

74HC4851

8-channel analog multiplexer/demultiplexer with injection-current effect control

Rev. 01 — 9 March 2007

Product data sheet

1. General description

The 74HC4851 is a high-speed Si-gate CMOS device and is specified in compliance with JEDEC standard no. 7A.

The 74HC4851 is an 8-channel analog multiplexer/demultiplexer with three digital select inputs (S0 to S2), an active-LOW enable input (\bar{E}), eight independent inputs/outputs (Y0 to Y7) and a common input/output (Z). The device features injection-current effect control, which has excellent value in automotive applications where voltages in excess of the supply voltage are common.

With \bar{E} LOW, one of the eight switches is selected (low impedance ON-state) by S0 to S2. With \bar{E} HIGH, all switches are in the high-impedance OFF-state, independent of S0 to S2.

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
- ESD protection:
 - ◆ HBM JESD22-A114D Class 2. Exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101C exceeds 1000 V
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- 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 | | | Version |
|-------------|-------------------|----------|---|----------|
| | Temperature range | Name | Description | |
| 74HC4851D | -40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HC4851PW | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74HC4851BQ | -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

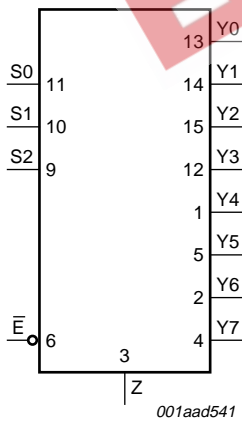


Fig 1. Logic symbol

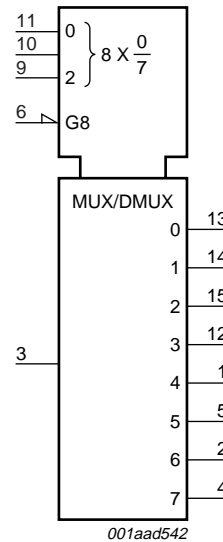


Fig 2. IEC logic symbol

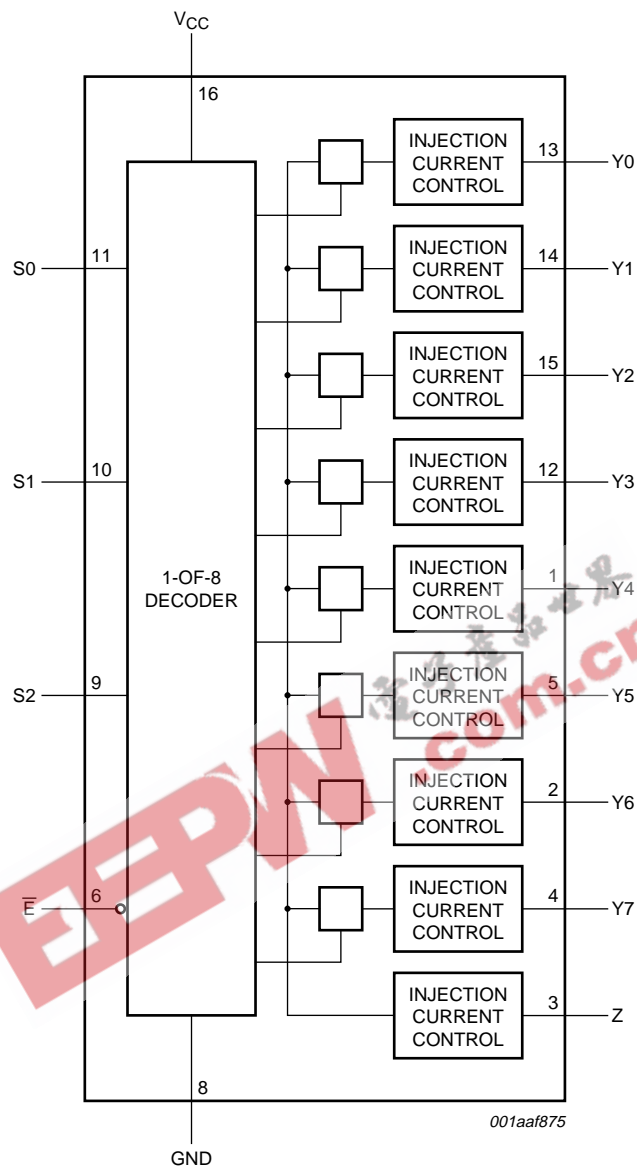
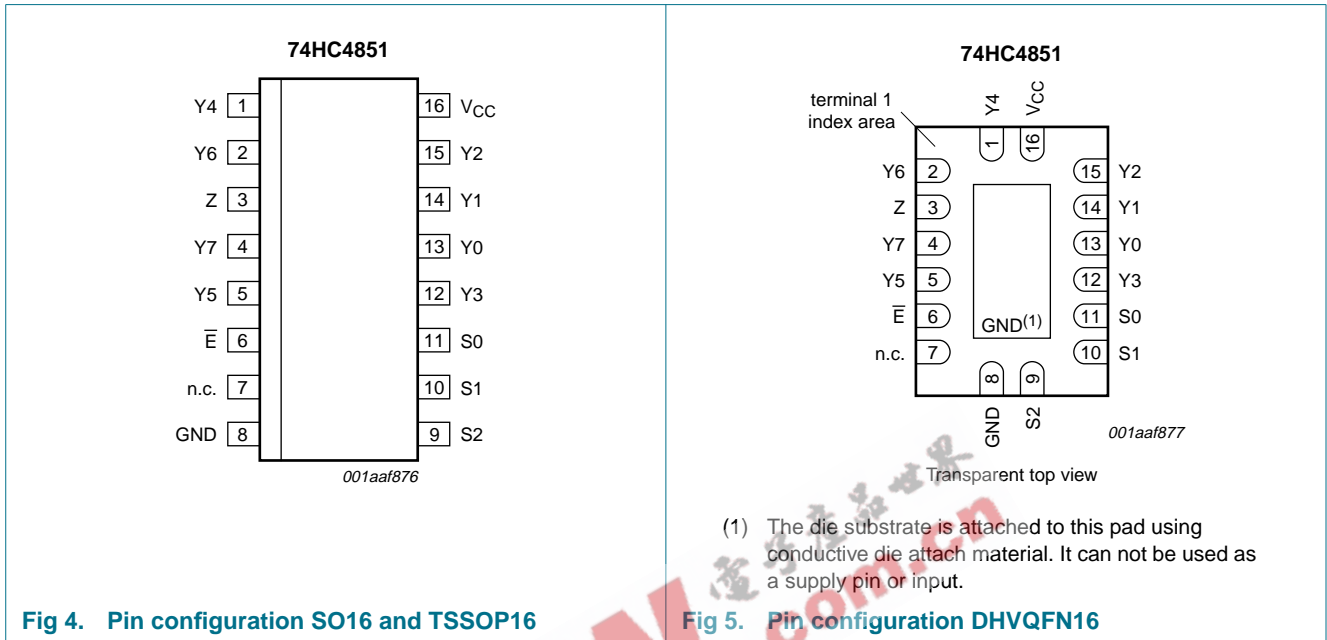


