# 74HC4852; 74HCT4852

## Dual 4-channel analog multiplexer/demultiplexer with injection-current effect control

Rev. 03 — 2 September 2008 Product data sheet

## 1. General description

The 74HC4852; 74HCT4852 are high-speed Si-gate CMOS devices and are specified in compliance with JEDEC standard no. 7A.

The 74HC4852; 74HCT4852 are dual 4-channel analog multiplexers/demultiplexers with common select inputs (S0 and S1). Both multiplexers have a common active LOW enable input ($\overline{E}$), four independent inputs/outputs (nY0 to nY3) and two common inputs/outputs (1Z, 2Z). The devices feature injection-current effect control, which has excellent value in automotive applications where voltages in excess of the supply voltage are common.

With $\overline{E}$ LOW, two of the eight switches are selected (low impedance ON-state) by S0 and S1. With $\overline{E}$ HIGH, all switches are in the high-impedance OFF-state, independent of S0 and S1.

The injection-current effect control allows signals at disabled analog input channels to exceed the supply voltage without affecting the signal of the enabled analog channel. This eliminates the need for external diode/resistor networks typically used to keep the analog channel signals within the supply-voltage range.

## 2. Features

- Injection-current cross coupling < 1 mV/mA
- Wide supply voltage range from 2.0 V to 6.0 V for 74HC4852
- ESD protection:
  - HBM JESD22-A114E exceeds 2000 V
  - CDM JESD22-C101C exceeds 1000 V
- Latch-up performance exceeds 100 mA per JESD 78 Class II level A
- Low ON-state resistance:
  - 400 Ω (typical) at $V_{CC}$ = 2.0 V
  - 215 Ω (typical) at $V_{CC}$ = 3.0 V
  - 120 Ω (typical) at $V_{CC}$ = 3.3 V
  - 76 Ω (typical) at $V_{CC}$ = 4.5 V
  - 59 Ω (typical) at $V_{CC}$ = 6.0 V

## 3. Applications

- Analog multiplexing and demultiplexing
- Digital multiplexing and demultiplexing
- Signal gating
- Automotive application

## 4. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HC4852D | –40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HC4852PW | –40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74HC4852BQ | –40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm | SOT763-1 |
| 74HCT4852D | –40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HCT4852PW | –40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74HCT4852BQ | –40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm | SOT763-1 |

