1.9  | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -20 μA                                       | 4.4  | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = -20 μA                                       | 5.9  | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -4.0 mA                                      | 3.7  | -   | -    | V    |
|  |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = -5.2 mA                                      | 5.2  | -   | -    | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |      |     |      |      |
|  |                           | V <sub>CC</sub> = 2.0 V; I <sub>O</sub> = 20 μA  | -    | -   | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 20 μA  | -    | -   | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = 20 μA  | -    | -   | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 4.0 mA                                       | -    | -   | 0.4  | V    |
|  |                           | V <sub>CC</sub> = 6.0 V; I <sub>O</sub> = 5.2 mA                                       | -    | -   | 0.4  | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND                       | -    | -   | ±0.1 | μA   |
| I <sub>CC</sub>                            | supply current            | V <sub>CC</sub> = 6.0 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A | -    | -   | 160  | μA   |



Table 7. Static characteristics 74HCT154

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

| Symbol                                     | Parameter                 | Conditions  | Min  | Typ  | Max  | Unit |
|--|---------------------------|---|------|------|------|------|
| <b>T<sub>amb</sub> = 25 °C</b>             |                           |   |      |      |      |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V  | 2.0  | 1.6  | -    | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V  | -    | 1.2  | 0.8  | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |      |      |      |      |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -20 μA  | 4.4  | 4.5  | -    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -4 mA   | 3.98 | 4.32 | -    | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |      |      |      |      |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 20 μA   | -    | 0    | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 4 mA  | -    | 0.15 | 0.25 | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND  | -    | -    | ±0.1 | μA   |
| I <sub>CC</sub>                            | supply current            | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A                          | -    | -    | 8.0  | μA   |
| ΔI <sub>CC</sub>                           | additional supply current | per input pin; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; I <sub>O</sub> = 0 A | -    | -    | 360  | μA   |
| C <sub>I</sub>                             | input capacitance         |   | -    | 3.5  | -    | pF   |
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b>  |                           |   |      |      |      |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V  | 2.0  | -    | -    | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V  | -    | -    | 0.8  | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |      |      |      |      |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -20 μA  | 4.4  | -    | -    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -4 mA   | 3.84 | -    | -    | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |      |      |      |      |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 20 μA   | -    | -    | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 4 mA  | -    | -    | 0.33 | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND  | -    | -    | ±1.0 | μA   |
| I <sub>CC</sub>                            | supply current            | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A                          | -    | -    | 80   | μA   |
| ΔI <sub>CC</sub>                           | additional supply current | per input pin; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; I <sub>O</sub> = 0 A | -    | -    | 450  | μA   |
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                           |   |      |      |      |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V  | 2.0  | -    | -    | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V  | -    | -    | 0.8  | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |      |      |      |      |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -20 μA  | 4.4  | -    | -    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = -4 mA   | 3.7  | -    | -    | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |      |      |      |      |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 20 μA   | -    | -    | 0.1  | V    |
|  |                           | V <sub>CC</sub> = 4.5 V; I <sub>O</sub> = 4 mA  | -    | -    | 0.4  | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND  | -    | -    | ±1.0 | μA   |
| I <sub>CC</sub>                            | supply current            | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A                          | -    | -    | 160  | μA   |
| ΔI <sub>CC</sub>                           | additional supply current | per input pin; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; I <sub>O</sub> = 0 A | -    | -    | 490  | μA   |

## 10. Dynamic characteristics

**Table 8. Dynamic characteristics**

GND (ground = 0 V);  $C_L = 50$  pF unless otherwise specified; for test circuit, see Fig. 7.

