# 74HC75

## Quad bistable transparant latch

Rev. 03 — 12 November 2004 Product data sheet

## 1. General description

The 74HC75 is a high-speed Si-gate CMOS device and is pin compatible with low power Schottky TTL (LSTTL). The 74HC75 is specified in compliance with JEDEC standard no. 7A.

The 74HC75 has four bistable latches. The two latches are simultaneously controlled by one of two active HIGH enable inputs (LE12 and LE34). When LEnn is HIGH, the data enters the latches and appears at the nQ outputs. The nQ outputs follow the data inputs (nD) as long as LEnn is HIGH (transparent). The data on the nD inputs one set-up time prior to the HIGH-to-LOW transition of the LEnn will be stored in the latches. The latched outputs remain stable as long as the LEnn is LOW.

## 2. Features

- Complementary Q and $\overline{Q}$ outputs
- $V_{CC}$ and GND on the center pins
- Low-power dissipation
- Complies with JEDEC standard no. 7A
- ESD protection:
  - HBM EIA/JESD22-A114-B exceeds 2000 V
  - MM EIA/JESD22-A115-A exceeds 200 V.
- Multiple package options
- Specified from –40 °C to +80 °C and from –40 °C to +125 °C.

PHILIPS

## 3. Quick reference data

**Table 1: Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $t_{PHL}$, $t_{PLH}$ | propagation delay | $C_L$ = 15 pF; $V_{CC}$ = 5 V | | | | | |
| | nD to nQ, n$\overline{Q}$ | | | - | 11 | - | ns |
| | LEnn to nQ, n$\overline{Q}$ | | | - | 11 | - | ns |
| $C_I$ | input capacitance | | | - | 3.5 | - | pF |
| $C_{PD}$ | power dissipation capacitance per latch | $V_I$ = GND to $V_{CC}$ | [1] | - | 42 | - | 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 |
| 74HC75N | –40 °C to +125 °C | DIP16 | plastic dual in-line package; 16 leads (300 mil) | SOT38-4 |
| 74HC75D | –40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HC75DB | –40 °C to +125 °C | SSOP16 | plastic shrink small outline package; 16 leads; body width 5.3 mm | SOT338-1 |
| 74HC75PW | –40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

