# 74HC245; 74HCT245

## Octal bus tranceiver; 3-state

Rev. 03 — 31 January 2005 Product data sheet

## 1. General description

The 74HC245; 74HCT245 is a high-speed Si-gate CMOS device and is pin compatible with Low-Power Schottky TTL (LSTTL).

The 74HC245; 74HCT245 is an octal transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The 74HC245; 74HCT245 features an output enable input ($\overline{OE}$) for easy cascading and a send/receive input (DIR) for direction control. $\overline{OE}$ controls the outputs so that the buses are effectively isolated.

The 74HC245; 74HCT245 is similar to the 74HC640; 74HCT640 but has true (non-inverting) outputs.

## 2. Features

- Octal bidirectional bus interface
- Non-inverting 3-state outputs
- Multiple package options
- Complies with JEDEC standard no. 7A
- ESD protection:
  - HBM EIA/JESD22-A114-B exceeds 2000 V
  - MM EIA/JESD22-A115-A exceeds 200 V
- Specified from –40 °C to +85 °C and from –40 °C to +125 °C

## 3. Quick reference data

**Table 1: Quick reference data**

*GND = 0 V; $T_{amb}$ = 25 °C; $t_r = t_f$ = 6 ns.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Type 74HC245** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | $C_L$ = 15 pF; $V_{CC}$ = 5 V | | - | 7 | - | ns |
| $C_I$ | input capacitance | | | - | 3.5 | - | pF |
| $C_{I/O}$ | input/output capacitance | | | - | 10 | - | pF |
| $C_{PD}$ | power dissipation capacitance per transceiver | $V_I$ = GND to $V_{CC}$ | [1] | - | 30 | - | pF |
| **Type 74HCT245** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | $C_L$ = 15 pF; $V_{CC}$ = 5 V | | - | 10 | - | ns |

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**Table 1: Quick reference data** *...continued*

*GND = 0 V; $T_{amb}$ = 25 °C; $t_r = t_f$ = 6 ns.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $C_I$ | input capacitance | | | - | 3.5 | - | pF |
| $C_{I/O}$ | input/output capacitance | | | - | 10 | - | pF |
| $C_{PD}$ | power dissipation capacitance per transceiver | $V_I$ = GND to $V_{CC}$ − 1.5 V | [1] | - | 30 | - | pF |

[1] $C_{PD}$ 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 inputs switching;
$\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

## 4. Ordering information

**Table 2: Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HC245N | –40 °C to +125 °C | DIP20 | plastic dual in-line package; 20 leads (300 mil) | SOT146-1 |
| 74HC245D | –40 °C to +125 °C | SO20 | plastic small outline package; 20 leads; body width 7.5 mm | SOT163-1 |
| 74HC245PW | –40 °C to +125 °C | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |
| 74HC245DB | –40 °C to +125 °C | SSOP20 | plastic shrink small outline package; 20 leads; body width 5.3 mm | SOT339-1 |
| 74HC245BQ | –40 °C to +125 °C | DHVQFN20 | plastic dual-in-line compatible thermal enhanced very thin quad flat package no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm | SOT764-1 |
| 74HCT245N | –40 °C to +125 °C | DIP20 | plastic dual in-line package; 20 leads (300 mil) | SOT146-1 |
| 74HCT245D | –40 °C to +125 °C | SO20 | plastic small outline package; 20 leads; body width 7.5 mm | SOT163-1 |
| 74HCT245PW | –40 °C to +125 °C | TSSOP20 | plastic thin shrink small outline package; 20 leads; body width 4.4 mm | SOT360-1 |
| 74HCT245DB | –40 °C to +125 °C | SSOP20 | plastic shrink small outline package; 20 leads; body width 5.3 mm | SOT339-1 |
| 74HCT245BQ | –40 °C to +125 °C | DHVQFN20 | plastic dual-in-line compatible thermal enhanced very thin quad flat package no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm | SOT764-1 |

