# 74HC154; 74HCT154

## 4-to-16 line decoder/demultiplexer

Rev. 06 — 12 February 2007 Product data sheet

## 1. General description

The 74HC154; 74HCT154 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL (LSTTL).

The 74HC154; 74HCT154 decoders accept four active HIGH binary address inputs and provide 16 mutually-exclusive active LOW outputs. The two-input enable gate can be used to strobe the decoder to eliminate the normal decoding ‘glitches’ on the outputs, or can be used for the expansion of the decoder.

The enable gate has two ANDed inputs which must be LOW to enable the outputs.

The 74HC154; 74HCT154 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.

## 2. Features

- 16-line demultiplexing capability
- Decodes 4 binary-coded inputs into 16 mutually-exclusive outputs
- Complies with JEDEC standard no. 7A
- Specified from –40 °C to +85 °C and –40 °C to +125 °C
- ESD protection:
  - HBM EIA/JESD22-A114D exceeds 2000 V
  - MM EIA/JESD22-A115-A exceeds 200 V

## 3. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| **74HC154** | | | | |
| 74HC154N | –40 °C to +125 °C | DIP24 | plastic dual in-line package; 24 leads (600 mil) | SOT101-1 |
| 74HC154D | –40 °C to +125 °C | SO24 | plastic small outline package; 24 leads; body width 7.5 mm | SOT137-1 |
| 74HC154DB | –40 °C to +125 °C | SSOP24 | plastic shrink small outline package; 24 leads; body width 5.3 mm | SOT340-1 |
| 74HC154PW | –40 °C to +125 °C | TSSOP24 | plastic thin shrink small outline package; 24 leads; body width 4.4 mm | SOT355-1 |

**Table 1. Ordering information** *…continued*

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HC154BQ | –40 °C to +125 °C | DHVQFN24 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 24 terminals; body $3.5 \times 5.5 \times 0.85$ mm | SOT815-1 |
| **74HCT154** | | | | |
| 74HCT154N | –40 °C to +125 °C | DIP24 | plastic dual in-line package; 24 leads (600 mil) | SOT101-1 |
| 74HCT154D | –40 °C to +125 °C | SO24 | plastic small outline package; 24 leads; body width 7.5 mm | SOT137-1 |
| 74HCT154DB | –40 °C to +125 °C | SSOP24 | plastic shrink small outline package; 24 leads; body width 5.3 mm | SOT340-1 |
| 74HCT154PW | –40 °C to +125 °C | TSSOP24 | plastic thin shrink small outline package; 24 leads; body width 4.4 mm | SOT355-1 |
| 74HCT154BQ | –40 °C to +125 °C | DHVQFN24 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 24 terminals; body $3.5 \times 5.5 \times 0.85$ mm | SOT815-1 |

