

# 74HC4051; 74HCT4051

## 8-channel analog multiplexer/demultiplexer

Rev. 12 — 21 March 2024

Product data sheet

### 1. General description

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The 74HC4051; 74HCT4051 is a single-pole octal-throw analog switch (SP8T) suitable for use in analog or digital 8:1 multiplexer/demultiplexer applications. The switch features three digital select inputs (S0, S1 and S2), eight independent inputs/outputs (Yn), a common input/output (Z) and a digital enable input (E). When E is HIGH, the switches are turned off. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

### 2. Features and benefits

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- Wide analog input voltage range from -5 V to +5 V
- CMOS low power dissipation
- High noise immunity
- Complies with JEDEC standards
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Low ON resistance:
  - 80  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 4.5$  V
  - 70  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 6.0$  V
  - 60  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 9.0$  V
- Logic level translation: to enable 5 V logic to communicate with  $\pm 5$  V analog signals
- Typical 'break before make' built-in
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

### 3. Applications

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

## 4. Ordering information

### Table 1. Ordering information

| Type number                                               | Package           |          |                                                                                                                                                                        |                           |
|-----------------------------------------------------------|-------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                                                           | Temperature range | Name     | Description                                                                                                                                                            | Version                   |
| <a href="#">74HC4051D</a><br><a href="#">74HCT4051D</a>   | -40 °C to +125 °C | SO16     | plastic small outline package; 16 leads;<br>body width 3.9 mm                                                                                                          | <a href="#">SOT109-1</a>  |
| <a href="#">74HC4051PW</a><br><a href="#">74HCT4051PW</a> | -40 °C to +125 °C | TSSOP16  | plastic thin shrink small outline package; 16 leads;<br>body width 4.4 mm                                                                                              | <a href="#">SOT403-1</a>  |
| <a href="#">74HC4051BQ</a><br><a href="#">74HCT4051BQ</a> | -40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced<br>very thin quad flat package; no leads; 16 terminals;<br>body 2.5 × 3.5 × 0.85 mm                                   | <a href="#">SOT763-1</a>  |
| <a href="#">74HC4051BZ</a><br><a href="#">74HCT4051BZ</a> | -40 °C to +125 °C | DHXQFN16 | plastic, leadless dual in-line compatible thermal<br>enhanced extreme thin quad flat package;<br>no leads; 16 terminals; 0.4 mm pitch;<br>body 2 mm × 2.4 mm × 0.48 mm | <a href="#">SOT8016-1</a> |

## 5. Functional diagram

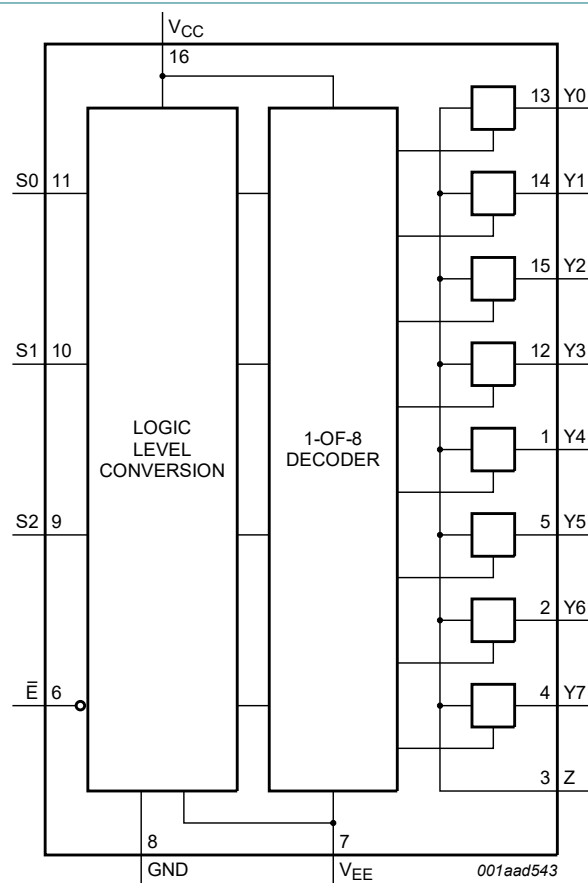


**Fig. 1. Functional diagram**

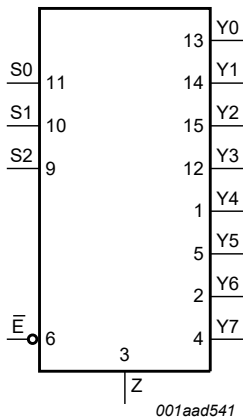


Fig. 2. Logic symbol

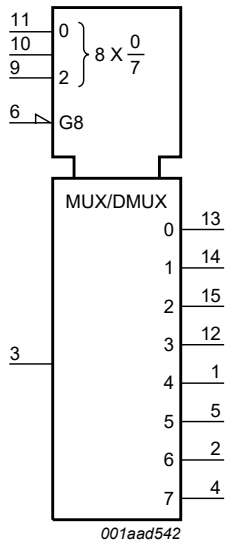


Fig. 3. IEC logic symbol

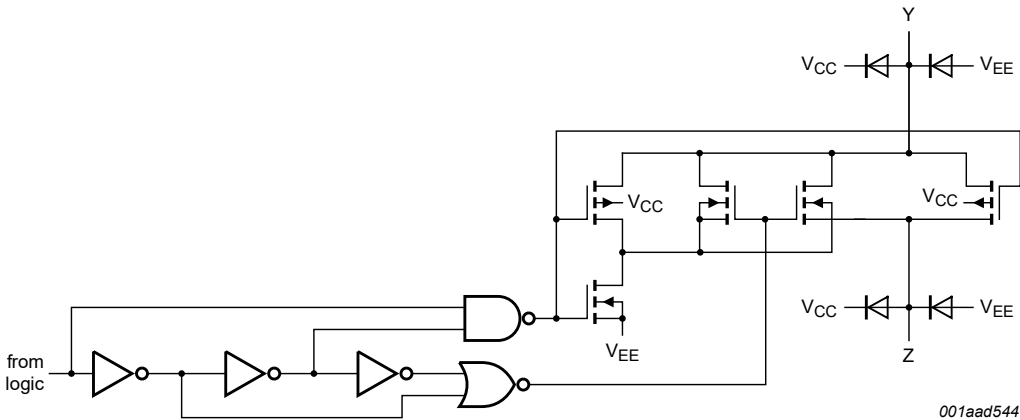


Fig. 4. Schematic diagram (one switch)

6. Pinning information

6.1. Pinning

**D package**  
**SOT109-1 (SO16)**

Y4 1 16 VCC  
Y6 2 15 Y2  
Z 3 14 Y1  
Y7 4 13 Y0  
Y5 5 12 Y3  
E 6 11 S0  
VEE 7 10 S1  
GND 8 9 S2

aaa-035655

**PW package**  
**SOT403-1 (TSSOP16)**

Y4 1 16 VCC  
Y6 2 15 Y2  
Z 3 14 Y1  
Y7 4 13 Y0  
Y5 5 12 Y3  
E 6 11 S0  
VEE 7 10 S1  
GND 8 9 S2

aaa-035656

**BQ package**  
**SOT763-1 (DHVQFN16)**

terminal 1 index area

Y4 1 16 VCC  
Y6 2 15 Y2  
Z 3 14 Y1  
Y7 4 13 Y0  
Y5 5 12 Y3  
E 6 11 S0  
VEE 7 10 S1  
GND 8 9 S2

VCC(1)

aaa-035657

Transparent top view

**BZ package**  
**SOT8016-1 (DHXQFN16)**

pin 1 index area

Y4 1 16 VCC  
Y6 2 15 Y2  
Z 3 14 Y1  
Y7 4 13 Y0  
Y5 5 12 Y3  
E 6 11 S0  
VEE 7 10 S1  
GND 8 9 S2

VCC(1)

aaa-035658

Transparent top view

(1) This is not a supply pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to VCC.

6.2. Pin description

Table 2. Pin description

| Symbol                         | Pin                        | Description                 |
|--------------------------------|----------------------------|-----------------------------|
| E                              | 6                          | enable input (active LOW)   |
| VEE                            | 7                          | supply voltage              |
| GND                            | 8                          | ground supply voltage       |
| S0, S1, S2                     | 11, 10, 9                  | select input                |
| Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7 | 13, 14, 15, 12, 1, 5, 2, 4 | independent input or output |
| Z                              | 3                          | common output or input      |
| VCC                            | 16                         | supply voltage              |

7. Function description

Table 3. Function table

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

| Input |    |    |    | Channel ON   |
|-------|----|----|----|--------------|
| 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  | switches off |

8. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to  $V_{SS} = 0\text{ V}$  (ground).