## 5. Functional diagram

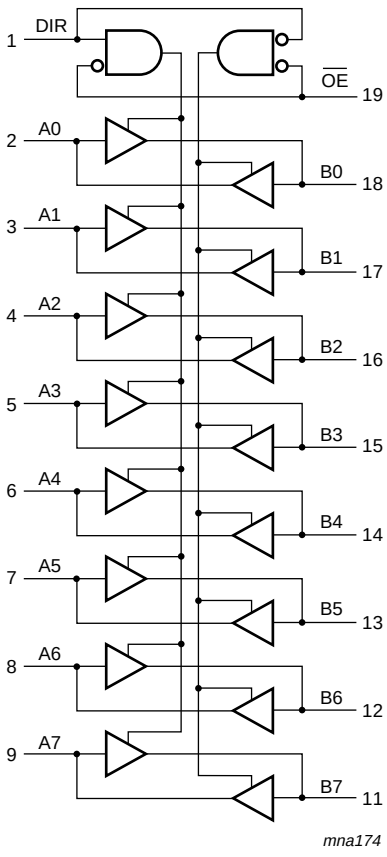



Fig 1. Logic symbol

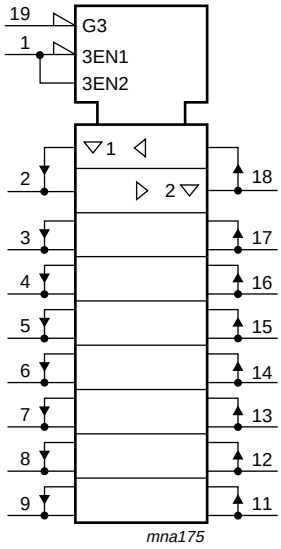



Fig 2. IEC logic symbol

# 6. Pinning information

## 6.1 Pinning

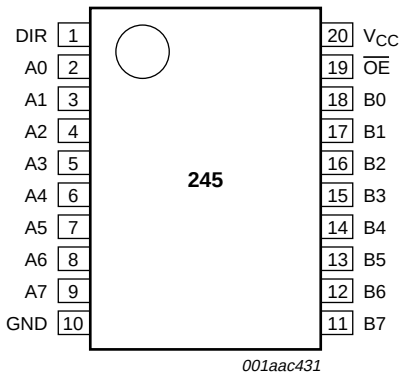
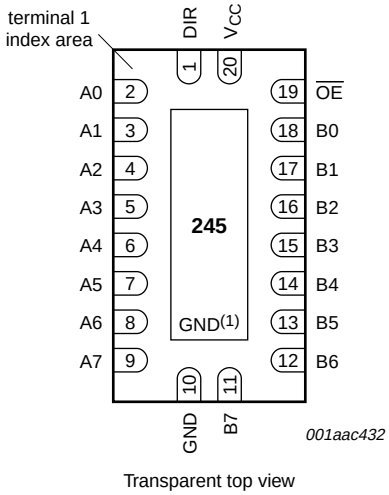



Fig 3. Pin configuration DIP20, SO20, SSOP20 and TSSOP20




Transparent top view

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

Fig 4. Pin configuration DHVQFN20

## 6.2 Pin description

Table 3: Pin description

| Symbol | Pin | Description |
|---|---|---|
| DIR | 1 | direction control |
| A0 | 2 | data input/output |
| A1 | 3 | data input/output |
| A2 | 4 | data input/output |
| A3 | 5 | data input/output |
| A4 | 6 | data input/output |
| A5 | 7 | data input/output |
| A6 | 8 | data input/output |
| A7 | 9 | data input/output |
| GND | 10 | ground (0 V) |
| B7 | 11 | data input/output |
| B6 | 12 | data input/output |
| B5 | 13 | data input/output |
| B4 | 14 | data input/output |
| B3 | 15 | data input/output |
| B2 | 16 | data input/output |

**Table 3: Pin description** *...continued*

| Symbol | Pin | Description |
|---|---|---|
| B1 | 17 | data input/output |
| B0 | 18 | data input/output |
| $\overline{OE}$ | 19 | output enable input (active LOW) |
| $V_{CC}$ | 20 | supply voltage |

# 7. Functional description

## 7.1 Function table

**Table 4: Function table** [1]

| Input | | Input/output | |
|---|---|---|---|
| $\overline{OE}$ | DIR | An | Bn |
| L | L | A = B | input |
| L | H | input | B = A |
| H | X | Z | Z |

[1] H = HIGH voltage level;
L = LOW voltage level;
X = don't care;
Z = high-impedance OFF-state.

# 8. Limiting values

**Table 5: 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 | V |
| $I_{IK}$ | input diode current | $V_I < –0.5$ V or $V_I > V_{CC} + 0.5$ V | - | ±20 | mA |
| $I_{OK}$ | output diode current | $V_O < –0.5$ V or $V_O > V_{CC} + 0.5$ V | - | ±20 | mA |
| $I_O$ | output source or sink current | $V_O = –0.5$ V to $V_{CC} + 0.5$ V | - | ±35 | mA |
| $I_{CC}$, $I_{GND}$ | $V_{CC}$ or GND current | | - | ±70 | mA |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $P_{tot}$ | total power dissipation | [1] | | | |
| | DIP20 package | | - | 750 | mW |
| | SO20, SSOP20, TSSOP20 and DHVQFN20 packages | | - | 500 | mW |

[1] For DIP20 packages: above 70 °C, $P_{tot}$ derates linearly with 12 mW/K.
For SO20 packages: above 70 °C, $P_{tot}$ derates linearly with 8 mW/K.
For SSOP20 and TSSOP20 packages: above 60 °C, $P_{tot}$ derates linearly with 5.5 mW/K.
For DHVQFN20 packages: above 60 °C, $P_{tot}$ derates linearly with 4.5 mW/K.

## 9. Recommended operating conditions

**Table 6: Recommended operating conditions**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Type 74HC245** | | | | | | |
| $V_{CC}$ | 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 |
| $t_r$, $t_f$ | input rise and fall times | $V_{CC}$ = 2.0 V | - | - | 1000 | ns |
| | | $V_{CC}$ = 4.5 V | - | 6.0 | 500 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 400 | ns |
| $T_{amb}$ | ambient temperature | | –40 | - | +125 | °C |
| **Type 74HCT245** | | | | | | |
| $V_{CC}$ | 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 |
| $t_r$, $t_f$ | input rise and fall times | $V_{CC}$ = 4.5 V | - | 6.0 | 500 | ns |
| $T_{amb}$ | ambient temperature | | –40 | - | +125 | °C |

## 10. Static characteristics

**Table 7: Static characteristics type 74HC245**

*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 $V_{IL}$ | | | | |
| | | $I_O$ = –20 µA; $V_{CC}$ = 2.0 V | 1.9 | 2.0 | - | V |
| | | $I_O$ = –20 µA; $V_{CC}$ = 4.5 V | 4.4 | 4.5 | - | V |
| | | $I_O$ = –20 µA; $V_{CC}$ = 6.0 V | 5.9 | 6.0 | - | V |
| | | $I_O$ = –6.0 mA; $V_{CC}$ = 4.5 V | 3.98 | 4.32 | - | V |
| | | $I_O$ = –7.8 mA; $V_{CC}$ = 6.0 V | 5.48 | 5.81 | - | V |

