

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

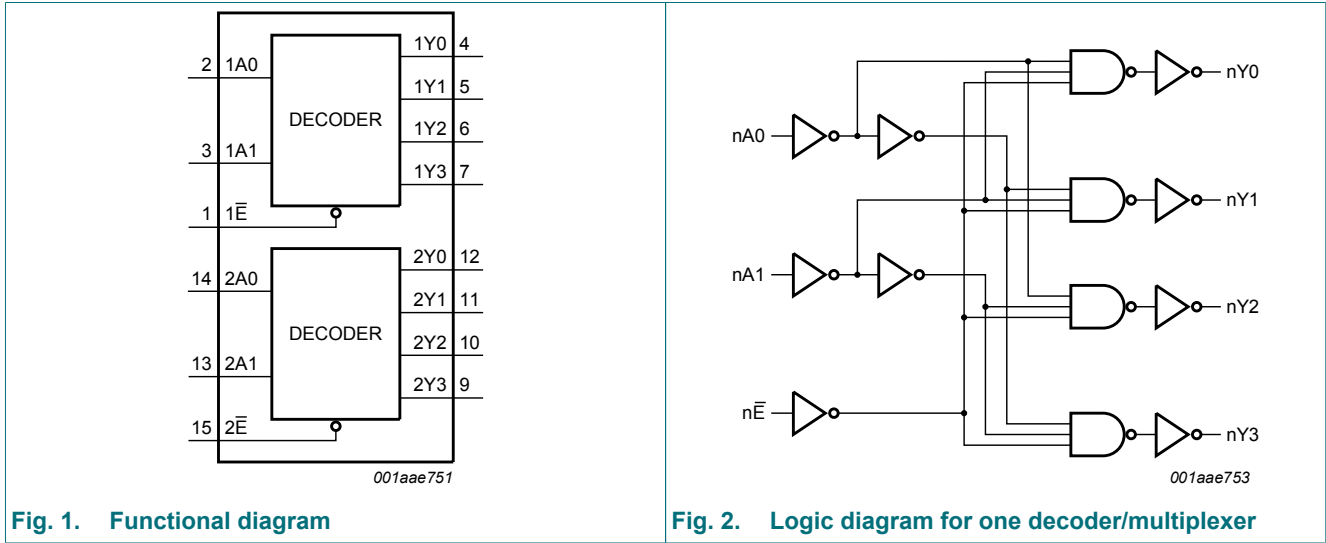


Fig. 1. Functional diagram

Fig. 2. Logic diagram for one decoder/multiplexer

6. Pinning information

6.1. Pinning

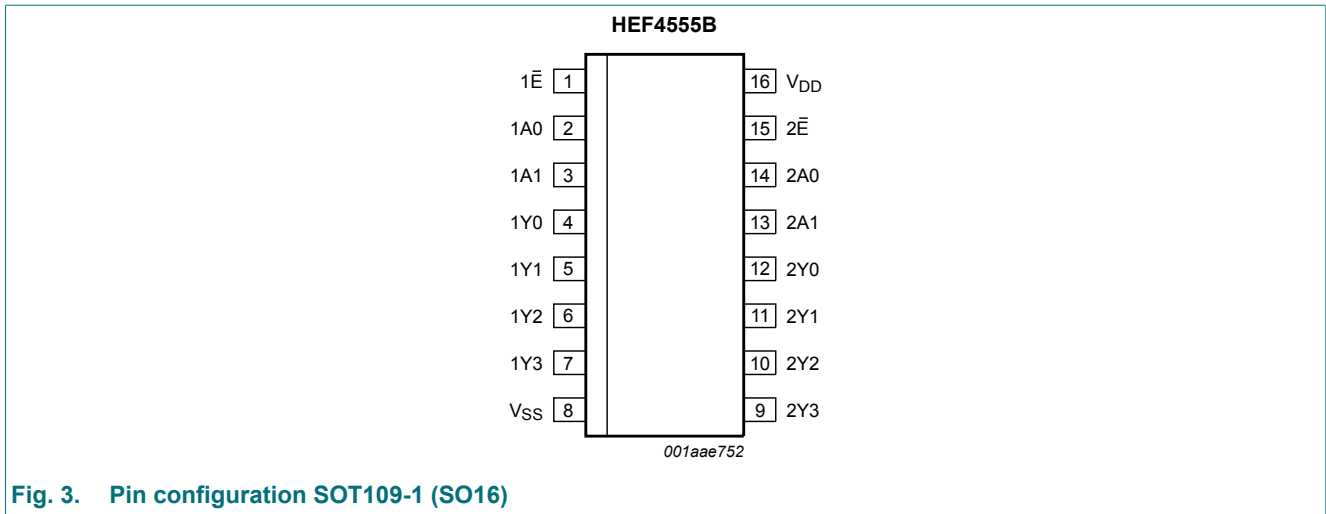


Fig. 3. Pin configuration SOT109-1 (SO16)

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 _{DD} | 16 | supply voltage |
| V _{SS} | 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 _{DD} | supply voltage | | -0.5 | +18 | V |
| I _{IK} | input clamping current | V _I < -0.5 V or V _I > V _{DD} + 0.5 V | - | ±10 | mA |
| V _I | input voltage | | -0.5 | V _{DD} + 0.5 | V |
| I _{OK} | output clamping current | V _O < -0.5 V or V _O > V _{DD} + 0.5 V | - | ±10 | mA |
| I _{I/O} | input/output current | | - | ±10 | mA |
| I _{DD} | supply current | | - | 50 | mA |
| T _{stg} | storage temperature | | -65 | +150 | °C |
| T _{amb} | ambient temperature | | -40 | +85 | °C |
| P _{tot} | total power dissipation | SO16 package [1] | - | 500 | mW |
| P | power dissipation | per output | - | 100 | mW |

[1] For SO16 package: P_{tot} 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 _{DD} | supply voltage | | 3 | - | 15 | V |
| V _I | input voltage | | 0 | - | V _{DD} | V |
| T _{amb} | ambient temperature | in free air | -40 | - | +85 | °C |
| Δt/ΔV | input transition rise and fall rate | V _{DD} = 5 V | - | - | 3.75 | μs/V |
| | | V _{DD} = 10 V | - | - | 0.5 | μs/V |
| | | V _{DD} = 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} | $T_{amb} = -40\text{ °C}$ | | $T_{amb} = 25\text{ °C}$ | | $T_{amb} = 85\text{ °C}$ | | 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}$; $V_I = V_{SS}$ 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}$; $V_I = V_{SS}$ 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 | - | ± 0.3 | - | ± 0.3 | - | ± 1.0 | μA |
| I_{DD} | supply current | $I_O = 0\text{ A}$; $V_I = V_{SS}$ or V_{DD} | 5 V | - | 20 | - | 20 | - | 150 | μA |
| | | | 10 V | - | 40 | - | 40 | - | 300 | μA |
| | | | 15 V | - | 80 | - | 80 | - | 600 | μA |
| 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 (μW) | 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, f_o = output frequency in MHz, C_L = output load capacitance in pF, V_{DD} = supply voltage in V, $\Sigma(f_o \times C_L)$ = 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