## 4. Functional diagram

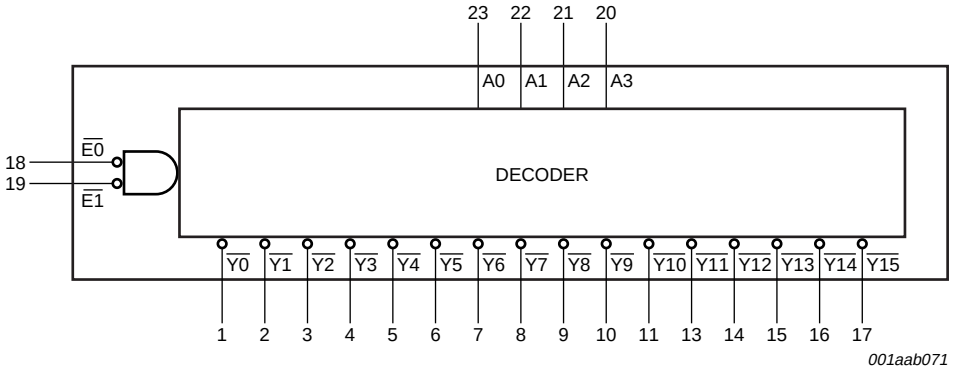



**Fig 1. Functional diagram**

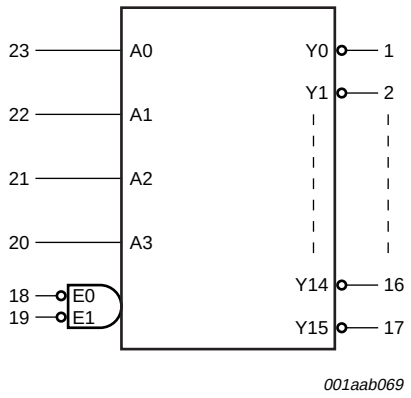



Fig 2. Logic symbol

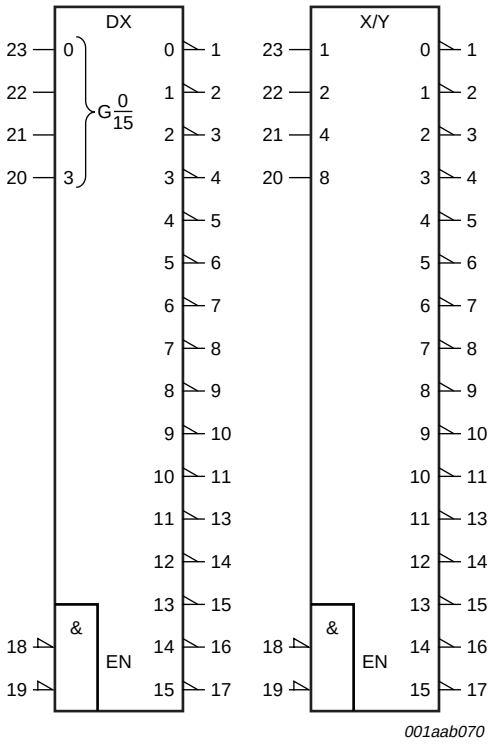



Fig 3. IEC logic symbol

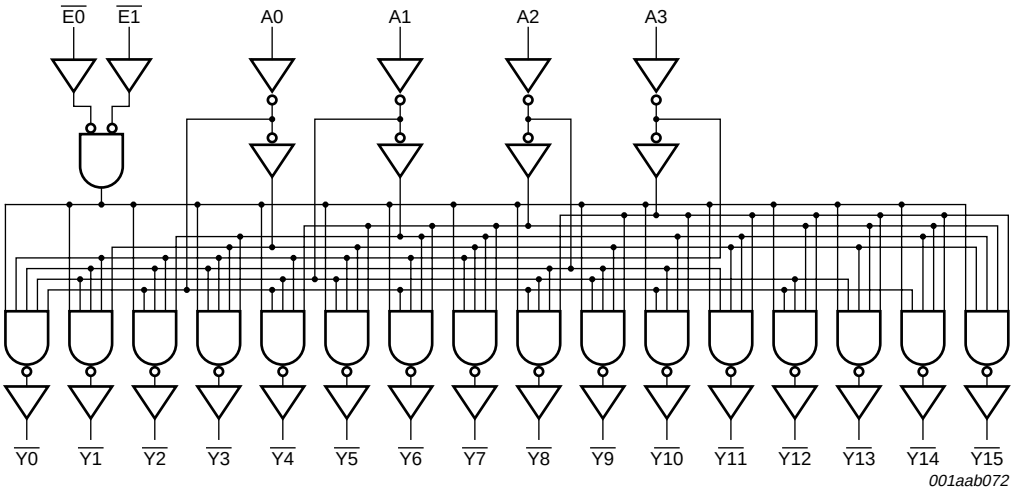



Fig 4. Logic diagram

# 5. Pinning information

## 5.1 Pinning

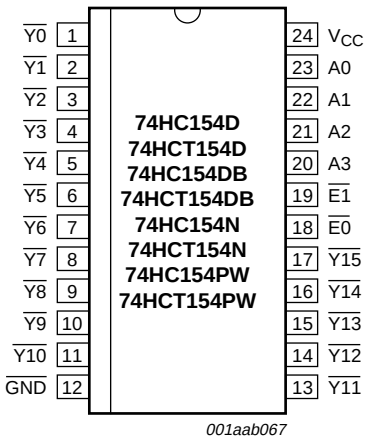
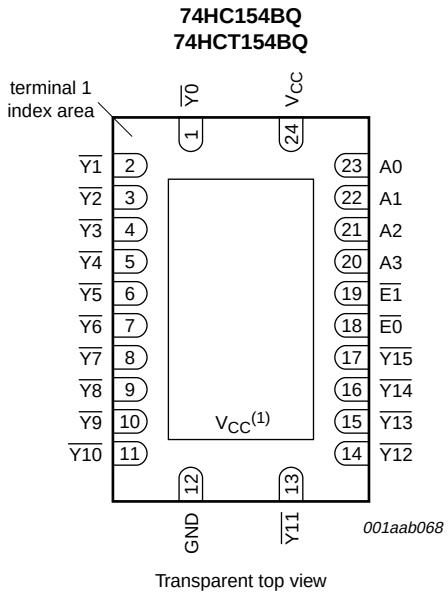



**Fig 5. Pin configuration for SO24, DIP24, SSOP24 and TSSOP24**




Transparent top view

(1) The die substrate is attached to this pad using conductive die attach material. It cannot be used as a supply pin or input.

**Fig 6. Pin configuration for DHVQFN24**

## 5.2 Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| $\overline{Y0}$ | 1 | data output (active LOW) |
| $\overline{Y1}$ | 2 | data output (active LOW) |
| $\overline{Y2}$ | 3 | data output (active LOW) |
| $\overline{Y3}$ | 4 | data output (active LOW) |
| $\overline{Y4}$ | 5 | data output (active LOW) |
| $\overline{Y5}$ | 6 | data output (active LOW) |
| $\overline{Y6}$ | 7 | data output (active LOW) |
| $\overline{Y7}$ | 8 | data output (active LOW) |
| $\overline{Y8}$ | 9 | data output (active LOW) |
| $\overline{Y9}$ | 10 | data output (active LOW) |
| $\overline{Y10}$ | 11 | data output (active LOW) |
| GND | 12 | ground (0 V) |
| $\overline{Y11}$ | 13 | data output (active LOW) |
| $\overline{Y12}$ | 14 | data output (active LOW) |

**Table 2. Pin description** *...continued*

| Symbol | Pin | Description |
|---|---|---|
| $\overline{Y13}$ | 15 | data output (active LOW) |
| $\overline{Y14}$ | 16 | data output (active LOW) |
| $\overline{Y15}$ | 17 | data output (active LOW) |
| $\overline{E0}$ | 18 | enable input (active LOW) |
| $\overline{E1}$ | 19 | enable input (active LOW) |
| A3 | 20 | address input |
| A2 | 21 | address input |
| A1 | 22 | address input |
| A0 | 23 | address input |
| $V_{CC}$ | 24 | supply voltage |

# 6. Functional description

**Table 3. Function table**[1]

| 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 | L | X | X | X | X | 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 |
| L | L | L | L | L | L | L | 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 |
| | | L | H | L | L | H | H | L | 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 |
| | | L | L | H | L | H | H | H | H | L | 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 |
| | | L | H | H | L | H | H | H | H | H | H | L | 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 |
| | | L | L | L | H | H | H | H | H | H | H | H | H | L | H | H | H | H | H | H | H |
| | | H | L | L | H | H | H | H | H | H | H | H | H | H | L | H | H | H | H | H | H |
| | | L | H | L | 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 | H | L | H | H | H | H |
| | | L | L | 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 | L | H | H |
| | | L | 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 | 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 | +7.0 | 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 | $–0.5$ V $< V_O < V_{CC} + 0.5$ V | [1] | - | ±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 °C to +125 °C | [2] | - | 300 | mW |

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

[2] For DIP24 packages: $P_{tot}$ derates linearly at 12 mW/K above 70 °C.
For SO24 packages: $P_{tot}$ derates linearly at 8 mW/K above 70 °C.
For SSOP24 and TSSOP24 packages: $P_{tot}$ derates linearly at 5.5 mW/K above 60 °C.
For DHVQFN24 packages: $P_{tot}$ derates linearly at 4.5 mW/K above 60 °C.