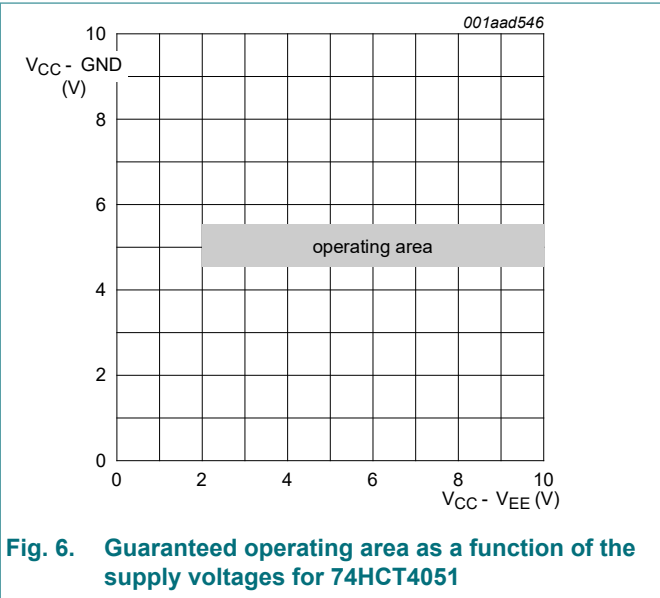
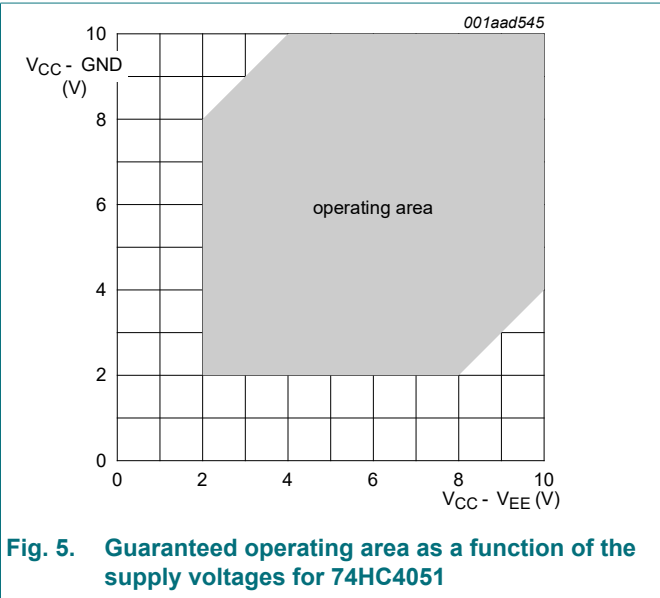
| Symbol    | Parameter               | Conditions                                                   | Min  | Max   | Unit |
|-----------|-------------------------|--------------------------------------------------------------|------|-------|------|
| $V_{CC}$  | supply voltage          | [1]                                                          | -0.5 | +11.0 | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$       | -    | ±20   | mA   |
| $I_{SK}$  | switch clamping current | $V_{SW} < -0.5\text{ V}$ or $V_{SW} > V_{CC} + 0.5\text{ V}$ | -    | ±20   | mA   |
| $I_{SW}$  | switch current          | $-0.5\text{ V} < V_{SW} < V_{CC} + 0.5\text{ V}$             | -    | ±25   | mA   |
| $I_{EE}$  | supply current          |                                                              | -    | ±20   | mA   |
| $I_{CC}$  | supply current          |                                                              | -    | 50    | mA   |
| $I_{GND}$ | ground current          |                                                              | -    | -50   | mA   |
| $T_{stg}$ | storage temperature     |                                                              | -65  | +150  | °C   |
| P         | power dissipation       | per switch                                                   | -    | 100   | mW   |
| $P_{tot}$ | total power dissipation | SOT109-1 (SO16) [2]                                          | -    | 500   | mW   |
|           |                         | SOT403-1 (TSSOP16) [3]                                       |      |       |      |
|           |                         | SOT763-1 (DHVQFN16) [4]                                      |      |       |      |
|           |                         | SOT8016-1 (DHXQFN16)                                         | -    | 250   | mW   |

- [1] To avoid drawing  $V_{CC}$  current out of terminal Z, when switch current flows into terminals  $Y_n$ , the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no  $V_{CC}$  current will flow out of terminals  $Y_n$ , and in this case there is no limit for the voltage drop across the switch, but the voltages at  $Y_n$  and Z may not exceed  $V_{CC}$  or  $V_{EE}$ .
- [2] For SOT109-1 (SO16) package:  $P_{tot}$  derates linearly with 12.4 mW/K above 110 °C.
- [3] For SOT403-1 (TSSOP16) package:  $P_{tot}$  derates linearly with 8.5 mW/K above 91 °C.
- [4] For SOT763-1 (DHVQFN16) package:  $P_{tot}$  derates linearly with 11.2 mW/K above 106 °C.

9. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol           | Parameter                           | Conditions                        | 74HC4051        |      |                 | 74HCT4051       |      |                 | Unit |
|------------------|-------------------------------------|-----------------------------------|-----------------|------|-----------------|-----------------|------|-----------------|------|
|                  |                                     |                                   | Min             | Typ  | Max             | Min             | Typ  | Max             |      |
| V <sub>CC</sub>  | supply voltage                      | see Fig. 5 and Fig. 6             |                 |      |                 |                 |      |                 |      |
|                  |                                     | V <sub>CC</sub> - GND             | 2.0             | 5.0  | 10.0            | 4.5             | 5.0  | 5.5             | V    |
|                  |                                     | V <sub>CC</sub> - V <sub>EE</sub> | 2.0             | 5.0  | 10.0            | 2.0             | 5.0  | 10.0            | V    |
| V <sub>I</sub>   | input voltage                       |                                   | GND             | -    | V <sub>CC</sub> | GND             | -    | V <sub>CC</sub> | V    |
| V <sub>SW</sub>  | switch voltage                      |                                   | V <sub>EE</sub> | -    | V <sub>CC</sub> | V <sub>EE</sub> | -    | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 |                                   | -40             | +25  | +125            | -40             | +25  | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 2.0 V           | -               | -    | 625             | -               | -    | -               | ns/V |
|                  |                                     | V <sub>CC</sub> = 4.5 V           | -               | 1.67 | 139             | -               | 1.67 | 139             | ns/V |
|                  |                                     | V <sub>CC</sub> = 6.0 V           | -               | -    | 83              | -               | -    | -               | ns/V |
|                  |                                     | V <sub>CC</sub> = 10.0 V          | -               | -    | 31              | -               | -    | -               | ns/V |



10. Static characteristics

Table 6.  $R_{ON}$  resistance per switch for 74HC4051 and 74HCT4051

$V_I = V_{IH}$  or  $V_{IL}$ ; for test circuit see Fig. 7.  
 $V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.  
 $V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.  
For 74HC4051:  $V_{CC} - GND$  or  $V_{CC} - V_{EE} = 2.0\text{ V}$ ,  $4.5\text{ V}$ ,  $6.0\text{ V}$  and  $9.0\text{ V}$ .  
For 74HCT4051:  $V_{CC} - GND = 4.5\text{ V}$  and  $5.5\text{ V}$ ,  $V_{CC} - V_{EE} = 2.0\text{ V}$ ,  $4.5\text{ V}$ ,  $6.0\text{ V}$  and  $9.0\text{ V}$ .