**Table 7: Static characteristics type 74HC245** *…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 $V_{IL}$ | | | | |
| | | $I_O$ = 20 µA; $V_{CC}$ = 2.0 V | - | 0 | 0.1 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 4.5 V | - | 0 | 0.1 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 6.0 V | - | 0 | 0.1 | V |
| | | $I_O$ = 6.0 mA; $V_{CC}$ = 4.5 V | - | 0.15 | 0.26 | V |
| | | $I_O$ = 7.8 mA; $V_{CC}$ = 6.0 V | - | 0.16 | 0.26 | V |
| $I_{LI}$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±0.1 | µA |
| $I_{OZ}$ | OFF-state output current | $V_I = V_{IH}$ or $V_{IL}$; $V_O = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±0.5 | µA |
| $I_{CC}$ | quiescent supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 8.0 | µA |
| $C_I$ | input capacitance | | - | 3.5 | - | pF |
| $C_{I/O}$ | input/output capacitance | | - | 10 | - | 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 $V_{IL}$ | | | | |
| | | $I_O$ = −20 µA; $V_{CC}$ = 2.0 V | 1.9 | - | - | V |
| | | $I_O$ = −20 µA; $V_{CC}$ = 4.5 V | 4.4 | - | - | V |
| | | $I_O$ = −20 µA; $V_{CC}$ = 6.0 V | 5.9 | - | - | V |
| | | $I_O$ = −6.0 mA; $V_{CC}$ = 4.5 V | 3.84 | - | - | V |
| | | $I_O$ = −7.8 mA; $V_{CC}$ = 6.0 V | 5.34 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = 20 µA; $V_{CC}$ = 2.0 V | - | - | 0.1 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 4.5 V | - | - | 0.1 | V |
| | | $I_O$ = 20 µA; $V_{CC}$ = 6.0 V | - | - | 0.1 | V |
| | | $I_O$ = 6.0 mA; $V_{CC}$ = 4.5 V | - | - | 0.33 | V |
| | | $I_O$ = 7.8 mA; $V_{CC}$ = 6.0 V | - | - | 0.33 | V |
| $I_{LI}$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±1.0 | µA |
| $I_{OZ}$ | OFF-state output current | $V_I = V_{IH}$ or $V_{IL}$; $V_O = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±5.0 | µA |
| $I_{CC}$ | quiescent supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 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 |

**Table 7: Static characteristics type 74HC245** *...continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{IL}$ | 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 $V_{IL}$ | | - | | |
| | | $I_O$ = –20 μA; $V_{CC}$ = 2.0 V | 1.9 | - | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 4.5 V | 4.4 | - | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 6.0 V | 5.9 | - | - | V |
| | | $I_O$ = –6.0 mA; $V_{CC}$ = 4.5 V | 3.7 | - | - | V |
| | | $I_O$ = –7.8 mA; $V_{CC}$ = 6.0 V | 5.2 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | - | | |
| | | $I_O$ = 20 μA; $V_{CC}$ = 2.0 V | - | - | 0.1 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 4.5 V | - | - | 0.1 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 6.0 V | - | - | 0.1 | V |
| | | $I_O$ = 6.0 mA; $V_{CC}$ = 4.5 V | - | - | 0.4 | V |
| | | $I_O$ = 7.8 mA; $V_{CC}$ = 6.0 V | - | - | 0.4 | V |
| $I_{LI}$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±1.0 | μA |
| $I_{OZ}$ | OFF-state output current | $V_I = V_{IH}$ or $V_{IL}$; $V_O = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±10.0 | μA |
| $I_{CC}$ | quiescent supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 160 | μA |

**Table 8: Static characteristics type 74HCT245**

*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 |
| | | $I_O$ = –6 mA | 3.98 | 4.32 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$; $V_{CC}$ = 4.5 V | | | | |
| | | $I_O$ = 20 μA | - | 0 | 0.1 | V |
| | | $I_O$ = 6.0 mA | - | 0.15 | 0.26 | V |
| $I_{LI}$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 5.5 V | - | - | ±0.1 | μA |
| $I_{OZ}$ | OFF-state output current | $V_I = V_{IH}$ or $V_{IL}$; $V_{CC}$ = 5.5 V; $V_O = V_{CC}$ or GND per input pin; other inputs at $V_{CC}$ or GND; $I_O$ = 0 A | - | - | ±0.5 | μA |
| $I_{CC}$ | quiescent supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | - | 8.0 | μA |

**Table 8: Static characteristics type 74HCT245** *…continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $\Delta I_{CC}$ | additional quiescent supply current per input pin | $V_I = V_{CC} - 2.1$ V; other inputs at $V_I = V_{CC}$ or GND; $V_{CC}$ = 4.5 V to 5.5 V; $I_O$ = 0 A | | | | |
| | An or Bn inputs | | - | 40 | 144 | µA |
| | $\overline{OE}$ input | | - | 150 | 540 | µA |
| | DIR input | | - | 90 | 324 | µA |
| $C_I$ | input capacitance | | - | 3.5 | - | pF |
| $C_{I/O}$ | input/output capacitance | | - | 10 | - | 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 |
| | | $I_O$ = –6 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 |
| | | $I_O$ = 6.0 mA | - | - | 0.33 | V |
| $I_{LI}$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 5.5 V | - | - | ±1.0 | µA |
| $I_{OZ}$ | OFF-state output current | $V_I = V_{IH}$ or $V_{IL}$; $V_{CC}$ = 5.5 V; $V_O = V_{CC}$ or GND per input pin; other inputs at $V_{CC}$ or GND; $I_O$ = 0 A | - | - | ±5.0 | µA |
| $I_{CC}$ | quiescent supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | - | 80 | µA |
| $\Delta I_{CC}$ | additional quiescent supply current per input pin | $V_I = V_{CC} - 2.1$ V; other inputs at $V_I = V_{CC}$ or GND; $V_{CC}$ = 4.5 V to 5.5 V; $I_O$ = 0 A | | | | |
| | An or Bn inputs | | - | - | 180 | µA |
| | $\overline{OE}$ input | | - | - | 675 | µA |
| | DIR input | | - | - | 405 | 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 |
| | | $I_O$ = –6 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 |
| | | $I_O$ = 6.0 mA | - | - | 0.4 | V |
| $I_{LI}$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 5.5 V | - | - | ±1.0 | µA |
| $I_{OZ}$ | OFF-state output current | $V_I = V_{IH}$ or $V_{IL}$; $V_{CC}$ = 5.5 V; $V_O = V_{CC}$ or GND per input pin; other inputs at $V_{CC}$ or GND; $I_O$ = 0 A | - | - | ±10 | µA |

