

# DATA SHEET

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## **74HC154; 74HCT154** 4-to-16 line decoder/demultiplexer

Product specification  
Supersedes data of 2004 Oct 05

2004 Oct 12

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

## FEATURES

- 16-line demultiplexing capability
- Decodes 4 binary-coded inputs into one 16 mutually exclusive outputs
- Complies with JEDEC standard no. 8-1 B
- ESD protection:  
HBM EIA/JESD22-A114-B exceeds 2000 V  
MM EIA/JESD22-A115-A exceeds 200 V.
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$ .

## DESCRIPTION

The 74HC154; 74HCT154 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

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.

## QUICK REFERENCE DATA

GND = 0 V;  $T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$ ;  $t_r = t_f = 6\text{ ns}$ .

| SYMBOL                          | PARAMETER                                   | CONDITIONS  | TYPICAL |          | UNIT |
|---------------------------------|---|---|---------|----------|------|
|                                 |   |   | 74HC154 | 74HCT154 |      |
| $t_{\text{PHL}}/t_{\text{PLH}}$ | propagation delay $A_n, \bar{E}_n$ to $Y_n$ | $C_L = 15\text{ pF}$ ; $R_L = 1\text{ k}\Omega$ ;<br>$V_{\text{CC}} = 5\text{ V}$ | 11      | 13       | ns   |
| $C_I$                           | input capacitance                           |   | 3.5     | 3.5      | pF   |
| $C_{\text{PD}}$                 | power dissipation capacitance per gate      | notes 1 and 2   | 60      | 60       | pF   |

## Notes

1.  $C_{\text{PD}}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{\text{PD}} \times V_{\text{CC}}^2 \times f_i \times N + \Sigma(C_L \times V_{\text{CC}}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $C_L$  = output load capacitance in pF;  
 $V_{\text{CC}}$  = supply voltage in Volts;  
 $N$  = total load switching outputs;  
 $\Sigma(C_L \times V_{\text{CC}}^2 \times f_o)$  = sum of the outputs.
2. For 74HC154 the condition is  $V_I = \text{GND}$  to  $V_{\text{CC}}$   
 For 74HCT154 the condition is  $V_I = \text{GND}$  to  $V_{\text{CC}} - 1.5\text{ V}$ .

4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

**FUNCTION TABLE**

See note 1.

| INPUT |    |    |    |    |    | OUTPUT |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |   |   |   |   |
|-------|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|---|---|---|---|
| E0    | E1 | A0 | A1 | A2 | A3 | Y0     | Y1 | Y2 | Y3 | Y4 | Y6 | Y7 | Y8 | Y2 | Y9 | Y10 | Y11 | Y12 | Y13 | Y14 | 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  | H  | L  | L  | H      | 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  | H  | L  | H  | H  | H  | H  | H   | H   | H   | H   | H   | H   | H | H | H |   |
|       |    | H  | L  | H  | L  | H      | 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  | 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  | 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 |
|       |    | H  | L  | L  | H  | H      | H  | H  | H  | H  | H  | H  | H  | H  | H  | L   | H   | 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  | H  | L  | H  | H      | H  | H  | H  | H  | H  | H  | H  | H  | H  | H   | H   | L   | H   | H   | H   | H | H | H | H |
|       |    | L  | L  | H  | 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   | 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 | H | L | H |

**Note**

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

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

## ORDERING INFORMATION

| TYPE NUMBER | TEMPERATURE RANGE | PACKAGE |          |          |          |
|-------------|-------------------|---------|----------|----------|----------|
|             |                   | PINS    | PACKAGE  | MATERIAL | CODE     |
| 74HC154N    | -40 °C to +125 °C | 24      | DIP24    | plastic  | SOT101-1 |
| 74HCT154N   | -40 °C to +125 °C | 24      | DIP24    | plastic  | SOT101-1 |
| 74HC154D    | -40 °C to +125 °C | 24      | SO24     | plastic  | SOT137-1 |
| 74HCT154D   | -40 °C to +125 °C | 24      | SO24     | plastic  | SOT137-1 |
| 74HC154DB   | -40 °C to +125 °C | 24      | SSOP24   | plastic  | SOT340-1 |
| 74HCT154DB  | -40 °C to +125 °C | 24      | SSOP24   | plastic  | SOT340-1 |
| 74HC154PW   | -40 °C to +125 °C | 24      | TSSOP24  | plastic  | SOT355-1 |
| 74HCT154PW  | -40 °C to +125 °C | 24      | TSSOP24  | plastic  | SOT355-1 |
| 74HC154BQ   | -40 °C to +125 °C | 24      | DHVQFN24 | plastic  | SOT815-1 |
| 74HCT154BQ  | -40 °C to +125 °C | 24      | DHVQFN24 | plastic  | SOT815-1 |

## PINNING

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

4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

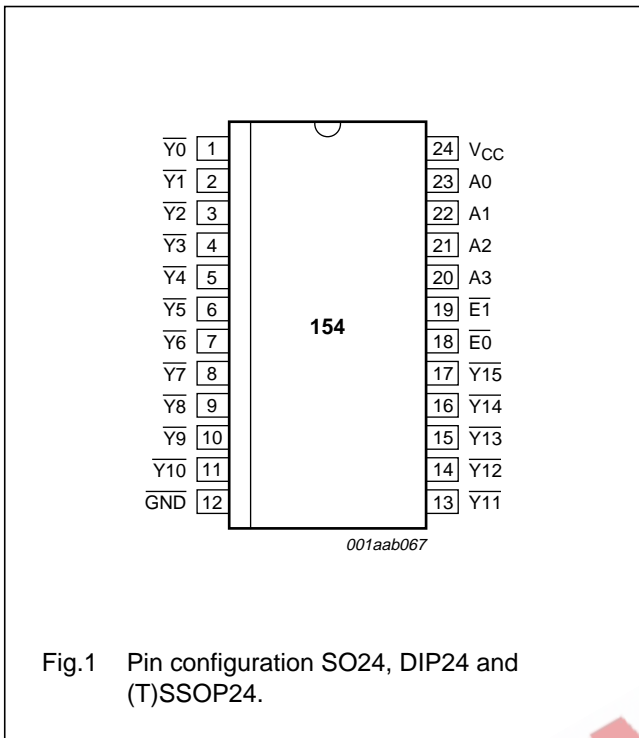


Fig.1 Pin configuration SO24, DIP24 and (T)SSOP24.

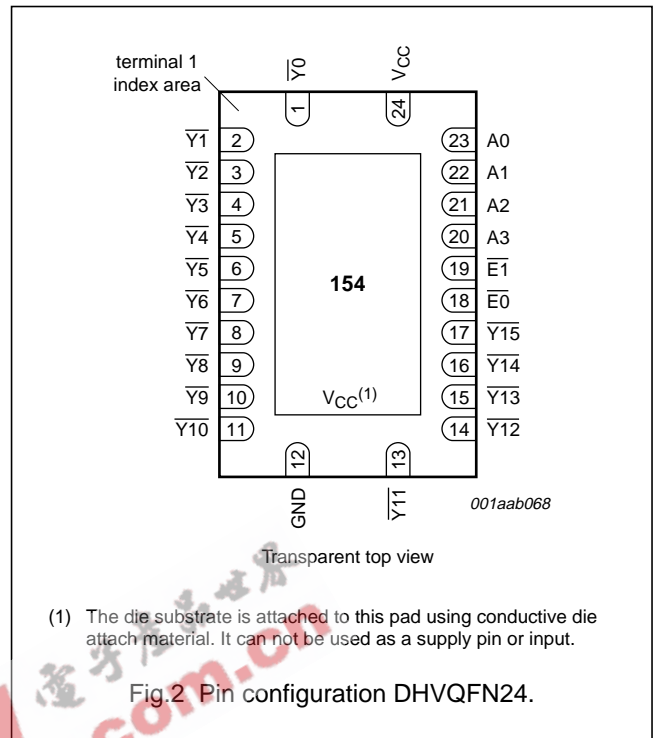


Fig.2 Pin configuration DHVQFN24.