## 8. Recommended operating conditions

**Table 5. Operating conditions**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **74HC154** | | | | | | |
| $V_{CC}$ | supply voltage | | 2.0 | 5.0 | 6.0 | V |
| $V_I$ | input voltage | | 0 | - | $V_{CC}$ | V |
| $V_O$ | output voltage | | 0 | - | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | –40 | +25 | +125 | °C |
| $t_r$ | rise time | $V_{CC}$ = 2.0 V | - | - | 1000 | ns |
| | | $V_{CC}$ = 4.5 V | - | 6.0 | 500 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 400 | ns |
| $t_f$ | fall time | $V_{CC}$ = 2.0 V | - | - | 1000 | ns |
| | | $V_{CC}$ = 4.5 V | - | 6.0 | 500 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 400 | ns |
| **74HCT154** | | | | | | |
| $V_{CC}$ | supply voltage | | 4.5 | 5.0 | 5.5 | V |
| $V_I$ | input voltage | | 0 | - | $V_{CC}$ | V |
| $V_O$ | output voltage | | 0 | - | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | –40 | +25 | +125 | °C |
| $t_r$ | input rise time | $V_{CC}$ = 4.5 V | - | 6.0 | 500 | ns |
| $t_f$ | input fall time | $V_{CC}$ = 4.5 V | - | 6.0 | 500 | ns |

## 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 |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | 1.5 | 1.2 | - | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | 2.4 | - | V |
| | | $V_{CC}$ = 6.0 V | 4.2 | 3.2 | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | - | 0.8 | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | - | 2.1 | 1.35 | V |
| | | $V_{CC}$ = 6.0 V | - | 2.8 | 1.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 2.0 V; $I_O$ = –20 µA | 1.9 | 2.0 | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –20 µA | 4.4 | 4.5 | - | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = –20 µA | 5.9 | 6.0 | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –4.0 mA | 3.98 | 4.32 | - | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = –5.2 mA | 5.48 | 5.81 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 2.0 V; $I_O$ = 20 µA | - | 0 | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 20 µA | - | 0 | 0.1 | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = 20 µA | - | 0 | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 4.0 mA | - | 0.15 | 0.26 | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = 5.2 mA | - | 0.16 | 0.26 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 6.0 V; $V_I = V_{CC}$ or GND | - | - | ±0.1 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 6.0 V; $V_I = V_{CC}$ or GND; $I_O$ = 0 A | - | - | 8.0 | µA |
| $C_I$ | input capacitance | | - | 3.5 | - | pF |
| **$T_{amb}$ = –40 °C to +85 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | 1.5 | - | - | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | - | - | V |
| | | $V_{CC}$ = 6.0 V | 4.2 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | - | - | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | - | - | 1.35 | V |
| | | $V_{CC}$ = 6.0 V | - | - | 1.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 2.0 V; $I_O$ = –20 µA | 1.9 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –20 µA | 4.4 | - | - | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = –20 µA | 5.9 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –4.0 mA | 3.84 | - | - | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = –5.2 mA | 5.34 | - | - | V |

**Table 6. Static characteristics 74HC154** *…continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 2.0 V; $I_O$ = 20 µA | - | - | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 20 µA | - | - | 0.1 | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = 20 µA | - | - | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 4.0 mA | - | - | 0.33 | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = 5.2 mA | - | - | 0.33 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 6.0 V; $V_I = V_{CC}$ or GND | - | - | ±1.0 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 6.0 V; $V_I = V_{CC}$ or GND; $I_O$ = 0 A | - | - | 80 | µA |
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | 1.5 | - | - | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | - | - | V |
| | | $V_{CC}$ = 6.0 V | 4.2 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | - | - | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | - | - | 1.35 | V |
| | | $V_{CC}$ = 6.0 V | - | - | 1.8 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 2.0 V; $I_O$ = −20 µA | 1.9 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = −20 µA | 4.4 | - | - | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = −20 µA | 5.9 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = −4.0 mA | 3.7 | - | - | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = −5.2 mA | 5.2 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 2.0 V; $I_O$ = 20 µA | - | - | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 20 µA | - | - | 0.1 | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = 20 µA | - | - | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 4.0 mA | - | - | 0.4 | V |
| | | $V_{CC}$ = 6.0 V; $I_O$ = 5.2 mA | - | - | 0.4 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 6.0 V; $V_I = V_{CC}$ or GND | - | - | ±0.1 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 6.0 V; $V_I = V_{CC}$ or GND; $I_O$ = 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 |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | 2.0 | 1.6 | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | - | 1.2 | 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 | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = −4 mA | 3.98 | 4.32 | - | V |

