



**THE DATASHEET OF  
HEF4555BT,653**



# HEF4555B

1-of-4 decoder/demultiplexer

Rev. 7 — 15 October 2018

Product data sheet

## 1. General description

The HEF4555B contains two 1-of-4 decoders/demultiplexers. Each has two address inputs (nA0 and nA1, an active LOW enable input (nE) and four mutually exclusive outputs which are active HIGH (nY0 to nY3). When used as a decoder, nE when HIGH, forces nY0 to nY3 LOW. When used as a demultiplexer, the appropriate output is selected by the information on nA0 and nA1 with nE as data input. All unselected outputs are LOW.

It operates over a recommended  $V_{DD}$  power supply range of 3 V to 15 V referenced to  $V_{SS}$  (usually ground). Unused inputs must be connected to  $V_{DD}$ ,  $V_{SS}$ , or another input.

## 2. Features and benefits

- Fully static operation
- 5 V, 10 V, and 15 V parametric ratings
- Standardized symmetrical output characteristics
- Specified from -40 °C to +85 °C
- Complies with JEDEC standard JESD 13-B

## 3. Applications

- Code conversion
- Address decoding
- Demultiplexing: when using the enable input as data input

## 4. Ordering information

Table 1. Ordering information

All types operate from -40 °C to +85 °C.

| Type number | Package |  | Version  |
|-------------|---------|--|----------|
|             | Name    | Description  |          |
| HEF4555BT   | SO16    | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |

### 5. Functional diagram

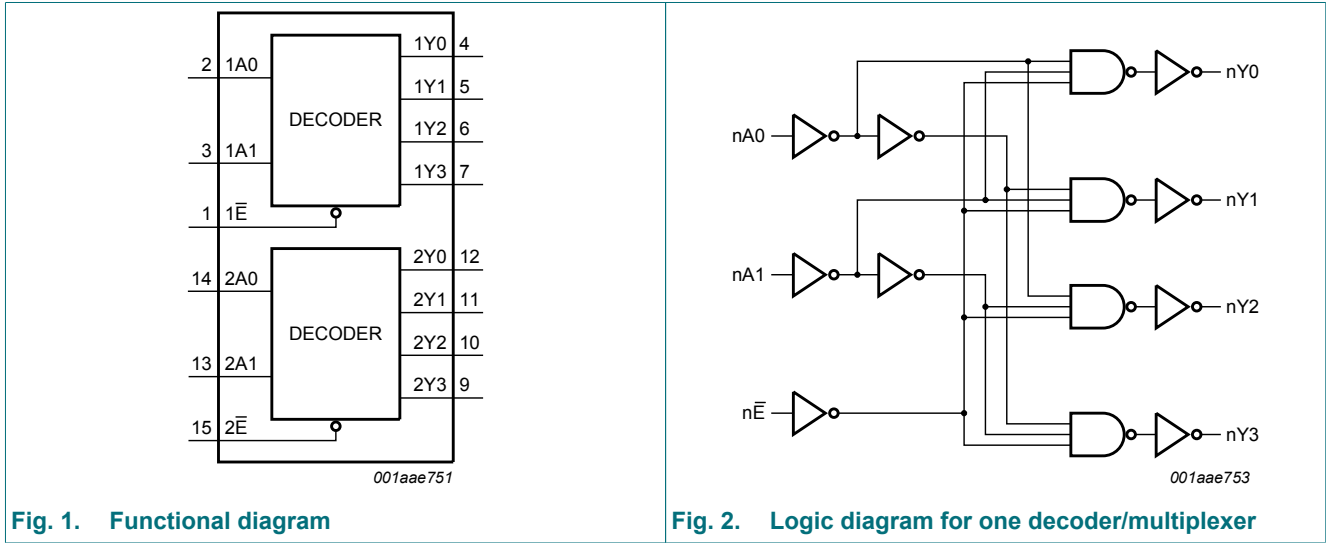


Fig. 1. Functional diagram

Fig. 2. Logic diagram for one decoder/multiplexer

### 6. Pinning information

#### 6.1. Pinning

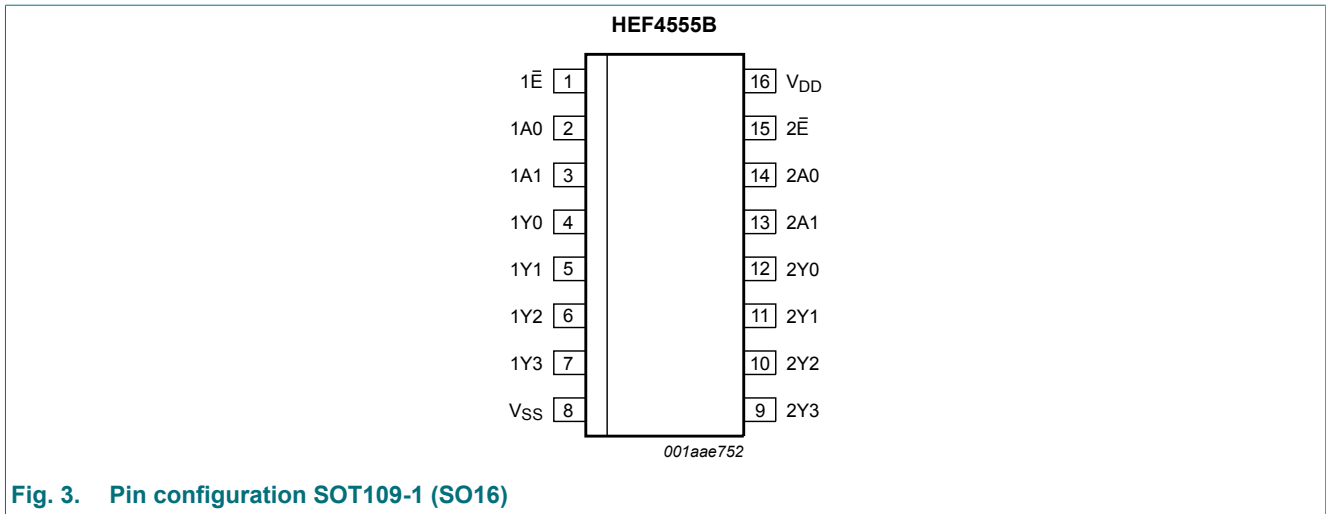


Fig. 3. Pin configuration SOT109-1 (SO16)

#### 6.2. Pin description

Table 2. Pin description

| Symbol                                 | Pin                       | Description               |
|--|---------------------------|---------------------------|
| 1A0, 1A1, 2A0, 2A1                     | 2, 3, 14, 13              | address input             |
| 1E, 2E                                 | 1, 15                     | enable input (active LOW) |
| 1Y0, 1Y1, 1Y2, 1Y3, 2Y0, 2Y1, 2Y2, 2Y3 | 4, 5, 6, 7, 12, 11, 10, 9 | output (active HIGH)      |
| V <sub>DD</sub>                        | 16                        | supply voltage            |
| V <sub>SS</sub>                        | 8                         | ground (GND)              |

## 7. Functional description

**Table 3. Function selection**

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

| Inputs |     |     | Outputs |     |     |     |
|--------|-----|-----|---------|-----|-----|-----|
| nE     | nA0 | nA1 | nY0     | nY1 | nY2 | nY3 |
| L      | L   | L   | H       | L   | L   | L   |
| L      | H   | L   | L       | H   | L   | L   |
| L      | L   | H   | L       | L   | H   | L   |
| L      | H   | H   | L       | L   | L   | H   |
| H      | X   | X   | L       | L   | L   | L   |

## 8. Limiting values

**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol           | Parameter               | Conditions  | Min  | Max                   | Unit |
|------------------|-------------------------|---|------|-----------------------|------|
| V <sub>DD</sub>  | supply voltage          |   | -0.5 | +18                   | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>DD</sub> + 0.5 V | -    | ±10                   | mA   |
| V <sub>I</sub>   | input voltage           |   | -0.5 | V <sub>DD</sub> + 0.5 | V    |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>DD</sub> + 0.5 V | -    | ±10                   | mA   |
| I <sub>I/O</sub> | input/output current    |   | -    | ±10                   | mA   |
| I <sub>DD</sub>  | supply current          |   | -    | 50                    | mA   |
| T <sub>stg</sub> | storage temperature     |   | -65  | +150                  | °C   |
| T <sub>amb</sub> | ambient temperature     |   | -40  | +85                   | °C   |
| P <sub>tot</sub> | total power dissipation | SO16 package [1]  | -    | 500                   | mW   |
| P                | power dissipation       | per output  | -    | 100                   | mW   |

[1] For SO16 package: P<sub>tot</sub> derates linearly with 8 mW/K above 70 °C.