Fig 3. Functional diagram

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|-----------------|-----|-----------------------------|
| Y4 | 1 | independent input/output Y4 |
| Y6 | 2 | independent input/output Y6 |
| Z | 3 | common input/output Z |
| Y7 | 4 | independent input/output Y7 |
| Y5 | 5 | independent input/output Y5 |
| \bar{E} | 6 | enable input (active LOW) |
| n.c. | 7 | not connected |
| GND | 8 | ground (0 V) |
| S2 | 9 | select input S2 |
| S1 | 10 | select input S1 |
| S0 | 11 | select input S0 |
| Y3 | 12 | independent input/output Y3 |
| Y0 | 13 | independent input/output Y0 |
| Y1 | 14 | independent input/output Y1 |
| Y2 | 15 | independent input/output Y2 |
| V _{CC} | 16 | positive supply voltage |

7. Functional description

Table 3. Function table^[1]

| Input | | | | Channel ON |
|-----------|----|----|----|------------|
| \bar{E} | S2 | S1 | S0 | |
| L | L | L | L | Y0 to Z |
| L | L | L | H | Y1 to Z |
| L | L | H | L | Y2 to Z |
| L | L | H | H | Y3 to Z |
| L | H | L | L | Y4 to Z |
| L | H | L | H | Y5 to Z |
| L | H | H | L | Y6 to Z |
| L | H | H | H | Y7 to Z |
| H | X | 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 | | -0.5 | $V_{CC} + 0.5$ | V |
| V_{SW} | switch voltage | enable and disable mode | -0.5 | $V_{CC} + 0.5$ | V |
| I_{IK} | input clamping current | $V_I < 0\text{ V}$ or $V_I > V_{CC}$ | - | ± 20 | mA |
| I_{SK} | switch clamping current | $V_I < 0\text{ V}$ or $V_I > V_{CC}$ | - | ± 20 | mA |
| I_{SW} | switch current | $V_{SW} = 0\text{ V}$ to V_{CC} | - | ± 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 | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ | ^[1] - | 500 | mW |

- [1] 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 | Min | Typ | Max | Unit |
|---------------------|-------------------------------------|-------------------------|-----|-----|----------|------|
| V_{CC} | supply voltage | | 2.0 | - | 6.0 | V |
| V_I | input voltage | | 0 | - | V_{CC} | V |
| V_{SW} | switch voltage | | 0 | - | V_{CC} | V |
| T_{amb} | ambient temperature | | -40 | - | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0\text{ V}$ | - | 6.0 | 1000 | ns/V |
| | | $V_{CC} = 3.0\text{ V}$ | - | 6.0 | 800 | ns/V |
| | | $V_{CC} = 3.3\text{ V}$ | - | 6.0 | 800 | ns/V |
| | | $V_{CC} = 4.5\text{ V}$ | - | 6.0 | 500 | ns/V |
| | | $V_{CC} = 6.0\text{ V}$ | - | 6.0 | 400 | ns/V |

10. Static characteristics

Table 6. R_{ON} resistance
For test circuit see [Figure 8](#).

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|---|--|-----|-----|-----|----------|
| $T_{amb} = 25\text{ °C}$ | | | | | | |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_I = V_{CC}$ to GND; $\bar{E} = V_{IL}$ | | | | |
| | | $V_{CC} = 2.0\text{ V}; I_{SW} = 2\text{ mA}$ | - | 400 | 650 | Ω |
| | | $V_{CC} = 3.0\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | 215 | 330 | Ω |
| | | $V_{CC} = 3.3\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | 120 | 270 | Ω |
| | | $V_{CC} = 4.5\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | 76 | 210 | Ω |
| ΔR_{ON} | ON resistance mismatch between channels | $V_I = 0.5 \times V_{CC}; \bar{E} = V_{IL}$ | | | | |
| | | $V_{CC} = 2.0\text{ V}; I_{SW} = 2\text{ mA}$ | - | 4 | 10 | Ω |
| | | $V_{CC} = 3.0\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | 2 | 8 | Ω |
| | | $V_{CC} = 3.3\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | 2 | 8 | Ω |
| | | $V_{CC} = 4.5\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | 2 | 8 | Ω |
| | | $V_{CC} = 6.0\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | 3 | 9 | Ω |
| $T_{amb} = -40\text{ °C to }+85\text{ °C}$ | | | | | | |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_I = V_{CC}$ to GND; $\bar{E} = V_{IL}$ | | | | |
| | | $V_{CC} = 2.0\text{ V}; I_{SW} = 2\text{ mA}$ | - | - | 670 | Ω |
| | | $V_{CC} = 3.0\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | - | 360 | Ω |
| | | $V_{CC} = 3.3\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | - | 305 | Ω |
| | | $V_{CC} = 4.5\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | - | 240 | Ω |
| | | $V_{CC} = 6.0\text{ V}; I_{SW} \leq 2\text{ mA}$ | - | - | 220 | Ω |

Table 6. R_{ON} resistance ...continued
For test circuit see [Figure 8](#).