| Symbol                        | Parameter                     | Conditions  | 25 °C |     |     | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|-------------------------------|-------------------------------|---|-------|-----|-----|------------------|-----|-------------------|-----|------|
|                               |                               |   | Min   | Typ | Max | Min              | Max | Min               | Max |      |
| <b>74HC154</b>                |                               |   |       |     |     |                  |     |                   |     |      |
| $t_{pd}$                      | propagation delay             | An to $\overline{Yn}$ ; see Fig. 5 [1]                        |       |     |     |                  |     |                   |     |      |
|                               |                               | $V_{CC} = 2.0$ V  | -     | 36  | 150 | -                | 190 | -                 | 225 | ns   |
|                               |                               | $V_{CC} = 4.5$ V  | -     | 13  | 30  | -                | 38  | -                 | 45  | ns   |
|                               |                               | $V_{CC} = 5$ V; $C_L = 15$ pF                                 | -     | 11  | -   | -                | -   | -                 | -   | ns   |
|                               |                               | $V_{CC} = 6.0$ V  | -     | 10  | 26  | -                | 33  | -                 | 38  | ns   |
|                               |                               | $\overline{En}$ to $\overline{Yn}$ ; see Fig. 6               |       |     |     |                  |     |                   |     |      |
|                               |                               | $V_{CC} = 2.0$ V  | -     | 39  | 150 | -                | 190 | -                 | 225 | ns   |
|                               |                               | $V_{CC} = 4.5$ V  | -     | 14  | 30  | -                | 38  | -                 | 45  | ns   |
|                               |                               | $V_{CC} = 5$ V; $C_L = 15$ pF                                 | -     | 11  | -   | -                | -   | -                 | -   | ns   |
| $V_{CC} = 6.0$ V              | -                             | 11  | 26    | -   | 33  | -                | 38  | ns                |     |      |
| $t_t$                         | transition time               | see Fig. 5 and Fig. 6 [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   |
| $C_{PD}$                      | power dissipation capacitance | per gate; $V_I = \text{GND to } V_{CC}$ [3]                   | -     | 60  | -   | -                | -   | -                 | -   | pF   |
| <b>74HCT154</b>               |                               |   |       |     |     |                  |     |                   |     |      |
| $t_{pd}$                      | propagation delay             | An to $\overline{Yn}$ ; see Fig. 5 [1]                        |       |     |     |                  |     |                   |     |      |
|                               |                               | $V_{CC} = 4.5$ V  | -     | 16  | 35  | -                | 44  | -                 | 53  | ns   |
|                               |                               | $V_{CC} = 5$ V; $C_L = 15$ pF                                 | -     | 13  | -   | -                | -   | -                 | -   | ns   |
|                               |                               | $\overline{En}$ to $\overline{Yn}$ ; see Fig. 6               |       |     |     |                  |     |                   |     |      |
|                               |                               | $V_{CC} = 4.5$ V  | -     | 15  | 32  | -                | 40  | -                 | 48  | ns   |
| $V_{CC} = 5$ V; $C_L = 15$ pF | -                             | 13  | -     | -   | -   | -                | -   | ns                |     |      |
| $t_t$                         | transition time               | see Fig. 5 and Fig. 6 [2]                                     |       |     |     |                  |     |                   |     |      |
|                               |                               | $V_{CC} = 4.5$ V  | -     | 7   | 15  | -                | 19  | -                 | 22  | ns   |
| $C_{PD}$                      | power dissipation capacitance | per gate; $V_I = \text{GND to } (V_{CC} - 1.5 \text{ V})$ [3] | -     | 60  | -   | -                | -   | -                 | -   | pF   |

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$

[2]  $t_t$  is the same as  $t_{TLH}$  and  $t_{THL}$

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = 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 load switching outputs;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