## 5. Functional diagram

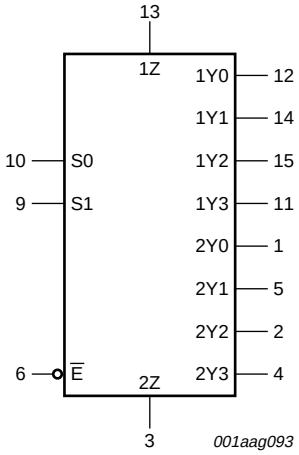



**Fig 1. Logic symbol**

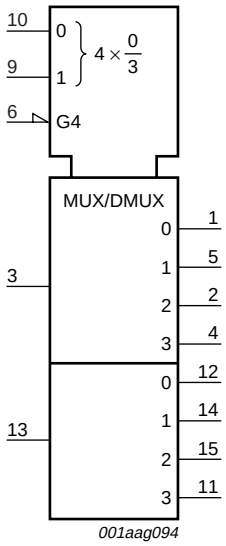



**Fig 2. IEC logic symbol**

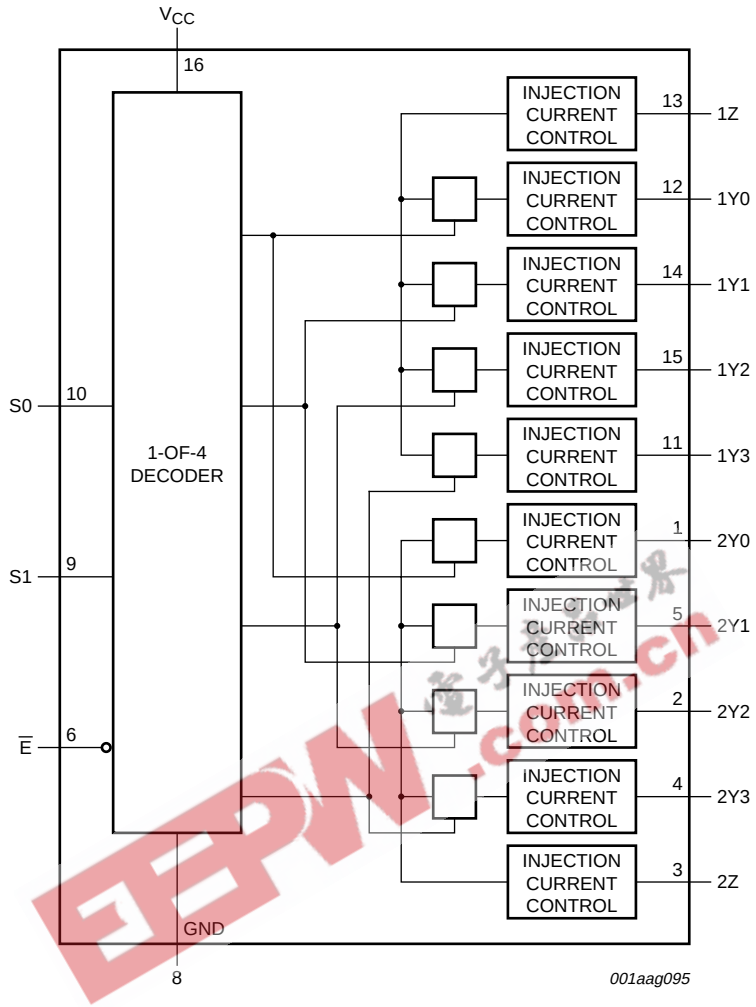



**Fig 3. Functional diagram**

# 6. Pinning information

## 6.1 Pinning

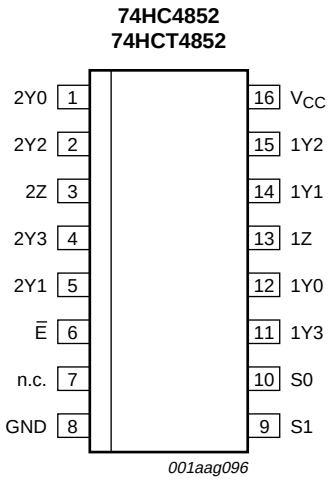
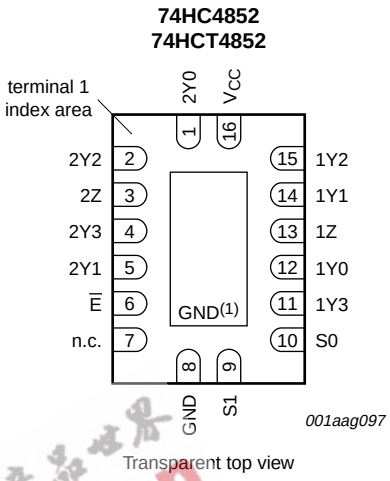



Fig 4. Pin configuration SO16 and TSSOP16




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

Fig 5. Pin configuration DHVQFN16

## 6.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|---|---|---|
| 2Y0 | 1 | independent input/output |
| 2Y2 | 2 | independent input/output |
| 2Z | 3 | common input/output |
| 2Y3 | 4 | independent input/output |
| 2Y1 | 5 | independent input/output |
| $\overline{E}$ | 6 | enable input (active LOW) |
| n.c. | 7 | not connected |
| GND | 8 | ground (0 V) |
| S1 | 9 | select input |
| S0 | 10 | select input |
| 1Y3 | 11 | independent input/output |
| 1Y0 | 12 | independent input/output |
| 1Z | 13 | common input/output |
| 1Y1 | 14 | independent input/output |
| 1Y2 | 15 | independent input/output |
| $V_{CC}$ | 16 | supply voltage |

# 7. Functional description

**Table 3. Function table[1]**

| Input | | | Channel ON |
|---|---|---|---|
| $\overline{E}$ | S1 | S0 | |
| L | L | L | nY0 to nZ |
| L | L | H | nY1 to nZ |
| L | H | L | nY2 to nZ |
| L | H | H | nY3 to nZ |
| H | X | X | - |

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

# 8. Limiting values

**Table 4. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | | –0.5 | +7.0 | V |
| $V_I$ | input voltage | | [1] | –0.5 | $V_{CC}$ + 0.5 | V |
| $V_{SW}$ | switch voltage | | [2] | –0.5 | $V_{CC}$ + 0.5 | V |
| $I_{IK}$ | input clamping current | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V | | - | ±20 | mA |
| $I_{SK}$ | switch clamping current | $V_{SW} < -0.5$ V or $V_{SW} > V_{CC} + 0.5$ V | | - | ±20 | mA |
| $I_{SW}$ | switch current | $V_{SW} > -0.5$ V or $V_{SW} < V_{CC} + 0.5$ V | | - | ±25 | mA |
| $I_{CC}$ | supply current | | | - | 50 | mA |
| $I_{GND}$ | ground current | | | –50 | - | mA |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = –40 °C to +125 °C | [3] | - | 500 | mW |

[1] The minimum and maximum input voltage rating may be exceeded if the input clamping current rating is observed.

[2] The minimum and maximum switch voltage rating may be exceeded if the switch clamping current rating is observed.

[3] For SO16 package: $P_{tot}$ derates linearly with 8 mW/K above 70 °C.
For TSSOP16 package: $P_{tot}$ derates linearly with 5.5 mW/K above 60 °C.
For DHVQFN16 packages: $P_{tot}$ derates linearly with 4.5 mW/K above 60 °C.

## 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol | Parameter | Conditions | 74HC4852 | | | 74HCT4852 | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $V_{CC}$ | supply voltage | | 2.0 | - | 6.0 | 4.5 | 5.0 | 5.5 | V |
| $V_I$ | input voltage | | 0 | - | $V_{CC}$ | 0 | - | $V_{CC}$ | V |
| $V_{SW}$ | switch voltage | | 0 | - | $V_{CC}$ | 0 | - | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | –40 | - | +125 | –40 | - | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC}$ = 2.0 V | - | 6.0 | 1000 | - | - | - | ns/V |
| | | $V_{CC}$ = 3.0 V | - | 6.0 | 800 | - | - | - | ns/V |
| | | $V_{CC}$ = 3.3 V | - | 6.0 | 800 | - | - | - | ns/V |
| | | $V_{CC}$ = 4.5 V | - | 6.0 | 500 | - | 6.0 | 500 | ns/V |
| | | $V_{CC}$ = 6.0 V | - | 6.0 | 400 | - | - | - | ns/V |