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|---|--|-----|-----|-----|----------|
| ΔR_{ON} | ON resistance mismatch between channels | $V_I = 0.5 \times V_{CC}; \bar{E} = V_{IL}$ | | | | |
| | | $V_{CC} = 2.0 \text{ V}; I_{SW} = 2 \text{ mA}$ | - | - | 15 | Ω |
| | | $V_{CC} = 3.0 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 12 | Ω |
| | | $V_{CC} = 3.3 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 12 | Ω |
| | | $V_{CC} = 4.5 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 12 | Ω |
| | | $V_{CC} = 6.0 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 13 | Ω |
| $T_{amb} = -40 \text{ }^\circ\text{C to } +125 \text{ }^\circ\text{C}$ | | | | | | |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_I = V_{CC} \text{ to GND}; \bar{E} = V_{IL}$ | | | | |
| | | $V_{CC} = 2.0 \text{ V}; I_{SW} = 2 \text{ mA}$ | - | - | 700 | Ω |
| | | $V_{CC} = 3.0 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 380 | Ω |
| | | $V_{CC} = 3.3 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 345 | Ω |
| | | $V_{CC} = 4.5 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 270 | Ω |
| | | $V_{CC} = 6.0 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 250 | Ω |
| ΔR_{ON} | ON resistance mismatch between channels | $V_I = 0.5 \times V_{CC}; \bar{E} = V_{IL}$ | | | | |
| | | $V_{CC} = 2.0 \text{ V}; I_{SW} = 2 \text{ mA}$ | - | - | 20 | Ω |
| | | $V_{CC} = 3.0 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 16 | Ω |
| | | $V_{CC} = 3.3 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 16 | Ω |
| | | $V_{CC} = 4.5 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 16 | Ω |
| | | $V_{CC} = 6.0 \text{ V}; I_{SW} \leq 2 \text{ mA}$ | - | - | 18 | Ω |

Table 7. Injection current coupling
For test circuit see [Figure 9](#).

| Symbol | Parameter | Conditions | Min | Typ ^[1] | Max | Unit |
|--|--------------------------|---|-----|--------------------|-----|------|
| $T_{amb} = -40 \text{ }^\circ\text{C to } +125 \text{ }^\circ\text{C}$ | | | | | | |
| ΔV_O | output voltage variation | $ I_{SW} \leq 1 \text{ mA}; R_S \leq 3.9 \text{ k}\Omega$ | | | | |
| | | $V_{CC} = 3.3 \text{ V}$ | - | 0.05 | 1 | mV |
| | | $V_{CC} = 5.0 \text{ V}$ | - | 0.03 | 1 | mV |
| | | $ I_{SW} \leq 10 \text{ mA}; R_S \leq 3.9 \text{ k}\Omega$ | | | | |
| | | $V_{CC} = 3.3 \text{ V}$ | - | 0.55 | 5 | mV |
| | | $V_{CC} = 5.0 \text{ V}$ | - | 0.27 | 5 | mV |
| | | $ I_{SW} \leq 1 \text{ mA}; R_S \leq 20 \text{ k}\Omega$ | | | | |
| | | $V_{CC} = 3.3 \text{ V}$ | - | 0.04 | 2 | mV |
| | | $V_{CC} = 5.0 \text{ V}$ | - | 0.03 | 2 | mV |
| | | $ I_{SW} \leq 10 \text{ mA}; R_S \leq 20 \text{ k}\Omega$ | | | | |
| | | $V_{CC} = 3.3 \text{ V}$ | - | 0.56 | 20 | mV |
| | | $V_{CC} = 5.0 \text{ V}$ | - | 0.48 | 20 | mV |

[1] Typical values are measured at $T_{amb} = 25 \text{ }^\circ\text{C}$.

[2] ΔV_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

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 | control inputs | | | | |
| | | V _{CC} = 2.0 V | 1.5 | - | - | V |
| | | V _{CC} = 3.0 V | 2.1 | - | - | V |
| | | V _{CC} = 3.3 V | 2.3 | - | - | V |
| | | V _{CC} = 4.5 V | 3.15 | - | - | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |
| I _I | input leakage current | control inputs; V _I = GND or V _{CC} | | | | |
| | | V _{CC} = 6.0 V | - | - | ±0.1 | µA |
| I _{S(OFF)} | OFF-state leakage current | $\bar{E} = V_{IH}; V_I = \text{GND or } V_{CC};$ $V_O = V_{CC} \text{ or } \text{GND}; V_{CC} = 6.0 \text{ V};$ see Figure 6 | | | | |
| | | per channel | - | - | ±0.1 | µA |
| | | all channels | - | - | ±0.2 | µA |
| I _{S(ON)} | ON-state leakage current | $\bar{E} = V_{IL}; V_I = \text{GND or } V_{CC};$ $V_O = V_{CC} \text{ or } \text{GND}; V_{CC} = 6.0 \text{ V};$ see Figure 7 | - | - | ±0.1 | µA |
| I _{CC} | supply current | V _I = GND or V _{CC} | | | | |
| | | V _{CC} = 6.0 V | - | - | 2.0 | µA |
| C _I | input capacitance | S0, S1, S2 and \bar{E} | - | 2 | 10 | pF |
| C _{sw} | switch capacitance | Z; OFF-state | - | 15 | 40 | pF |
| | | Yn; OFF-state | - | 3 | 15 | pF |
| T_{amb} = -40 °C to +85 °C | | | | | | |
| V _{IH} | HIGH-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | 1.5 | - | - | V |
| | | V _{CC} = 3.0 V | 2.1 | - | - | V |
| | | V _{CC} = 3.3 V | 2.3 | - | - | V |
| | | V _{CC} = 4.5 V | 3.15 | - | - | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |
| V _{IL} | LOW-level input voltage | control inputs | | | | |
| | | V _{CC} = 2.0 V | - | - | 0.5 | V |
| | | V _{CC} = 3.0 V | - | - | 0.9 | V |
| | | V _{CC} = 3.3 V | - | - | 1.0 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | V |