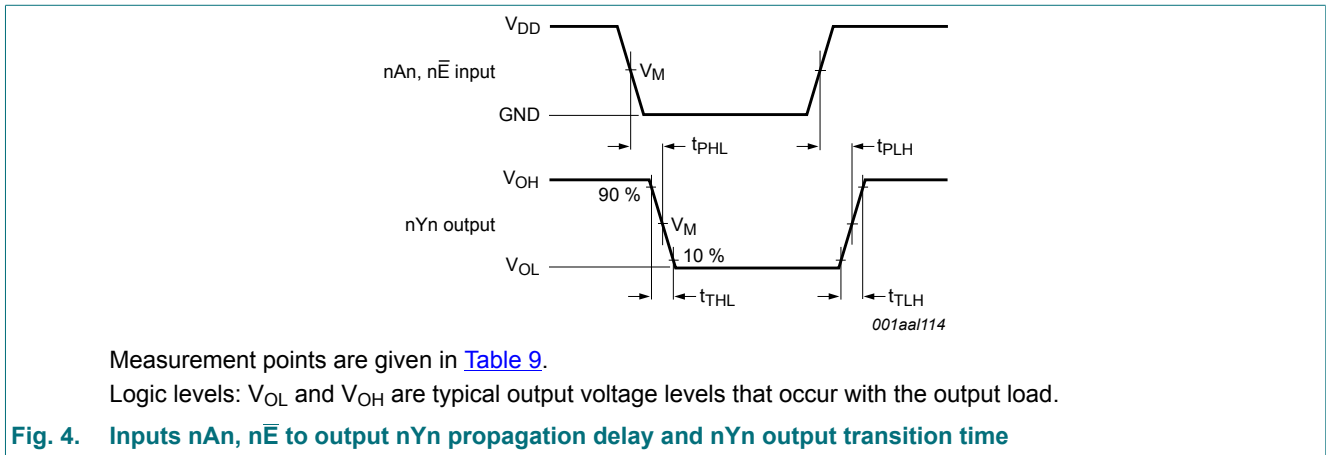


Table 9. Measurement points

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

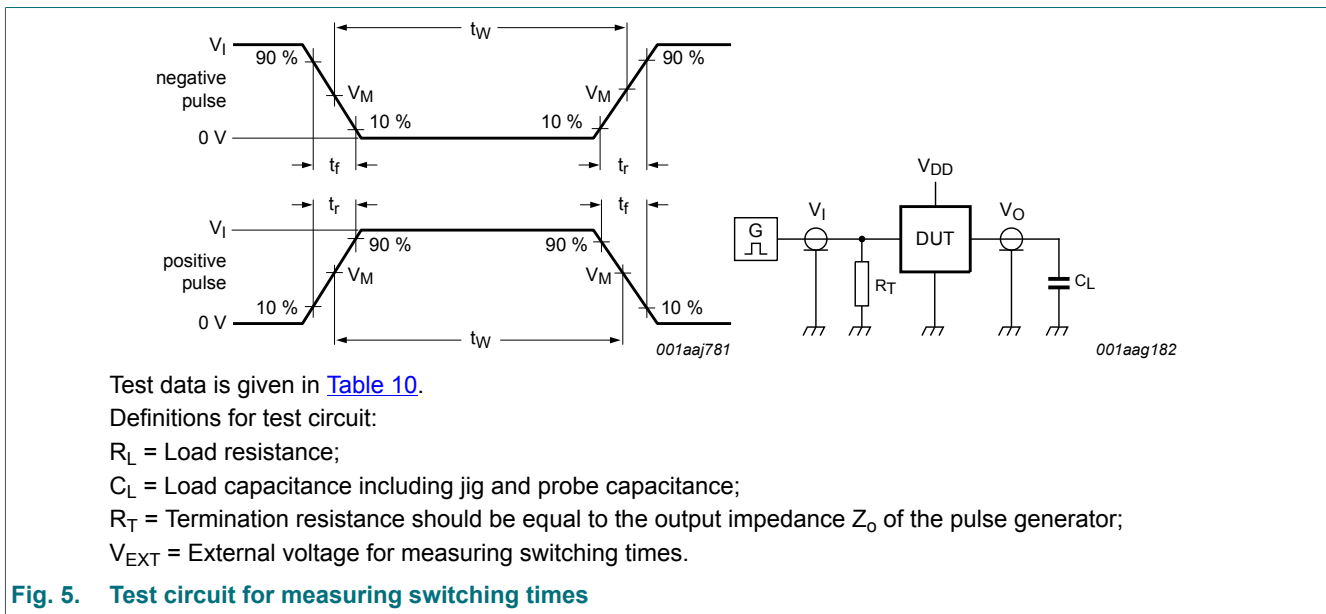


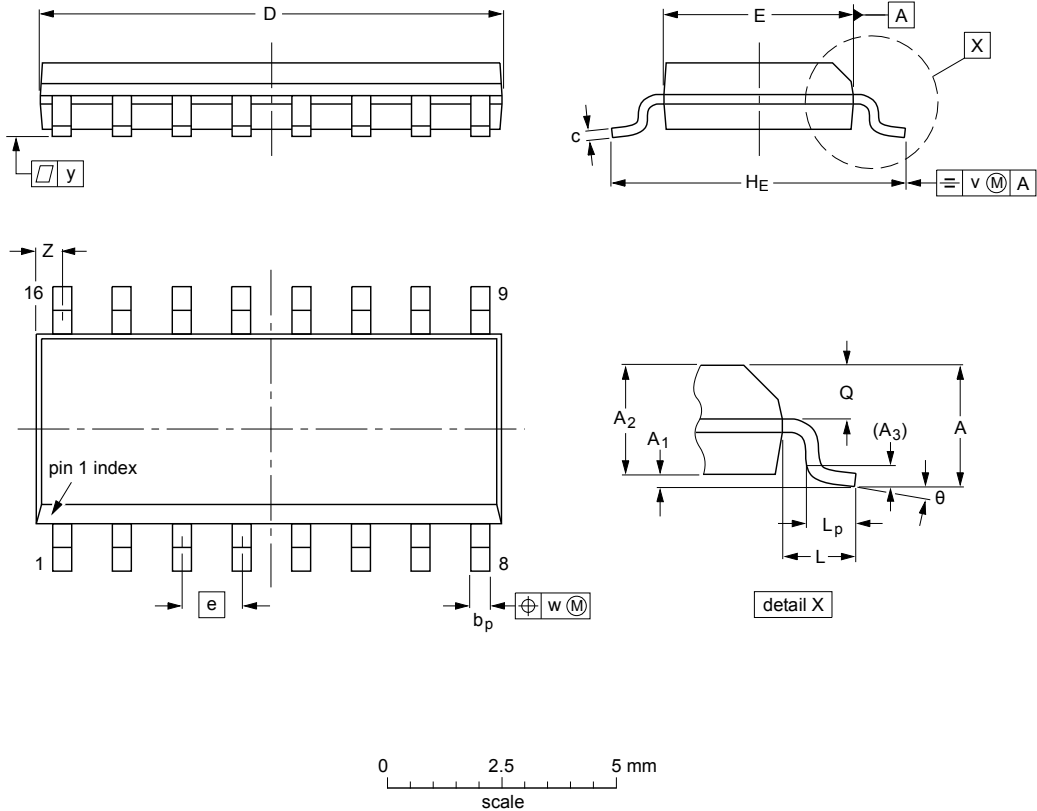
Table 10. Test data

| Supply voltage | Input | Load |
|----------------|----------|----------------------|
| V_{DD} | V_I | C_L |
| 5 V to 15 V | V_{DD} | $\leq 20 \text{ ns}$ |
| | | 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 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 | 1.75 | 0.25 0.10 | 1.45 1.25 | 0.25 | 0.49 0.36 | 0.25 0.19 | 10.0 9.8 | 4.0 3.8 | 1.27 | 6.2 5.8 | 1.05 | 1.0 0.4 | 0.7 0.6 | 0.25 | 0.25 | 0.1 | 0.7 0.3 | 8° 0° |
| inches | 0.069 | 0.010 0.004 | 0.057 0.049 | 0.01 | 0.019 0.014 | 0.0100 0.0075 | 0.39 0.38 | 0.16 0.15 | 0.05 | 0.244 0.228 | 0.041 | 0.039 0.016 | 0.028 0.020 | 0.01 | 0.01 | 0.004 | 0.028 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 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"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. | | | |
| HEF4555B v.6 | 20160401 | Product data sheet | - | HEF4555B v.5 |
| Modifications: | <ul style="list-style-type: none"> Type number HEF4555BP (SOT38-4) removed. | | | |
| HEF4555B v.5 | 20111118 | Product data sheet | - | HEF4555B v.4 |
| Modifications: | <ul style="list-style-type: none"> Table 6: I_{OH} minimum values changed to maximum | | | |
| 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. |

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