10.1. Waveforms and test circuit

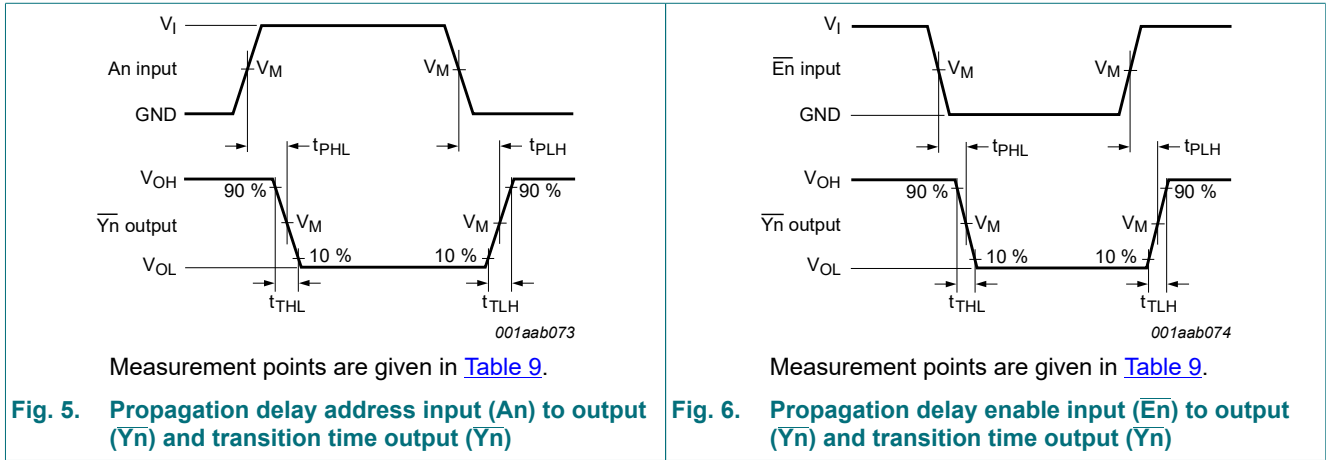


Table 9. Measurement points

| Type     | Input              | Output             |
|----------|--------------------|--------------------|
|          | $V_M$              | $V_M$              |
| 74HC154  | 0.5V <sub>CC</sub> | 0.5V <sub>CC</sub> |
| 74HCT154 | 1.3 V              | 1.3 V              |