Table 8. Static characteristics ...continued
 Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---------------------------|---|------|-----|------------|---------------|
| I_I | input leakage current | control inputs; $V_I = \text{GND or } V_{CC}$ $V_{CC} = 6.0 \text{ V}$ | - | - | ± 0.1 | μA |
| $I_{S(\text{OFF})}$ | OFF-state leakage current | $\bar{E} = V_{IH}$; $V_I = \text{GND or } V_{CC}$; $V_O = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$; see Figure 6 | | | | |
| | | per channel | - | - | ± 0.5 | μA |
| | | all channels | - | - | ± 2.0 | μA |
| $I_{S(\text{ON})}$ | ON-state leakage current | $\bar{E} = V_{IL}$; $V_I = \text{GND or } V_{CC}$; $V_O = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$; see Figure 7 | - | - | ± 2.0 | μA |
| I_{CC} | supply current | $V_I = \text{GND or } V_{CC}$ $V_{CC} = 6.0 \text{ V}$ | - | - | 5.0 | μA |
| C_I | input capacitance | S0, S1, S2 and \bar{E} | - | - | 10 | pF |
| C_{sw} | switch capacitance | Z; OFF-state | | | 40 | pF |
| | | Yn; OFF-state | | | 15 | pF |
| $T_{\text{amb}} = -40 \text{ }^\circ\text{C to } +125 \text{ }^\circ\text{C}$ | | | | | | |
| V_{IH} | HIGH-level input voltage | control inputs | | | | |
| | | $V_{CC} = 2.0 \text{ V}$ | 1.5 | - | - | V |
| | | $V_{CC} = 3.0 \text{ V}$ | 2.1 | - | - | V |
| | | $V_{CC} = 3.3 \text{ V}$ | 2.3 | - | - | V |
| | | $V_{CC} = 4.5 \text{ V}$ | 3.15 | - | - | V |
| | | $V_{CC} = 6.0 \text{ V}$ | 4.2 | - | - | V |
| V_{IL} | LOW-level input voltage | control inputs | | | | |
| | | $V_{CC} = 2.0 \text{ V}$ | - | - | 0.5 | V |
| | | $V_{CC} = 3.0 \text{ V}$ | - | - | 0.9 | V |
| | | $V_{CC} = 3.3 \text{ V}$ | - | - | 1.0 | V |
| | | $V_{CC} = 4.5 \text{ V}$ | - | - | 1.35 | V |
| | | $V_{CC} = 6.0 \text{ V}$ | - | - | 1.8 | V |
| I_I | input leakage current | control inputs; $V_I = \text{GND or } V_{CC}$ $V_{CC} = 6.0 \text{ V}$ | - | - | ± 1.0 | μA |
| $I_{S(\text{OFF})}$ | OFF-state leakage current | $\bar{E} = V_{IH}$; $V_I = \text{GND or } V_{CC}$; $V_O = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$; see Figure 6 | | | | |
| | | per channel | - | - | ± 2.0 | μA |
| | | all channels | - | - | ± 10.0 | μA |
| $I_{S(\text{ON})}$ | ON-state leakage current | $\bar{E} = V_{IL}$; $V_I = \text{GND or } V_{CC}$; $V_O = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$; see Figure 7 | - | - | ± 10.0 | μA |
| I_{CC} | supply current | $V_I = \text{GND or } V_{CC}$ $V_{CC} = 6.0 \text{ V}$ | - | - | 20.0 | μA |

Table 8. Static characteristics ...continued
 Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|--------------------|--------------------------|-----|-----|-----|------|
| C_I | input capacitance | S0, S1, S2 and \bar{E} | - | - | 10 | pF |
| C_{SW} | switch capacitance | Z; OFF-state | - | - | 40 | pF |
| | | Yn; OFF-state | - | - | 15 | pF |

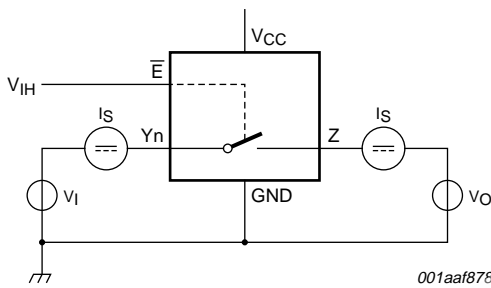


Fig 6. Test circuit for measuring OFF-state leakage current

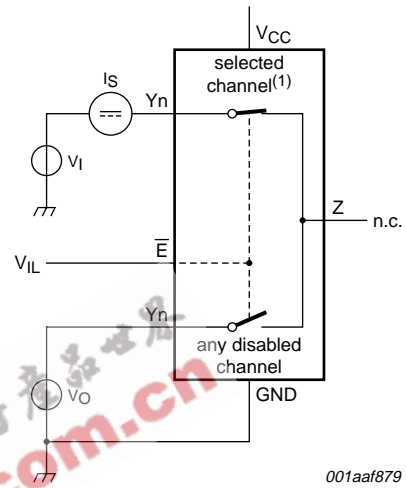
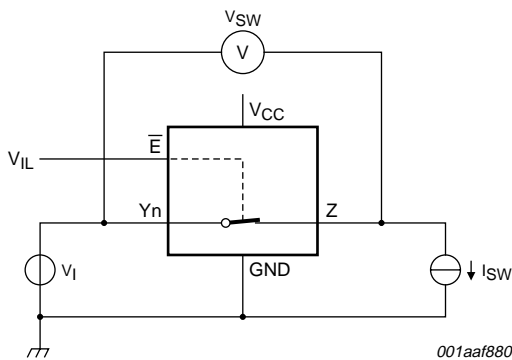
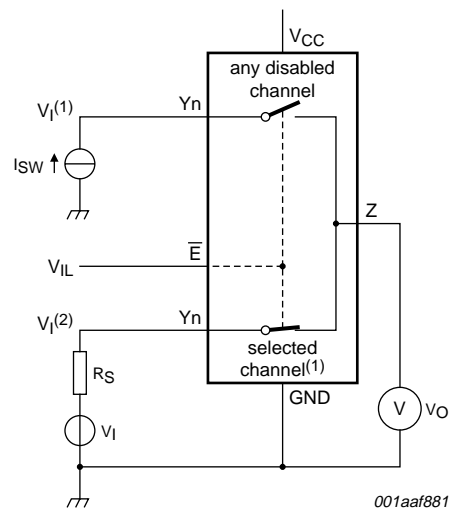


Fig 7. Test circuit for measuring ON-state leakage current
 (1) Channel is selected by S0, S1 and S2.