## 10. Static characteristics

**Table 6. $R_{ON}$ resistance**

*At recommended operating conditions; voltages are referenced to GND (ground 0 V); For test circuit see Figure 8.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HC4852** | | | | | | | | | | |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_I = V_{CC}$ to GND; $\overline{E} = V_{IL}$ | | | | | | | | |
| | | $V_{CC}$ = 2.0 V; $I_{SW}$ = 2 mA | - | 400 | 650 | - | 670 | - | 700 | Ω |
| | | $V_{CC}$ = 3.0 V; $I_{SW} \leq$ 2 mA | - | 215 | 330 | - | 360 | - | 380 | Ω |
| | | $V_{CC}$ = 3.3 V; $I_{SW} \leq$ 2 mA | - | 120 | 270 | - | 305 | - | 345 | Ω |
| | | $V_{CC}$ = 4.5 V; $I_{SW} \leq$ 2 mA | - | 76 | 210 | - | 240 | - | 270 | Ω |
| | | $V_{CC}$ = 6.0 V; $I_{SW} \leq$ 2 mA | - | 59 | 195 | - | 220 | - | 250 | Ω |
| $\Delta R_{ON}$ | ON resistance mismatch between channels | $V_I = 0.5 \times V_{CC}$; $\overline{E} = V_{IL}$ | | | | | | | | |
| | | $V_{CC}$ = 2.0 V; $I_{SW}$ = 2 mA | - | 4 | 10 | - | 15 | - | 20 | Ω |
| | | $V_{CC}$ = 3.0 V; $I_{SW} \leq$ 2 mA | - | 2 | 8 | - | 12 | - | 16 | Ω |
| | | $V_{CC}$ = 3.3 V; $I_{SW} \leq$ 2 mA | - | 2 | 8 | - | 12 | - | 16 | Ω |
| | | $V_{CC}$ = 4.5 V; $I_{SW} \leq$ 2 mA | - | 2 | 8 | - | 12 | - | 16 | Ω |
| | | $V_{CC}$ = 6.0 V; $I_{SW} \leq$ 2 mA | - | 3 | 9 | - | 13 | - | 18 | Ω |
| **74HCT4852** | | | | | | | | | | |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_I = V_{CC}$ to GND; $\overline{E} = V_{IL}$ | | | | | | | | |
| | | $V_{CC}$ = 4.5 V; $I_{SW} \leq$ 2 mA | - | 76 | 210 | - | 240 | - | 270 | Ω |
| $\Delta R_{ON}$ | ON resistance mismatch between channels | $V_I = 0.5 \times V_{CC}$; $\overline{E} = V_{IL}$ | | | | | | | | |
| | | $V_{CC}$ = 4.5 V; $I_{SW} \leq$ 2 mA | - | 2 | 8 | - | 12 | - | 16 | Ω |

**Table 7. Injection current coupling**

*At recommended operating conditions; voltages are referenced to GND (ground 0 V); For test circuit see Figure 9.*

| Symbol | Parameter | Conditions | 74HC4852 | | | 74HCT4852 | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Typ[1] | Max | |
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | | | | |
| $\Delta V_O$ | output voltage variation | $\lvert I_{SW}\rvert \leq 1$ mA; $R_S \leq 3.9$ kΩ [2][3] | | | | | | | |
| | | $V_{CC}$ = 3.3 V | - | 0.05 | 1 | - | - | - | mV |
| | | $V_{CC}$ = 5.0 V | - | 0.03 | 1 | - | 0.03 | 1 | mV |
| | | $\lvert I_{SW}\rvert \leq 10$ mA; $R_S \leq 3.9$ kΩ | | | | | | | |
| | | $V_{CC}$ = 3.3 V | - | 0.55 | 5 | - | - | - | mV |
| | | $V_{CC}$ = 5.0 V | - | 0.27 | 5 | - | 0.27 | 5 | mV |
| | | $\lvert I_{SW}\rvert \leq 1$ mA; $R_S \leq 20$ kΩ | | | | | | | |
| | | $V_{CC}$ = 3.3 V | - | 0.04 | 2 | - | - | - | mV |
| | | $V_{CC}$ = 5.0 V | - | 0.03 | 2 | - | 0.03 | 2 | mV |
| | | $\lvert I_{SW}\rvert \leq 10$ mA; $R_S \leq 20$ kΩ | | | | | | | |
| | | $V_{CC}$ = 3.3 V | - | 0.56 | 20 | - | - | - | mV |
| | | $V_{CC}$ = 5.0 V | - | 0.48 | 20 | - | 0.48 | 20 | mV |

[1] Typical values are measured at $T_{amb}$ = 25 °C.

[2] $\Delta V_O$ here is the maximum variation of output voltage of an enabled analog channel when current is injected into any disabled channel.

[3] $I_{SW}$ = total current injected into all disabled channels.

**Table 8. Static characteristics**

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

| Symbol | Parameter | Conditions | 25 °C | | | −40 °C to +85 °C | | −40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HC4852** | | | | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | control inputs | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 1.5 | - | - | 1.5 | - | 1.5 | - | V |
| | | $V_{CC}$ = 3.0 V | 2.1 | - | - | 2.1 | - | 2.1 | - | V |
| | | $V_{CC}$ = 3.3 V | 2.3 | - | - | 2.3 | - | 2.3 | - | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | - | - | 3.15 | - | 3.15 | - | V |
| | | $V_{CC}$ = 6.0 V | 4.2 | - | - | 4.2 | - | 4.2 | - | V |
| $V_{IL}$ | LOW-level input voltage | control inputs | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 0.5 | - | 0.5 | - | 0.5 | V |
| | | $V_{CC}$ = 3.0 V | - | - | 0.9 | - | 0.9 | - | 0.9 | V |
| | | $V_{CC}$ = 3.3 V | - | - | 1.0 | - | 1.0 | - | 1.0 | V |
| | | $V_{CC}$ = 4.5 V | - | - | 1.35 | - | 1.35 | - | 1.35 | V |
| | | $V_{CC}$ = 6.0 V | - | - | 1.8 | - | 1.8 | - | 1.8 | V |
| $I_I$ | input leakage current | control inputs; $V_I$ = GND or $V_{CC}$ | | | | | | | | |
| | | $V_{CC}$ = 6.0 V | - | - | ±0.1 | - | ±0.1 | - | ±1.0 | μA |