| Symbol                         | Parameter                               | Conditions                                                                              | Min | Typ | Max | Unit     |
|--------------------------------|-----------------------------------------|-----------------------------------------------------------------------------------------|-----|-----|-----|----------|
| <b>T<sub>amb</sub> = 25 °C</b> |                                         |                                                                                         |     |     |     |          |
| $R_{ON(peak)}$                 | ON resistance (peak)                    | $V_{is} = V_{CC}$ to $V_{EE}$                                                           |     |     |     |          |
|                                |                                         | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 100\text{ }\mu\text{A}$ [1] | -   | -   | -   | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$    | -   | 100 | 180 | $\Omega$ |
|                                |                                         | $V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$    | -   | 90  | 160 | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -   | 70  | 130 | $\Omega$ |
| $R_{ON(rail)}$                 | ON resistance (rail)                    | $V_{is} = V_{EE}$                                                                       |     |     |     |          |
|                                |                                         | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 100\text{ }\mu\text{A}$ [1] | -   | 150 | -   | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$    | -   | 80  | 140 | $\Omega$ |
|                                |                                         | $V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$    | -   | 70  | 120 | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -   | 60  | 105 | $\Omega$ |
|                                |                                         | $V_{is} = V_{CC}$                                                                       |     |     |     |          |
|                                |                                         | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 100\text{ }\mu\text{A}$ [1] | -   | 150 | -   | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$    | -   | 90  | 160 | $\Omega$ |
|                                |                                         | $V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$    | -   | 80  | 140 | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -   | 65  | 120 | $\Omega$ |
| $\Delta R_{ON}$                | ON resistance mismatch between channels | $V_{is} = V_{CC}$ to $V_{EE}$                                                           |     |     |     |          |
|                                |                                         | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ [1]                                     | -   | -   | -   | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                         | -   | 9   | -   | $\Omega$ |
|                                |                                         | $V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                                         | -   | 8   | -   | $\Omega$ |
|                                |                                         | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                      | -   | 6   | -   | $\Omega$ |

| Symbol                               | Parameter            | Conditions                                                                   | Min | Typ | Max | Unit |
|--------------------------------------|----------------------|------------------------------------------------------------------------------|-----|-----|-----|------|
| T <sub>amb</sub> = -40 °C to +85 °C  |                      |                                                                              |     |     |     |      |
| R <sub>ON(peak)</sub>                | ON resistance (peak) | V <sub>is</sub> = V <sub>CC</sub> to V <sub>EE</sub>                         |     |     |     |      |
|                                      |                      | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 100 μA [1] | -   | -   | -   | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 225 | Ω    |
|                                      |                      | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 200 | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V; I <sub>SW</sub> = 1000 μA | -   | -   | 165 | Ω    |
| R <sub>ON(rail)</sub>                | ON resistance (rail) | V <sub>is</sub> = V <sub>EE</sub>                                            |     |     |     |      |
|                                      |                      | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 100 μA [1] | -   | -   | -   | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 175 | Ω    |
|                                      |                      | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 150 | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V; I <sub>SW</sub> = 1000 μA | -   | -   | 130 | Ω    |
|                                      |                      | V <sub>is</sub> = V <sub>CC</sub>                                            |     |     |     |      |
|                                      |                      | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 100 μA [1] | -   | -   | -   | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 200 | Ω    |
|                                      |                      | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 175 | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V; I <sub>SW</sub> = 1000 μA | -   | -   | 150 | Ω    |
| T <sub>amb</sub> = -40 °C to +125 °C |                      |                                                                              |     |     |     |      |
| R <sub>ON(peak)</sub>                | ON resistance (peak) | V <sub>is</sub> = V <sub>CC</sub> to V <sub>EE</sub>                         |     |     |     |      |
|                                      |                      | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 100 μA [1] | -   | -   | -   | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 270 | Ω    |
|                                      |                      | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 240 | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V; I <sub>SW</sub> = 1000 μA | -   | -   | 195 | Ω    |
| R <sub>ON(rail)</sub>                | ON resistance (rail) | V <sub>is</sub> = V <sub>EE</sub>                                            |     |     |     |      |
|                                      |                      | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 100 μA [1] | -   | -   | -   | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 210 | Ω    |
|                                      |                      | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 180 | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V; I <sub>SW</sub> = 1000 μA | -   | -   | 160 | Ω    |
|                                      |                      | V <sub>is</sub> = V <sub>CC</sub>                                            |     |     |     |      |
|                                      |                      | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 100 μA [1] | -   | -   | -   | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 240 | Ω    |
|                                      |                      | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V; I <sub>SW</sub> = 1000 μA    | -   | -   | 210 | Ω    |
|                                      |                      | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V; I <sub>SW</sub> = 1000 μA | -   | -   | 180 | Ω    |

[1] When supply voltages (V<sub>CC</sub> - V<sub>EE</sub>) near 2.0 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 2 V, it is recommended to use these devices only for transmitting digital signals.

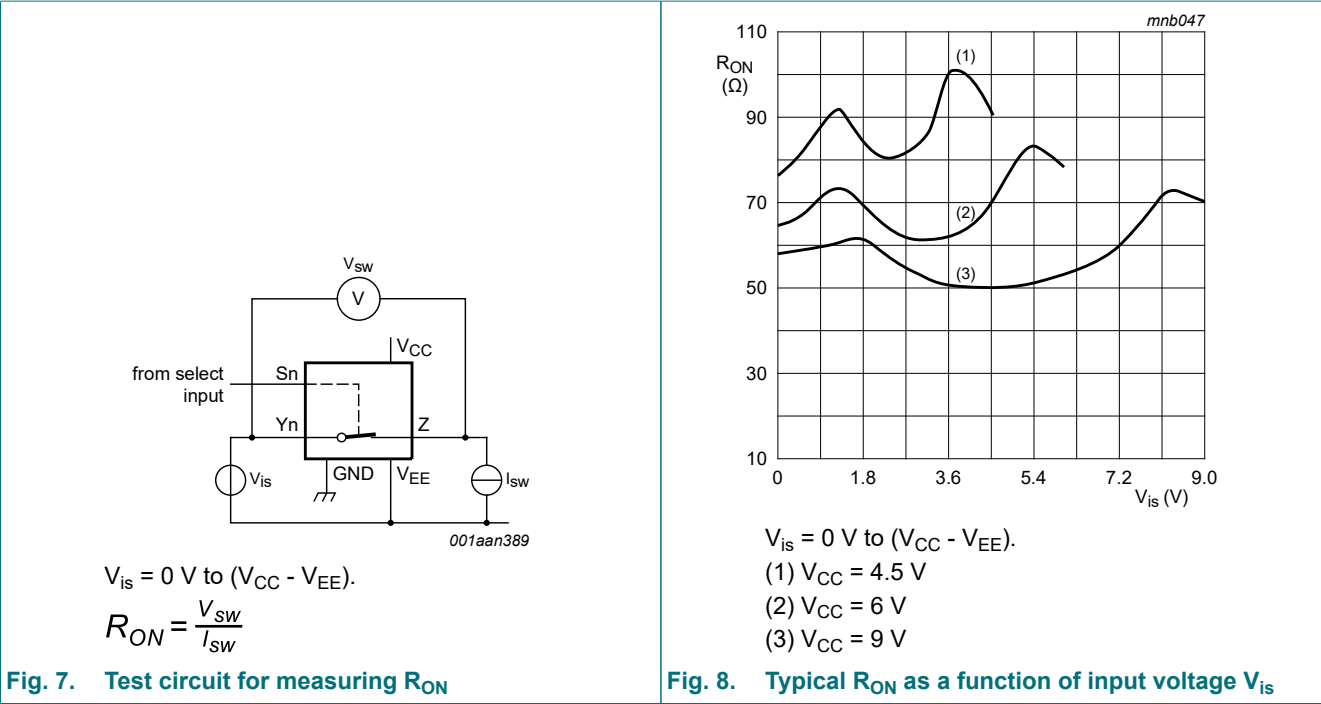


Table 7. Static characteristics for 74HC4051

Voltages are referenced to GND (ground = 0 V).  
 $V_{is}$  is the input voltage at pins  $Y_n$  or  $Z$ , whichever is assigned as an input.  
 $V_{os}$  is the output voltage at pins  $Z$  or  $Y_n$ , whichever is assigned as an output.