**Table 8: Static characteristics type 74HCT245** *…continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $I_{CC}$ | quiescent supply current | $V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V | - | - | 160 | µA |
| $\Delta I_{CC}$ | additional quiescent supply current per input pin | $V_I = V_{CC} - 2.1$ V; other inputs at $V_I = V_{CC}$ or GND; $V_{CC} = 4.5$ V to 5.5 V; $I_O = 0$ A | | | | |
| | An or Bn inputs | | - | - | 196 | µA |
| | $\overline{OE}$ input | | - | - | 735 | µA |
| | DIR input | | - | - | 441 | µA |

## 11. Dynamic characteristics

**Table 9: Dynamic characteristics type 74HC245**

*GND = 0 V; test circuit see Figure 7.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | see Figure 5 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | 25 | 90 | ns |
| | | $V_{CC}$ = 4.5 V | | - | 9 | 18 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | | - | 7 | - | ns |
| | | $V_{CC}$ = 6.0 V | | - | 7 | 15 | ns |
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | see Figure 6 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | 30 | 150 | ns |
| | | $V_{CC}$ = 4.5 V | | - | 11 | 30 | ns |
| | | $V_{CC}$ = 6.0 V | | - | 9 | 26 | ns |
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | see Figure 6 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | 41 | 150 | ns |
| | | $V_{CC}$ = 4.5 V | | - | 15 | 30 | ns |
| | | $V_{CC}$ = 6.0 V | | - | 12 | 26 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | see Figure 5 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | 14 | 60 | ns |
| | | $V_{CC}$ = 4.5 V | | - | 5 | 12 | ns |
| | | $V_{CC}$ = 6.0 V | | - | 4 | 10 | ns |
| $C_{PD}$ | power dissipation capacitance per transceiver | $V_I$ = GND to $V_{CC}$ | [1] | - | 30 | - | pF |
| **$T_{amb}$ = −40 °C to +85 °C** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | see Figure 5 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | - | 115 | ns |
| | | $V_{CC}$ = 4.5 V | | - | - | 23 | ns |
| | | $V_{CC}$ = 6.0 V | | - | - | 20 | ns |

**Table 9: Dynamic characteristics type 74HC245** *…continued*

*GND = 0 V; test circuit see Figure 7.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 190 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 38 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 33 | ns |
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 190 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 38 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 33 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | see Figure 5 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 75 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 15 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 13 | ns |
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | see Figure 5 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 135 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 27 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 23 | ns |
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 225 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 45 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 38 | ns |
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 225 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 45 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 38 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | see Figure 5 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 90 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 18 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 15 | ns |

[1] $C_{PD}$ 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 inputs switching;
$\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

**Table 10: Dynamic characteristics type 74HCT245**

*GND = 0 V; test circuit see Figure 7.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | see Figure 5 | | | | | |
| | | $V_{CC}$ = 4.5 V | | - | 12 | 22 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | | - | 10 | - | ns |
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | $V_{CC}$ = 4.5 V; see Figure 6 | | - | 16 | 30 | ns |
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | $V_{CC}$ = 4.5 V; see Figure 6 | | - | 16 | 30 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | $V_{CC}$ = 4.5 V; see Figure 5 | | - | 5 | 12 | ns |
| $C_{PD}$ | power dissipation capacitance per transceiver | $V_I$ = GND to $V_{CC}$ − 1.5 V | [1] | - | 30 | - | pF |
| **$T_{amb}$ = −40 °C to +85 °C** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | $V_{CC}$ = 4.5 V; see Figure 5 | | - | - | 28 | ns |
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | $V_{CC}$ = 4.5 V; see Figure 6 | | - | - | 38 | ns |
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | $V_{CC}$ = 4.5 V; see Figure 6 | | - | - | 38 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | $V_{CC}$ = 4.5 V; see Figure 5 | | - | - | 15 | ns |
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay An to Bn or Bn to An | $V_{CC}$ = 4.5 V; see Figure 5 | | - | - | 33 | ns |
| $t_{PZH}$, $t_{PZL}$ | 3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | $V_{CC}$ = 4.5 V; see Figure 6 | | - | - | 45 | ns |
| $t_{PHZ}$, $t_{PLZ}$ | 3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn | $V_{CC}$ = 4.5 V; see Figure 6 | | - | - | 45 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | $V_{CC}$ = 4.5 V; see Figure 5 | | - | - | 18 | ns |

[1] $C_{PD}$ 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;

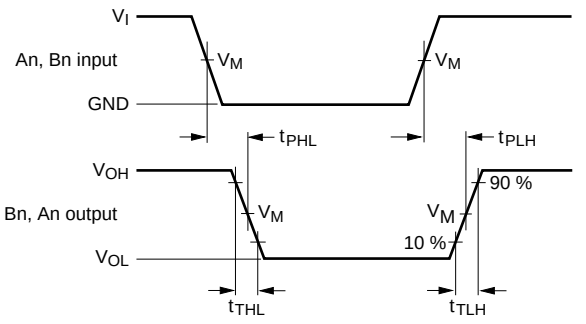
$C_L$ = output load capacitance in pF;