**Table 8. Static characteristics** *…continued*

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

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $I_{S(OFF)}$ | OFF-state leakage current | $\overline{E}$ = $V_{IH}$; $V_I$ = GND or $V_{CC}$; $V_O$ = $V_{CC}$ or GND; $V_{CC}$ = 6.0 V; see Figure 6 | | | | | | | | |
| | | nYn; per channel | - | - | ±0.1 | - | ±0.5 | - | ±1.0 | µA |
| | | nZ; all channels | - | - | ±0.2 | - | ±2.0 | - | ±4.0 | µA |
| $I_{S(ON)}$ | ON-state leakage current | $\overline{E}$ = $V_{IL}$; $V_I$ = GND or $V_{CC}$; $V_O$ = $V_{CC}$ or GND; $V_{CC}$ = 6.0 V; see Figure 7 | - | - | ±0.1 | - | ±0.5 | - | ±1.0 | µA |
| $I_{CC}$ | supply current | $V_I$ = GND or $V_{CC}$ | | | | | | | | |
| | | $V_{CC}$ = 6.0 V | - | - | 2.0 | - | 5.0 | - | 20.0 | µA |
| $C_I$ | input capacitance | S0, S1, S2 and $\overline{E}$ | - | 2 | 10 | - | 10 | - | 10 | pF |
| $C_{sw}$ | switch capacitance | nZ; OFF-state | - | 15 | 40 | - | 40 | - | 40 | pF |
| | | nYn; OFF-state | - | 3 | 15 | - | 15 | - | 15 | pF |
| **74HCT4852** | | | | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | control inputs | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 2.0 | - | - | 2.0 | - | 2.0 | - | V |
| $V_{IL}$ | LOW-level input voltage | control inputs | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 0.8 | - | 0.8 | - | 0.8 | V |
| $I_I$ | input leakage current | control inputs; $V_I$ = GND or $V_{CC}$ | | | | | | | | |
| | | $V_{CC}$ = 5.5 V | - | - | ±0.1 | - | ±0.1 | - | ±1.0 | µA |
| $I_{S(OFF)}$ | OFF-state leakage current | $\overline{E}$ = $V_{IH}$; $V_I$ = GND or $V_{CC}$; $V_O$ = $V_{CC}$ or GND; $V_{CC}$ = 5.5 V; see Figure 6 | | | | | | | | |
| | | per channel | - | - | ±0.1 | - | ±0.5 | - | ±1.0 | µA |
| | | all channels | - | - | ±0.2 | - | ±2.0 | - | ±4.0 | µA |
| $I_{S(ON)}$ | ON-state leakage current | $\overline{E}$ = $V_{IL}$; $V_I$ = GND or $V_{CC}$; $V_O$ = $V_{CC}$ or GND; $V_{CC}$ = 5.5 V; see Figure 7 | - | - | ±0.1 | - | ±0.5 | - | ±1.0 | µA |
| $I_{CC}$ | supply current | $V_I$ = GND or $V_{CC}$ | | | | | | | | |
| | | $V_{CC}$ = 5.5 V | - | - | 2.0 | - | 5.0 | - | 20.0 | µA |
| $\Delta I_{CC}$ | additional supply current | control inputs; $V_I$ = $V_{CC}$ – 2.1 V; other inputs at $V_{CC}$ or GND; $V_{CC}$ = 4.5 V to 5.5 V; $I_O$ = 0 A | - | - | 300 | - | 370 | - | 370 | µA |
| $C_I$ | input capacitance | S0, S1, S2 and $\overline{E}$ | - | 2 | 10 | - | 10 | - | 10 | pF |
| $C_{sw}$ | switch capacitance | nZ; OFF-state | - | 9 | 40 | - | 40 | - | 40 | pF |
| | | nYn; OFF-state | - | 3 | 15 | - | 15 | - | 15 | pF |

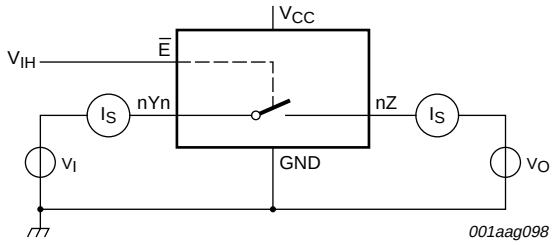
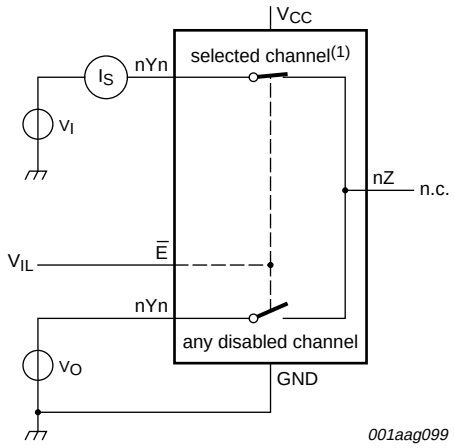
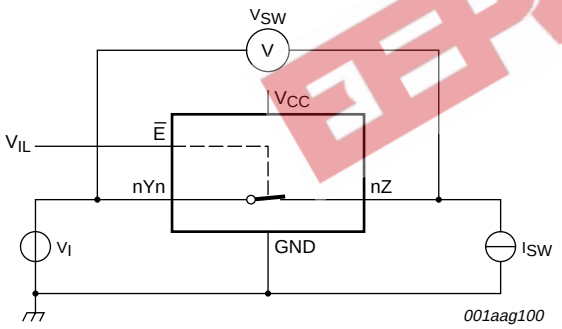



**Fig 6. Test circuit for measuring OFF-state leakage current**



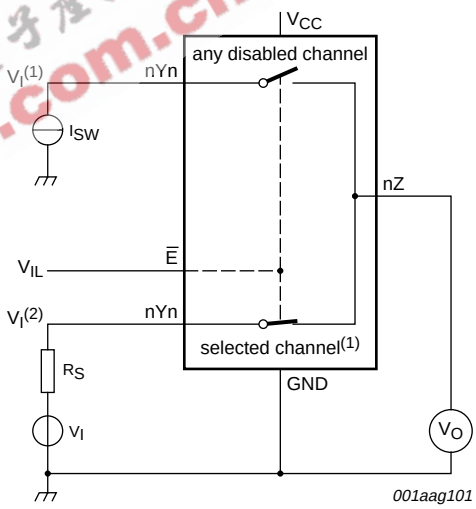

(1) Channel is selected by S0 and S1.