| Symbol                         | Parameter                 | Conditions                                                                                                            | Min  | Typ | Max  | Unit |
|--------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------|------|-----|------|------|
| <b>T<sub>amb</sub> = 25 °C</b> |                           |                                                                                                                       |      |     |      |      |
| $V_{IH}$                       | HIGH-level input voltage  | $V_{CC} = 2.0\text{ V}$                                                                                               | 1.5  | 1.2 | -    | V    |
|                                |                           | $V_{CC} = 4.5\text{ V}$                                                                                               | 3.15 | 2.4 | -    | V    |
|                                |                           | $V_{CC} = 6.0\text{ V}$                                                                                               | 4.2  | 3.2 | -    | V    |
|                                |                           | $V_{CC} = 9.0\text{ V}$                                                                                               | 6.3  | 4.7 | -    | V    |
| $V_{IL}$                       | LOW-level input voltage   | $V_{CC} = 2.0\text{ V}$                                                                                               | -    | 0.8 | 0.5  | V    |
|                                |                           | $V_{CC} = 4.5\text{ V}$                                                                                               | -    | 2.1 | 1.35 | V    |
|                                |                           | $V_{CC} = 6.0\text{ V}$                                                                                               | -    | 2.8 | 1.8  | V    |
|                                |                           | $V_{CC} = 9.0\text{ V}$                                                                                               | -    | 4.3 | 2.7  | V    |
| $I_I$                          | input leakage current     | $V_{EE} = 0\text{ V}; V_I = V_{CC}\text{ or GND}$                                                                     |      |     |      |      |
|                                |                           | $V_{CC} = 6.0\text{ V}$                                                                                               | -    | -   | ±0.1 | µA   |
|                                |                           | $V_{CC} = 10.0\text{ V}$                                                                                              | -    | -   | ±0.2 | µA   |
| $I_{S(OFF)}$                   | OFF-state leakage current | $V_{CC} = 10.0\text{ V}; V_{EE} = 0\text{ V}; V_I = V_{IH}\text{ or }V_{IL};  V_{SW}  = V_{CC} - V_{EE};$ see Fig. 9  |      |     |      |      |
|                                |                           | per channel                                                                                                           | -    | -   | ±0.1 | µA   |
|                                |                           | all channels                                                                                                          | -    | -   | ±0.4 | µA   |
| $I_{S(ON)}$                    | ON-state leakage current  | $V_{CC} = 10.0\text{ V}; V_{EE} = 0\text{ V}; V_I = V_{IH}\text{ or }V_{IL};  V_{SW}  = V_{CC} - V_{EE};$ see Fig. 10 | -    | -   | ±0.4 | µA   |
| $I_{CC}$                       | supply current            | $V_{EE} = 0\text{ V}; V_I = V_{CC}\text{ or GND}; V_{is} = V_{EE}\text{ or }V_{CC}; V_{os} = V_{CC}\text{ or }V_{EE}$ |      |     |      |      |
|                                |                           | $V_{CC} = 6.0\text{ V}$                                                                                               | -    | -   | 8.0  | µA   |
|                                |                           | $V_{CC} = 10.0\text{ V}$                                                                                              | -    | -   | 16.0 | µA   |

| Symbol                               | Parameter                 | Conditions                                                                                                                                                                                  | Min  | Typ | Max   | Unit |
|--------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|-------|------|
| C <sub>I</sub>                       | input capacitance         |                                                                                                                                                                                             | -    | 3.5 | -     | pF   |
| C <sub>sw</sub>                      | switch capacitance        | independent pins Yn                                                                                                                                                                         | -    | 5   | -     | pF   |
|                                      |                           | common pins Z                                                                                                                                                                               | -    | 25  | -     | pF   |
| T <sub>amb</sub> = -40 °C to +85 °C  |                           |                                                                                                                                                                                             |      |     |       |      |
| V <sub>IH</sub>                      | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V                                                                                                                                                                     | 1.5  | -   | -     | V    |
|                                      |                           | V <sub>CC</sub> = 4.5 V                                                                                                                                                                     | 3.15 | -   | -     | V    |
|                                      |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                                     | 4.2  | -   | -     | V    |
|                                      |                           | V <sub>CC</sub> = 9.0 V                                                                                                                                                                     | 6.3  | -   | -     | V    |
| V <sub>IL</sub>                      | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V                                                                                                                                                                     | -    | -   | 0.5   | V    |
|                                      |                           | V <sub>CC</sub> = 4.5 V                                                                                                                                                                     | -    | -   | 1.35  | V    |
|                                      |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                                     | -    | -   | 1.8   | V    |
|                                      |                           | V <sub>CC</sub> = 9.0 V                                                                                                                                                                     | -    | -   | 2.7   | V    |
| I <sub>I</sub>                       | input leakage current     | V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>CC</sub> or GND                                                                                                                              |      |     |       |      |
|                                      |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                                     | -    | -   | ±1.0  | µA   |
|                                      |                           | V <sub>CC</sub> = 10.0 V                                                                                                                                                                    | -    | -   | ±2.0  | µA   |
| I <sub>S(OFF)</sub>                  | OFF-state leakage current | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see <a href="#">Fig. 9</a>  |      |     |       |      |
|                                      |                           | per channel                                                                                                                                                                                 | -    | -   | ±1.0  | µA   |
|                                      |                           | all channels                                                                                                                                                                                | -    | -   | ±4.0  | µA   |
| I <sub>S(ON)</sub>                   | ON-state leakage current  | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see <a href="#">Fig. 10</a> | -    | -   | ±4.0  | µA   |
| I <sub>CC</sub>                      | supply current            | V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>is</sub> = V <sub>EE</sub> or V <sub>CC</sub> ; V <sub>os</sub> = V <sub>CC</sub> or V <sub>EE</sub>                 |      |     |       |      |
|                                      |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                                     | -    | -   | 80.0  | µA   |
|                                      |                           | V <sub>CC</sub> = 10.0 V                                                                                                                                                                    | -    | -   | 160.0 | µA   |
| T <sub>amb</sub> = -40 °C to +125 °C |                           |                                                                                                                                                                                             |      |     |       |      |
| V <sub>IH</sub>                      | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V                                                                                                                                                                     | 1.5  | -   | -     | V    |
|                                      |                           | V <sub>CC</sub> = 4.5 V                                                                                                                                                                     | 3.15 | -   | -     | V    |
|                                      |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                                     | 4.2  | -   | -     | V    |
|                                      |                           | V <sub>CC</sub> = 9.0 V                                                                                                                                                                     | 6.3  | -   | -     | V    |
| V <sub>IL</sub>                      | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V                                                                                                                                                                     | -    | -   | 0.5   | V    |
|                                      |                           | V <sub>CC</sub> = 4.5 V                                                                                                                                                                     | -    | -   | 1.35  | V    |
|                                      |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                                     | -    | -   | 1.8   | V    |
|                                      |                           | V <sub>CC</sub> = 9.0 V                                                                                                                                                                     | -    | -   | 2.7   | V    |

| Symbol              | Parameter                 | Conditions                                                                                                                                                                  | Min | Typ | Max   | Unit |
|---------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|
| I <sub>I</sub>      | input leakage current     | V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>CC</sub> or GND                                                                                                              |     |     |       |      |
|                     |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                     | -   | -   | ±1.0  | µA   |
|                     |                           | V <sub>CC</sub> = 10.0 V                                                                                                                                                    | -   | -   | ±2.0  | µA   |
| I <sub>S(OFF)</sub> | OFF-state leakage current | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 9  |     |     |       |      |
|                     |                           | per channel                                                                                                                                                                 | -   | -   | ±1.0  | µA   |
|                     |                           | all channels                                                                                                                                                                | -   | -   | ±4.0  | µA   |
| I <sub>S(ON)</sub>  | ON-state leakage current  | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 10 | -   | -   | ±4.0  | µA   |
| I <sub>CC</sub>     | supply current            | V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>is</sub> = V <sub>EE</sub> or V <sub>CC</sub> ; V <sub>os</sub> = V <sub>CC</sub> or V <sub>EE</sub> |     |     |       |      |
|                     |                           | V <sub>CC</sub> = 6.0 V                                                                                                                                                     | -   | -   | 160.0 | µA   |
|                     |                           | V <sub>CC</sub> = 10.0 V                                                                                                                                                    | -   | -   | 320.0 | µA   |

Table 8. Static characteristics for 74HCT4051

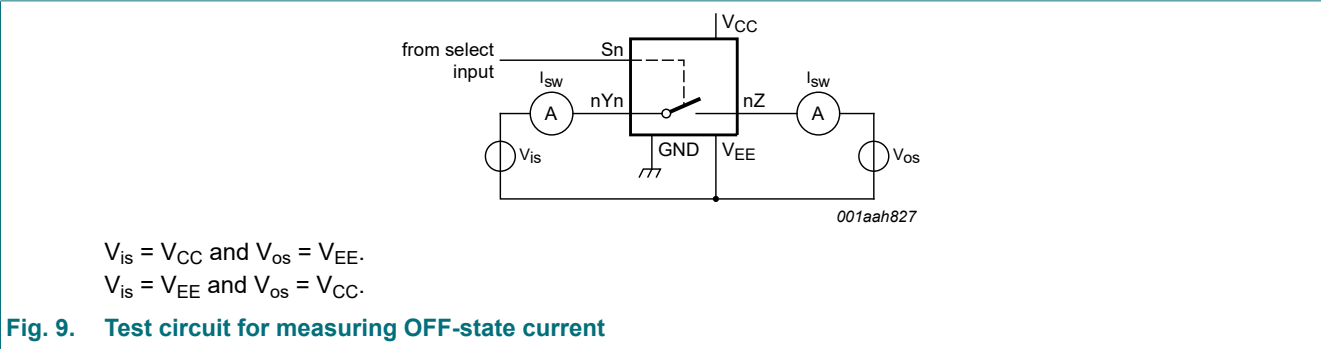
Voltages are referenced to GND (ground = 0 V).