**Table 7. Static characteristics 74HCT154** *…continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 20 µA | - | 0 | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 4 mA | - | 0.15 | 0.25 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 5.5 V; $V_I = V_{CC}$ or GND | - | - | ±0.1 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 5.5 V; $V_I = V_{CC}$ or GND; $I_O$ = 0 A | - | - | 8.0 | µA |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_{CC}$ = 4.5 V to 5.5 V; $V_I = V_{CC}$ – 2.1 V; $I_O$ = 0 A | - | - | 360 | µA |
| $C_I$ | input capacitance | | - | 3.5 | - | pF |
| **$T_{amb}$ = –40 °C to +85 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 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 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –4 mA | 3.84 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 20 µA | - | - | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 4 mA | - | - | 0.33 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 5.5 V; $V_I = V_{CC}$ or GND | - | - | ±1.0 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 5.5 V; $V_I = V_{CC}$ or GND; $I_O$ = 0 A | - | - | 80 | µA |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_{CC}$ = 4.5 V to 5.5 V; $V_I = V_{CC}$ – 2.1 V; $I_O$ = 0 A | - | - | 450 | µA |
| **$T_{amb}$ = –40 °C to +125 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 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 | - | - | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = –4 mA | 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 | - | - | 0.1 | V |
| | | $V_{CC}$ = 4.5 V; $I_O$ = 4 mA | - | - | 0.4 | V |
| $I_I$ | input leakage current | $V_{CC}$ = 5.5 V; $V_I = V_{CC}$ or GND | - | - | ±1.0 | µA |
| $I_{CC}$ | supply current | $V_{CC}$ = 5.5 V; $V_I = V_{CC}$ or GND; $I_O$ = 0 A | - | - | 160 | µA |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_{CC}$ = 4.5 V to 5.5 V; $V_I = V_{CC}$ – 2.1 V; $I_O$ = 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 Figure 9.*

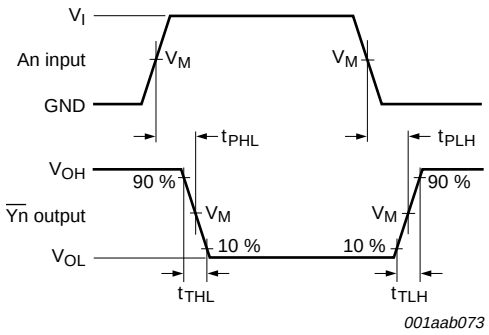
| Symbol | Parameter | Conditions | | 25 °C | | | –40 °C to +125 °C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max (85 °C) | Max (125 °C) | |
| **74HC154** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | An to $\overline{Yn}$; see Figure 7 | [1] | | | | | | | |
| | | $V_{CC}$ = 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 Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 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 Figure 7 and 8 | [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; $V_I$ = GND to $V_{CC}$ | [3] | - | 60 | - | - | - | - | pF |
| **74HCT154** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | An to $\overline{Yn}$; see Figure 7 | [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 Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | | - | 15 | 32 | - | 40 | 48 | ns |
| | | $V_{CC}$ = 5 V; $C_L$ = 15 pF | | - | 13 | - | - | - | - | ns |
| $t_t$ | transition time | see Figure 7 and 8 | [2] | | | | | | | |
| | | $V_{CC}$ = 4.5 V | | - | 7 | 15 | - | 19 | 22 | ns |
| $C_{PD}$ | power dissipation capacitance | per gate; $V_I$ = GND to ($V_{CC}$ − 1.5 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 $t_{THL}$

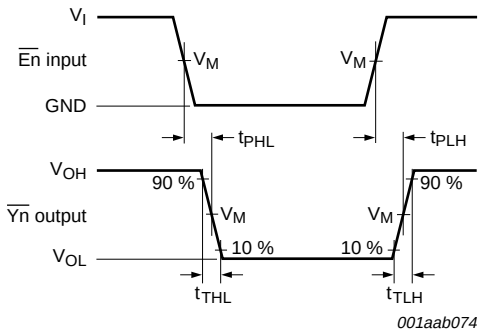
[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage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

## 11. Waveforms




Measurement points are given in Table 9.

**Fig 7. Propagation delay address input (An) to output ($\overline{Yn}$) and transition time output ($\overline{Yn}$)**

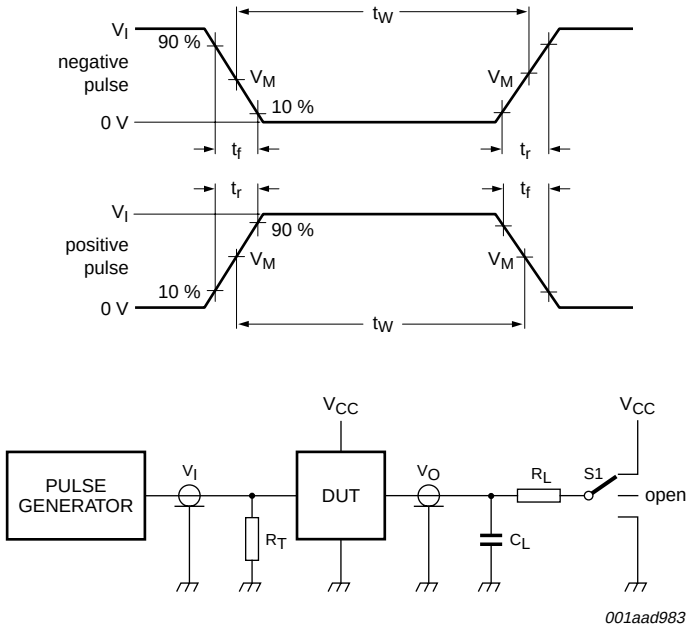



Measurement points are given in Table 9.

**Fig 8. Propagation delay enable input ($\overline{En}$) to output ($\overline{Yn}$) and transition time output ($\overline{Yn}$)**

**Table 9. Measurement points**

| Type | Input | Output |
|---|---|---|
| | $V_M$ | $V_M$ |
| 74HC154 | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT154 | 1.3 V | 1.3 V |




Test data is given in Table 10.

Definitions for test circuit:

$R_T$ = Termination resistance; should be equal to output impedance $Z_o$ of the pulse generator.

$C_L$ = Load capacitance including jig and probe capacitance.

$R_L$ = Load resistor.

S1 = Test selection switch.