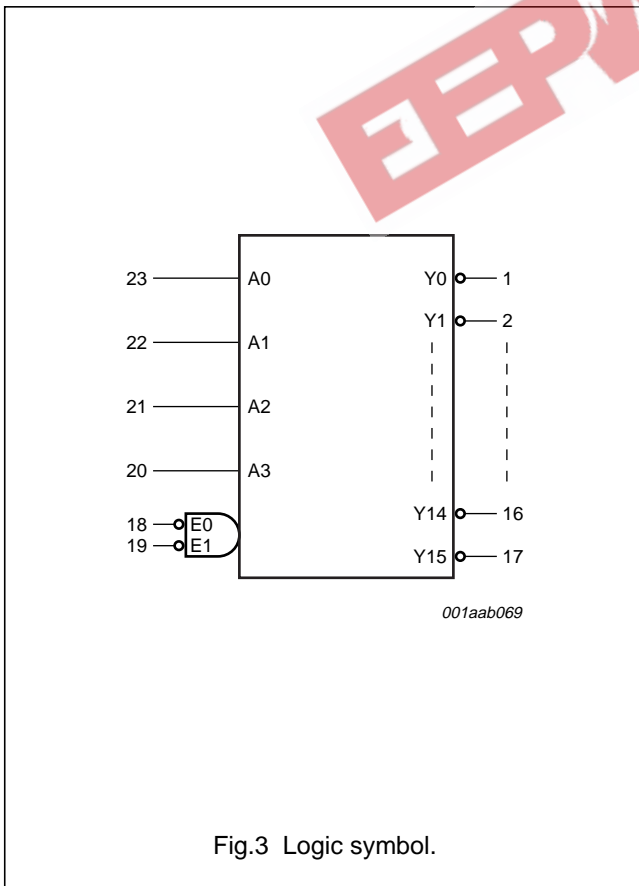


Fig.3 Logic symbol.

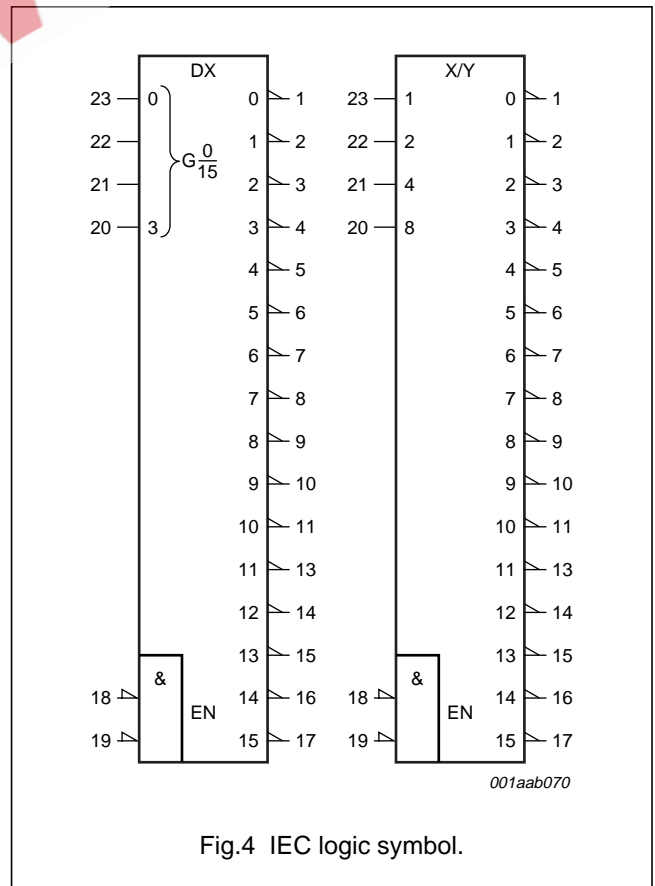


Fig.4 IEC logic symbol.

4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

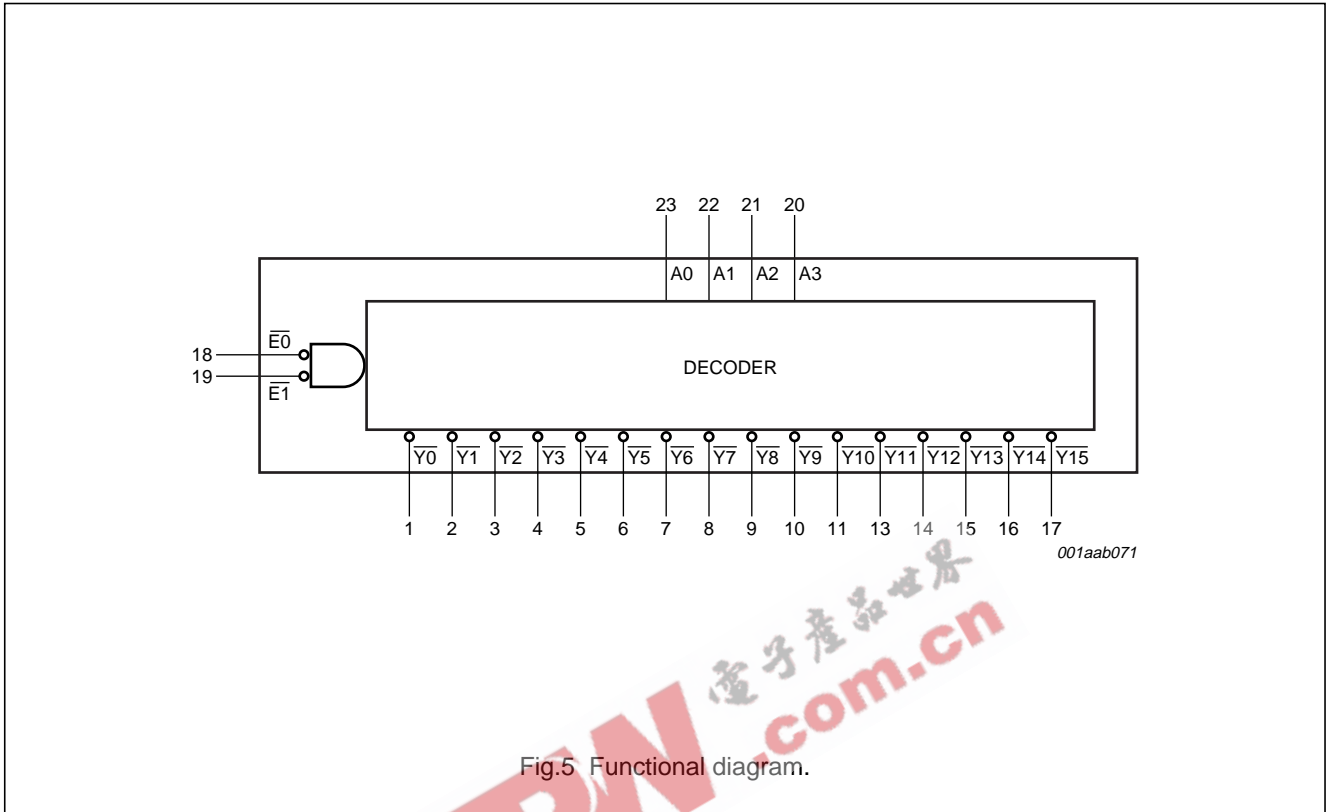


Fig.5 Functional diagram.