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

Fig 8. Test circuit for measuring ON resistance



(1) Channel is selected by S0, S1 and S2.
 $V_I(1) < GND$ 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

$GND = 0\text{ V}$; $C_L = 50\text{ pF}$; $R_L = 10\text{ K}\Omega$ unless specified otherwise; for test circuit see [Figure 12](#).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|-------------------|-------------------------------|---------------------|------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $V_{CC} = 2.0\text{ V}$ | | | | | | | | | | |
| t_{pd} | propagation delay | see Figure 10 | [1] | | | | | | | |
| | | Z, Yn to Yn, Z | - | 10.0 | 25 | - | 29 | - | 32 | ns |
| | | Sn to Z, Yn | - | 18.0 | 32 | - | 35 | - | 40 | ns |
| t_{en} | enable time | see Figure 11 | [2] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 95 | - | 105 | - | 115 | ns |
| t_{dis} | disable time | see Figure 11 | [3] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 95 | - | 105 | - | 115 | ns |
| $V_{CC} = 3.0\text{ V}$ | | | | | | | | | | |
| t_{pd} | propagation delay | see Figure 10 | [1] | | | | | | | |
| | | Z, Yn to Yn, Z | - | 6.0 | 15.5 | - | 17.5 | - | 19.5 | ns |
| | | Sn to Z, Yn | - | 9.5 | 17.5 | - | 20 | - | 23 | ns |
| t_{en} | enable time | see Figure 11 | [2] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 90 | - | 100 | - | 110 | ns |
| t_{dis} | disable time | see Figure 11 | [3] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 90 | - | 100 | - | 110 | ns |
| $V_{CC} = 3.3\text{ V}$ | | | | | | | | | | |
| t_{pd} | propagation delay | see Figure 10 | [1] | | | | | | | |
| | | Z, Yn to Yn, Z | - | 5.0 | 14.5 | - | 16.5 | - | 18.5 | ns |
| | | Sn to Z, Yn | - | 8.5 | 16.5 | - | 19 | - | 22 | ns |
| t_{en} | enable time | see Figure 11 | [2] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 85 | - | 95 | - | 105 | ns |
| t_{dis} | disable time | see Figure 11 | [3] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 85 | - | 95 | - | 105 | ns |
| $V_{CC} = 4.5\text{ V}$ | | | | | | | | | | |
| t_{pd} | propagation delay | see Figure 10 | [1] | | | | | | | |
| | | Z, Yn to Yn, Z | - | 4.0 | 11.5 | - | 12.5 | - | 13.5 | ns |
| | | Sn to Z, Yn | - | 6.5 | 13 | - | 15 | - | 17 | ns |
| t_{en} | enable time | see Figure 11 | [2] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 80 | - | 90 | - | 100 | ns |
| t_{dis} | disable time | see Figure 11 | [3] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 80 | - | 90 | - | 100 | ns |

Table 9. Dynamic characteristics ...continued

$GND = 0\text{ V}$; $C_L = 50\text{ pF}$; $R_L = 10\text{ K}\Omega$ unless specified otherwise; for test circuit see [Figure 12](#).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|-------------------------------|-------------------------------|-------|-----|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $V_{CC} = 6.0\text{ V}$ | | | | | | | | | | |
| t_{pd} | propagation delay | see Figure 10 | [1] | | | | | | | |
| | | Z, Yn to Yn, Z | - | 3.0 | 10 | - | 11 | - | 12 | ns |
| | | Sn to Z, Yn | - | 5.0 | 12.5 | - | 14.5 | - | 16.5 | ns |
| t_{en} | enable time | see Figure 11 | [2] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 78 | - | 80 | - | 80 | ns |
| t_{dis} | disable time | see Figure 11 | [3] | | | | | | | |
| | | \bar{E} to Z, Yn | - | - | 78 | - | 80 | - | 80 | ns |
| Power dissipation capacitance | | | | | | | | | | |
| C_{PD} | power dissipation capacitance | per channel | [4] | | | | | | | |
| | | $V_{CC} = 3.3\text{ V}$ | - | 28 | - | - | - | - | - | pF |
| | | $V_{CC} = 5.0\text{ V}$ | - | 33 | - | - | - | - | - | 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):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$$

where:

f_i = input frequency in MHz;

f_o = output frequency in MHz;

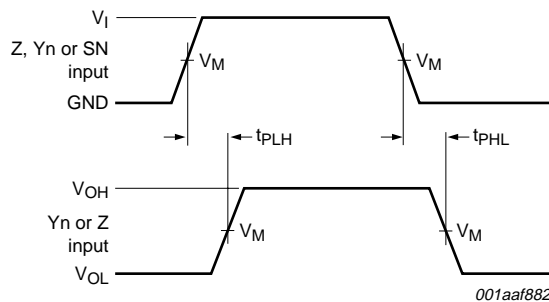
$\sum\{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$ = sum of outputs;

C_L = output load capacitance in pF;

C_{sw} = switch capacitance in pF;

V_{CC} = supply voltage in V.

12. Waveforms



Measurement points are given in [Table 10](#).