## 5. Functional diagram

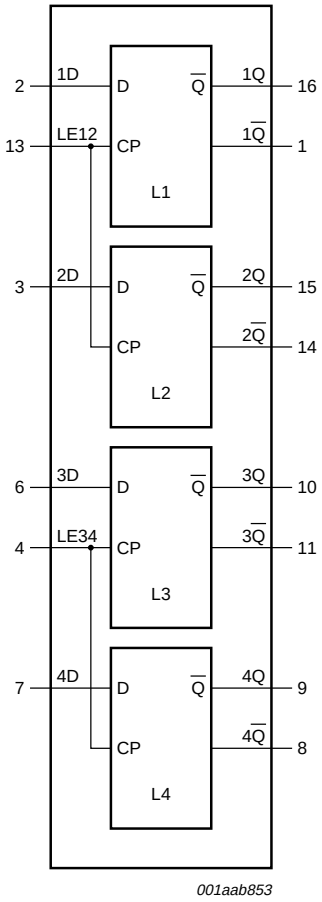



Fig 1. Functional diagram

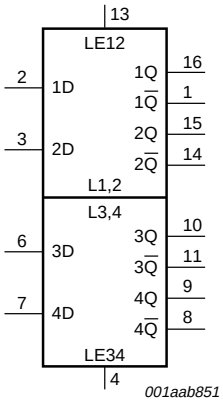



Fig 2. Logic symbol

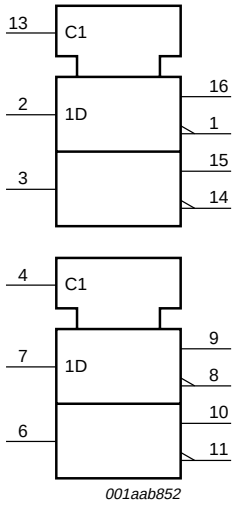



Fig 3. IEC logic symbol

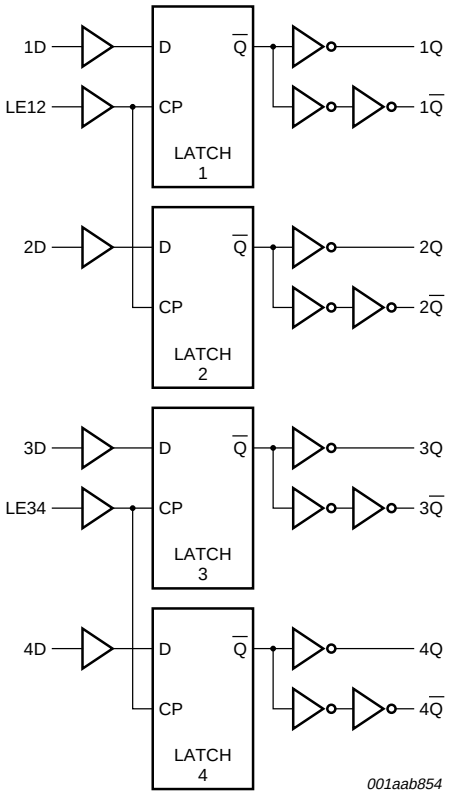



Fig 4. Logic diagram

## 6. Pinning information

### 6.1 Pinning

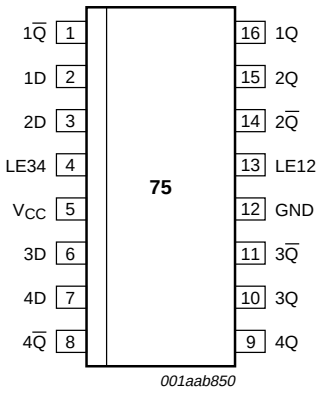



Fig 5. Pin configuration

## 6.2 Pin description

**Table 3: Pin description**

| Symbol | Pin | Description |
|---|---|---|
| $1\overline{Q}$ | 1 | complementary latch output 1 |
| 1D | 2 | data input 1 |
| 2D | 3 | data input 2 |
| LE34 | 4 | latch enable input for latches 3 and 4 (active HIGH) |
| $V_{CC}$ | 5 | positive supply voltage |
| 3D | 6 | data input 3 |
| 4D | 7 | data input 4 |
| $4\overline{Q}$ | 8 | complementary latch output 4 |
| 4Q | 9 | latch output 4 |
| 3Q | 10 | latch output 3 |
| $3\overline{Q}$ | 11 | complementary latch output 3 |
| GND | 12 | ground (0 V) |
| LE12 | 13 | latch enable input for latches 1 and 2 (active HIGH) |
| $2\overline{Q}$ | 14 | complementary latch output 2 |
| 2Q | 15 | latch output 2 |
| 1Q | 16 | latch output 1 |

# 7. Functional description

## 7.1 Function table

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

| Operating mode | Input | | Output | |
|---|---|---|---|---|
| | LEnn | nD | nQ | $n\overline{Q}$ |
| Data enabled | H | L | L | H |
| | H | H | H | L |
| Data latched | L | X | q | $\overline{q}$ |

[1] H = HIGH voltage level;
L = LOW voltage level;
q = lower case letters indicate the state of the referenced output one set-up time prior to the HIGH-to-LOW LEnn transition;
X = don't care.

## 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 | | - | ±25 | mA |
| $I_{CC}$, $I_{GND}$ | $V_{CC}$ or GND current | | | - | ±50 | mA |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |
| $P_{tot}$ | power dissipation | | | | | |
| | DIP16 package | | [1] | - | 750 | mW |
| | SO16, SSOP16 and TSSOP16 packages | | [2] | - | 500 | mW |

[1] Above 70 °C: $P_{tot}$ derates linearly with 12 mW/K.

[2] Above 70 °C: $P_{tot}$ derates linearly with 8 mW/K.