## 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol           | Parameter                           | Conditions             | Min | Typ | Max             | Unit |
|------------------|-------------------------------------|------------------------|-----|-----|-----------------|------|
| V <sub>DD</sub>  | supply voltage                      |                        | 3   | -   | 15              | V    |
| V <sub>I</sub>   | input voltage                       |                        | 0   | -   | V <sub>DD</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 | in free air            | -40 | -   | +85             | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>DD</sub> = 5 V  | -   | -   | 3.75            | μs/V |
|                  |                                     | V <sub>DD</sub> = 10 V | -   | -   | 0.5             | μs/V |
|                  |                                     | V <sub>DD</sub> = 15 V | -   | -   | 0.08            | μs/V |

## 10. Static characteristics

**Table 6. Static characteristics**

$V_{SS} = 0\text{ V}$ ;  $V_I = V_{SS}$  or  $V_{DD}$  unless otherwise specified.

| Symbol   | Parameter                 | Conditions   | $V_{DD}$ | $T_{amb} = -40\text{ }^{\circ}\text{C}$ |           | $T_{amb} = 25\text{ }^{\circ}\text{C}$ |           | $T_{amb} = 85\text{ }^{\circ}\text{C}$ |           | Unit          |
|----------|---------------------------|--|----------|---|-----------|--|-----------|--|-----------|---------------|
|          |                           |  |          | Min                                     | Max       | Min                                    | Max       | Min                                    | Max       |               |
| $V_{IH}$ | HIGH-level input voltage  | $ I_O  < 1\text{ }\mu\text{A}$                                 | 5 V      | 3.5                                     | -         | 3.5                                    | -         | 3.5                                    | -         | V             |
|          |                           |  | 10 V     | 7.0                                     | -         | 7.0                                    | -         | 7.0                                    | -         | V             |
|          |                           |  | 15 V     | 11.0                                    | -         | 11.0                                   | -         | 11.0                                   | -         | V             |
| $V_{IL}$ | LOW-level input voltage   | $ I_O  < 1\text{ }\mu\text{A}$                                 | 5 V      | -                                       | 1.5       | -                                      | 1.5       | -                                      | 1.5       | V             |
|          |                           |  | 10 V     | -                                       | 3.0       | -                                      | 3.0       | -                                      | 3.0       | V             |
|          |                           |  | 15 V     | -                                       | 4.0       | -                                      | 4.0       | -                                      | 4.0       | V             |
| $V_{OH}$ | HIGH-level output voltage | $ I_O  < 1\text{ }\mu\text{A}$ ;<br>$V_I = V_{SS}$ or $V_{DD}$ | 5 V      | 4.95                                    | -         | 4.95                                   | -         | 4.95                                   | -         | V             |
|          |                           |  | 10 V     | 9.95                                    | -         | 9.95                                   | -         | 9.95                                   | -         | V             |
|          |                           |  | 15 V     | 14.95                                   | -         | 14.95                                  | -         | 14.95                                  | -         | V             |
| $V_{OL}$ | LOW-level output voltage  | $ I_O  < 1\text{ }\mu\text{A}$ ;<br>$V_I = V_{SS}$ or $V_{DD}$ | 5 V      | -                                       | 0.05      | -                                      | 0.05      | -                                      | 0.05      | V             |
|          |                           |  | 10 V     | -                                       | 0.05      | -                                      | 0.05      | -                                      | 0.05      | V             |
|          |                           |  | 15 V     | -                                       | 0.05      | -                                      | 0.05      | -                                      | 0.05      | V             |
| $I_{OH}$ | HIGH-level output current | $V_O = 2.5\text{ V}$   | 5 V      | -                                       | -1.7      | -                                      | -1.4      | -                                      | -1.1      | mA            |
|          |                           | $V_O = 4.6\text{ V}$   | 5 V      | -                                       | -0.52     | -                                      | -0.44     | -                                      | -0.36     | mA            |
|          |                           | $V_O = 9.5\text{ V}$   | 10 V     | -                                       | -1.3      | -                                      | -1.1      | -                                      | -0.9      | mA            |
|          |                           | $V_O = 13.5\text{ V}$  | 15 V     | -                                       | -3.6      | -                                      | -3.0      | -                                      | -2.4      | mA            |
| $I_{OL}$ | LOW-level output current  | $V_O = 0.4\text{ V}$   | 5 V      | 0.52                                    | -         | 0.44                                   | -         | 0.36                                   | -         | mA            |
|          |                           | $V_O = 0.5\text{ V}$   | 10 V     | 1.3                                     | -         | 1.1                                    | -         | 0.9                                    | -         | mA            |
|          |                           | $V_O = 1.5\text{ V}$   | 15 V     | 3.6                                     | -         | 3.0                                    | -         | 2.4                                    | -         | mA            |
| $I_I$    | input leakage current     | $V_{DD} = 15\text{ V}$   | 15 V     | -                                       | $\pm 0.3$ | -                                      | $\pm 0.3$ | -                                      | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{DD}$ | supply current            | $I_O = 0\text{ A}$ ;<br>$V_I = V_{SS}$ or $V_{DD}$             | 5 V      | -                                       | 20        | -                                      | 20        | -                                      | 150       | $\mu\text{A}$ |
|          |                           |  | 10 V     | -                                       | 40        | -                                      | 40        | -                                      | 300       | $\mu\text{A}$ |
|          |                           |  | 15 V     | -                                       | 80        | -                                      | 80        | -                                      | 600       | $\mu\text{A}$ |
| $C_I$    | input capacitance         |  | -        | -                                       | -         | 7.5                                    | -         | -                                      | pF        |               |