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

Fig 10. Input (Z, Yn or Sn) to output (Yn, Z) propagation delays

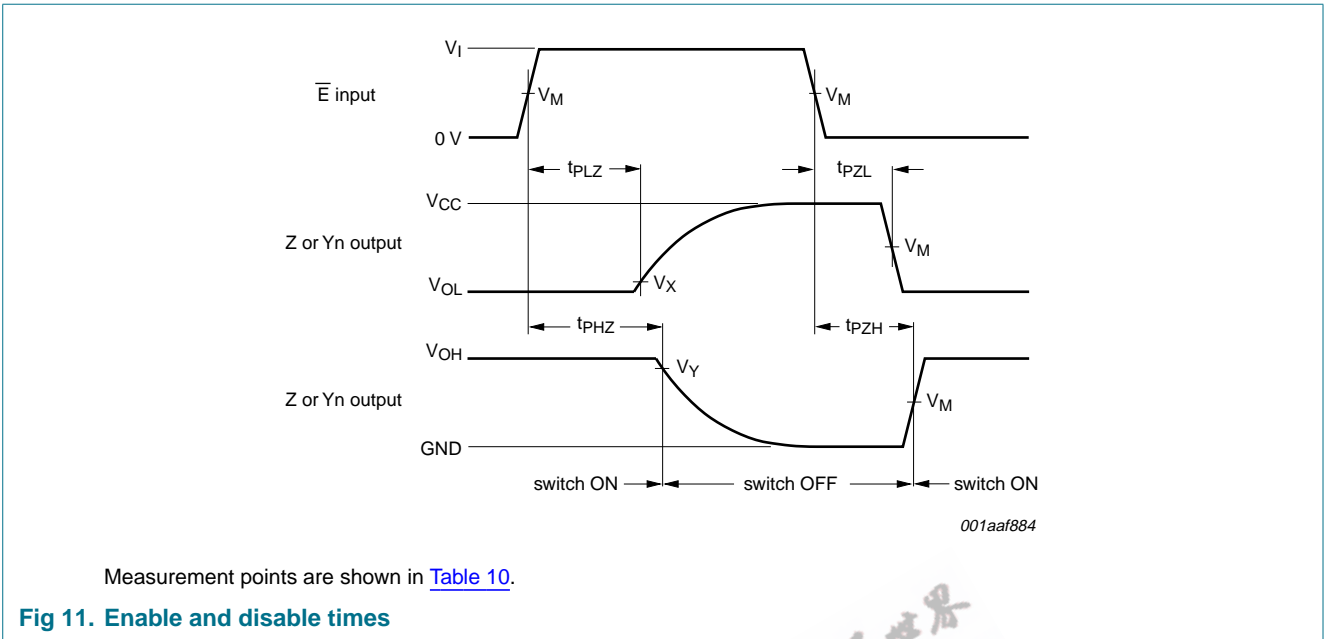
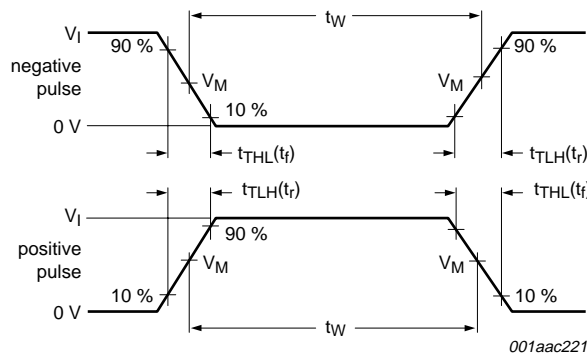
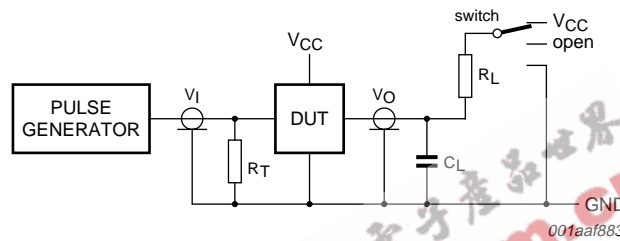


Table 10. Measurement points

| Supply voltage | Input | | Output | | |
|----------------|---------------------|-----------------|---------------------|---|---------------------|
| | V_M | V_I | V_M | V_X | V_Y |
| 2.0 V to 6.0 V | $0.5 \times V_{CC}$ | GND to V_{CC} | $0.5 \times V_{CC}$ | $V_{OL} + 0.1 \times (V_{CC} - V_{OL})$ | $0.9 \times V_{OH}$ |



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 circuitry

Test data is given in [Table 11](#).

Fig 12. Switching times

Table 11. Test data

| Test | Input | | Switch |
|--------------------|------------|----------|----------|
| | t_r, t_f | V_I | |
| t_{PZH}, t_{PHZ} | 6 ns | V_{CC} | GND |
| t_{PZL}, t_{PLZ} | 6 ns | GND | V_{CC} |
| t_{PHL}, t_{PLH} | 6 ns | pulse | open |