## 9. Recommended operating conditions

**Table 6: Recommended operating conditions**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | 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 |

## 10. Static characteristics

**Table 7: Static characteristics**

*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 |
| | | $I_O$ = –4 mA; $V_{CC}$ = 4.5 V | 3.98 | 4.32 | - | V |
| | | $I_O$ = –5.2 mA; $V_{CC}$ = 6.0 V | 5.48 | 5.81 | - | V |
| $V_{OL}$ | 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 |
| | | $I_O$ = 4 mA; $V_{CC}$ = 4.5 V | - | 0.15 | 0.26 | V |
| | | $I_O$ = 5.2 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 |
| $I_{CC}$ | 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 |
| **$T_{amb}$ = –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 |
| | | $I_O$ = –4 mA; $V_{CC}$ = 4.5 V | 3.84 | - | - | V |
| | | $I_O$ = –5.2 mA; $V_{CC}$ = 6.0 V | 5.34 | - | - | V |

**Table 7: Static characteristics** *…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 | - | - | 0.1 | 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 |
| | | $I_O$ = 4 mA; $V_{CC}$ = 4.5 V | - | - | 0.33 | V |
| | | $I_O$ = 5.2 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 |
| $I_{CC}$ | 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 |
| $V_{IL}$ | 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 |
| | | $I_O$ = –4 mA; $V_{CC}$ = 4.5 V | 3.7 | - | - | V |
| | | $I_O$ = –5.2 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 |
| | | $I_O$ = 4 mA; $V_{CC}$ = 4.5 V | - | - | 0.4 | V |
| | | $I_O$ = 5.2 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 |
| $I_{CC}$ | quiescent supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 160 | µA |

## 11. Dynamic characteristics

**Table 8: Dynamic characteristics**

*GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF; unless otherwise specified, see Figure 10.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay nD to nQ | see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | 33 | 110 | ns |
| | | $V_{CC}$ = 4.5 V | - | 12 | 22 | ns |
| | | $V_{CC}$ = 6.0 V | - | 10 | 19 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 11 | - | ns |
| | propagation delay nD to n$\overline{Q}$ | see Figure 7 | | | | |
| | | $V_{CC}$ = 2.0 V | - | 39 | 120 | ns |
| | | $V_{CC}$ = 4.5 V | - | 14 | 24 | ns |
| | | $V_{CC}$ = 6.0 V | - | 11 | 20 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 11 | - | ns |
| | propagation delay LEnn to nQ | see Figure 9 | | | | |
| | | $V_{CC}$ = 2.0 V | - | 33 | 120 | ns |
| | | $V_{CC}$ = 4.5 V | - | 12 | 24 | ns |
| | | $V_{CC}$ = 6.0 V | - | 10 | 20 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 11 | - | ns |
| | propagation delay LEnn to n$\overline{Q}$ | see Figure 9 | | | | |
| | | $V_{CC}$ = 2.0 V | - | 39 | 125 | ns |
| | | $V_{CC}$ = 4.5 V | - | 14 | 25 | ns |
| | | $V_{CC}$ = 6.0 V | - | 11 | 21 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 11 | - | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | see Figure 6 and 7 | | | | |
| | | $V_{CC}$ = 2.0 V | - | 19 | 75 | ns |
| | | $V_{CC}$ = 4.5 V | - | 7 | 15 | ns |
| | | $V_{CC}$ = 6.0 V | - | 6 | 13 | ns |
| $t_W$ | enable pulse width HIGH | see Figure 9 | | | | |
| | | $V_{CC}$ = 2.0 V | 80 | 17 | - | ns |
| | | $V_{CC}$ = 4.5 V | 16 | 6 | - | ns |
| | | $V_{CC}$ = 6.0 V | 14 | 5 | - | ns |
| $t_{su}$ | set-up time nD to LEnn | see Figure 8 | | | | |
| | | $V_{CC}$ = 2.0 V | 60 | 14 | - | ns |
| | | $V_{CC}$ = 4.5 V | 12 | 5 | - | ns |
| | | $V_{CC}$ = 6.0 V | 10 | 4 | - | ns |
| $t_h$ | hold time nD to LEnn | see Figure 8 | | | | |
| | | $V_{CC}$ = 2.0 V | 3 | –8 | - | ns |
| | | $V_{CC}$ = 4.5 V | 3 | –3 | - | ns |
| | | $V_{CC}$ = 6.0 V | 3 | –2 | - | ns |