**Fig 9. Load circuitry for measuring switching times**

**Table 10. Test data**

| Type | Input | | Load | | S1 position |
|---|---|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PHL}$, $t_{PLH}$ |
| 74HC154 | $V_{CC}$ | 6 ns | 15 pF, 50 pF | 1 kΩ | open |
| 74HCT154 | 3 V | 6 ns | 15 pF, 50 pF | 1 kΩ | open |

## 12. Application information

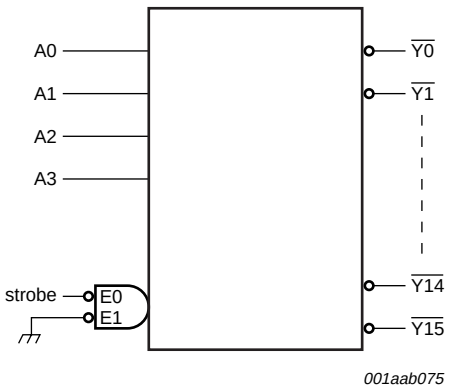



Fig 10. 1-of-16 decoder; LOW level output selected

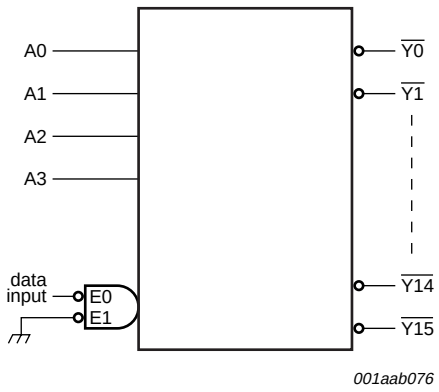
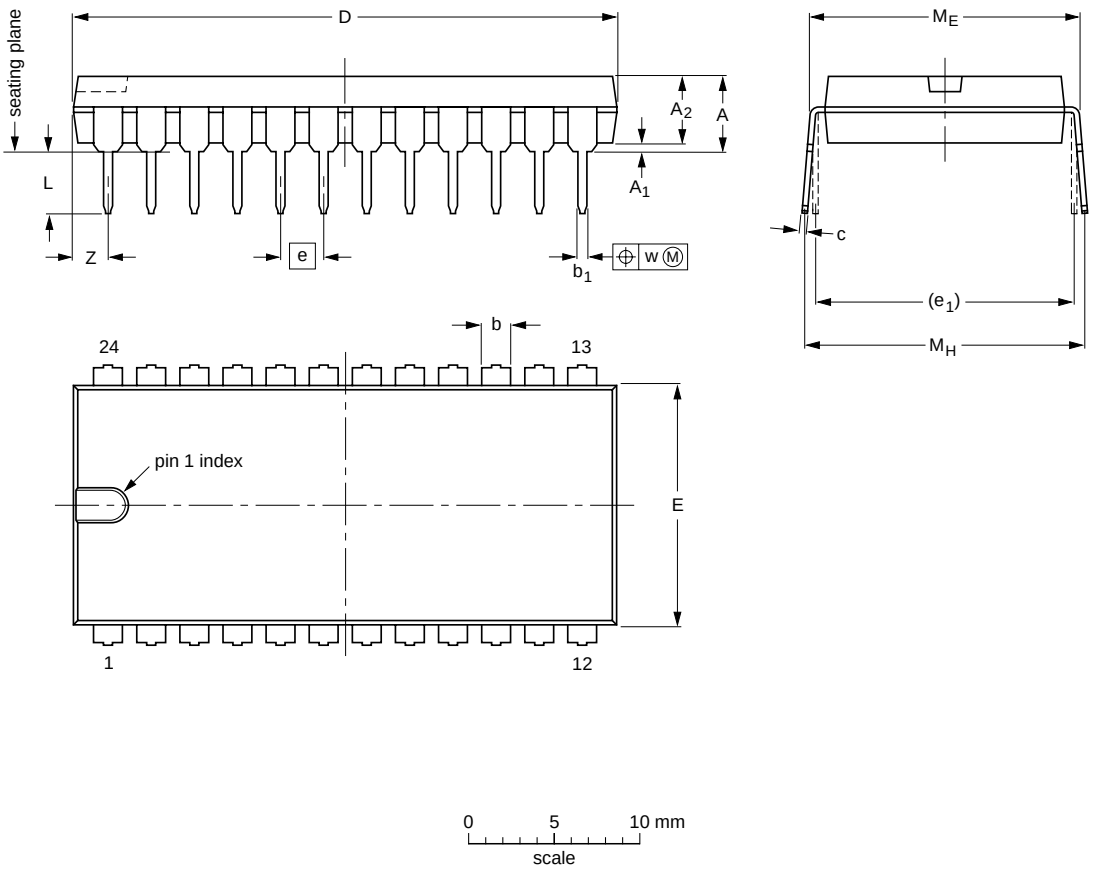



Fig 11. 1-of-16 demultiplexer; logic level on selected outputs follow the logic level on the data input

## 13. Package outline

**DIP24: plastic dual in-line package; 24 leads (600 mil)** **SOT101-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT | A max. | $A_1$ min. | $A_2$ max. | b | $b_1$ | c | D (1) | E (1) | e | $e_1$ | L | $M_E$ | $M_H$ | w | Z (1) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 5.1 | 0.51 | 4 | 1.7<br>1.3 | 0.53<br>0.38 | 0.32<br>0.23 | 32.0<br>31.4 | 14.1<br>13.7 | 2.54 | 15.24 | 3.9<br>3.4 | 15.80<br>15.24 | 17.15<br>15.90 | 0.25 | 2.2 |
| inches | 0.2 | 0.02 | 0.16 | 0.066<br>0.051 | 0.021<br>0.015 | 0.013<br>0.009 | 1.26<br>1.24 | 0.56<br>0.54 | 0.1 | 0.6 | 0.15<br>0.13 | 0.62<br>0.60 | 0.68<br>0.63 | 0.01 | 0.087 |