13. Package outline

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

SOT109-1

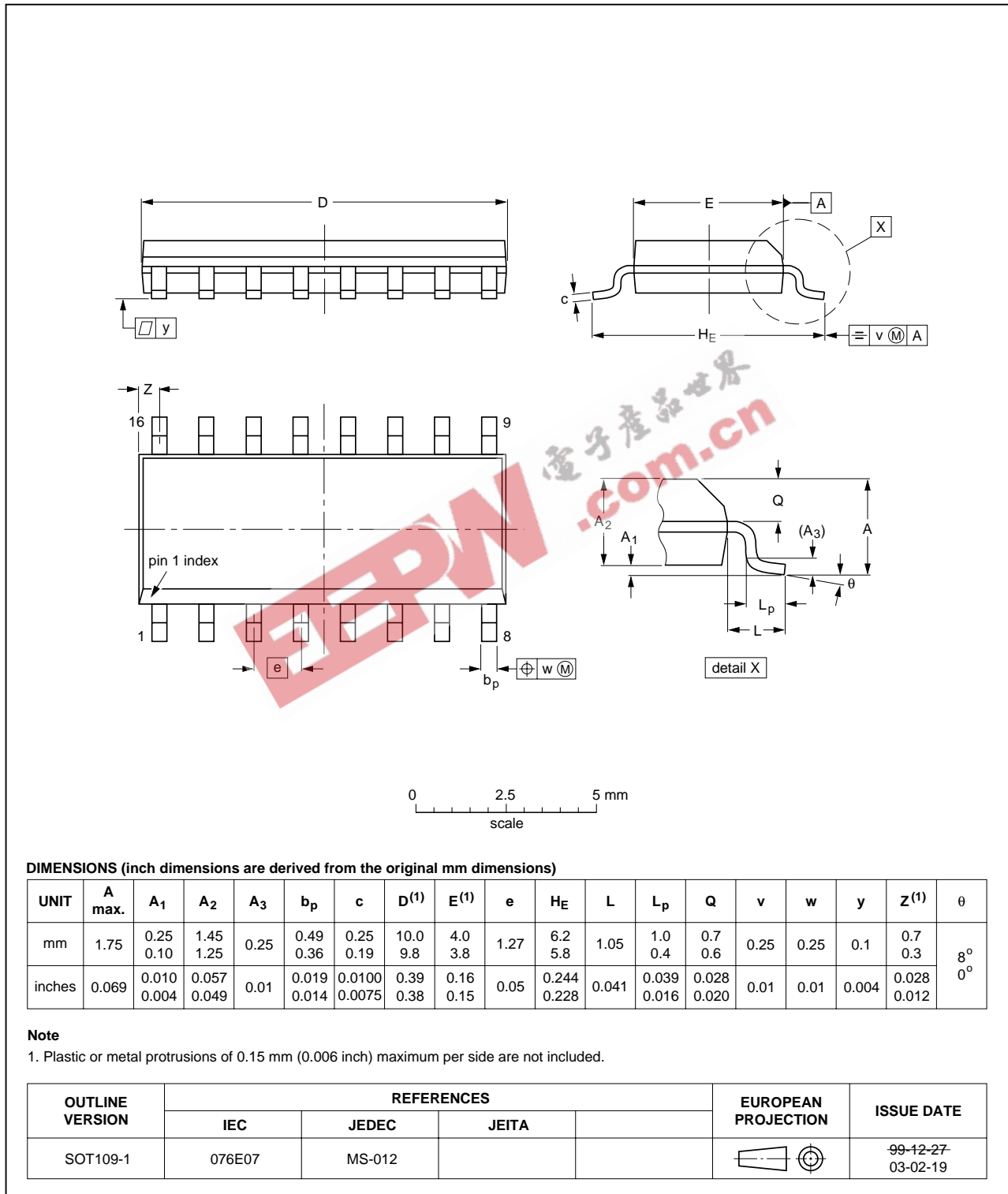


Fig 13. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

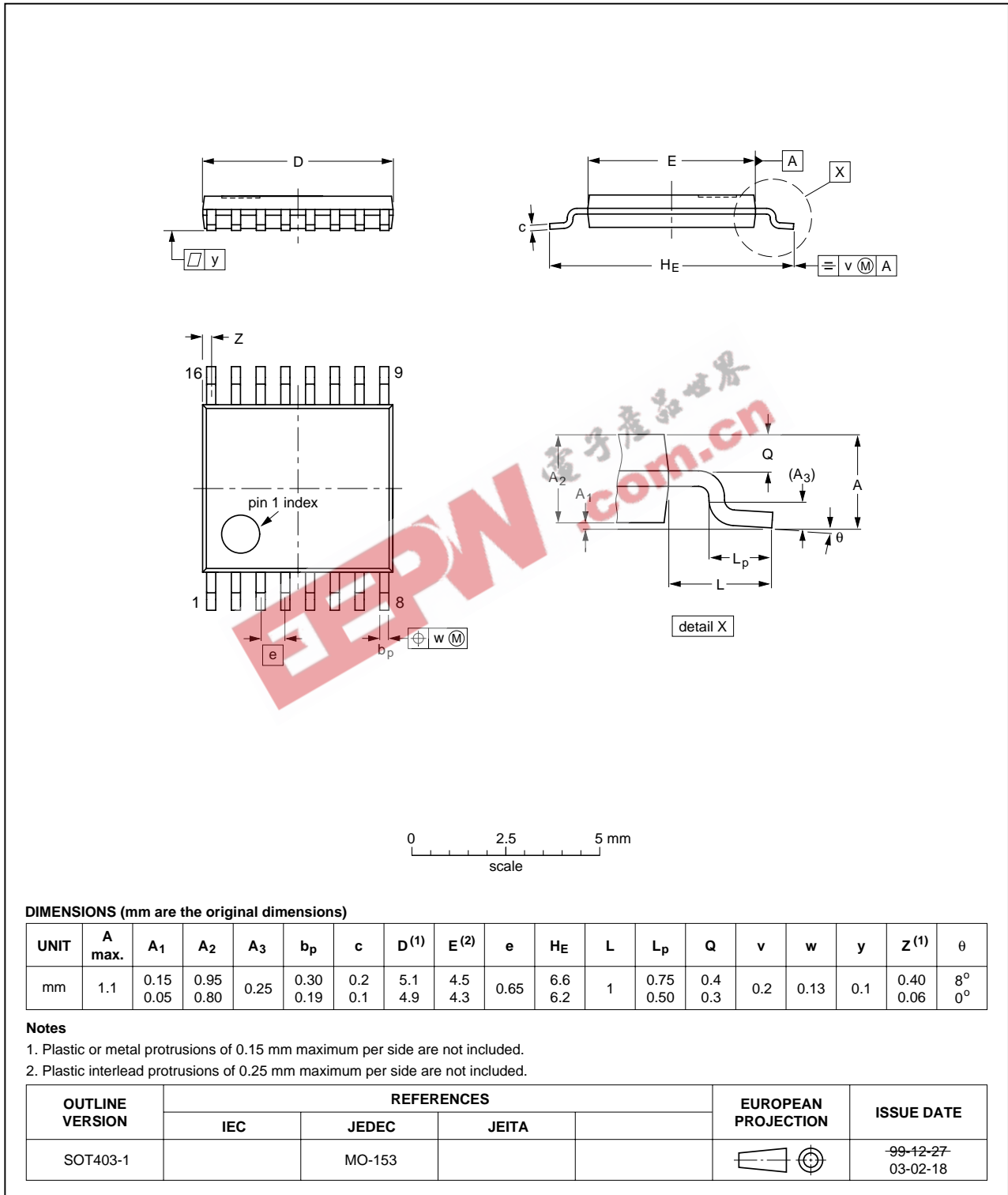


Fig 14. Package outline SOT403-1 (TSSOP16)