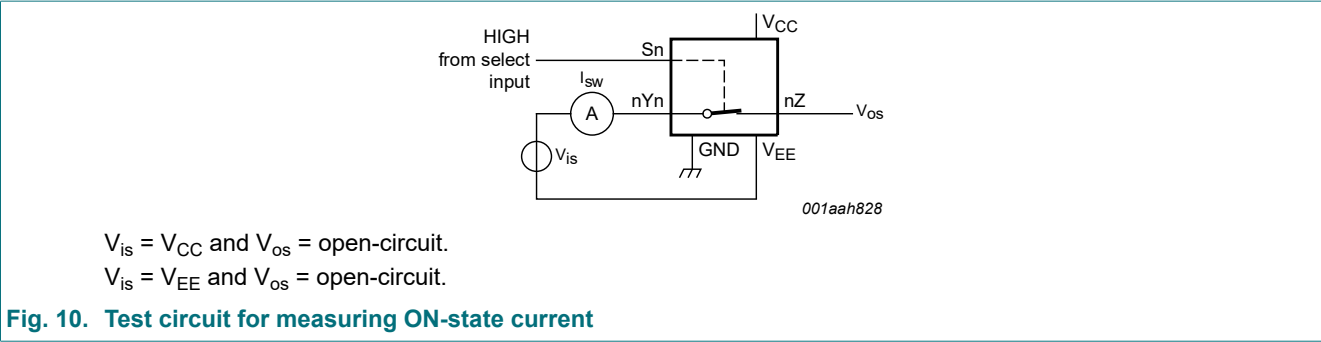
V<sub>is</sub> is the input voltage at pins Y<sub>n</sub> or Z, whichever is assigned as an input.

V<sub>os</sub> is the output voltage at pins Z or Y<sub>n</sub>, whichever is assigned as an output.

| Symbol                   | Parameter                 | Conditions                                                                                                                                                                  | Min | Typ | Max  | Unit |
|--------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| T <sub>amb</sub> = 25 °C |                           |                                                                                                                                                                             |     |     |      |      |
| V <sub>IH</sub>          | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                                            | 2.0 | 1.6 | -    | V    |
| V <sub>IL</sub>          | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                                            | -   | 1.2 | 0.8  | V    |
| I <sub>I</sub>           | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V; V <sub>EE</sub> = 0 V                                                                                     | -   | -   | ±0.1 | µA   |
| I <sub>S(OFF)</sub>      | OFF-state leakage current | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 9  |     |     |      |      |
|                          |                           | per channel                                                                                                                                                                 | -   | -   | ±0.1 | µA   |
|                          |                           | all channels                                                                                                                                                                | -   | -   | ±0.4 | µA   |
| I <sub>S(ON)</sub>       | ON-state leakage current  | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 10 | -   | -   | ±0.4 | µA   |
| I <sub>CC</sub>          | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>is</sub> = V <sub>EE</sub> or V <sub>CC</sub> ; V <sub>os</sub> = V <sub>CC</sub> or V <sub>EE</sub>                        |     |     |      |      |
|                          |                           | V <sub>CC</sub> = 5.5 V; V <sub>EE</sub> = 0 V                                                                                                                              | -   | -   | 8.0  | µA   |
|                          |                           | V <sub>CC</sub> = 5.0 V; V <sub>EE</sub> = -5.0 V                                                                                                                           | -   | -   | 16.0 | µA   |
| ΔI <sub>CC</sub>         | additional supply current | per input; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>EE</sub> = 0 V                        | -   | 50  | 180  | µA   |
| C <sub>I</sub>           | input capacitance         |                                                                                                                                                                             | -   | 3.5 | -    | pF   |
| C <sub>sw</sub>          | switch capacitance        | independent pins Y <sub>n</sub>                                                                                                                                             | -   | 5   | -    | pF   |
|                          |                           | common pins Z                                                                                                                                                               | -   | 25  | -    | pF   |

| Symbol                                     | Parameter                 | Conditions                                                                                                                                                                  | Min | Typ | Max   | Unit |
|--------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b>  |                           |                                                                                                                                                                             |     |     |       |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                                            | 2.0 | -   | -     | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                                            | -   | -   | 0.8   | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V; V <sub>EE</sub> = 0 V                                                                                     | -   | -   | ±1.0  | µA   |
| I <sub>S(OFF)</sub>                        | OFF-state leakage current | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 9  |     |     |       |      |
|                                            |                           | per channel                                                                                                                                                                 | -   | -   | ±1.0  | µA   |
|                                            |                           | all channels                                                                                                                                                                | -   | -   | ±4.0  | µA   |
| I <sub>S(ON)</sub>                         | ON-state leakage current  | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 10 | -   | -   | ±4.0  | µA   |
| I <sub>CC</sub>                            | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>is</sub> = V <sub>EE</sub> or V <sub>CC</sub> ; V <sub>os</sub> = V <sub>CC</sub> or V <sub>EE</sub>                        |     |     |       |      |
|                                            |                           | V <sub>CC</sub> = 5.5 V; V <sub>EE</sub> = 0 V                                                                                                                              | -   | -   | 80.0  | µA   |
|                                            |                           | V <sub>CC</sub> = 5.0 V; V <sub>EE</sub> = -5.0 V                                                                                                                           | -   | -   | 160.0 | µA   |
| ΔI <sub>CC</sub>                           | additional supply current | per input; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>EE</sub> = 0 V                        | -   | -   | 225   | µA   |
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                           |                                                                                                                                                                             |     |     |       |      |
| V <sub>IH</sub>                            | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                                            | 2.0 | -   | -     | V    |
| V <sub>IL</sub>                            | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                                            | -   | -   | 0.8   | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V; V <sub>EE</sub> = 0 V                                                                                     | -   | -   | ±1.0  | µA   |
| I <sub>S(OFF)</sub>                        | OFF-state leakage current | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 9  |     |     |       |      |
|                                            |                           | per channel                                                                                                                                                                 | -   | -   | ±1.0  | µA   |
|                                            |                           | all channels                                                                                                                                                                | -   | -   | ±4.0  | µA   |
| I <sub>S(ON)</sub>                         | ON-state leakage current  | V <sub>CC</sub> = 10.0 V; V <sub>EE</sub> = 0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>SW</sub>   = V <sub>CC</sub> - V <sub>EE</sub> ; see Fig. 10 | -   | -   | ±4.0  | µA   |
| I <sub>CC</sub>                            | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>is</sub> = V <sub>EE</sub> or V <sub>CC</sub> ; V <sub>os</sub> = V <sub>CC</sub> or V <sub>EE</sub>                        |     |     |       |      |
|                                            |                           | V <sub>CC</sub> = 5.5 V; V <sub>EE</sub> = 0 V                                                                                                                              | -   | -   | 160.0 | µA   |
|                                            |                           | V <sub>CC</sub> = 5.0 V; V <sub>EE</sub> = -5.0 V                                                                                                                           | -   | -   | 320.0 | µA   |
| ΔI <sub>CC</sub>                           | additional supply current | per input; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; V <sub>EE</sub> = 0 V                        | -   | -   | 245   | µA   |