## 11. Dynamic characteristics

**Table 7. Dynamic characteristics**

$V_{SS} = 0\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ; for test circuit see Fig. 5; unless otherwise specified.

| Symbol    | Parameter                     | Conditions                     | $V_{DD}$   | Extrapolation formula                    | Min | Typ | Max | Unit |
|-----------|-------------------------------|--------------------------------|------------|--|-----|-----|-----|------|
| $t_{PHL}$ | HIGH to LOW propagation delay | nAn to nYn; see Fig. 4         | 5 V [1]    | $88\text{ ns} + (0.55\text{ ns/pF})C_L$  | -   | 115 | 230 | ns   |
|           |                               |                                | 10 V       | $34\text{ ns} + (0.23\text{ ns/pF})C_L$  | -   | 45  | 90  | ns   |
|           |                               |                                | 15 V       | $22\text{ ns} + (0.16\text{ ns/pF})C_L$  | -   | 30  | 65  | ns   |
|           |                               | n $\bar{E}$ to nYn; see Fig. 4 | 5 V [1]    | $98\text{ ns} + (0.55\text{ ns/pF})C_L$  | -   | 125 | 250 | ns   |
|           |                               |                                | 10 V       | $39\text{ ns} + (0.23\text{ ns/pF})C_L$  | -   | 50  | 95  | ns   |
|           |                               |                                | 15 V       | $22\text{ ns} + (0.16\text{ ns/pF})C_L$  | -   | 30  | 65  | ns   |
| $t_{PLH}$ | LOW to HIGH propagation delay | nAn to nYn; see Fig. 4         | 5 V [1]    | $113\text{ ns} + (0.55\text{ ns/pF})C_L$ | -   | 140 | 280 | ns   |
|           |                               |                                | 10 V       | $44\text{ ns} + (0.23\text{ ns/pF})C_L$  | -   | 55  | 105 | ns   |
|           |                               |                                | 15 V       | $32\text{ ns} + (0.16\text{ ns/pF})C_L$  | -   | 40  | 75  | ns   |
|           |                               | n $\bar{E}$ to nYn; see Fig. 4 | 5 V [1]    | $123\text{ ns} + (0.55\text{ ns/pF})C_L$ | -   | 150 | 295 | ns   |
|           |                               |                                | 10 V       | $44\text{ ns} + (0.23\text{ ns/pF})C_L$  | -   | 55  | 110 | ns   |
|           |                               |                                | 15 V       | $32\text{ ns} + (0.16\text{ ns/pF})C_L$  | -   | 40  | 75  | ns   |
| $t_t$     | transition time               | nYn; see Fig. 4                | 5 V [1][2] | $10\text{ ns} + (1.00\text{ ns/pF})C_L$  | -   | 60  | 120 | ns   |
|           |                               |                                | 10 V       | $9\text{ ns} + (0.42\text{ ns/pF})C_L$   | -   | 30  | 60  | ns   |
|           |                               |                                | 15 V       | $6\text{ ns} + (0.28\text{ ns/pF})C_L$   | -   | 20  | 40  | ns   |