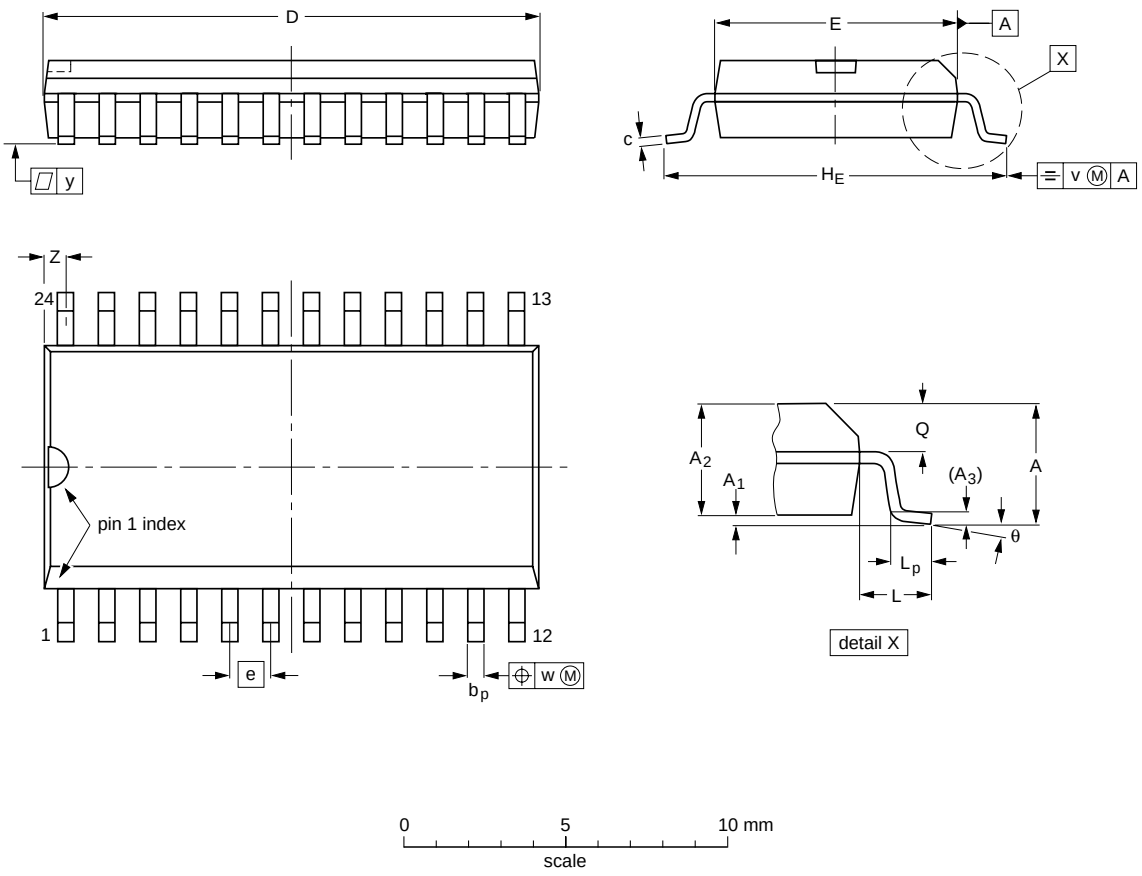
**Note**

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT101-1 | 051G02 | MO-015 | SC-509-24 | | | ~~99-12-27~~<br>03-02-13 |

**Fig 12. Package outline SOT101-1 (DIP24)**

**SO24: plastic small outline package; 24 leads; body width 7.5 mm** **SOT137-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (1) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 2.65 | 0.3<br>0.1 | 2.45<br>2.25 | 0.25 | 0.49<br>0.36 | 0.32<br>0.23 | 15.6<br>15.2 | 7.6<br>7.4 | 1.27 | 10.65<br>10.00 | 1.4 | 1.1<br>0.4 | 1.1<br>1.0 | 0.25 | 0.25 | 0.1 | 0.9<br>0.4 | $8^o$<br>$0^o$ |
| inches | 0.1 | 0.012<br>0.004 | 0.096<br>0.089 | 0.01 | 0.019<br>0.014 | 0.013<br>0.009 | 0.61<br>0.60 | 0.30<br>0.29 | 0.05 | 0.419<br>0.394 | 0.055 | 0.043<br>0.016 | 0.043<br>0.039 | 0.01 | 0.01 | 0.004 | 0.035<br>0.016 | |