**Fig 7. Test circuit for measuring ON-state leakage current**




$R_{ON} = V_{SW} / I_{SW}$.

**Fig 8. Test circuit for measuring ON resistance**




(1) Channel is selected by S0 and S1.

$V_I^{(1)} < GND$ or $V_I^{(1)} > V_{CC}$.

$GND < V_I^{(2)} < V_{CC}$.

**Fig 9. Test circuit for injection current coupling**

## 11. Dynamic characteristics

**Table 9. Dynamic characteristics**

*At recommended operating conditions; voltages are referenced to GND (ground 0 V); for load circuit see Figure 14.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HC4852** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nZ, nYn to nYn, nZ; see Figure 10 [1] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 2.2 | 9.3 | 33 | 2.2 | 34 | 2.2 | 35 | ns |
| | | $V_{CC}$ = 3.0 V | 2.2 | 4.9 | 16.5 | 1.9 | 18 | 1.9 | 19.5 | ns |
| | | $V_{CC}$ = 3.3 V | 2.0 | 4.4 | 15.0 | 1.6 | 16.5 | 1.6 | 18.5 | ns |
| | | $V_{CC}$ = 4.5 V | 1.6 | 3.2 | 11.6 | 1.1 | 12.5 | 1.1 | 13.5 | ns |
| | | $V_{CC}$ = 6.0 V | 1.5 | 2.5 | 10.2 | 0.9 | 11 | 0.9 | 12 | ns |
| | | Sn to nZ, nYn; see Figure 11 [1] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 7.7 | 16.8 | 38 | 6.3 | 40 | 6.3 | 42 | ns |
| | | $V_{CC}$ = 3.0 V | 4.9 | 8.8 | 20 | 3.9 | 21.5 | 3.9 | 23 | ns |
| | | $V_{CC}$ = 3.3 V | 4.4 | 7.9 | 17.5 | 3.4 | 19 | 3.4 | 22 | ns |
| | | $V_{CC}$ = 4.5 V | 3.2 | 5.8 | 14 | 2.3 | 15 | 2.3 | 17 | ns |
| | | $V_{CC}$ = 6.0 V | 2.4 | 4.8 | 12.6 | 1.6 | 14.5 | 1.6 | 16.5 | ns |
| $t_{en}$ | enable time | $\overline{E}$ to nZ, nYn; see Figure 12 [2] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 10.5 | 20.5 | 47.5 | 8.5 | 52.5 | 8.5 | 57.5 | ns |
| | | $V_{CC}$ = 3.0 V | 6.2 | 10.6 | 45 | 5.2 | 50 | 5.2 | 55 | ns |
| | | $V_{CC}$ = 3.3 V | 5.6 | 9.4 | 42.5 | 4.6 | 47.5 | 4.6 | 52.5 | ns |
| | | $V_{CC}$ = 4.5 V | 4.2 | 6.9 | 40 | 3 | 45 | 3 | 50 | ns |
| | | $V_{CC}$ = 6.0 V | 3.2 | 5.6 | 39 | 2.2 | 40 | 2.2 | 40 | ns |
| $t_{dis}$ | disable time | $\overline{E}$ to nZ, nYn; see Figure 12 [3] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 39.5 | 75.4 | 100 | 39.3 | 105 | 39 | 115 | ns |
| | | $V_{CC}$ = 3.0 V | 35.2 | 69.5 | 90 | 35.5 | 100 | 35 | 110 | ns |
| | | $V_{CC}$ = 3.3 V | 34.6 | 68.1 | 85 | 34.6 | 95 | 34.5 | 105 | ns |
| | | $V_{CC}$ = 4.5 V | 28.5 | 63 | 80 | 28.2 | 90 | 28 | 100 | ns |
| | | $V_{CC}$ = 6.0 V | 14.4 | 57.9 | 78 | 13.5 | 80 | 13.0 | 80 | ns |
| $C_{PD}$ | power dissipation capacitance | per channel; see Figure 13 [4] | | | | | | | | |
| | | $V_{CC}$ = 3.3 V | - | 42 | - | - | - | - | - | pF |
| | | $V_{CC}$ = 5.0 V | - | 47 | - | - | - | - | - | pF |

**Table 9. Dynamic characteristics** *…continued*

*At recommended operating conditions; voltages are referenced to GND (ground 0 V); for load circuit see Figure 14.*

| Symbol | Parameter | Conditions | | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HCT4852** | | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nZ, nYn to nYn, nZ; see Figure 10 | [1] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | | 1.6 | 3.5 | 11.5 | 1.1 | 12.5 | 1.1 | 13.5 | ns |
| | | Sn to nZ, nYn; see Figure 11 | [1] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | | 3.2 | 7.6 | 13 | 2.3 | 15 | 1.6 | 17 | ns |
| $t_{en}$ | enable time | $\overline{E}$ to nZ, nYn; see Figure 12 | [2] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | | 4.2 | 8.3 | 25 | 3.0 | 30 | 3.0 | 35 | ns |
| $t_{dis}$ | disable time | $\overline{E}$ to nZ, nYn; see Figure 12 | [3] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | | 28.5 | 61.8 | 80 | 28.2 | 90 | 28.0 | 100 | ns |
| $C_{PD}$ | power dissipation capacitance | per channel; see Figure 13 | [4] | | | | | | | | |
| | | $V_{CC}$ = 5.0 V | | - | 47 | - | - | - | - | - | pF |

[1] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.