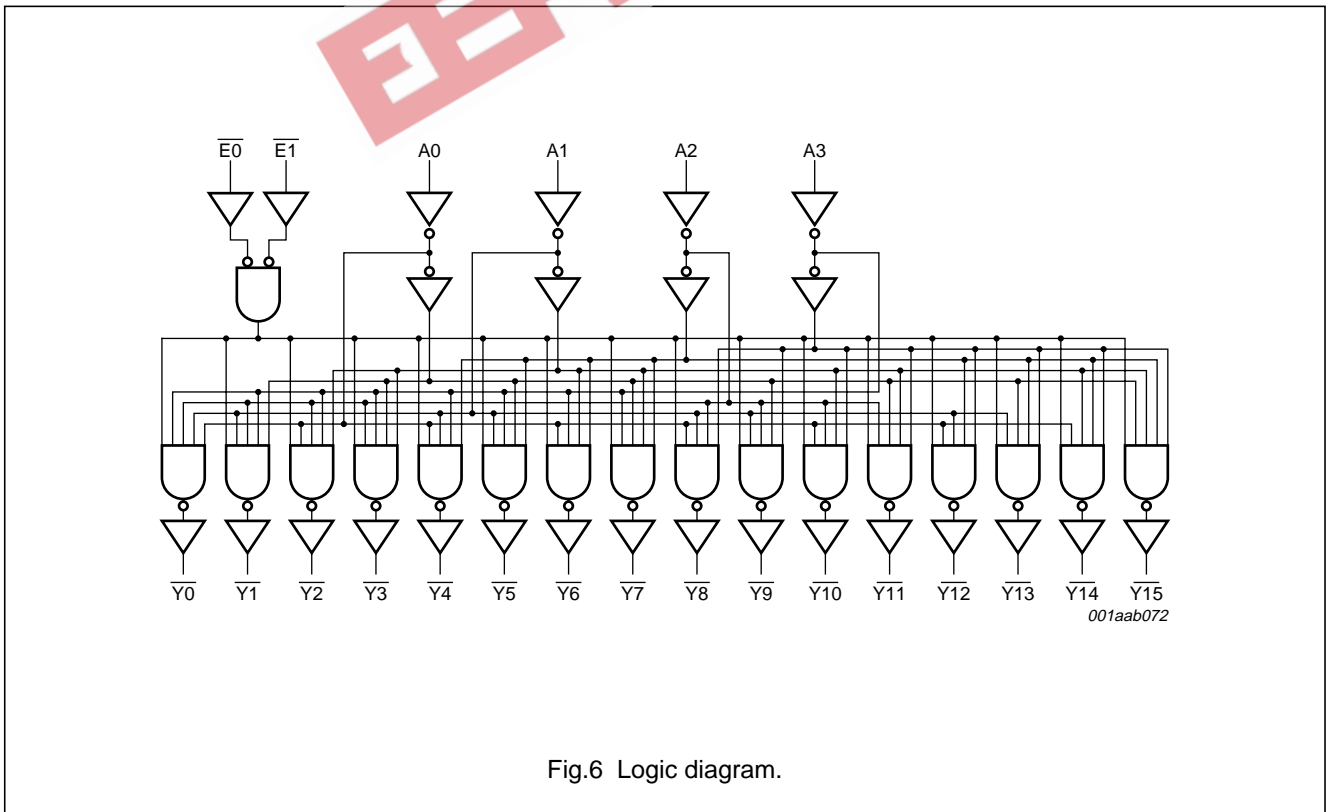


Fig.6 Logic diagram.

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

## RECOMMENDED OPERATING CONDITIONS

| 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   |
| $t_r, t_f$ | input rise and fall times | $V_{CC} = 2.0\text{ V}$ | –       | –    | 1000     | –        | –    | –        | ns   |
|            |                           | $V_{CC} = 4.5\text{ V}$ | –       | 6.0  | 500      | –        | 6.0  | 500      | ns   |
|            |                           | $V_{CC} = 6.0\text{ V}$ | –       | –    | 400      | –        | –    | –        | ns   |

## 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 diode current           | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ ; note 1 | –    | ±20  | mA   |
| $I_{OK}$          | output diode current          | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ ; note 1 | –    | ±20  | mA   |
| $I_O$             | output source or sink current | $-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$ ; note 1          | –    | ±25  | mA   |
| $I_{CC}, I_{GND}$ | $V_{CC}$ or GND current       | note 1  | –    | ±50  | mA   |
| $T_{stg}$         | storage temperature           |   | –65  | +150 | °C   |
| $P_{tot}$         | power dissipation             | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ ; note 2          | –    | 300  | mW   |

## Notes

- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- For DIP24 packages: above 70 °C the value of  $P_{tot}$  derates linearly with 12 mW/K.  
For SO24 packages: above 70 °C the value of  $P_{tot}$  derates linearly with 8 mW/K.  
For SSOP24 and TSSOP24 packages: above 60 °C the value of  $P_{tot}$  derates linearly with 5.5 mW/K.  
For DHVQFN24 packages: above 60 °C the value of  $P_{tot}$  derates linearly with 4.5 mW/K.

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

## DC CHARACTERISTICS

## Type 74HC154

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

| SYMBOL                   | PARAMETER                 | CONDITIONS   |                     | MIN. | TYP. | MAX. | UNIT |
|--------------------------|---------------------------|--|---------------------|------|------|------|------|
|                          |                           | OTHER  | V <sub>CC</sub> (V) |      |      |      |      |
| T <sub>amb</sub> = 25 °C |                           |  |                     |      |      |      |      |
| V <sub>IH</sub>          | HIGH-level input voltage  |  | 2.0                 | 1.5  | 1.2  | –    | V    |
|                          |                           |  | 4.5                 | 3.15 | 2.4  | –    | V    |
|                          |                           |  | 6.0                 | 4.2  | 3.2  | –    | V    |
| V <sub>IL</sub>          | LOW-level input voltage   |  | 2.0                 | –    | 0.8  | 0.5  | V    |
|                          |                           |  | 4.5                 | –    | 2.1  | 1.35 | V    |
|                          |                           |  | 6.0                 | –    | 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><br>I <sub>O</sub> = –20 μA | 2.0                 | 1.9  | 2.0  | –    | V    |
|                          |                           | I <sub>O</sub> = –20 μA  | 4.5                 | 4.4  | 4.5  | –    | V    |
|                          |                           | I <sub>O</sub> = –20 μA  | 6.0                 | 5.9  | 6.0  | –    | V    |
|                          |                           | I <sub>O</sub> = –4.0 mA   | 4.5                 | 3.98 | 4.32 | –    | V    |
|                          |                           | I <sub>O</sub> = –5.2 mA   | 6.0                 | 5.48 | 5.81 | –    | V    |
| V <sub>OL</sub>          | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = 20 μA  | 2.0                 | –    | 0    | 0.1  | V    |
|                          |                           | I <sub>O</sub> = 20 μA   | 4.5                 | –    | 0    | 0.1  | V    |
|                          |                           | I <sub>O</sub> = 20 μA   | 6.0                 | –    | 0    | 0.1  | V    |
|                          |                           | I <sub>O</sub> = 4.0 mA  | 4.5                 | –    | 0.15 | 0.26 | V    |
|                          |                           | I <sub>O</sub> = 5.2 mA  | 6.0                 | –    | 0.16 | 0.26 | V    |
| I <sub>LI</sub>          | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND  | 6.0                 | –    | –    | ±0.1 | μA   |
| I <sub>CC</sub>          | quiescent supply current  | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A               | 6.0                 | –    | –    | 8.0  | μA   |



## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

| SYMBOL                                    | PARAMETER                 | CONDITIONS   |                     | MIN. | TYP. | MAX. | UNIT |
|---|---------------------------|--|---------------------|------|------|------|------|
|   |                           | OTHER  | V <sub>CC</sub> (V) |      |      |      |      |
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b> |                           |  |                     |      |      |      |      |
| V <sub>IH</sub>                           | HIGH-level input voltage  |  | 2.0                 | 1.5  | –    | –    | V    |
|   |                           |  | 4.5                 | 3.15 | –    | –    | V    |
|   |                           |  | 6.0                 | 4.2  | –    | –    | V    |
| V <sub>IL</sub>                           | LOW-level input voltage   |  | 2.0                 | –    | –    | 0.5  | V    |
|   |                           |  | 4.5                 | –    | –    | 1.35 | V    |
|   |                           |  | 6.0                 | –    | –    | 1.8  | V    |
| V <sub>OH</sub>                           | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = -20 μA | 2.0                 | 1.9  | –    | –    | V    |
|   |                           | I <sub>O</sub> = -20 μA  | 4.5                 | 4.4  | –    | –    | V    |
|   |                           | I <sub>O</sub> = -20 μA  | 6.0                 | 5.9  | –    | –    | V    |
|   |                           | I <sub>O</sub> = -4.0 mA   | 4.5                 | 3.84 | –    | –    | V    |
|   |                           | I <sub>O</sub> = -5.2 mA   | 6.0                 | 5.34 | –    | –    | V    |
| V <sub>OL</sub>                           | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = 20 μA  | 2.0                 | –    | –    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 20 μA   | 4.5                 | –    | –    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 20 μA   | 6.0                 | –    | –    | 0.1  | V    |
|   |                           | I <sub>O</sub> = 4.0 mA  | 4.5                 | –    | –    | 0.33 | V    |
|   |                           | I <sub>O</sub> = 5.2 mA  | 6.0                 | –    | –    | 0.33 | V    |
| I <sub>LI</sub>                           | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND  | 6.0                 | –    | –    | ±1.0 | μA   |
| I <sub>CC</sub>                           | quiescent supply current  | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A               | 6.0                 | –    | –    | 80   | μA   |

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

| SYMBOL                                     | PARAMETER                 | CONDITIONS   |                     | MIN. | TYP. | MAX. | UNIT |
|--|---------------------------|--|---------------------|------|------|------|------|
|  |                           | OTHER  | V <sub>CC</sub> (V) |      |      |      |      |
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                           |  |                     |      |      |      |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  |  | 2.0                 | 1.5  | –    | –    | V    |
|  |                           |  | 4.5                 | 3.15 | –    | –    | V    |
|  |                           |  | 6.0                 | 4.2  | –    | –    | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   |  | 2.0                 | –    | –    | 0.5  | V    |
|  |                           |  | 4.5                 | –    | –    | 1.35 | V    |
|  |                           |  | 6.0                 | –    | –    | 1.8  | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = -20 μA | 2.0                 | 1.9  | –    | –    | V    |
|  |                           | I <sub>O</sub> = -20 μA  | 4.5                 | 4.4  | –    | –    | V    |
|  |                           | I <sub>O</sub> = -20 μA  | 6.0                 | 5.9  | –    | –    | V    |
|  |                           | I <sub>O</sub> = -4.0 mA   | 4.5                 | 3.7  | –    | –    | V    |
|  |                           | I <sub>O</sub> = -5.2 mA   | 6.0                 | 5.2  | –    | –    | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = 20 μA  | 2.0                 | –    | –    | 0.1  | V    |
|  |                           | I <sub>O</sub> = 20 μA   | 4.5                 | –    | –    | 0.1  | V    |
|  |                           | I <sub>O</sub> = 20 μA   | 6.0                 | –    | –    | 0.1  | V    |
|  |                           | I <sub>O</sub> = 4.0 mA  | 4.5                 | –    | –    | 0.4  | V    |
|  |                           | I <sub>O</sub> = 5.2 mA  | 6.0                 | –    | –    | 0.4  | V    |
| I <sub>LI</sub>                            | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND  | 6.0                 | –    | –    | ±0.1 | μA   |
| I <sub>CC</sub>                            | quiescent supply current  | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A               | 6.0                 | –    | –    | 160  | μA   |

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

**Type 74HCT154**

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

| SYMBOL                                    | PARAMETER                                     | CONDITIONS   |                     | MIN. | TYP. | MAX. | UNIT |
|---|---|--|---------------------|------|------|------|------|
|   |   | OTHER  | V <sub>CC</sub> (V) |      |      |      |      |
| <b>T<sub>amb</sub> = 25 °C</b>            |   |  |                     |      |      |      |      |
| V <sub>IH</sub>                           | HIGH-level input voltage                      |  | 4.5 to 5.5          | 2.0  | 1.6  | –    | V    |
| V <sub>IL</sub>                           | LOW-level input voltage                       |  | 4.5 to 5.5          | –    | 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><br>I <sub>O</sub> = –20 μA | 4.5                 | 4.4  | 4.5  | –    | V    |
|   |   | I <sub>O</sub> = –4 mA   | 4.5                 | 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><br>I <sub>O</sub> = 20 μA  | 4.5                 | –    | 0    | 0.1  | V    |
|   |   | I <sub>O</sub> = 4 mA  | 4.5                 | –    | 0.15 | 0.25 | V    |
| I <sub>LI</sub>                           | input leakage current                         | V <sub>I</sub> = V <sub>CC</sub> or GND  | 5.5                 | –    | –    | ±0.1 | μA   |
| I <sub>CC</sub>                           | quiescent supply current                      | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A               | 5.5                 | –    | –    | 8.0  | μA   |
| ΔI <sub>CC</sub>                          | additional quiescent supply current per input | V <sub>I</sub> = V <sub>CC</sub> – 2.1 V;<br>I <sub>O</sub> = 0 A              | 4.5 to 5.5          | –    | –    | 360  | μA   |
| <b>T<sub>amb</sub> = –40 °C to +85 °C</b> |   |  |                     |      |      |      |      |
| V <sub>IH</sub>                           | HIGH-level input voltage                      |  | 4.5 to 5.5          | 2.0  | –    | –    | V    |
| V <sub>IL</sub>                           | LOW-level input voltage                       |  | 4.5 to 5.5          | –    | –    | 0.8  | V    |
| V <sub>OH</sub>                           | HIGH-level output voltage                     | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = –20 μA | 4.5                 | 4.4  | –    | –    | V    |
|   |   | I <sub>O</sub> = –4 mA   | 4.5                 | 3.84 | –    | –    | V    |
| V <sub>OL</sub>                           | LOW-level output voltage                      | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = 20 μA  | 4.5                 | –    | –    | 0.1  | V    |
|   |   | I <sub>O</sub> = 4 mA  | 4.5                 | –    | –    | 0.33 | V    |
| I <sub>LI</sub>                           | input leakage current                         | V <sub>I</sub> = V <sub>CC</sub> or GND  | 5.5                 | –    | –    | ±1.0 | μA   |
| I <sub>CC</sub>                           | quiescent supply current                      | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A               | 5.5                 | –    | –    | 80   | μA   |
| ΔI <sub>CC</sub>                          | additional quiescent supply current per input | V <sub>I</sub> = V <sub>CC</sub> – 2.1 V;<br>I <sub>O</sub> = 0 A              | 4.5 to 5.5          | –    | –    | 450  | μA   |

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

| SYMBOL                                     | PARAMETER                                     | CONDITIONS   |                     | MIN. | TYP. | MAX. | UNIT |
|--|---|--|---------------------|------|------|------|------|
|  |   | OTHER  | V <sub>CC</sub> (V) |      |      |      |      |
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |   |  |                     |      |      |      |      |
| V <sub>IH</sub>                            | HIGH-level input voltage                      |  | 4.5 to 5.5          | 2.0  | –    | –    | V    |
| V <sub>IL</sub>                            | LOW-level input voltage                       |  | 4.5 to 5.5          | –    | –    | 0.8  | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage                     | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = -20 μA | 4.5                 | 4.4  | –    | –    | V    |
|  |   | I <sub>O</sub> = -4 mA   | 4.5                 | 3.7  | –    | –    | V    |
| V <sub>OL</sub>                            | LOW-level output voltage                      | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>I <sub>O</sub> = 20 μA  | 4.5                 | –    | –    | 0.1  | V    |
|  |   | I <sub>O</sub> = 4 mA  | 4.5                 | –    | –    | 0.4  | V    |
| I <sub>LI</sub>                            | input leakage current                         | V <sub>I</sub> = V <sub>CC</sub> or GND  | 5.5                 | –    | –    | ±1.0 | μA   |
| I <sub>CC</sub>                            | quiescent supply current                      | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>I <sub>O</sub> = 0 A               | 5.5                 | –    | –    | 160  | μA   |
| ΔI <sub>CC</sub>                           | additional quiescent supply current per input | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V;<br>I <sub>O</sub> = 0 A              | 4.5 to 5.5          | –    | –    | 490  | μA   |