$V_{CC}$ = supply voltage in V;

N = number of inputs switching;

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

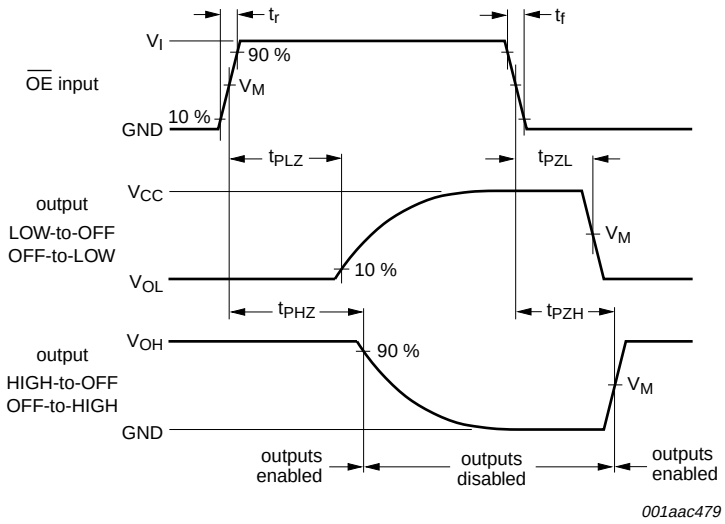
## 12. Waveforms




Measurement points are given in Table 11.

$V_{OL}$ and $V_{OH}$ are typical voltage output drop that occur with the output load.

**Fig 5. Input (An, Bn) to output (Bn, An) propagation delays and output transition times**



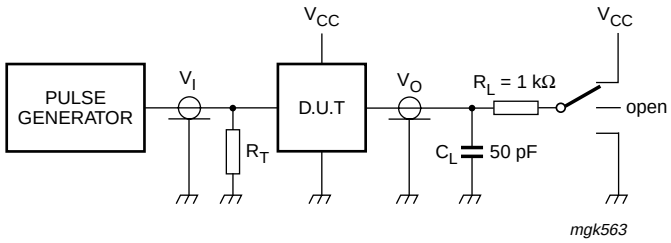

Measurement points are given in Table 11.

$V_{OL}$ and $V_{OH}$ are typical voltage output drop that occur with the output load.

**Fig 6. 3-state output enable and disable times**

**Table 11: Measurement points**

| Type | Input | Output |
|---|---|---|
| | $V_M$ | $V_M$ |
| 74HC245 | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT245 | 1.3 V | 1.3 V |




Test data is given in Table 12.

Definitions 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.

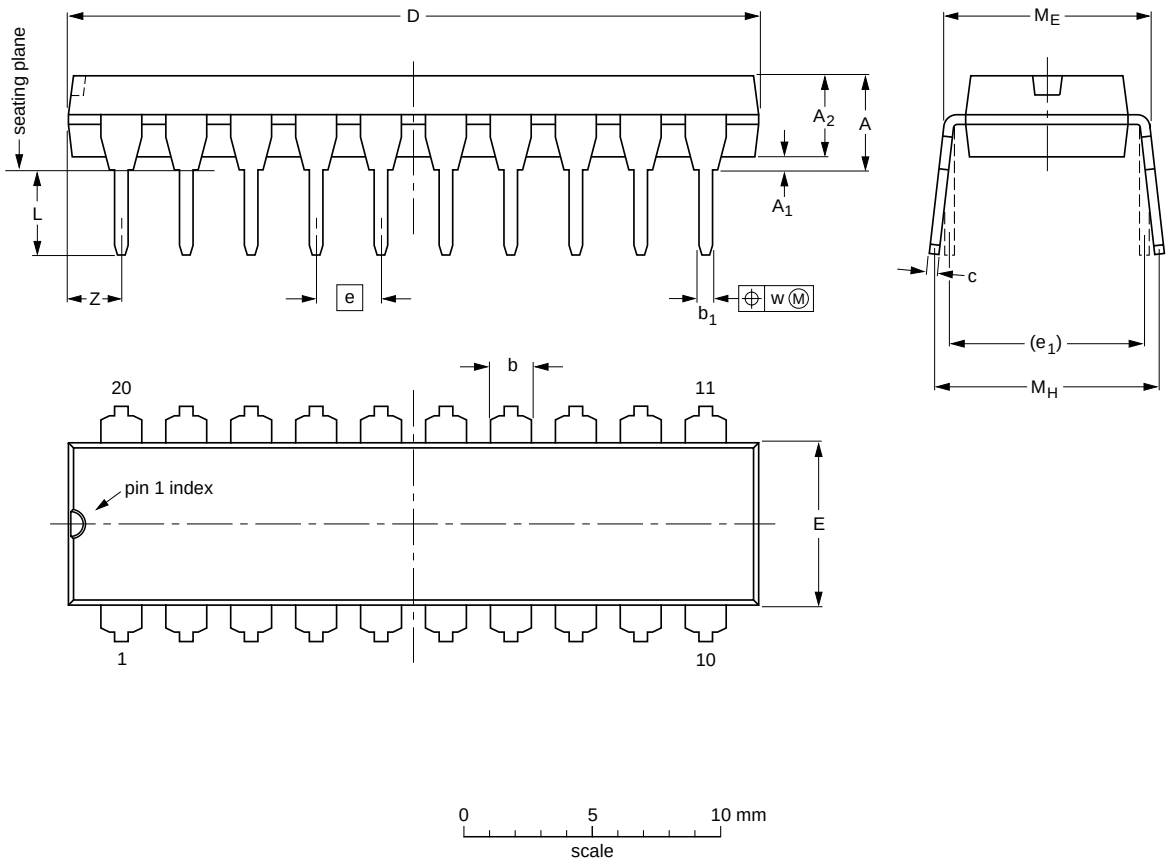
**Fig 7. Load circuitry for switching times**