[1] The typical values of the propagation delay and transition times are calculated from the extrapolation formulas shown ( $C_L$  in pF).

[2] Transition time  $t_t$  is the same as the HIGH to LOW and LOW to HIGH transition times  $t_{THL}$  and  $t_{TLH}$ .

**Table 8. Dynamic power dissipation  $P_D$**

$P_D$  can be calculated from the formulas shown.  $V_{SS} = 0\text{ V}$ ;  $t_r = t_f \leq 20\text{ ns}$ ;  $T_{amb} = 25\text{ °C}$ .

| Symbol | Parameter                 | $V_{DD}$ | Typical formula for $P_D$ ( $\mu\text{W}$ )                       | Where:   |
|--------|---------------------------|----------|---|--|
| $P_D$  | dynamic power dissipation | 5 V      | $P_D = 4500 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$  | $f_i$ = input frequency in MHz,<br>$f_o$ = output frequency in MHz,<br>$C_L$ = output load capacitance in pF,<br>$V_{DD}$ = supply voltage in V,<br>$\Sigma(f_o \times C_L)$ = sum of the outputs. |
|        |                           | 10 V     | $P_D = 18800 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ |  |
|        |                           | 15 V     | $P_D = 45700 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ |  |

11.1. Waveforms and test circuit

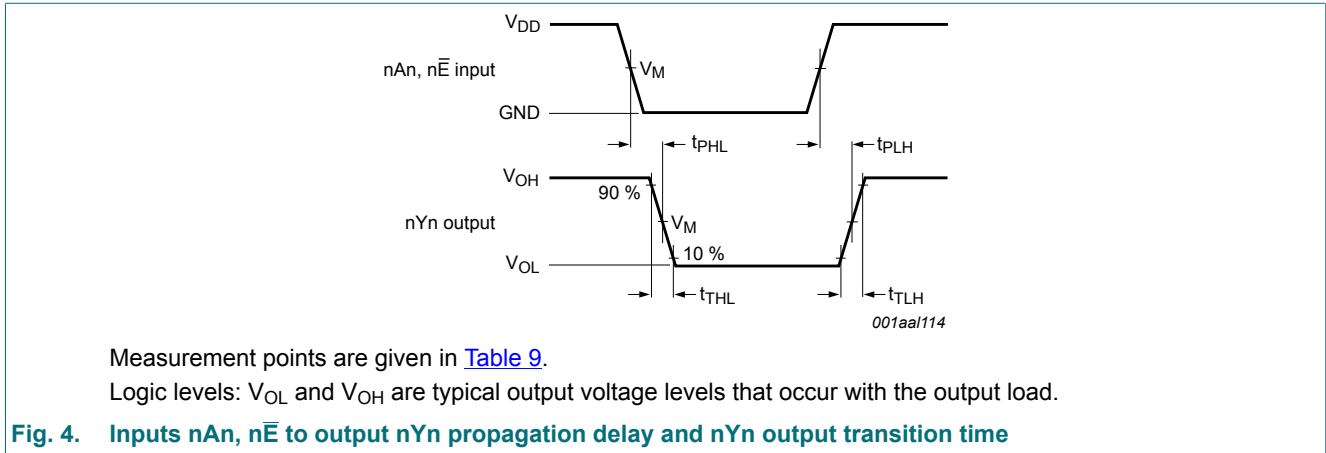


Table 9. Measurement points

| Supply voltage | Input       | Output      |
|----------------|-------------|-------------|
| $V_{DD}$       | $V_M$       | $V_M$       |
| 5 V to 15 V    | $0.5V_{DD}$ | $0.5V_{DD}$ |