**Table 8: Dynamic characteristics** *...continued*

*GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF; unless otherwise specified, see Figure 10.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $C_{PD}$ | power dissipation capacitance per latch | $V_I$ = GND to $V_{CC}$ | [1] | - | 42 | - | pF |
| **$T_{amb}$ = −40 °C to +85 °C** | | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay nD to nQ | see Figure 6 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | - | 140 | ns |
| | | $V_{CC}$ = 4.5 V | | - | - | 28 | ns |
| | | $V_{CC}$ = 6.0 V | | - | - | 24 | ns |
| | propagation delay nD to $n\overline{Q}$ | see Figure 7 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | - | 150 | ns |
| | | $V_{CC}$ = 4.5 V | | - | - | 30 | ns |
| | | $V_{CC}$ = 6.0 V | | - | - | 26 | ns |
| | propagation delay LEnn to nQ | see Figure 9 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | - | 150 | ns |
| | | $V_{CC}$ = 4.5 V | | - | - | 30 | ns |
| | | $V_{CC}$ = 6.0 V | | - | - | 26 | ns |
| | propagation delay LEnn to $n\overline{Q}$ | see Figure 9 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | - | 155 | ns |
| | | $V_{CC}$ = 4.5 V | | - | - | 31 | ns |
| | | $V_{CC}$ = 6.0 V | | - | - | 26 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | see Figure 6 and 7 | | | | | |
| | | $V_{CC}$ = 2.0 V | | - | - | 95 | ns |
| | | $V_{CC}$ = 4.5 V | | - | - | 19 | ns |
| | | $V_{CC}$ = 6.0 V | | - | - | 16 | ns |
| $t_W$ | enable pulse width HIGH | see Figure 9 | | | | | |
| | | $V_{CC}$ = 2.0 V | | 100 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | | 20 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | | 17 | - | - | ns |
| $t_{su}$ | set-up time nD to LEnn | see Figure 8 | | | | | |
| | | $V_{CC}$ = 2.0 V | | 75 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | | 15 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | | 13 | - | - | ns |
| $t_h$ | hold time nD to LEnn | see Figure 8 | | | | | |
| | | $V_{CC}$ = 2.0 V | | 3 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | | 3 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | | 3 | - | - | ns |

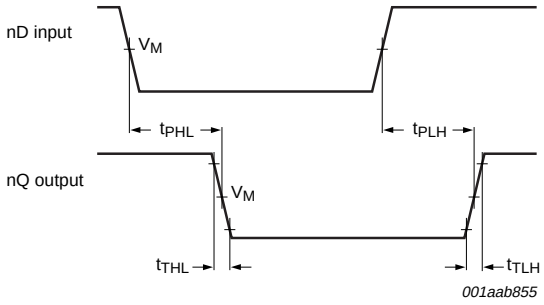
**Table 8: Dynamic characteristics** *...continued*

*GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF; unless otherwise specified, see Figure 10.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | |
| $t_{PHL}$, $t_{PLH}$ | propagation delay nD to nQ | see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 165 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 33 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 28 | ns |
| | propagation delay nD to n$\overline{Q}$ | see Figure 7 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 180 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 36 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 31 | ns |
| | propagation delay LEnn to nQ | see Figure 9 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 180 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 36 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 31 | ns |
| | propagation delay LEnn to n$\overline{Q}$ | see Figure 9 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 190 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 38 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 32 | ns |
| $t_{THL}$, $t_{TLH}$ | output transition time | see Figure 6 and 7 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 110 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 22 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 19 | ns |
| $t_W$ | enable pulse width HIGH | see Figure 9 | | | | |
| | | $V_{CC}$ = 2.0 V | 120 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 24 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 20 | - | - | ns |
| $t_{su}$ | set-up time nD to LEnn | see Figure 8 | | | | |
| | | $V_{CC}$ = 2.0 V | 90 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 18 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 15 | - | - | ns |
| $t_h$ | hold time nD to LEnn | see Figure 8 | | | | |
| | | $V_{CC}$ = 2.0 V | 3 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 3 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 3 | - | - | ns |