11. Dynamic characteristics

Table 9. Dynamic characteristics for 74HC4051

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; for test circuit see Fig. 13.  
 $V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.  
 $V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

| Symbol                         | Parameter         | Conditions                                                             | Min | Typ | Max | Unit |
|--------------------------------|-------------------|------------------------------------------------------------------------|-----|-----|-----|------|
| <b>T<sub>amb</sub> = 25 °C</b> |                   |                                                                        |     |     |     |      |
| t <sub>pd</sub>                | propagation delay | $V_{is}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Fig. 11 [1]        |     |     |     |      |
|                                |                   | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 14  | 60  | ns   |
|                                |                   | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 5   | 12  | ns   |
|                                |                   | $V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 4   | 10  | ns   |
|                                |                   | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 4   | 8   | ns   |
| t <sub>on</sub>                | turn-on time      | $\bar{E}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Fig. 12 [2]       |     |     |     |      |
|                                |                   | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 72  | 345 | ns   |
|                                |                   | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 29  | 69  | ns   |
|                                |                   | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$ | -   | 22  | -   | ns   |
|                                |                   | $V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 21  | 59  | ns   |
|                                |                   | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 18  | 51  | ns   |
|                                |                   | Sn to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Fig. 12 [2]              |     |     |     |      |
|                                |                   | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 66  | 345 | ns   |
|                                |                   | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 28  | 69  | ns   |
|                                |                   | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$ | -   | 20  | -   | ns   |
|                                |                   | $V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 19  | 59  | ns   |
|                                |                   | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 16  | 51  | ns   |

| Symbol                              | Parameter                     | Conditions                                                                 | Min | Typ | Max | Unit |
|-------------------------------------|-------------------------------|----------------------------------------------------------------------------|-----|-----|-----|------|
| t <sub>off</sub>                    | turn-off time                 | $\bar{E}$ to V <sub>OS</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]      |     |     |     |      |
|                                     |                               | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | 58  | 290 | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | 31  | 58  | ns   |
|                                     |                               | V <sub>CC</sub> = 5.0 V; V <sub>EE</sub> = 0 V; C <sub>L</sub> = 15 pF     | -   | 18  | -   | ns   |
|                                     |                               | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | 17  | 49  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | 18  | 42  | ns   |
|                                     |                               | Sn to V <sub>OS</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]             |     |     |     |      |
|                                     |                               | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | 61  | 290 | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | 25  | 58  | ns   |
|                                     |                               | V <sub>CC</sub> = 5.0 V; V <sub>EE</sub> = 0 V; C <sub>L</sub> = 15 pF     | -   | 19  | -   | ns   |
|                                     |                               | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | 18  | 49  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | 18  | 42  | ns   |
| C <sub>PD</sub>                     | power dissipation capacitance | per switch; V <sub>I</sub> = GND to V <sub>CC</sub> [4]                    | -   | 25  | -   | pF   |
| T <sub>amb</sub> = -40 °C to +85 °C |                               |                                                                            |     |     |     |      |
| t <sub>pd</sub>                     | propagation delay             | V <sub>is</sub> to V <sub>OS</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 11 [1] |     |     |     |      |
|                                     |                               | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 75  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 15  | ns   |
|                                     |                               | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 13  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 10  | ns   |
| t <sub>on</sub>                     | turn-on time                  | $\bar{E}$ to V <sub>OS</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 12 [2]       |     |     |     |      |
|                                     |                               | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 430 | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 86  | ns   |
|                                     |                               | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 73  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 64  | ns   |
|                                     |                               | Sn to V <sub>OS</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 12 [2]              |     |     |     |      |
|                                     |                               | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 430 | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 86  | ns   |
|                                     |                               | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 73  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 64  | ns   |
| t <sub>off</sub>                    | turn-off time                 | $\bar{E}$ to V <sub>OS</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]      |     |     |     |      |
|                                     |                               | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 365 | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 73  | ns   |
|                                     |                               | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 62  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 53  | ns   |
|                                     |                               | Sn to V <sub>OS</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]             |     |     |     |      |
|                                     |                               | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 365 | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 73  | ns   |
|                                     |                               | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 62  | ns   |
|                                     |                               | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 53  | ns   |

| Symbol                                     | Parameter         | Conditions                                                                 | Min | Typ | Max | Unit |
|--------------------------------------------|-------------------|----------------------------------------------------------------------------|-----|-----|-----|------|
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                   |                                                                            |     |     |     |      |
| t <sub>pd</sub>                            | propagation delay | V <sub>is</sub> to V <sub>os</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 11 [1] |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 90  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 18  | ns   |
|                                            |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 15  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 12  | ns   |
| t <sub>on</sub>                            | turn-on time      | E to V <sub>os</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 12 [2]               |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 520 | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 104 | ns   |
|                                            |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 88  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 77  | ns   |
|                                            |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 12 [2]              |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 520 | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 104 | ns   |
|                                            |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 88  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 77  | ns   |
| t <sub>off</sub>                           | turn-off time     | E to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]              |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 435 | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 87  | ns   |
|                                            |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 74  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 72  | ns   |
|                                            |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]             |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 435 | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 87  | ns   |
|                                            |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 74  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 72  | ns   |

[1] t<sub>pd</sub> is the same as t<sub>PHL</sub> and t<sub>PLH</sub>.  
[2] t<sub>on</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.  
[3] t<sub>off</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.  
[4] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N + Σ{(C<sub>L</sub> + C<sub>sw</sub>) × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>} where:  
f<sub>i</sub> = input frequency in MHz;  
f<sub>o</sub> = output frequency in MHz;  
N = number of inputs switching;  
Σ{(C<sub>L</sub> + C<sub>sw</sub>) × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>} = sum of outputs;  
C<sub>L</sub> = output load capacitance in pF;  
C<sub>sw</sub> = switch capacitance in pF;  
V<sub>CC</sub> = supply voltage in V.

**Table 10. Dynamic characteristics for 74HCT4051**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; for test circuit see Fig. 13.

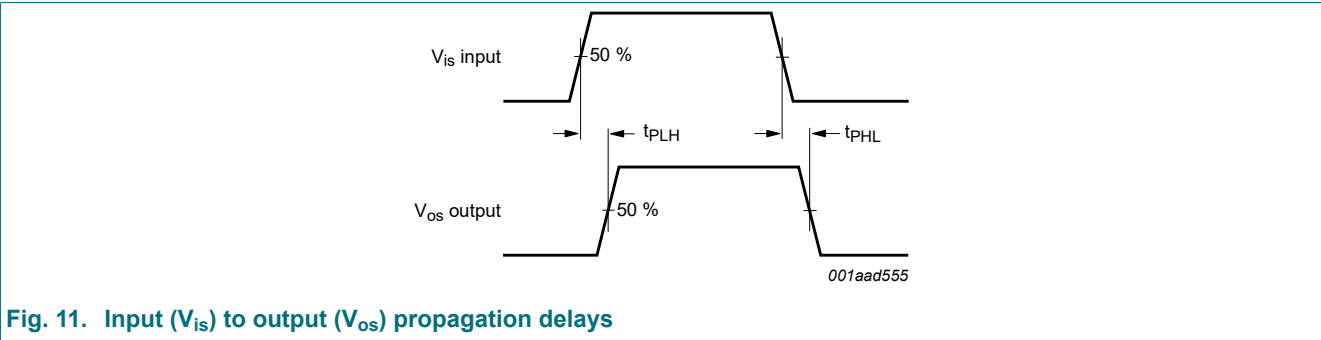
$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

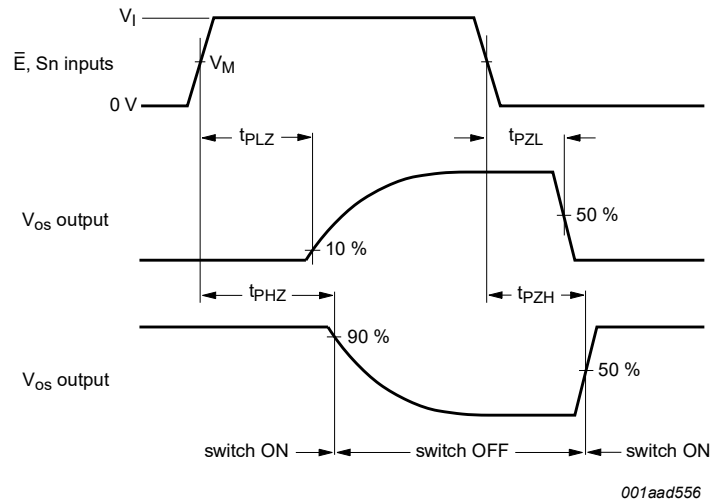
$V_{os}$  is the output voltage at a Yn or Z terminal, whichever is assigned as an output.