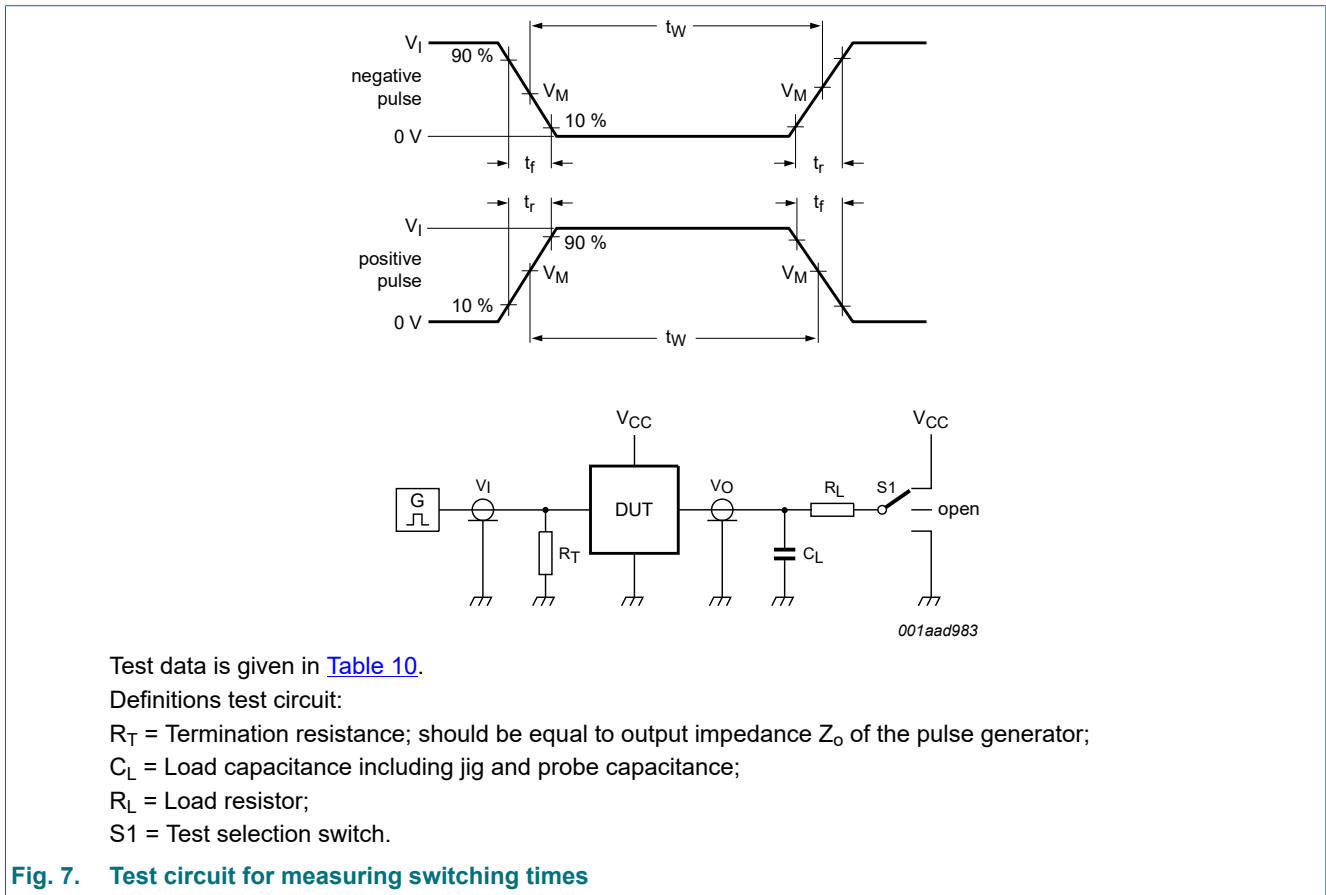
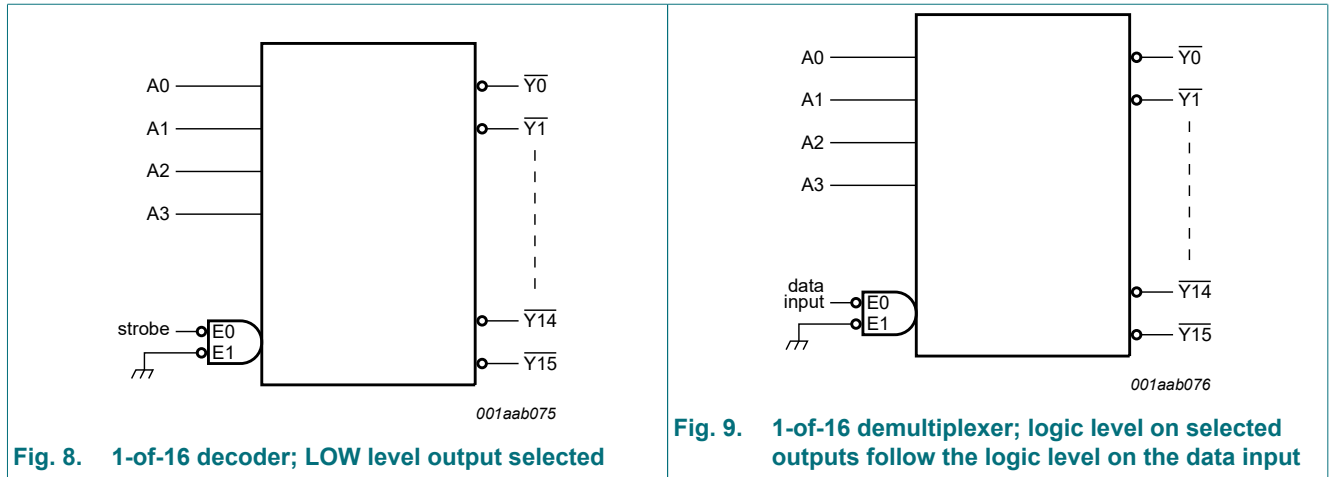