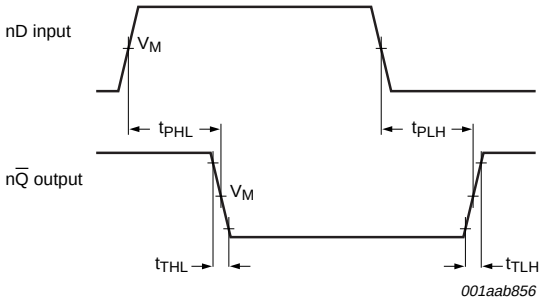
[1] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage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

## 12. Waveforms



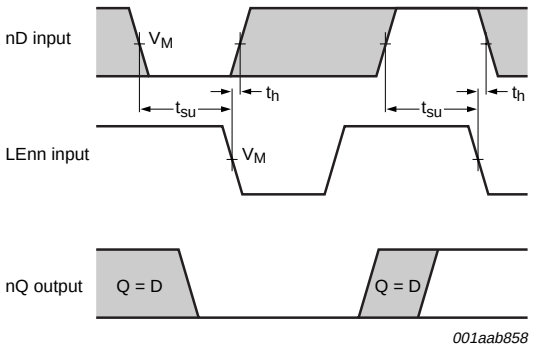

$V_M = 0.5 \times V_I$.

**Fig 6. Waveforms showing the data input (nD) to output (nQ) propagation delays and the output transition times**




$V_M = 0.5 \times V_I$.

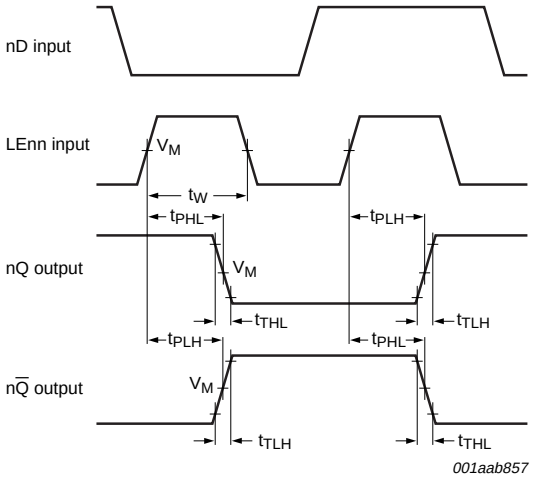
**Fig 7. Waveforms showing the data input (nD) to output ($n\overline{Q}$) propagation delays and the output transition times**




The shaded areas indicate when the input is permitted to change for predictable output performance.

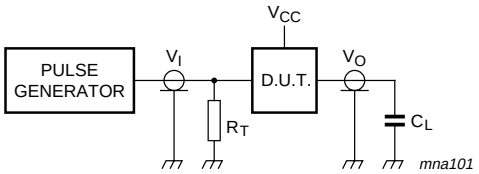
$V_M = 0.5 \times V_I$.

**Fig 8. Waveforms showing the data set-up and hold times for nD input to LEnn input**




$V_M = 0.5 \times V_I$.

**Fig 9. Waveforms showing the latch enable input (LEnn) pulse width, the latch enable input to outputs (nQ, nQ) propagation delays and the output transition times**




Test data is given in Table 9.

Definitions for test circuit:

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

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

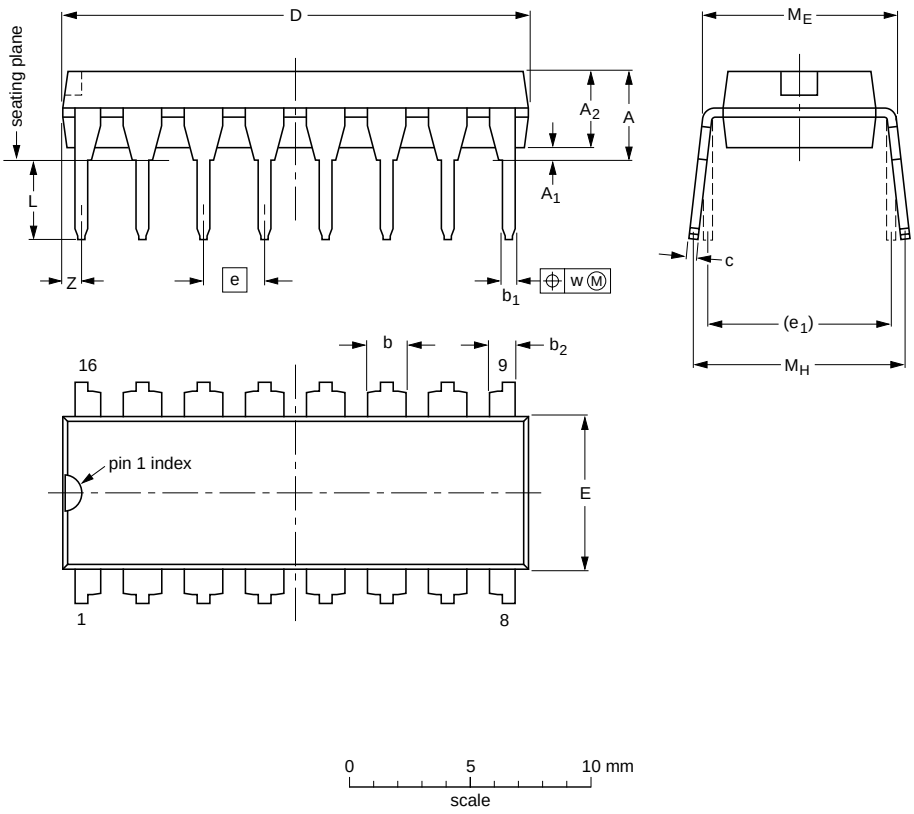
**Fig 10. Load circuitry for switching times**

**Table 9: Test data**

| Supply | Input | | Load |
|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r$, $t_f$ | $C_L$ |
| 2.0 V | $V_{CC}$ | 6 ns | 50 pF |
| 4.5 V | $V_{CC}$ | 6 ns | 50 pF |
| 6.0 V | $V_{CC}$ | 6 ns | 50 pF |
| 5.0 V | $V_{CC}$ | 6 ns | 15 pF |

## 13. Package outline

**DIP16: plastic dual in-line package; 16 leads (300 mil)** **SOT38-4**




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

| UNIT | A max. | $A_1$ min. | $A_2$ max. | b | $b_1$ | $b_2$ | 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 | 1.25<br>0.85 | 0.36<br>0.23 | 19.50<br>18.55 | 6.48<br>6.20 | 2.54 | 7.62 | 3.60<br>3.05 | 8.25<br>7.80 | 10.0<br>8.3 | 0.254 | 0.76 |
| inches | 0.17 | 0.02 | 0.13 | 0.068<br>0.051 | 0.021<br>0.015 | 0.049<br>0.033 | 0.014<br>0.009 | 0.77<br>0.73 | 0.26<br>0.24 | 0.1 | 0.3 | 0.14<br>0.12 | 0.32<br>0.31 | 0.39<br>0.33 | 0.01 | 0.03 |