| Symbol                                                       | Parameter                     | Conditions                                                             | Min | Typ | Max | Unit |
|--------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------|-----|-----|-----|------|
| <b><math>T_{amb} = 25\text{ °C}</math></b>                   |                               |                                                                        |     |     |     |      |
| $t_{pd}$                                                     | propagation delay             | $V_{is}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Fig. 11 [1]        |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 5   | 12  | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 4   | 8   | ns   |
| $t_{on}$                                                     | turn-on time                  | $\bar{E}$ to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [2]     |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 26  | 55  | ns   |
|                                                              |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$ | -   | 22  | -   | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 16  | 39  | ns   |
|                                                              |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [2]            |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 28  | 55  | ns   |
|                                                              |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$ | -   | 24  | -   | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 16  | 39  | ns   |
| $t_{off}$                                                    | turn-off time                 | $\bar{E}$ to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [3]     |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 19  | 45  | ns   |
|                                                              |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$ | -   | 16  | -   | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 16  | 32  | ns   |
|                                                              |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [3]            |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | 23  | 45  | ns   |
|                                                              |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$ | -   | 20  | -   | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | 16  | 32  | ns   |
| $C_{PD}$                                                     | power dissipation capacitance | per switch; $V_I = GND$ to $V_{CC} - 1.5\text{ V}$ [4]                 | -   | 25  | -   | pF   |
| <b><math>T_{amb} = -40\text{ °C to }+85\text{ °C}</math></b> |                               |                                                                        |     |     |     |      |
| $t_{pd}$                                                     | propagation delay             | $V_{is}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Fig. 11 [1]        |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | -   | 15  | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | -   | 10  | ns   |
| $t_{on}$                                                     | turn-on time                  | $\bar{E}$ to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [2]     |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | -   | 69  | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | -   | 49  | ns   |
|                                                              |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [2]            |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | -   | 69  | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | -   | 49  | ns   |
| $t_{off}$                                                    | turn-off time                 | $\bar{E}$ to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [3]     |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | -   | 56  | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | -   | 40  | ns   |
|                                                              |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Fig. 12 [3]            |     |     |     |      |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                        | -   | -   | 56  | ns   |
|                                                              |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                     | -   | -   | 40  | ns   |

| Symbol                                     | Parameter         | Conditions                                                                 | Min | Typ | Max | Unit |
|--------------------------------------------|-------------------|----------------------------------------------------------------------------|-----|-----|-----|------|
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                   |                                                                            |     |     |     |      |
| t <sub>pd</sub>                            | propagation delay | V <sub>is</sub> to V <sub>os</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 11 [1] |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 18  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 12  | ns   |
| t <sub>on</sub>                            | turn-on time      | $\bar{E}$ to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [2]      |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 83  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 59  | ns   |
|                                            |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [2]             |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 83  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 59  | ns   |
| t <sub>off</sub>                           | turn-off time     | $\bar{E}$ to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]      |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 68  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 48  | ns   |
|                                            |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 12 [3]             |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 68  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 48  | ns   |

- [1] t<sub>pd</sub> is the same as t<sub>PHL</sub> and t<sub>PLH</sub>.
- [2] t<sub>on</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.
- [3] t<sub>off</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.
- [4] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N + Σ{(C<sub>L</sub> + C<sub>sw</sub>) × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>} where:  
f<sub>i</sub> = input frequency in MHz;  
f<sub>o</sub> = output frequency in MHz;  
N = number of inputs switching;  
Σ{(C<sub>L</sub> + C<sub>sw</sub>) × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>} = sum of outputs;  
C<sub>L</sub> = output load capacitance in pF;  
C<sub>sw</sub> = switch capacitance in pF;  
V<sub>CC</sub> = supply voltage in V.

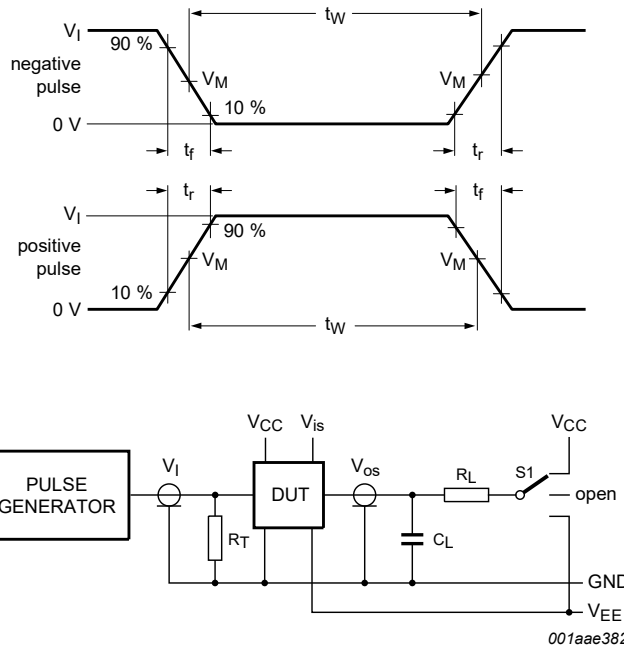




For 74HC4051:  $V_M = 0.5 \times V_{CC}$ .

For 74HCT4051:  $V_M = 1.3 \text{ V}$ .

**Fig. 12. Turn-on and turn-off times**



Definitions for test circuit; see [Table 11](#):

$R_T$  = termination resistance should be equal to the output impedance  $Z_O$  of the pulse generator;

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

$R_L$  = load resistance;

$S1$  = test selection switch.

**Fig. 13. Test circuit for measuring switching times**

Table 11. Test data

| Test                                | Input              |                 |                                 |           | Load           |                | S1 position     |
|-------------------------------------|--------------------|-----------------|---------------------------------|-----------|----------------|----------------|-----------------|
|                                     | V <sub>I</sub> [1] | V <sub>is</sub> | t <sub>r</sub> , t <sub>f</sub> |           | C <sub>L</sub> | R <sub>L</sub> |                 |
|                                     |                    |                 | at f <sub>max</sub>             | other [2] |                |                |                 |
| t <sub>PHL</sub> , t <sub>PLH</sub> | V <sub>CC</sub>    | pulse           | < 2 ns                          | 6 ns      | 50 pF          | 1 kΩ           | open            |
| t <sub>PZH</sub> , t <sub>PHZ</sub> | V <sub>CC</sub>    | V <sub>CC</sub> | < 2 ns                          | 6 ns      | 50 pF          | 1 kΩ           | V <sub>EE</sub> |
| t <sub>PZL</sub> , t <sub>PLZ</sub> | V <sub>CC</sub>    | V <sub>EE</sub> | < 2 ns                          | 6 ns      | 50 pF          | 1 kΩ           | V <sub>CC</sub> |

[1] For 74HCT4051:  $V_I = 3\text{ V}$   
[2]  $t_r = t_f = 6\text{ ns}$ ; when measuring  $f_{max}$ , there is no constraint to  $t_r$  and  $t_f$  with 50 % duty factor.

11.1. Additional dynamic characteristics

Table 12. Additional dynamic characteristics

Recommended conditions and typical values;  $GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $C_L = 50\text{ pF}$ .  
 $V_{is}$  is the input voltage at pins nYn or nZ, whichever is assigned as an input.  
 $V_{os}$  is the output voltage at pins nYn or nZ, whichever is assigned as an output.