[2] $t_{en}$ is the same as $t_{PZH}$ and $t_{PZL}$.

[3] $t_{dis}$ is the same as $t_{PLZ}$ and $t_{PHZ}$.

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

## 12. Waveforms

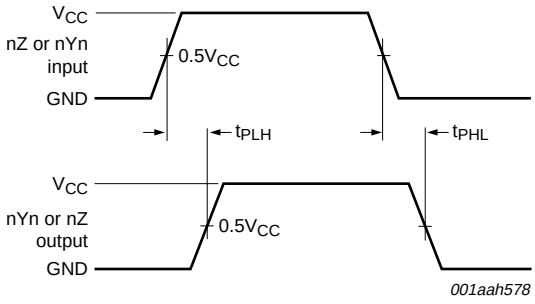
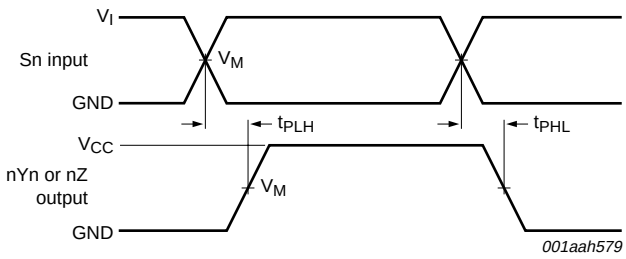
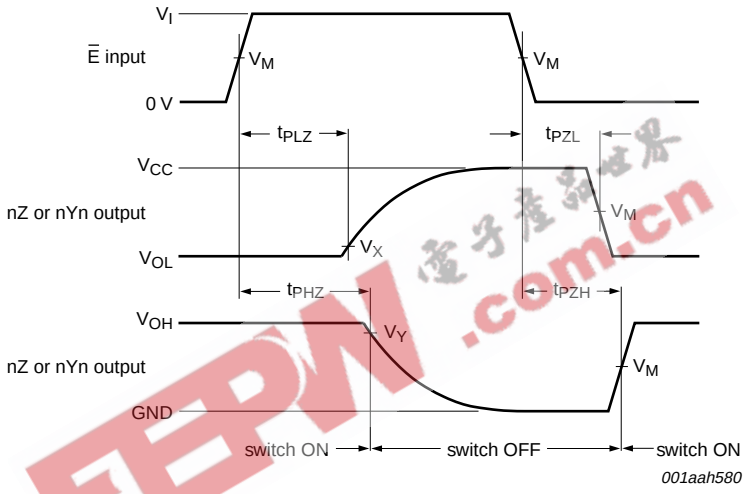



**Fig 10. Input (nZ, nYn) to output (nYn, nZ) propagation delays**




Measurement points are given in Table 10.

**Fig 11. Input (Sn) to output (nYn, nZ) propagation delays**




Measurement points are shown in Table 10.

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

**Fig 12. Enable and disable times**

**Table 10. Measurement points**

| Type | Input | | Output | | |
|---|---|---|---|---|---|
| | $V_M$ | $V_I$ | $V_M$ | $V_X$ | $V_Y$ |
| 74HC4852 | $0.5V_{CC}$ | $V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.1(V_{CC} - V_{OL})$ | $0.9V_{OH}$ |
| 74HCT4852 | 1.3 V | 3.0 V | $0.5V_{CC}$ | $V_{OL} + 0.1(V_{CC} - V_{OL})$ | $0.9V_{OH}$ |

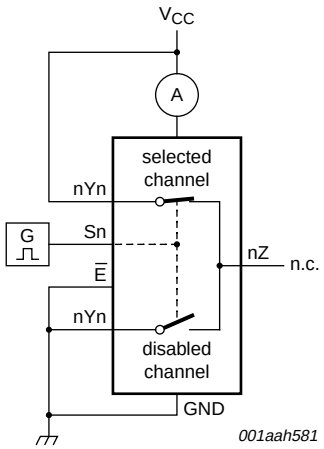
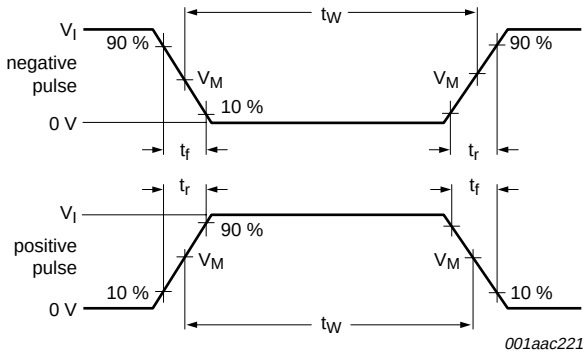
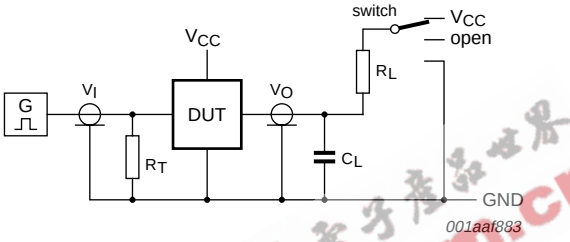



**Fig 13. Test circuit for measuring power dissipation capacitance**




a. Input pulse definition




Definitions for test circuit:

$R_L$ = load resistance.

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

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

b. Load circuit

Test data is given in Table 11.