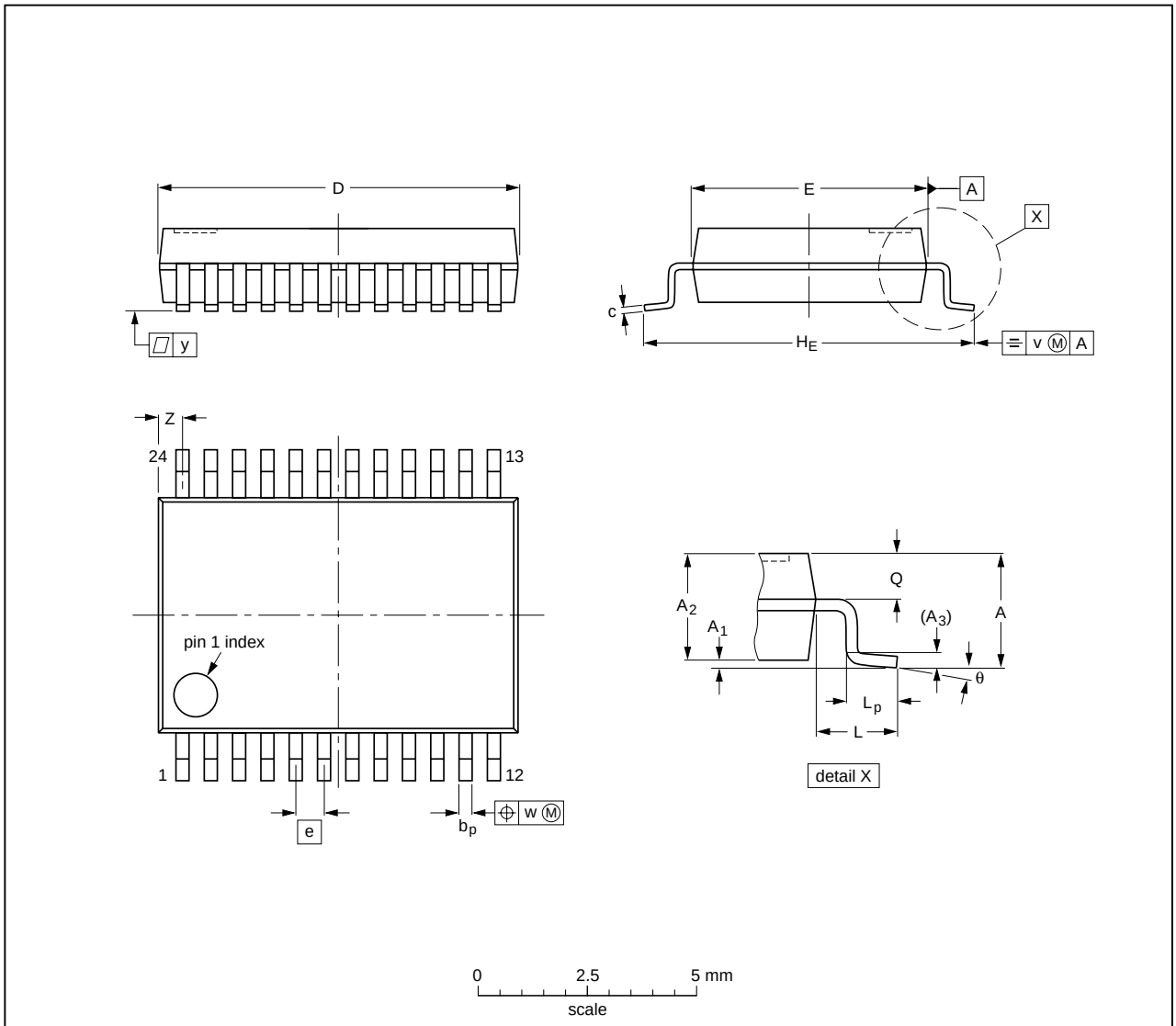
**Note**

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT137-1 | 075E05 | MS-013 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 13. Package outline SOT137-1 (SO24)**

**SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm** **SOT340-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 2 | 0.21<br>0.05 | 1.80<br>1.65 | 0.25 | 0.38<br>0.25 | 0.20<br>0.09 | 8.4<br>8.0 | 5.4<br>5.2 | 0.65 | 7.9<br>7.6 | 1.25 | 1.03<br>0.63 | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 0.8<br>0.4 | $8^o$<br>$0^o$ |

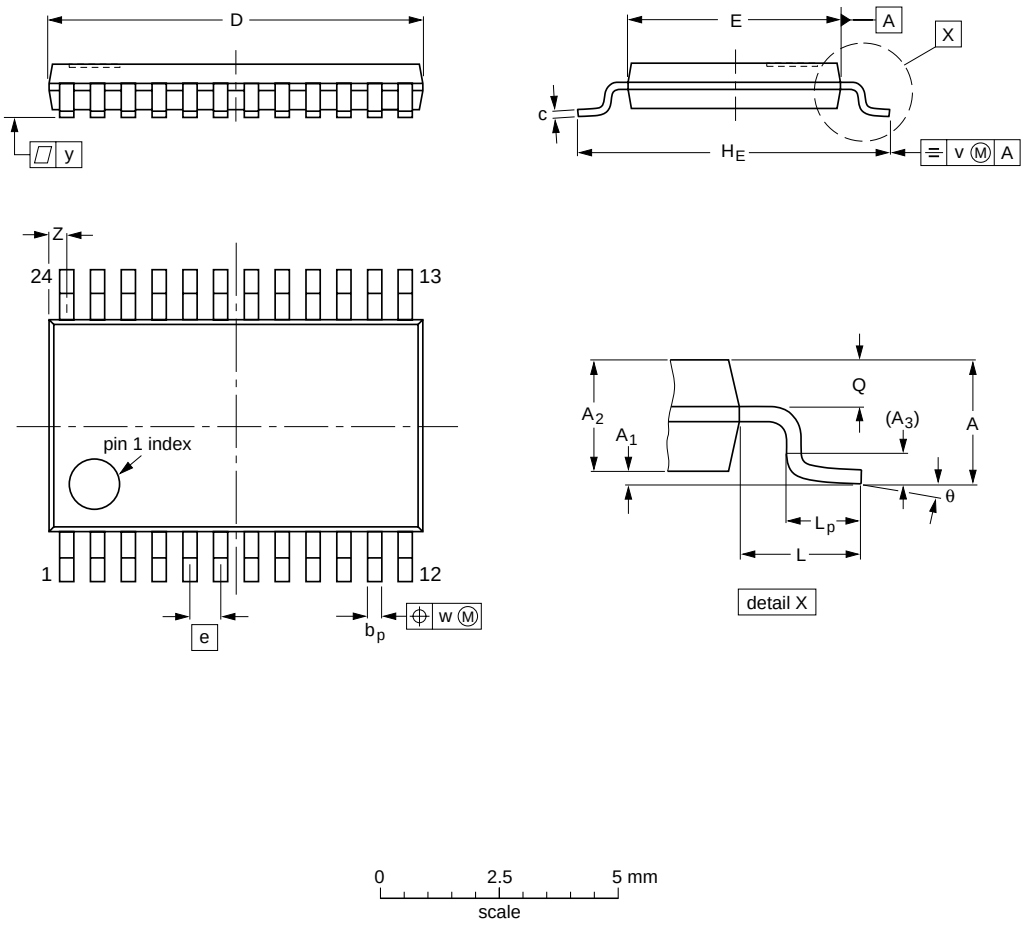
**Note**

1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT340-1 | | MO-150 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 14. Package outline SOT340-1 (SSOP24)**