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## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

## AC CHARACTERISTICS

## Type 74HC154

GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF.

| SYMBOL   | PARAMETER  | TEST CONDITIONS     |              | MIN. | TYP. | MAX. | UNIT |
|--|--|---------------------|--------------|------|------|------|------|
|  |  | WAVEFORMS           | $V_{CC}$ (V) |      |      |      |      |
| <b><math>T_{amb} = 25</math> °C</b>                          |  |                     |              |      |      |      |      |
| $t_{PHL}/t_{PLH}$  | propagation delay $A_n$ to $\overline{Y}_n$            | see Figs 7 and 9    | 2.0          | –    | 36   | 150  | ns   |
|  |  |                     | 4.5          | –    | 13   | 30   | ns   |
|  |  |                     | 6.0          | –    | 10   | 26   | ns   |
|  | propagation delay $\overline{E}_n$ to $\overline{Y}_n$ | see Figs 8 and 9    | 2.0          | –    | 39   | 150  | ns   |
|  |  |                     | 4.5          | –    | 14   | 30   | ns   |
|  |  |                     | 6.0          | –    | 11   | 26   | ns   |
| $t_{THL}/t_{TLH}$  | output transition time                                 | see Figs 7, 8 and 9 | 2.0          | –    | 19   | 75   | ns   |
|  |  |                     | 4.5          | –    | 7    | 15   | ns   |
|  |  |                     | 6.0          | –    | 6    | 13   | ns   |
| <b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>  |  |                     |              |      |      |      |      |
| $t_{PHL}/t_{PLH}$  | propagation delay $A_n$ to $\overline{Y}_n$            | see Figs 7 and 9    | 2.0          | –    | –    | 190  | ns   |
|  |  |                     | 4.5          | –    | –    | 38   | ns   |
|  |  |                     | 6.0          | –    | –    | 33   | ns   |
|  | propagation delay $\overline{E}_n$ to $\overline{Y}_n$ | see Figs 8 and 9    | 2.0          | –    | –    | 190  | ns   |
|  |  |                     | 4.5          | –    | –    | 38   | ns   |
|  |  |                     | 6.0          | –    | –    | 33   | ns   |
| $t_{THL}/t_{TLH}$  | output transition time                                 | see Figs 7, 8 and 9 | 2.0          | –    | –    | 95   | ns   |
|  |  |                     | 4.5          | –    | –    | 19   | ns   |
|  |  |                     | 6.0          | –    | –    | 16   | ns   |
| <b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b> |  |                     |              |      |      |      |      |
| $t_{PHL}/t_{PLH}$  | propagation delay $A_n$ to $\overline{Y}_n$            | see Figs 7 and 9    | 2.0          | –    | –    | 225  | ns   |
|  |  |                     | 4.5          | –    | –    | 45   | ns   |
|  |  |                     | 6.0          | –    | –    | 38   | ns   |
|  | propagation delay $\overline{E}_n$ to $\overline{Y}_n$ | see Figs 8 and 9    | 2.0          | –    | –    | 225  | ns   |
|  |  |                     | 4.5          | –    | –    | 45   | ns   |
|  |  |                     | 6.0          | –    | –    | 38   | ns   |
| $t_{THL}/t_{TLH}$  | output transition time                                 | see Figs 7, 8 and 9 | 2.0          | –    | –    | 110  | ns   |
|  |  |                     | 4.5          | –    | –    | 22   | ns   |
|  |  |                     | 6.0          | –    | –    | 19   | ns   |

4-to-16 line decoder/demultiplexer

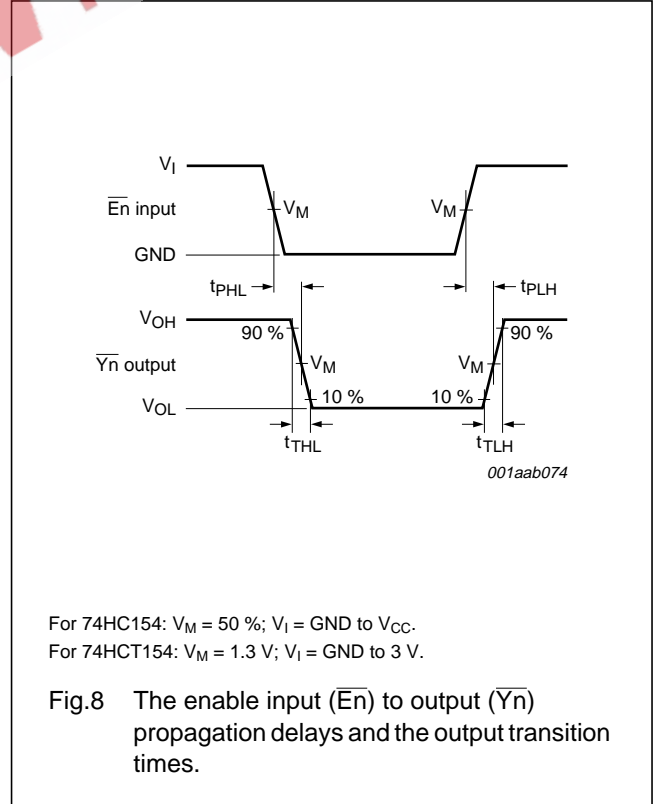
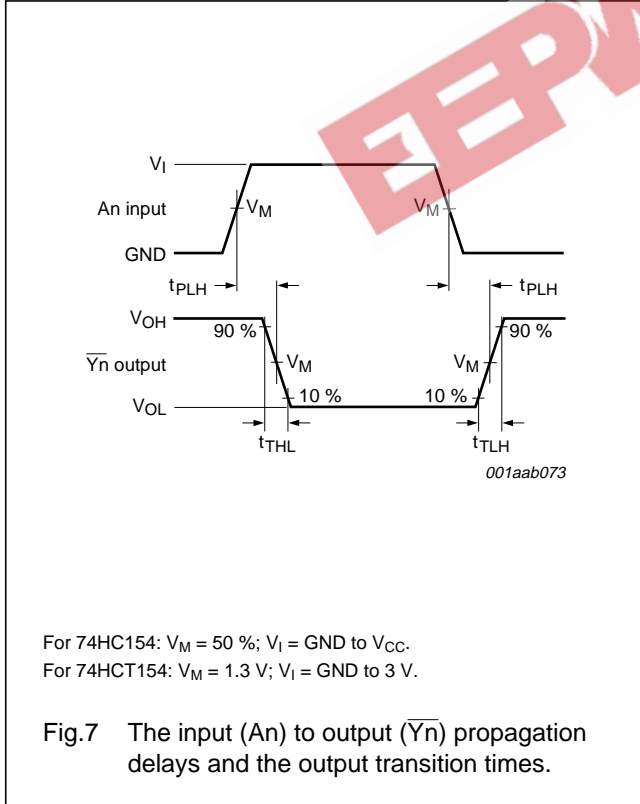
74HC154; 74HCT154

Type 74HCT154

GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF.