Fig. 7. Test circuit for measuring switching times

Table 10. Test data

| Type     | Input           |                                 | Load           |                | S1 position                         |
|----------|-----------------|---------------------------------|----------------|----------------|-------------------------------------|
|          | V <sub>I</sub>  | t <sub>r</sub> , t <sub>f</sub> | C <sub>L</sub> | R <sub>L</sub> | t <sub>pHL</sub> , t <sub>pLH</sub> |
| 74HC154  | V <sub>CC</sub> | 6 ns                            | 15 pF, 50 pF   | 1 kΩ           | open                                |
| 74HCT154 | 3 V             | 6 ns                            | 15 pF, 50 pF   | 1 kΩ           | open                                |

## 11. Application information



12. Package outline

SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1

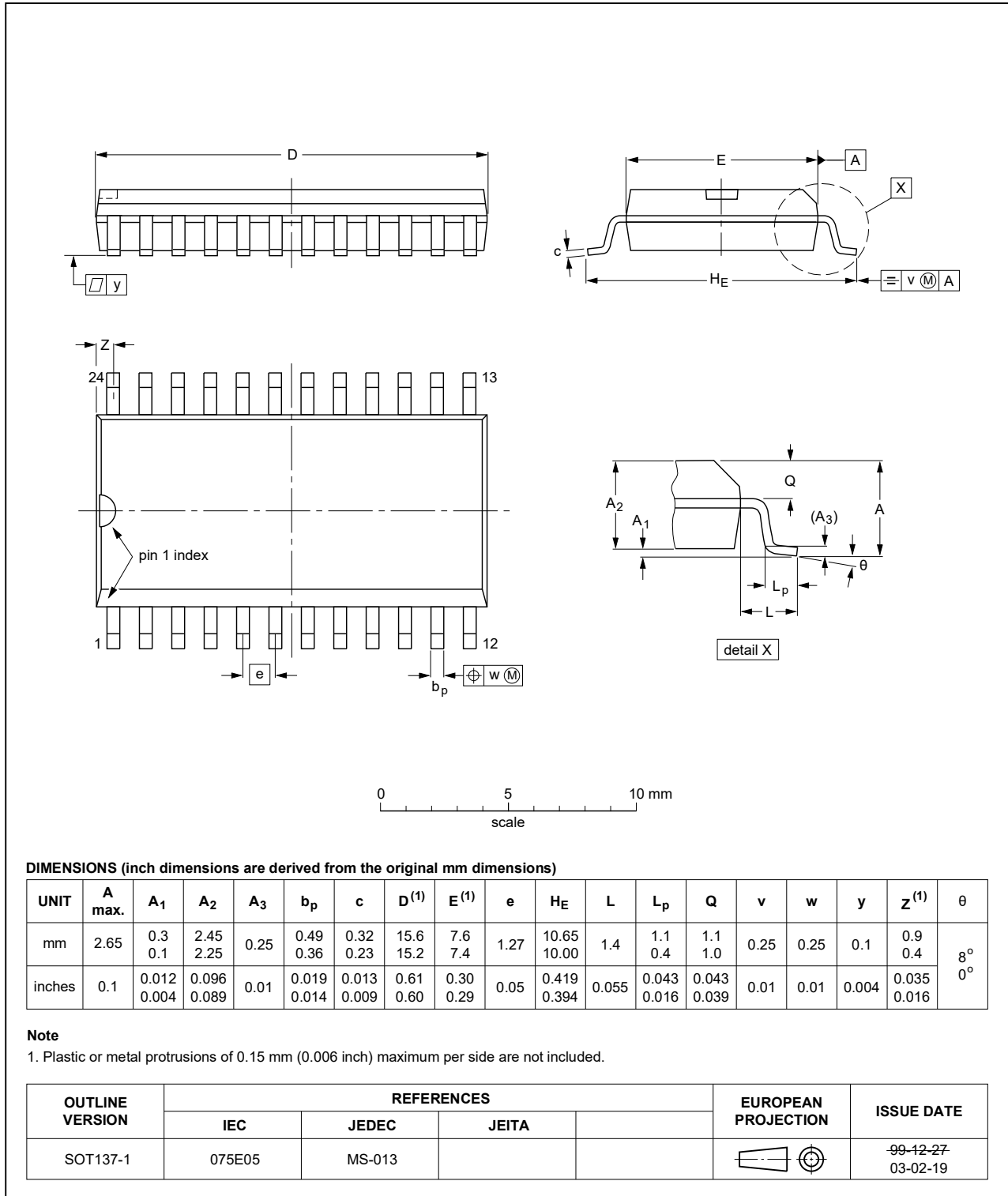


Fig. 10. Package outline SOT137-1 (SO24)

TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm

SOT355-1

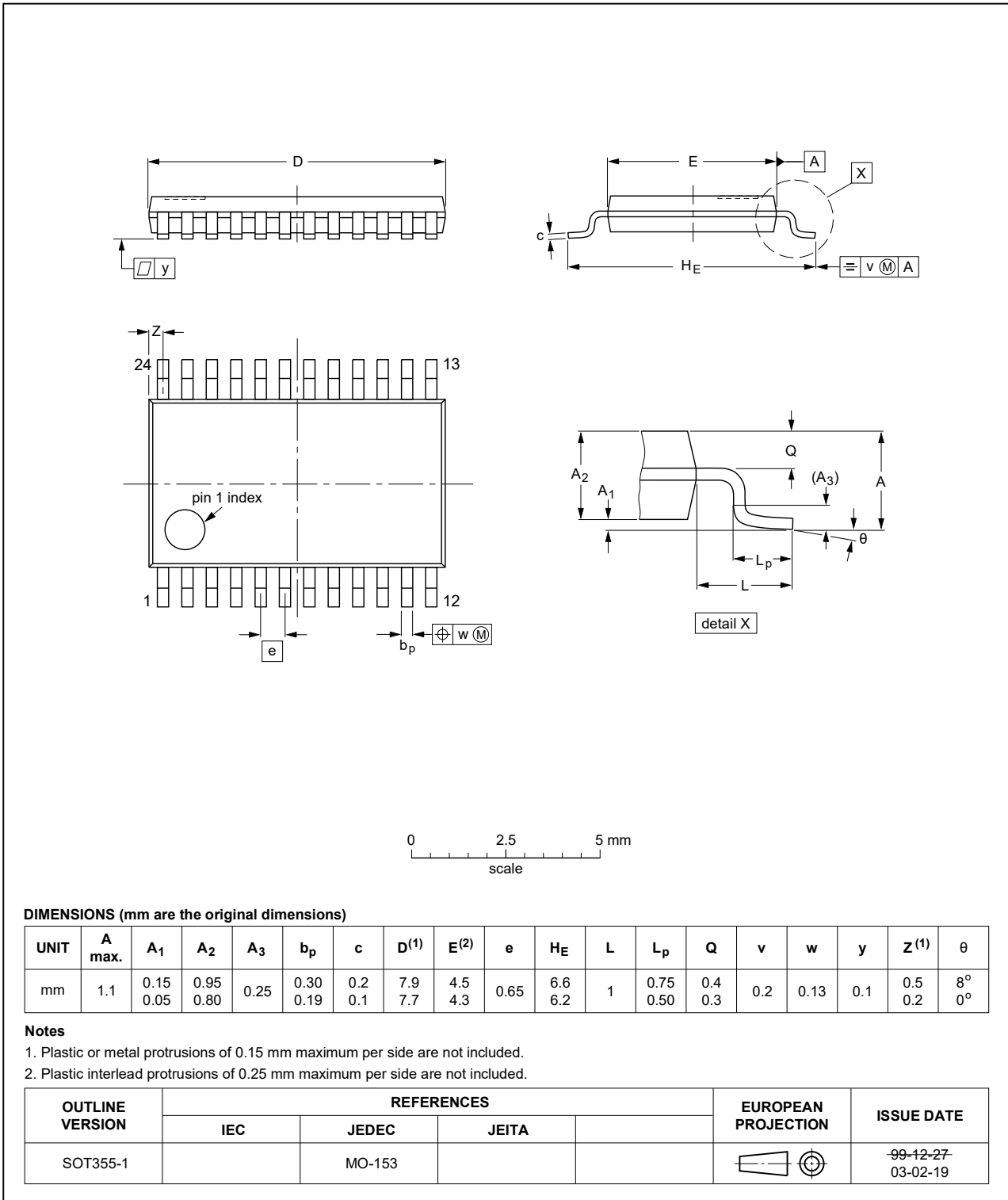


Fig. 11. Package outline SOT355-1 (TSSOP24)

DHVQFN24: plastic dual in-line compatible thermal enhanced very thin quad flat package;  
no leads; 24 terminals; body 3.5 x 5.5 x 0.85 mm