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

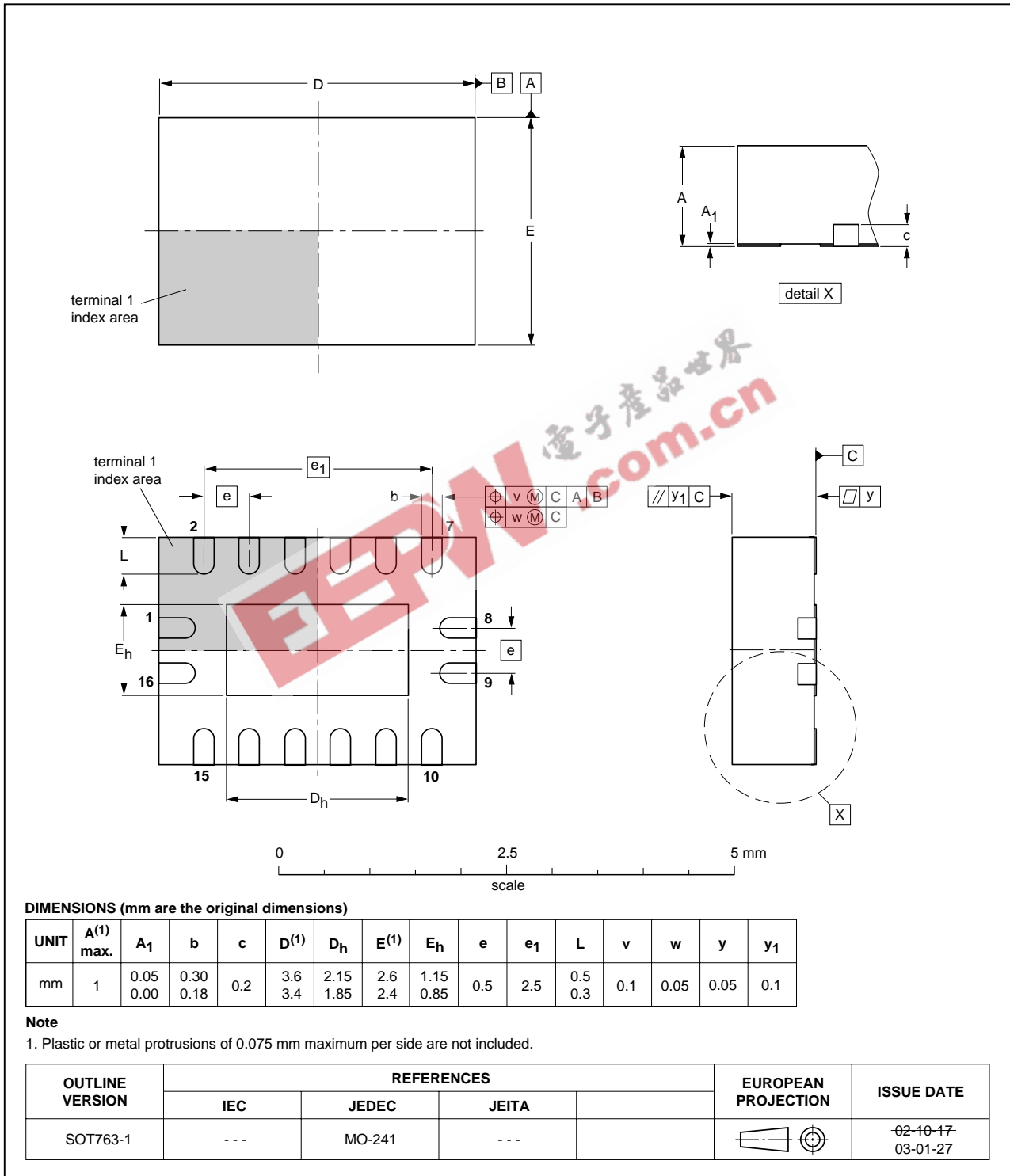


Fig 15. Package outline SOT763-1 (DHVQFN16)

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 |
|-------------|--------------|--------------------|---------------|------------|
| 74HC4851_1 | 20070309 | Product data sheet | - | - |

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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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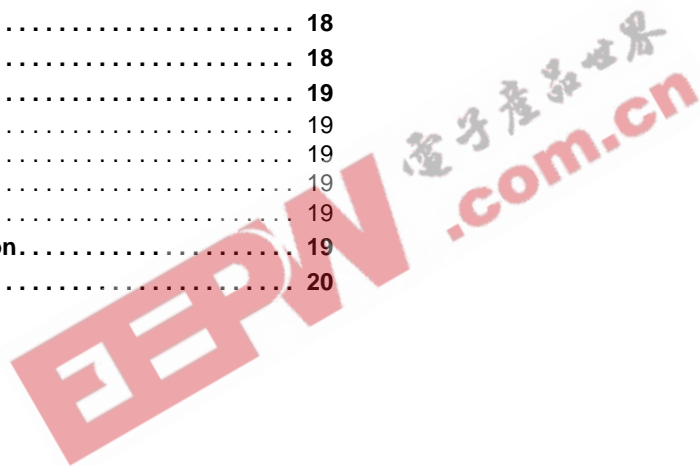
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