**Table 12: Test data**

| Type | Input | | Test | | |
|---|---|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $t_{PHL}$, $t_{PLH}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$ |
| 74HC245 | $V_{CC}$ | 6 ns | open | GND | $V_{CC}$ |
| 74HCT245 | 3 V | 6 ns | open | GND | $V_{CC}$ |

## 13. Package outline

**DIP20: plastic dual in-line package; 20 leads (300 mil)** **SOT146-1**




**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 | 4.2 | 0.51 | 3.2 | 1.73<br>1.30 | 0.53<br>0.38 | 0.36<br>0.23 | 26.92<br>26.54 | 6.40<br>6.22 | 2.54 | 7.62 | 3.60<br>3.05 | 8.25<br>7.80 | 10.0<br>8.3 | 0.254 | 2 |
| inches | 0.17 | 0.02 | 0.13 | 0.068<br>0.051 | 0.021<br>0.015 | 0.014<br>0.009 | 1.060<br>1.045 | 0.25<br>0.24 | 0.1 | 0.3 | 0.14<br>0.12 | 0.32<br>0.31 | 0.39<br>0.33 | 0.01 | 0.078 |

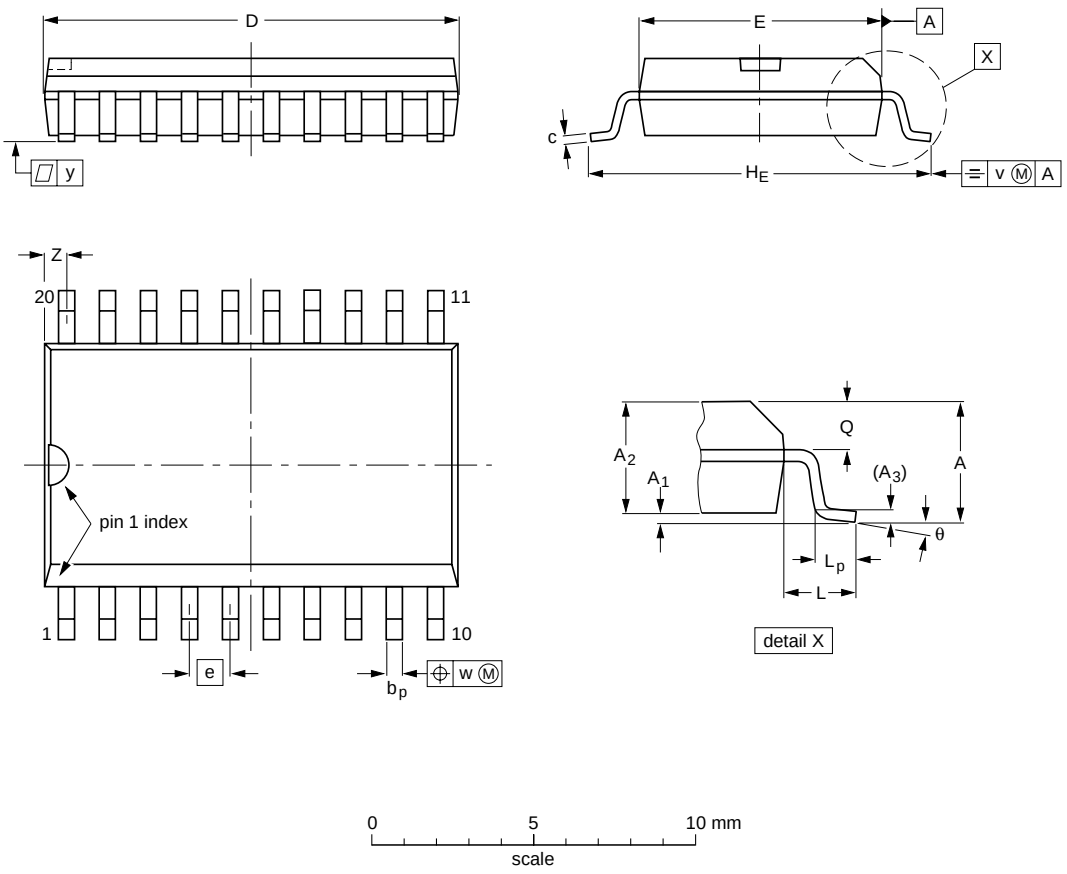
**Note**

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 | | | |
| SOT146-1 | | MS-001 | SC-603 | | | ~~99-12-27~~<br>03-02-13 |

**Fig 8. Package outline SOT146-1 (DIP20)**

**SO20: plastic small outline package; 20 leads; body width 7.5 mm** **SOT163-1**




**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 | 13.0<br>12.6 | 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 | 0.51<br>0.49 | 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 | |