SOT815-1

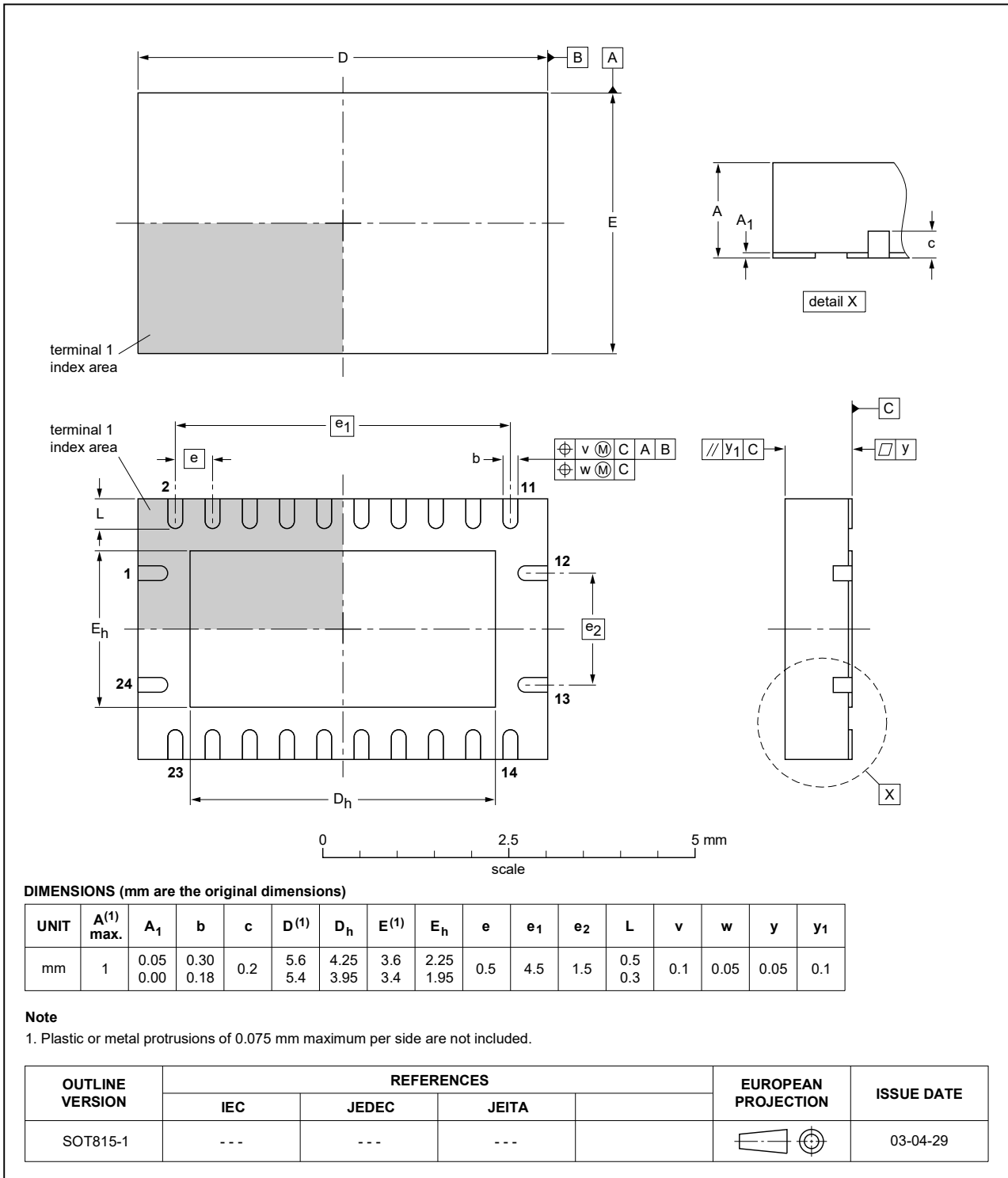


Fig. 12. Package outline SOT815-1 (DHVQFN24)

## 13. Abbreviations

Table 11. Abbreviations

| Acronym | Description                               |
|---------|---|
| ANSI    | American National Standards Institute     |
| CDM     | Charged Device Model                      |
| CMOS    | Complementary Metal Oxide Semiconductor   |
| DUT     | Device Under Test                         |
| ESD     | ElectroStatic Discharge                   |
| ESDA    | ElectroStatic Discharge Association       |
| HBM     | Human Body Model                          |
| JEDEC   | Joint Electron Device Engineering Council |
| TTL     | Transistor-Transistor Logic               |

## 14. Revision history

Table 12. Revision history

| Document ID      | Release date  | Data sheet status     | Change notice | Supersedes          |
|------------------|---|-----------------------|---------------|---------------------|
| 74HC_HCT154 v.10 | 20240805  | Product data sheet    | -             | 74HC_HCT154 v.9     |
| Modifications:   | <ul style="list-style-type: none"> <li><a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li> </ul>  |                       |               |                     |
| 74HC_HCT154 v.9  | 20210819  | Product data sheet    | -             | 74HC_HCT154 v.8     |
| Modifications:   | <ul style="list-style-type: none"> <li><a href="#">Section 2</a> updated.</li> <li>Type number 74HC154DB (SOT340-1/SSOP24) removed.</li> </ul>  |                       |               |                     |