**Fig 14. Input pulse definition and load circuit**

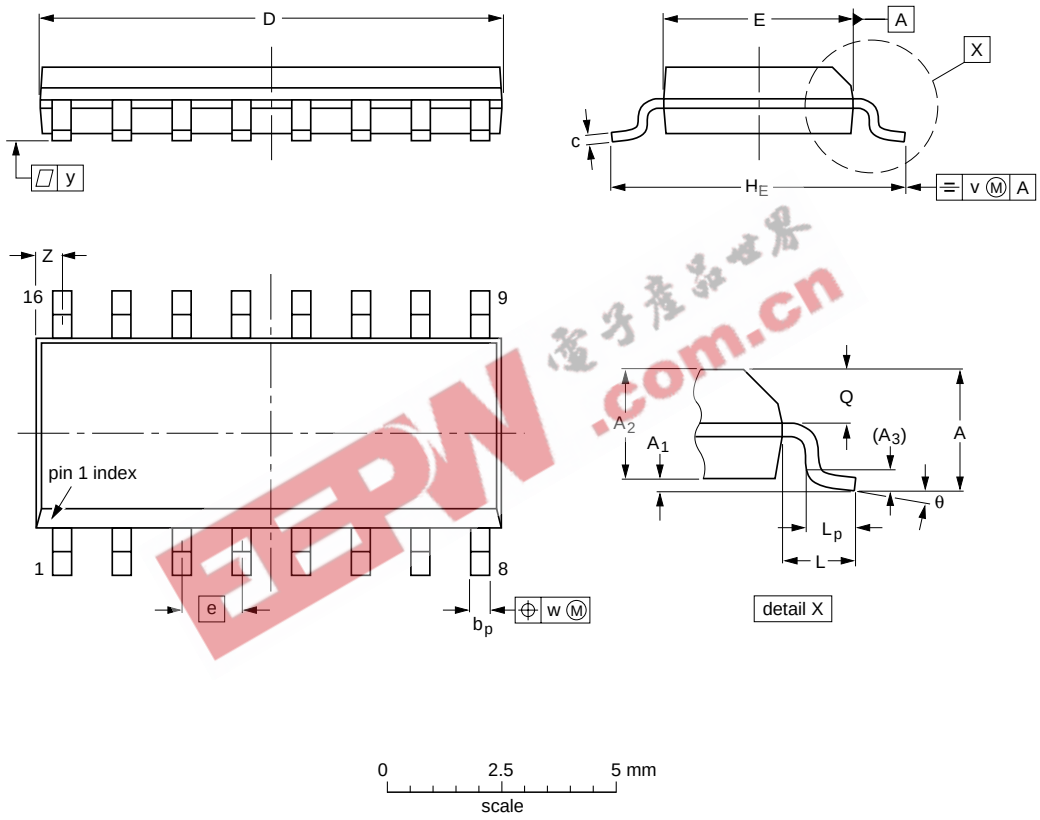
**Table 11. Test data**

| Test | Input | | | Output | | S1 position |
|---|---|---|---|---|---|---|
| | Control $\overline{E}$, Sn | Switch nYn (nZ) | $t_r$, $t_f$ | Switch nZ (nYn) | | |
| | $V_I$[1] | $V_I$ | | $C_L$ | $R_L$ | |
| $t_{PHL}$, $t_{PLH}$ | $V_{CC}$ | $V_{CC}$ | 6 ns | 50 pF | - | open |
| $t_{PHZ}$, $t_{PZH}$ | $V_{CC}$ | $V_{CC}$ | 6 ns | 50 pF | 10 kΩ | GND |
| $t_{PLZ}$, $t_{PZL}$ | $V_{CC}$ | $V_{CC}$ | 6 ns | 50 pF | 10 kΩ | $V_{CC}$ |
| $C_{PD}$ | $V_{CC}$ | $V_{CC}$ | 6 ns | 0 pF | - | open |

[1] For 74HCT4852: input voltage $V_I$ = 3.0 V.