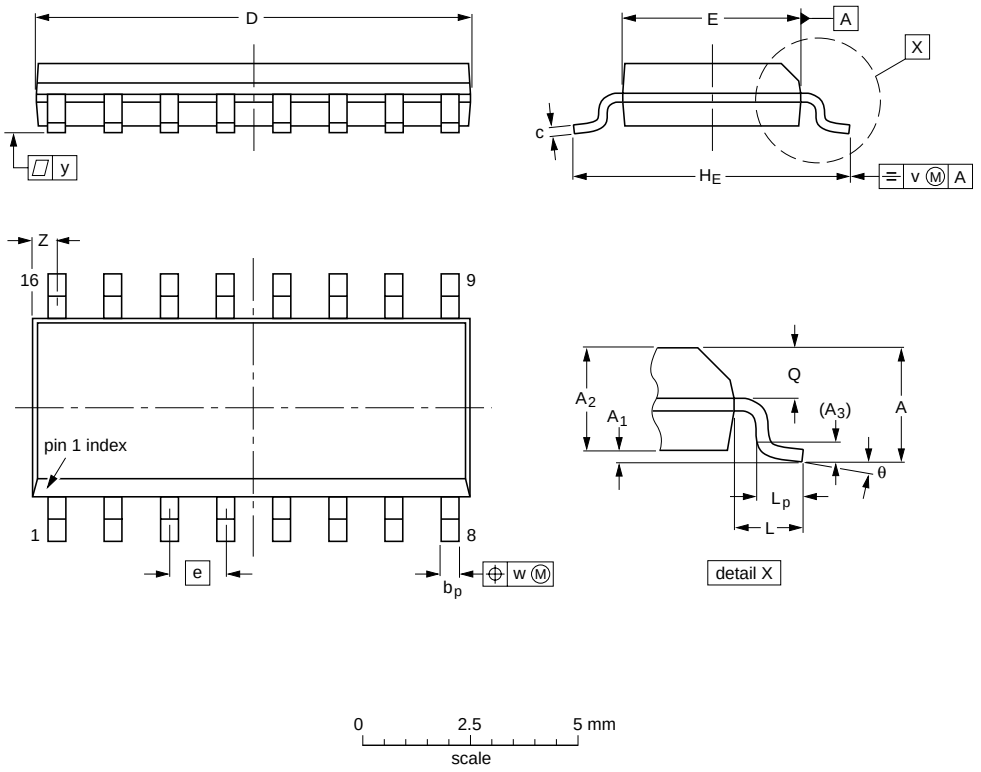
**Note**

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 | | | |
| SOT38-4 | | | | | | ~~95-01-14~~<br>03-02-13 |

**Fig 11. Package outline SOT38-4 (DIP16)**

**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<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 | $8^o$<br>$0^o$ |
| 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 | |

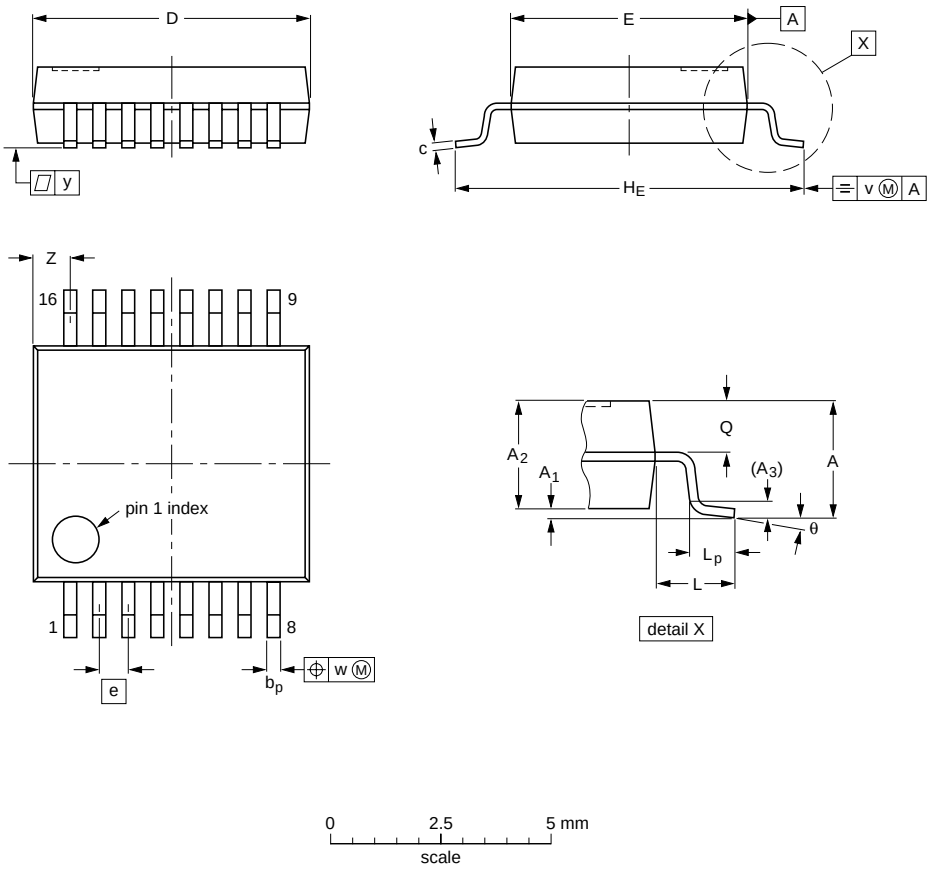
**Note**

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 12. Package outline SOT109-1 (SO16)**

**SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm** **SOT338-1**




**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 | 6.4<br>6.0 | 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 | 1.00<br>0.55 | $8^o$<br>$0^o$ |

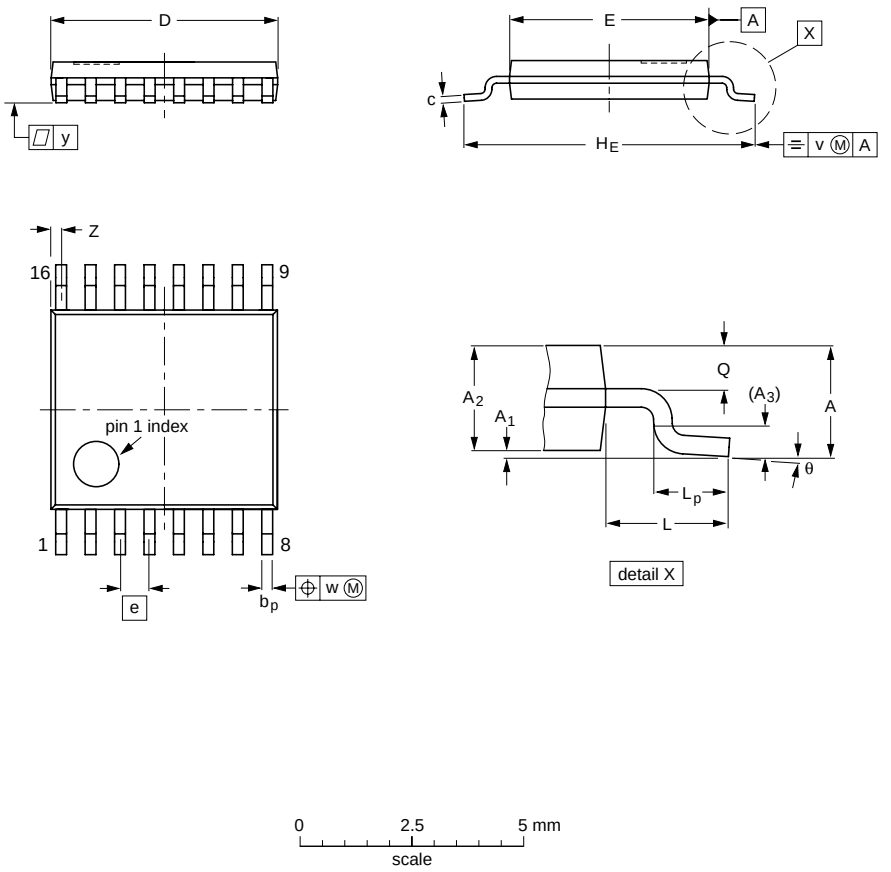
**Note**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT338-1 | | MO-150 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 13. Package outline SOT338-1 (SSOP16)**

**TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm** **SOT403-1**




**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 | 5.1<br>4.9 | 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 | 0.40<br>0.06 | $8^o$<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 | | | |
| SOT403-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-18 |

**Fig 14. Package outline SOT403-1 (TSSOP16)**

## 14. Revision history

**Table 10: Revision history**

| Document ID | Release date | Data sheet status | Change notice | Doc. number | Supersedes |
|---|---|---|---|---|---|
| 74HC75_3 | 20041112 | Product data sheet | - | 9397 750 13816 | 74HC_HCT75_CNV_2 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the current presentation and information standard of Philips Semiconductors.<br>• Removed type number 74HCT75.<br>• Inserted family specification. | | | | |
| 74HC_HCT75_CNV_2 | 19970918 | Product specification | - | - | 74HC_HCT75_1 |
| 74HC_HCT75_1 | 19901201 | 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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## 19. Contents





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