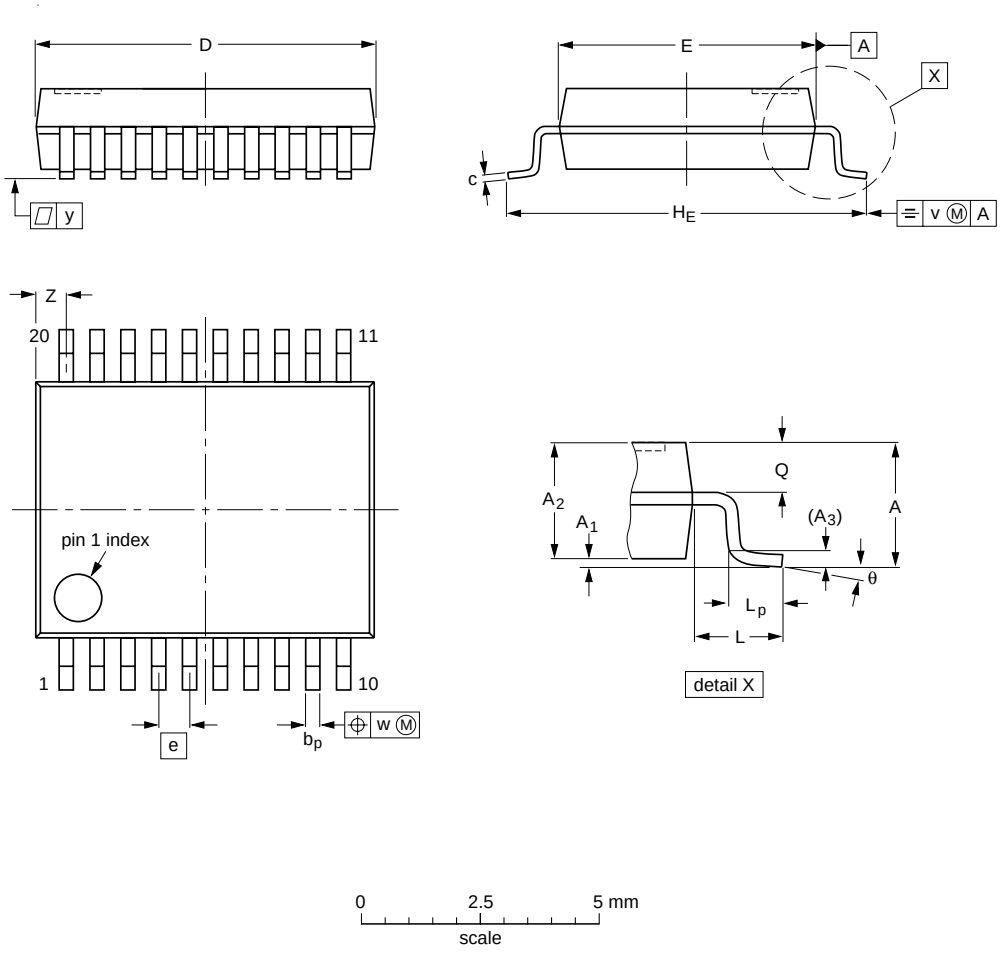
**Note**

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 | | | |
| SOT163-1 | 075E04 | MS-013 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 9. Package outline SOT163-1 (SO20)**

**SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm** **SOT339-1**




**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 | 7.4<br>7.0 | 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 | 0.9<br>0.5 | $8^o$<br>$0^o$ |

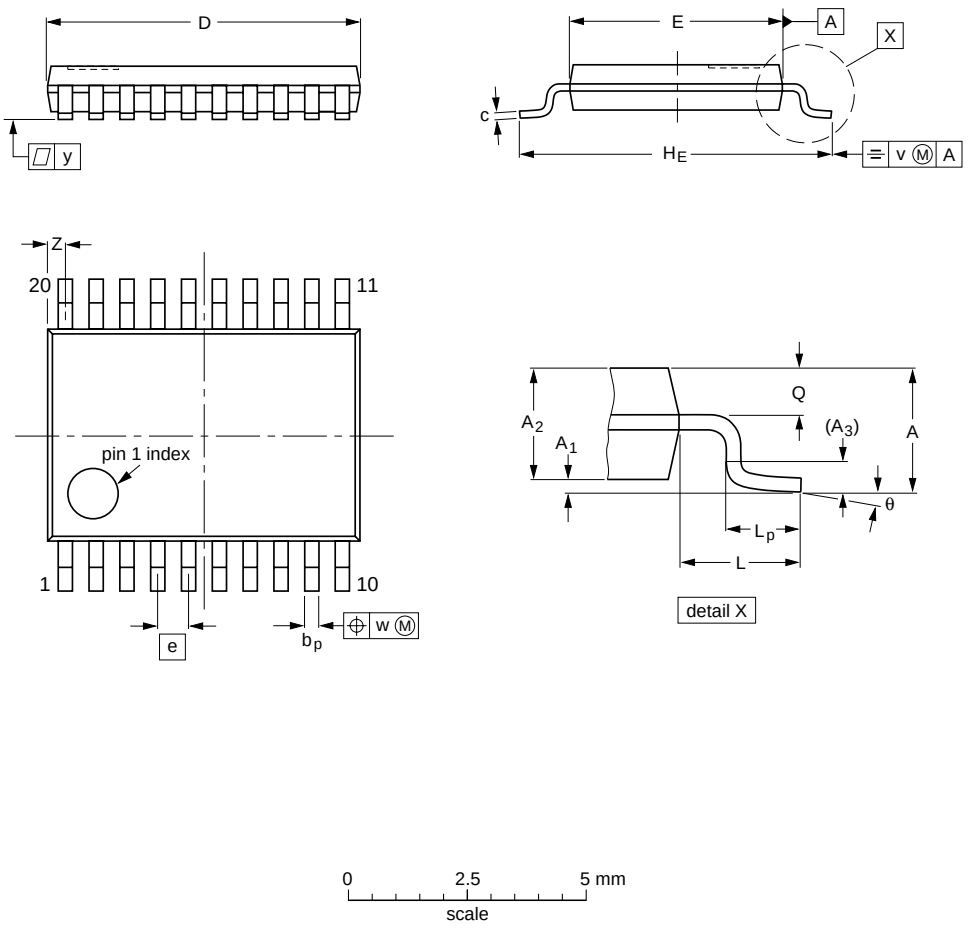
**Note**

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 | | | |
| SOT339-1 | | MO-150 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 10. Package outline SOT339-1 (SSOP20)**

**TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm** **SOT360-1**




**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 | 6.6<br>6.4 | 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>$0^o$ |

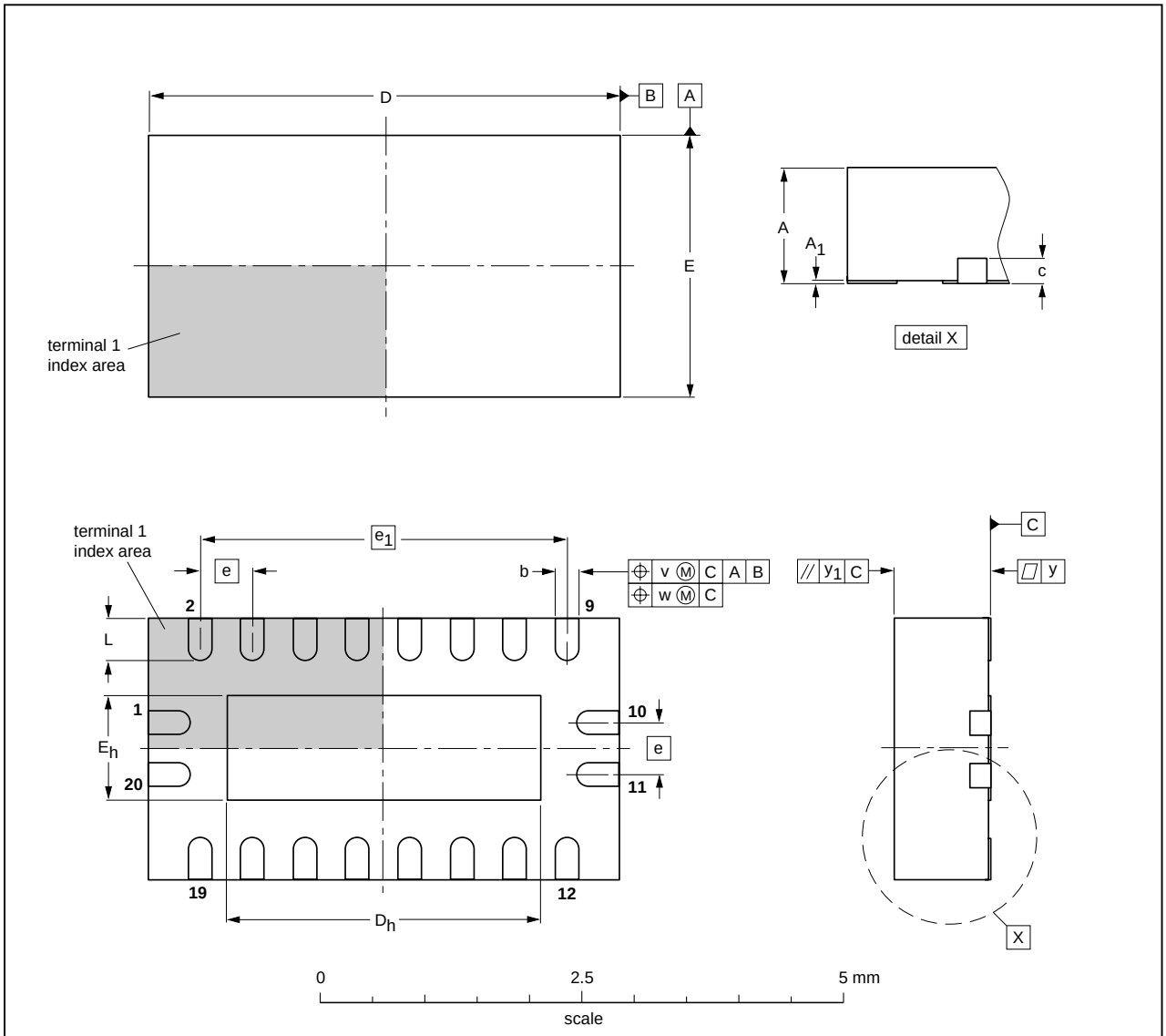
**Notes**

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 | | | |
| SOT360-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 11. Package outline SOT360-1 (TSSOP20)**

**DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 x 4.5 x 0.85 mm** **SOT764-1**




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

| UNIT | $A^{(1)}$ max. | $A_1$ | b | c | $D^{(1)}$ | $D_h$ | $E^{(1)}$ | $E_h$ | e | $e_1$ | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1 | 0.05<br>0.00 | 0.30<br>0.18 | 0.2 | 4.6<br>4.4 | 3.15<br>2.85 | 2.6<br>2.4 | 1.15<br>0.85 | 0.5 | 3.5 | 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 | | | |
| SOT764-1 | - - - | MO-241 | - - - | | | ~~02-10-17~~<br>03-01-27 |

**Fig 12. Package outline SOT764-1 (DHVQFN20)**

## 14. Revision history

**Table 13: Revision history**

| Document ID | Release date | Data sheet status | Change notice | Doc. number | Supersedes |
|---|---|---|---|---|---|
| 74HC_HCT245_3 | 20050131 | Product data sheet | - | 9397 750 14502 | 74HC_HCT245_CNV_2 |
| Modifications: | • The format of this data sheet is redesigned to comply with the new presentation and information standard of Philips Semiconductors<br>• Section 4 “Ordering information”, Section 6 “Pinning information” and Section 13 “Package outline” are modified to include the DHVQFN20 package. | | | | |
| 74HC_HCT245_CNV_2 | 19930930 | Product specification | - | - | - |

## 15. Data sheet status

| Level | Data sheet status [1] | Product status [2] [3] | 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). |

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Short-form specification —** The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**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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## 19. Contents





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