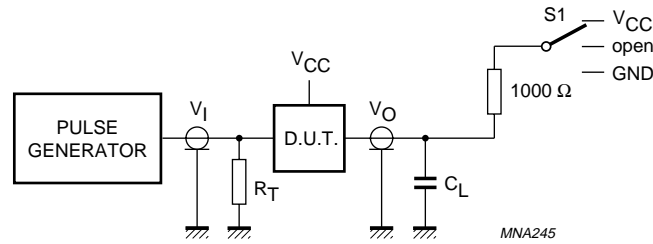
| SYMBOL                                     | PARAMETER                                    | TEST CONDITIONS     |                     | MIN. | TYP. | MAX. | UNIT |
|--|--|---------------------|---------------------|------|------|------|------|
|  |  | WAVEFORMS           | V <sub>CC</sub> (V) |      |      |      |      |
| <b>T<sub>amb</sub> = 25 °C</b>             |  |                     |                     |      |      |      |      |
| t <sub>PHL</sub> /t <sub>PLH</sub>         | propagation delay An to $\bar{Y}_n$          | see Figs 7 and 9    | 4.5                 | –    | 16   | 35   | ns   |
|  | propagation delay $\bar{E}_n$ to $\bar{Y}_n$ | see Figs 8 and 9    | 4.5                 | –    | 15   | 32   | ns   |
| t <sub>THL</sub> /t <sub>TLH</sub>         | output transition time                       | see Figs 7, 8 and 9 | 4.5                 | –    | 7    | 15   | ns   |
| <b>T<sub>amb</sub> = –40 °C to +85 °C</b>  |  |                     |                     |      |      |      |      |
| t <sub>PHL</sub> /t <sub>PLH</sub>         | propagation delay An to $\bar{Y}_n$          | see Figs 7 and 9    | 4.5                 | –    | –    | 44   | ns   |
|  | propagation delay $\bar{E}_n$ to $\bar{Y}_n$ | see Figs 8 and 9    | 4.5                 | –    | –    | 40   | ns   |
| t <sub>THL</sub> /t <sub>TLH</sub>         | output transition time                       | see Figs 7, 8 and 9 | 4.5                 | –    | –    | 19   | ns   |
| <b>T<sub>amb</sub> = –40 °C to +125 °C</b> |  |                     |                     |      |      |      |      |
| t <sub>PHL</sub> /t <sub>PLH</sub>         | propagation delay An to $\bar{Y}_n$          | see Figs 7 and 9    | 4.5                 | –    | –    | 53   | ns   |
|  | propagation delay $\bar{E}_n$ to $\bar{Y}_n$ | see Figs 8 and 9    | 4.5                 | –    | –    | 48   | ns   |
| t <sub>THL</sub> /t <sub>TLH</sub>         | output transition time                       | see Figs 7, 8 and 9 | 4.5                 | –    | –    | 22   | ns   |

AC WAVEFORMS



4-to-16 line decoder/demultiplexer

74HC154; 74HCT154



| TEST              | S1   |
|-------------------|------|
| $t_{PLH}/t_{PHL}$ | open |
| $t_{PLZ}/t_{PZL}$ | VCC  |
| $t_{PHZ}/t_{PZH}$ | GND  |

Definitions for test circuit:

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

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

Fig.9 Load circuitry for switching times.

APPLICATION DATA

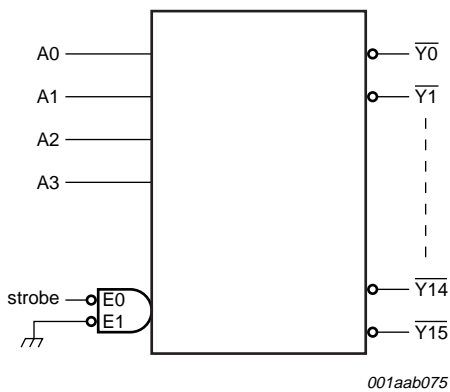


Fig.10 1-of-16 decoder; LOW level output selected.

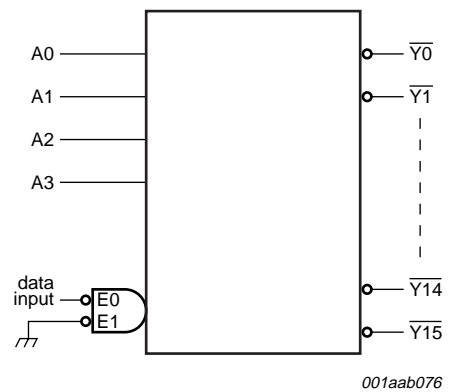


Fig.11 1-of-16 demultiplexer; logic level on selected outputs follow the logic level on the data input.

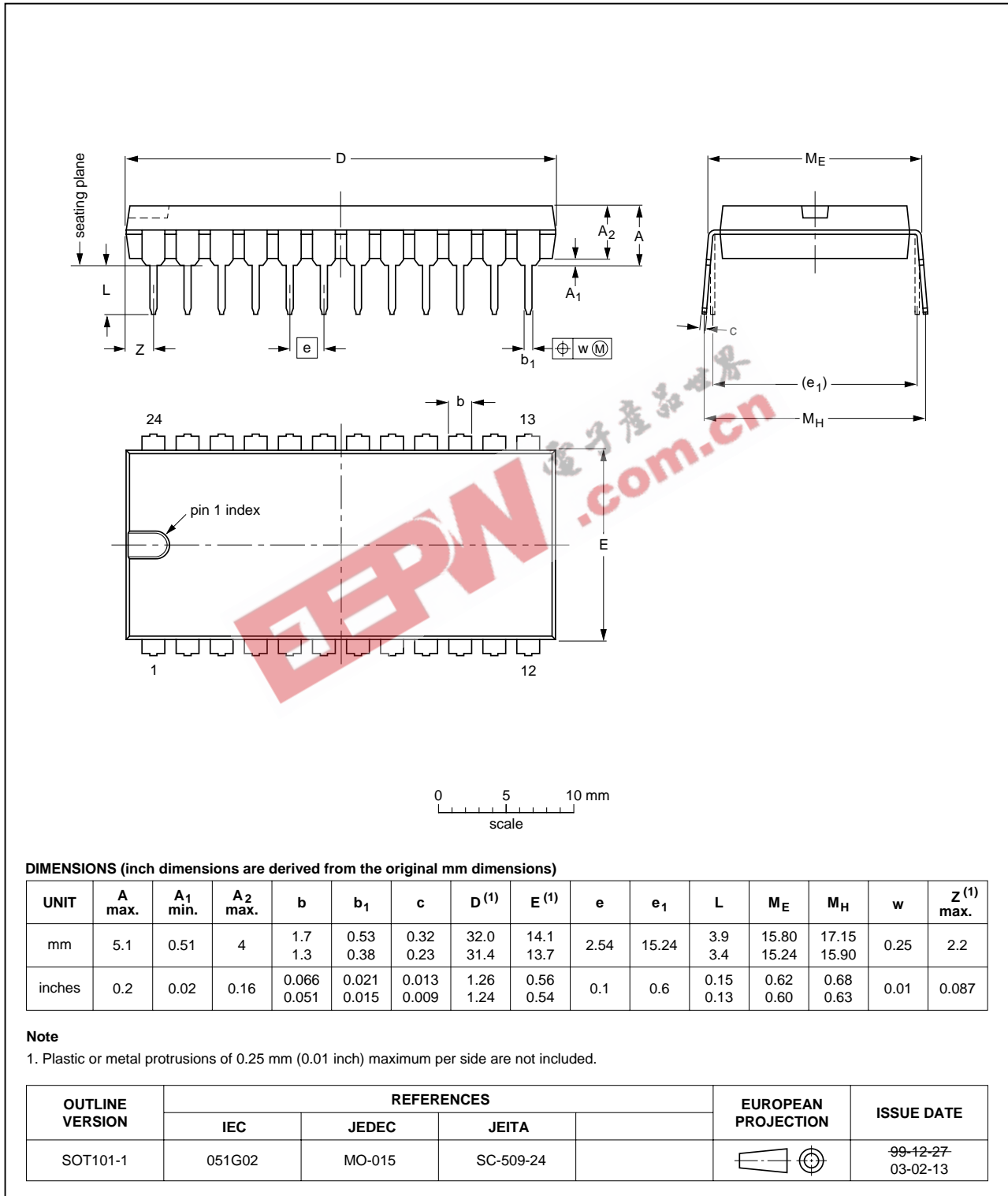
4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