**TSSOP24: plastic thin shrink small outline package; 24 leads; body width 4.4 mm** **SOT355-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(2)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.15<br>0.05 | 0.95<br>0.80 | 0.25 | 0.30<br>0.19 | 0.2<br>0.1 | 7.9<br>7.7 | 4.5<br>4.3 | 0.65 | 6.6<br>6.2 | 1 | 0.75<br>0.50 | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.5<br>0.2 | $8^o$<br>$0^o$ |

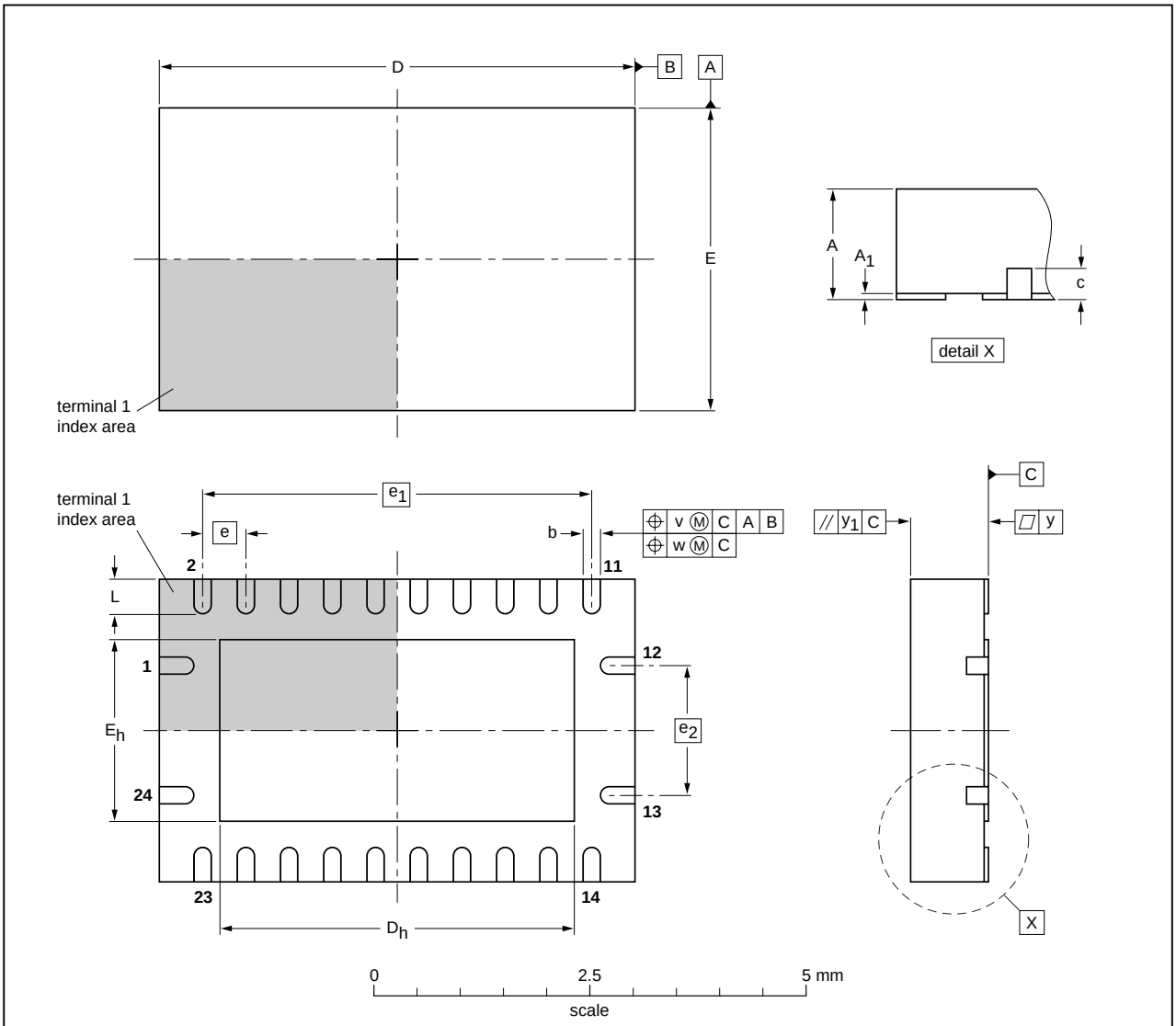
**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT355-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 15. 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**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | $A^{(1)}$ max. | $A_1$ | b | c | $D^{(1)}$ | $D_h$ | $E^{(1)}$ | $E_h$ | e | $e_1$ | $e_2$ | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1 | 0.05<br>0.00 | 0.30<br>0.18 | 0.2 | 5.6<br>5.4 | 4.25<br>3.95 | 3.6<br>3.4 | 2.25<br>1.95 | 0.5 | 4.5 | 1.5 | 0.5<br>0.3 | 0.1 | 0.05 | 0.05 | 0.1 |

**Note**

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT815-1 | - - - | - - - | - - - | | | 03-04-29 |

**Fig 16. Package outline SOT815-1 (DHVQFN24)**

## 14. Abbreviations

**Table 11. Abbreviations**

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

## 15. Revision history

**Table 12. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HC_HCT154_6 | 20070212 | Product data sheet | - | 74HC_HCT154_5 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Table 3 on page 5: Corrected errors in output information. | | | |
| 74HC_HCT154_5 | 20041012 | Product specification | - | 74HC_HCT154_4 |
| 74HC_HCT154_4 | 20041005 | Product specification | - | 74HC_HCT154_3 |
| 74HC_HCT154_3 | 20040601 | Product specification | - | 74HC_HCT154_CNV_2 |

# 16. Legal information

## 16.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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