## 13. 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<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 | |

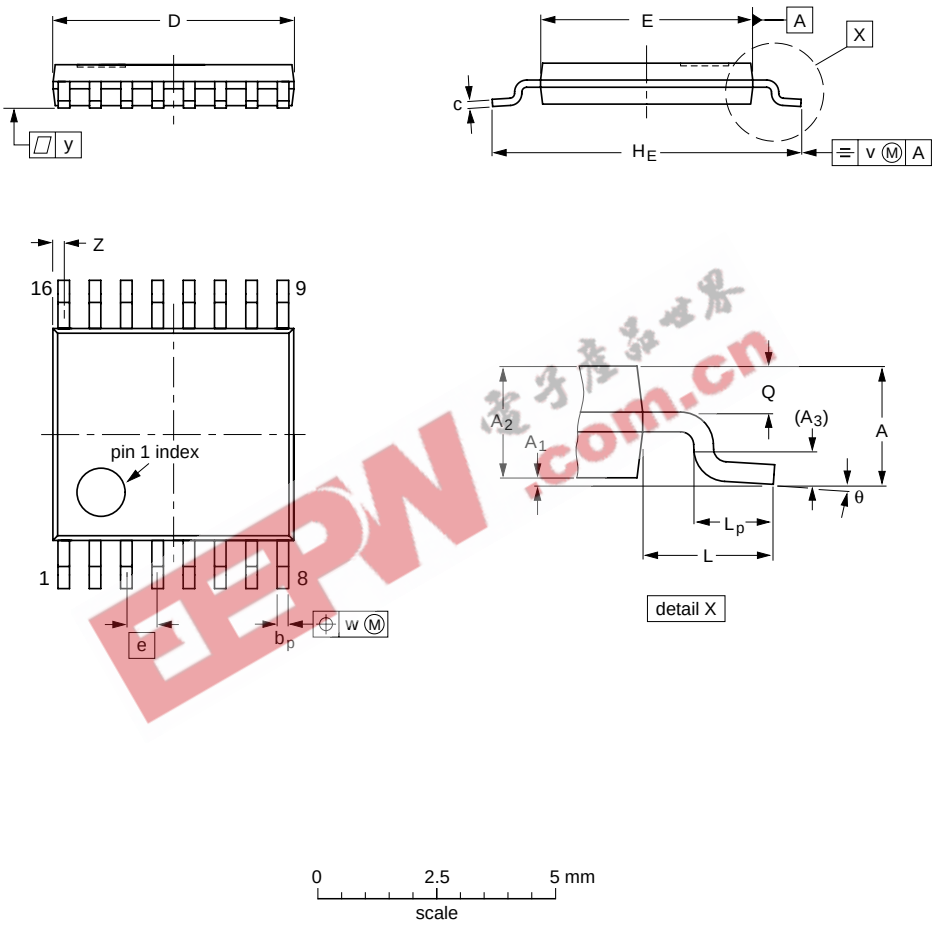
**Note**

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

**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>$0^o$ |

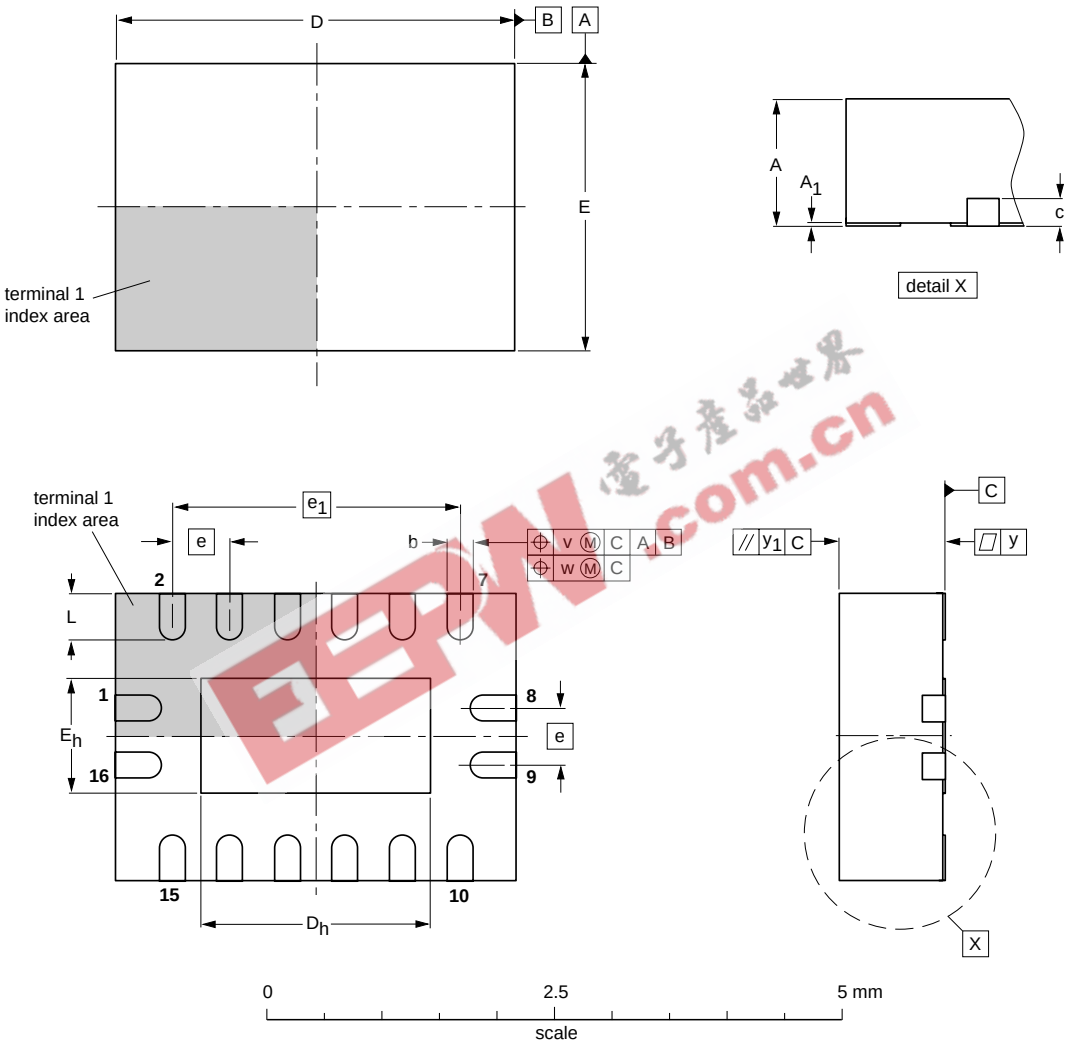
**Notes**

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 16. Package outline SOT403-1 (TSSOP16)**

**DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm** **SOT763-1**




**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 | 3.6<br>3.4 | 2.15<br>1.85 | 2.6<br>2.4 | 1.15<br>0.85 | 0.5 | 2.5 | 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 | | | |
| SOT763-1 | - - - | MO-241 | - - - | | | ~~02-10-17~~<br>03-01-27 |

**Fig 17. Package outline SOT763-1 (DHVQFN16)**

## 14. Abbreviations

**Table 12. Abbreviations**

| Acronym | Description |
|---|---|
| CDM | Charged Device Model |
| CMOS | Complementary Metal Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |

## 15. Revision history

**Table 13. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HC_HCT4852_3 | 20080902 | Product data sheet | - | 74HC4852_2 |
| Modifications: | • 74HCT4852 device added. | | | |
| 74HC4852_2 | 20070530 | Product data sheet | - | 74HC4852_1 |
| 74HC4852_1 | 20070323 | Product data sheet | - | - |

# 16. Legal information

## 16.1 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.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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