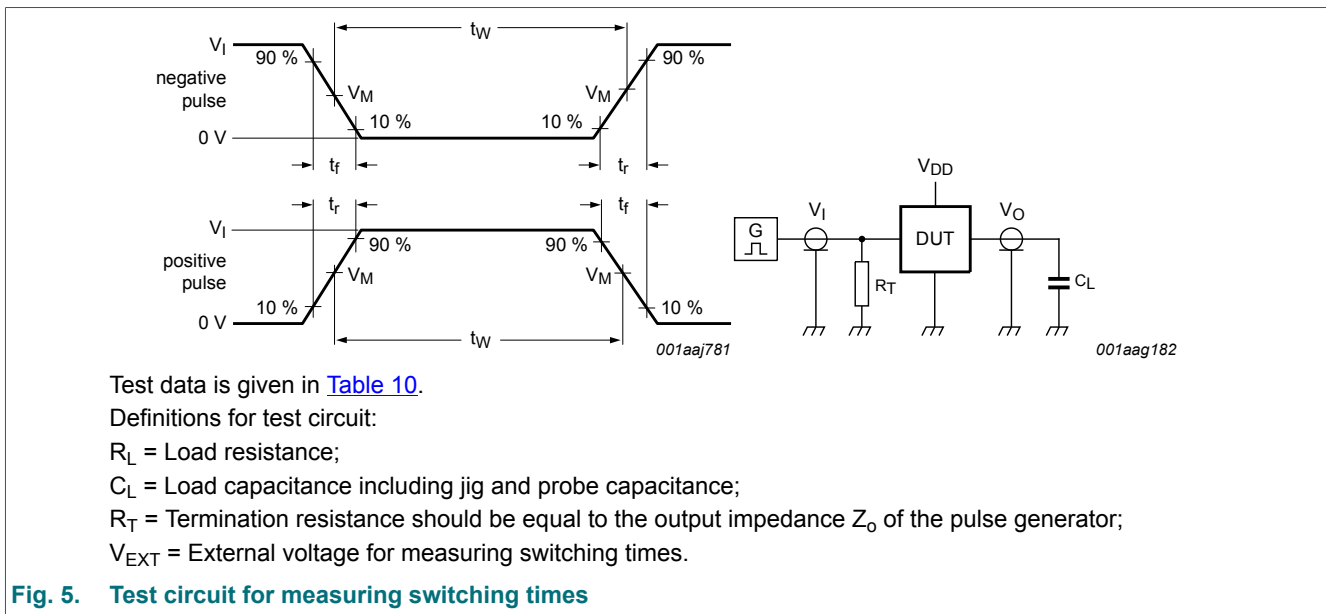


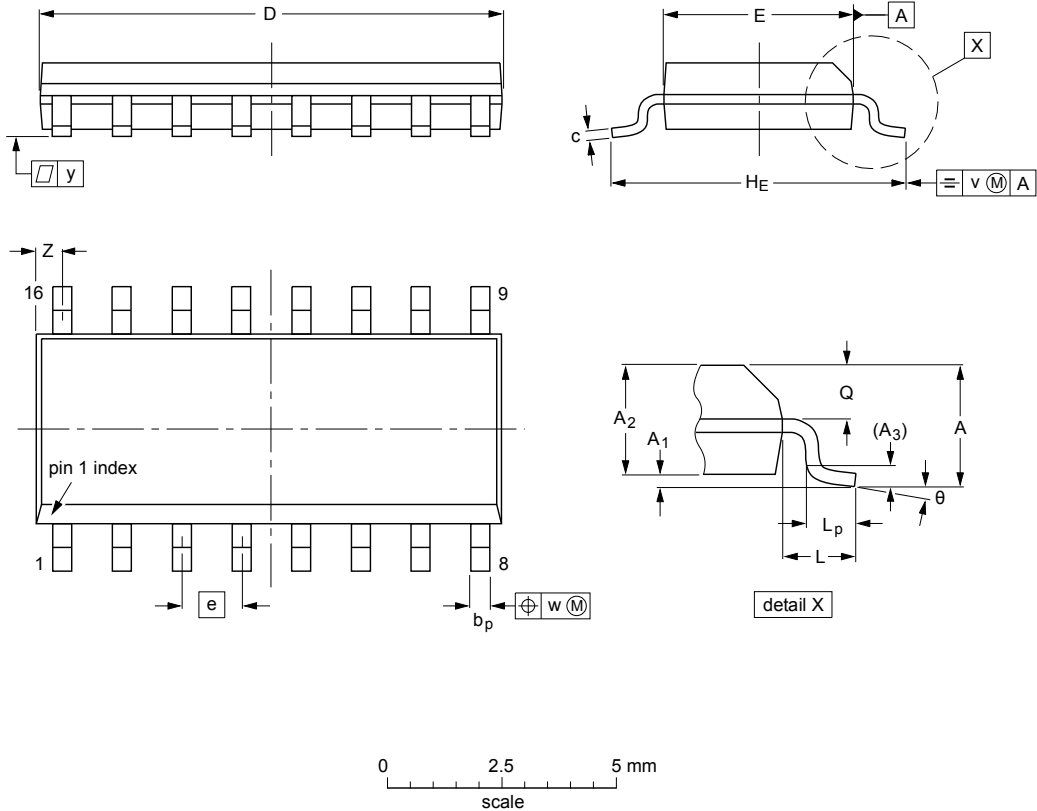
Table 10. Test data

| Supply voltage | Input    | Load  |
|----------------|----------|-------|
| $V_{DD}$       | $V_I$    | $C_L$ |
| 5 V to 15 V    | $V_{DD}$ | 50 pF |

## 12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



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

| UNIT   | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c                | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | Z <sup>(1)</sup> | $\theta$ |
|--------|--------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 1.75   | 0.25<br>0.10   | 1.45<br>1.25   | 0.25           | 0.49<br>0.36   | 0.25<br>0.19     | 10.0<br>9.8      | 4.0<br>3.8       | 1.27 | 6.2<br>5.8     | 1.05  | 1.0<br>0.4     | 0.7<br>0.6     | 0.25 | 0.25 | 0.1   | 0.7<br>0.3       | 8°<br>0° |
| inches | 0.069  | 0.010<br>0.004 | 0.057<br>0.049 | 0.01           | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.39<br>0.38     | 0.16<br>0.15     | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.020 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012   |          |

**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 |  |                     |                      |
| SOT109-1        | 076E07     | MS-012 |       |  |                     | 99-12-27<br>03-02-19 |

Fig. 6. Package outline SOT109-1 (SO16)

## 13. Revision history

Table 11. Revision history

| Document ID      | Release date  | Data sheet status     | Change notice | Supersedes       |
|------------------|---|-----------------------|---------------|------------------|
| HEF4555B v.7     | 20181015  | Product data sheet    | -             | HEF4555B v.6     |
| 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> </ul> |                       |               |                  |
| HEF4555B v.6     | 20160401  | Product data sheet    | -             | HEF4555B v.5     |
| Modifications:   | <ul style="list-style-type: none"> <li>Type number HEF4555BP (SOT38-4) removed.</li> </ul>  |                       |               |                  |
| HEF4555B v.5     | 20111118  | Product data sheet    | -             | HEF4555B v.4     |
| Modifications:   | <ul style="list-style-type: none"> <li><a href="#">Table 6</a>: <math>I_{OH}</math> minimum values changed to maximum</li> </ul>  |                       |               |                  |
| HEF4555B v.4     | 20100106  | Product data sheet    | -             | HEF4555B_CNV v.3 |
| HEF4555B_CNV v.3 | 19950101  | Product specification | -             | HEF4555B_CNV v.2 |
| HEF4555B_CNV v.2 | 19950101  | Product specification | -             | -                |

## 14. 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.
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