PACKAGE OUTLINES

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

SOT101-1



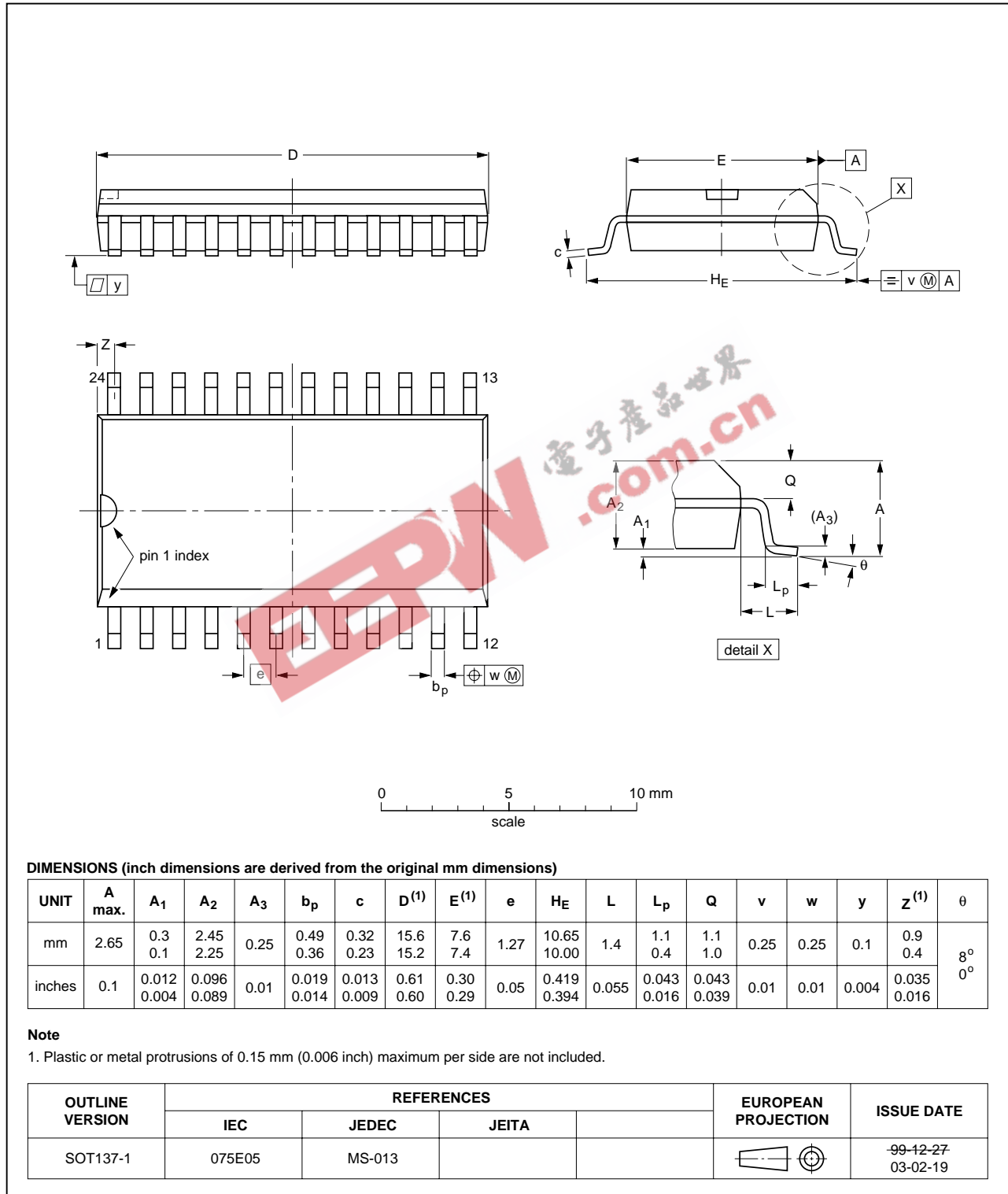


4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

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

SOT137-1

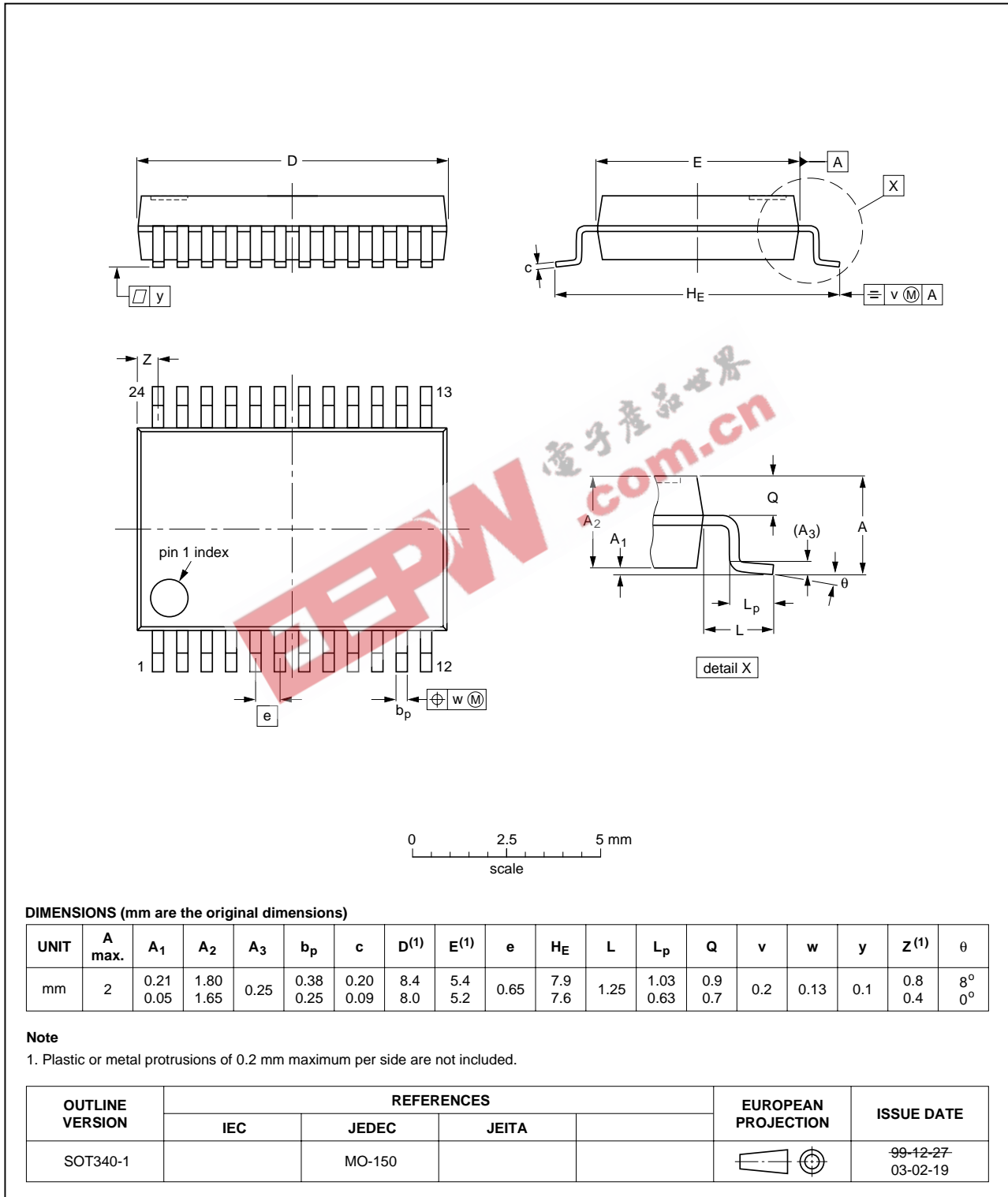


4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1

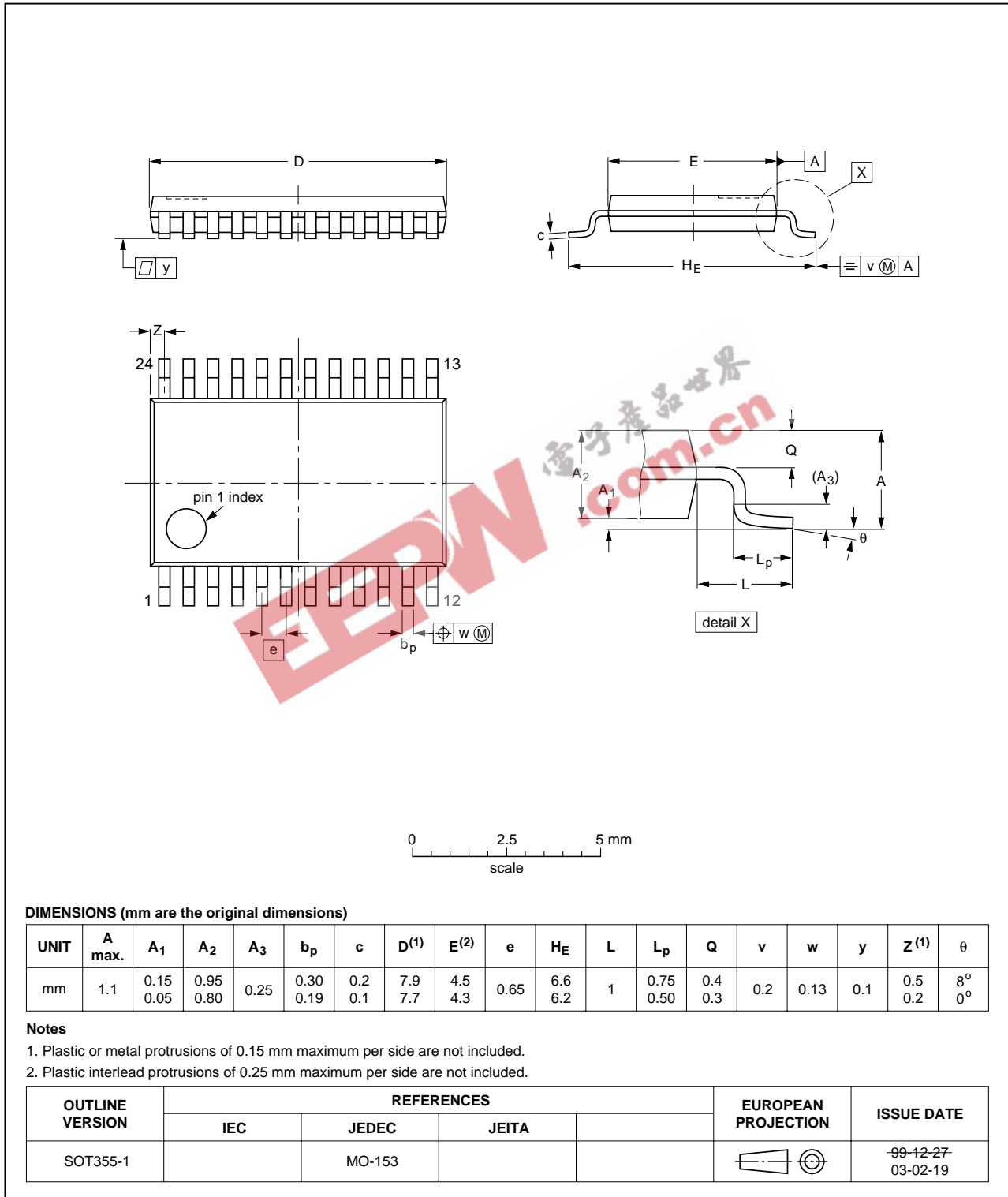


4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

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

SOT355-1

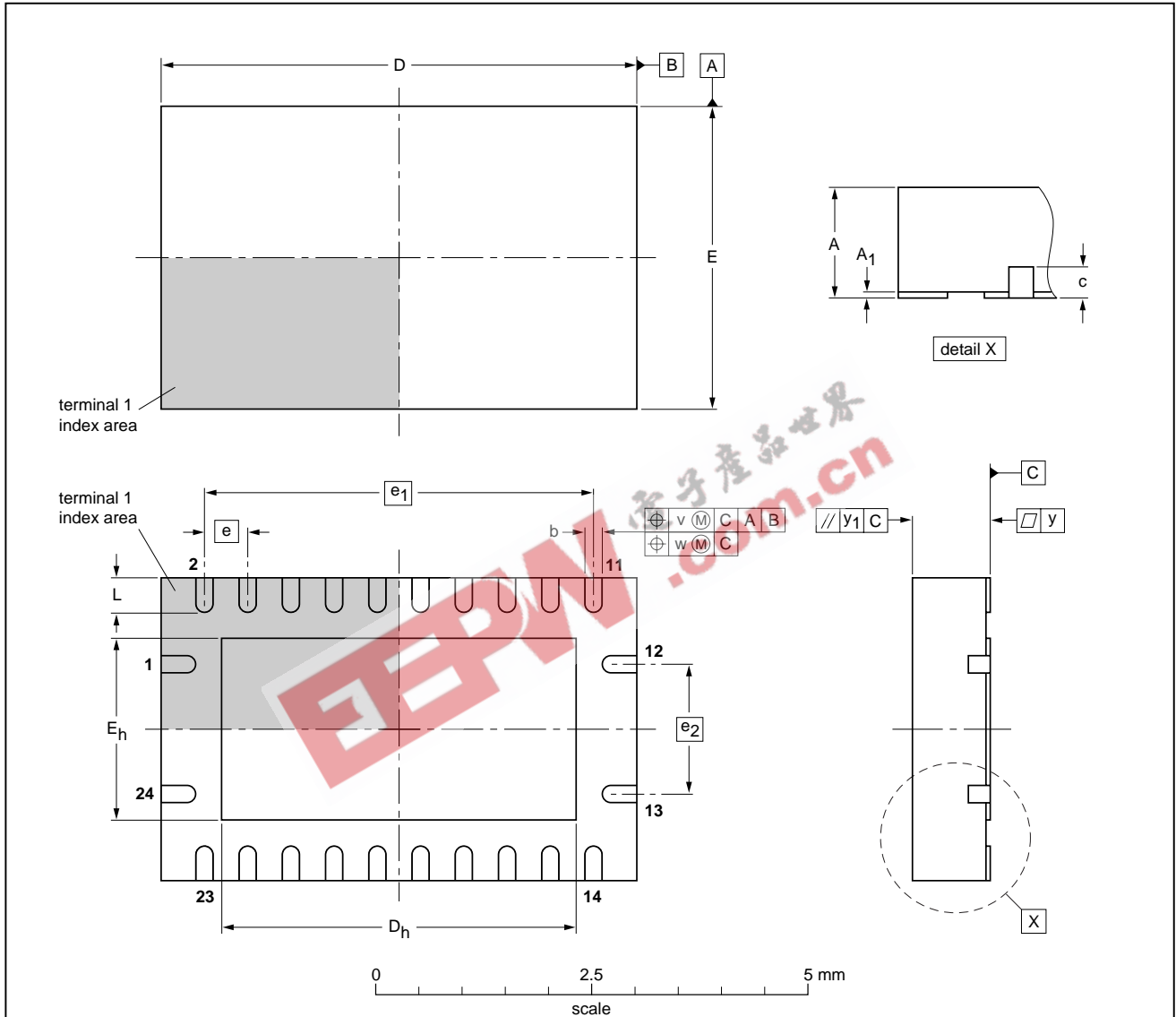


4-to-16 line decoder/demultiplexer

74HC154; 74HCT154

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 <sup>(1)</sup><br>max. | A <sub>1</sub> | b            | c   | D <sup>(1)</sup> | D <sub>h</sub> | E <sup>(1)</sup> | E <sub>h</sub> | e   | e <sub>1</sub> | e <sub>2</sub> | L          | v   | w    | y    | y <sub>1</sub> |
|------|--------------------------|----------------|--------------|-----|------------------|----------------|------------------|----------------|-----|----------------|----------------|------------|-----|------|------|----------------|
| 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<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|--|------------------------|------------|
|                    | IEC        | JEDEC | JEITA |  |                        |            |
| SOT815-1           | ---        | ---   | ---   |  |                        | 03-04-29   |

## 4-to-16 line decoder/demultiplexer

## 74HC154; 74HCT154

## DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)(3)</sup> | DEFINITION   |
|-------|----------------------------------|----------------------------------|--|
| I     | Objective data                   | Development                      | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.  |
| II    | Preliminary data                 | Qualification                    | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
| III   | Product data                     | Production                       | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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SCA76

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