| 74HC_HCT154 v.8  | 20210511  | Product data sheet    | -             | 74HC_HCT154 v.7     |
| Modifications:   | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Type number 74HCT154DB (SOT340-1/SSOP24) removed.</li> <li><a href="#">Section 5.1</a>: overline corrected (errata).</li> <li><a href="#">Section 7</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul> |                       |               |                     |
| 74HC_HCT154 v.7  | 20160229  | Product data sheet    | -             | 74HC_HCT154 v.6     |
| Modifications:   | <ul style="list-style-type: none"> <li>Type numbers 74HC154N and 74HCT154N (SOT101-1) removed.</li> </ul>   |                       |               |                     |
| 74HC_HCT154 v.6  | 20070212  | Product data sheet    | -             | 74HC_HCT154 v.5     |
| Modifications:   | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Table 3</a>: Corrected errors in output information.</li> </ul>   |                       |               |                     |
| 74HC_HCT154 v.5  | 20041012  | Product specification | -             | 74HC_HCT154 v.4     |
| 74HC_HCT154 v.4  | 20041005  | Product specification | -             | 74HC_HCT154 v.3     |
| 74HC_HCT154 v.3  | 20040601  | Product specification | -             | 74HC_HCT154_CNV v.2 |



## 15. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition  |
|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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