| Symbol         | Parameter                | Conditions                                                                                                                                                                                      | Min | Typ  | Max | Unit |
|----------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| $d_{sin}$      | sine-wave distortion     | $f_i = 1\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; see Fig. 14                                                                                                                                  |     |      |     |      |
|                |                          | $V_{is} = 4.0\text{ V (p-p)}$ ; $V_{CC} = 2.25\text{ V}$ ; $V_{EE} = -2.25\text{ V}$                                                                                                            | -   | 0.04 | -   | %    |
|                |                          | $V_{is} = 8.0\text{ V (p-p)}$ ; $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                                                                                              | -   | 0.02 | -   | %    |
|                |                          | $f_i = 10\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; see Fig. 14                                                                                                                                 |     |      |     |      |
|                |                          | $V_{is} = 4.0\text{ V (p-p)}$ ; $V_{CC} = 2.25\text{ V}$ ; $V_{EE} = -2.25\text{ V}$                                                                                                            | -   | 0.12 | -   | %    |
|                |                          | $V_{is} = 8.0\text{ V (p-p)}$ ; $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                                                                                              | -   | 0.06 | -   | %    |
| $\alpha_{iso}$ | isolation (OFF-state)    | $R_L = 600\text{ }\Omega$ ; $f_i = 1\text{ MHz}$ ; see Fig. 15                                                                                                                                  |     |      |     |      |
|                |                          | $V_{CC} = 2.25\text{ V}$ ; $V_{EE} = -2.25\text{ V}$ [1]                                                                                                                                        | -   | -50  | -   | dB   |
|                |                          | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$ [1]                                                                                                                                          | -   | -50  | -   | dB   |
| $V_{ct}$       | crosstalk voltage        | peak-to-peak value; between control and any switch;<br>$R_L = 600\text{ }\Omega$ ; $f_i = 1\text{ MHz}$ ; E or Sn square wave between $V_{CC}$ and GND; $t_r = t_f = 6\text{ ns}$ ; see Fig. 16 |     |      |     |      |
|                |                          | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                                                                                                                                 | -   | 110  | -   | mV   |
|                |                          | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                                                                                                                              | -   | 220  | -   | mV   |
| $f_{(-3dB)}$   | -3 dB frequency response | $R_L = 50\text{ }\Omega$ ; see Fig. 17                                                                                                                                                          |     |      |     |      |
|                |                          | $V_{CC} = 2.25\text{ V}$ ; $V_{EE} = -2.25\text{ V}$ [2]                                                                                                                                        | -   | 170  | -   | MHz  |
|                |                          | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$ [2]                                                                                                                                          | -   | 180  | -   | MHz  |

[1] Adjust input voltage  $V_{is}$  to 0 dBm level (0 dBm = 1 mW into 600  $\Omega$ ).  
[2] Adjust input voltage  $V_{is}$  to 0 dBm level at  $V_{os}$  for 1 MHz (0 dBm = 1 mW into 50  $\Omega$ ).

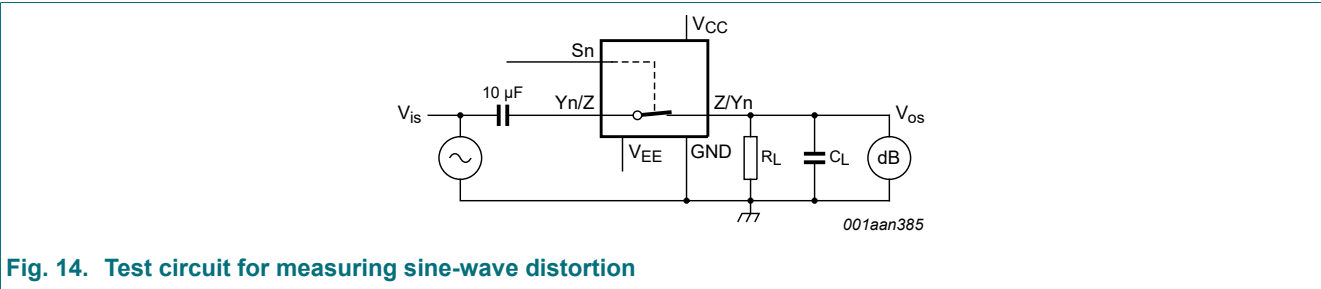
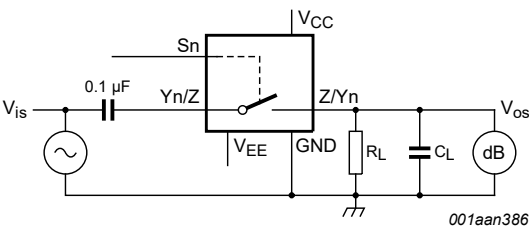
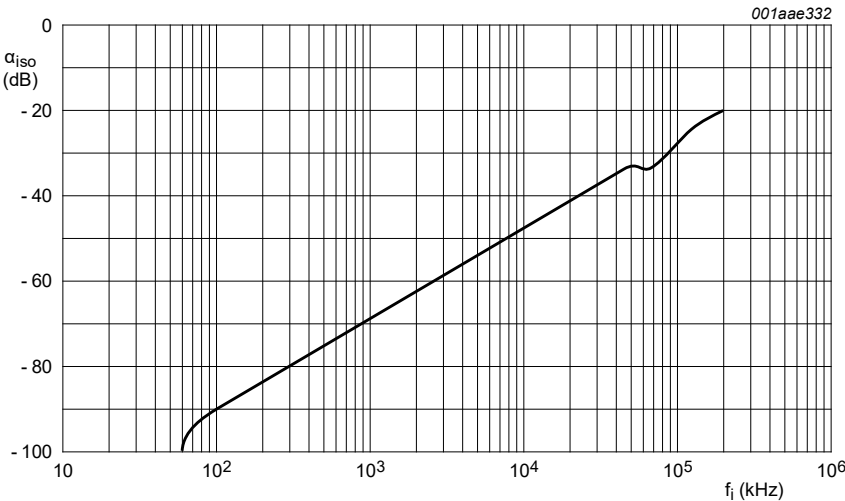


Fig. 14. Test circuit for measuring sine-wave distortion



$V_{CC} = 4.5\text{ V}$ ;  $GND = 0\text{ V}$ ;  $V_{EE} = -4.5\text{ V}$ ;  $R_L = 600\text{ }\Omega$ ;  $R_S = 1\text{ k}\Omega$ .

a. Test circuit



b. Isolation (OFF-state) as a function of frequency

Fig. 15. Test circuit for measuring isolation (OFF-state)

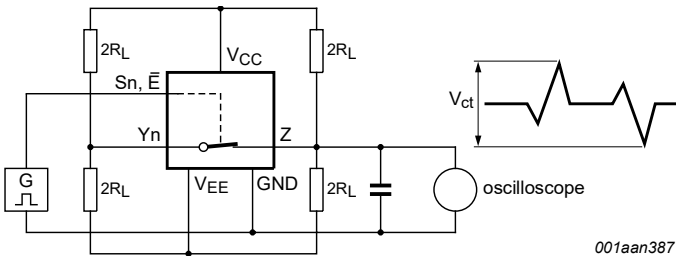
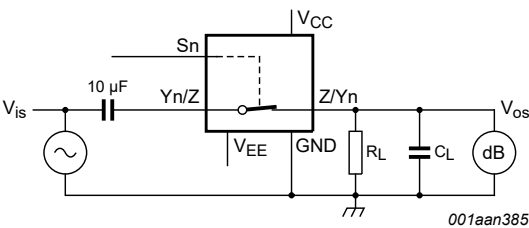
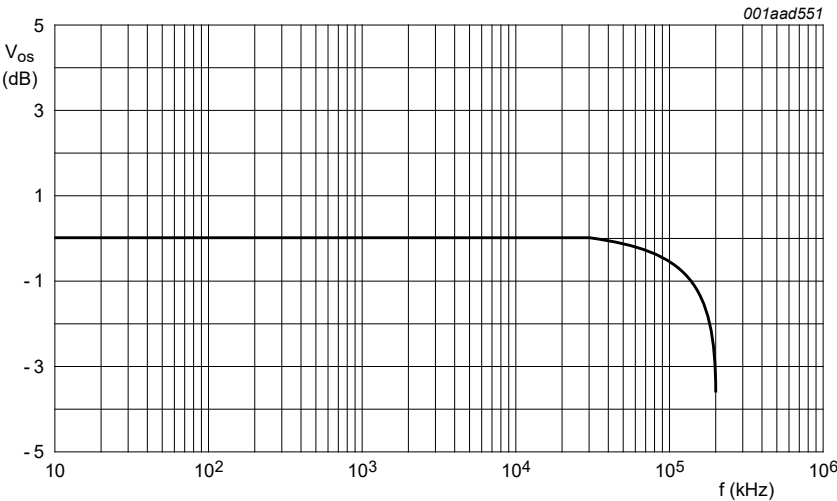


Fig. 16. Test circuit for measuring crosstalk between control input and any switch



$V_{CC} = 4.5\text{ V}$ ;  $GND = 0\text{ V}$ ;  $V_{EE} = -4.5\text{ V}$ ;  $R_L = 50\text{ }\Omega$ ;  $R_S = 1\text{ k}\Omega$ .

a. Test circuit



b. Typical frequency response

Fig. 17. Test circuit for frequency response

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mmSOT109-1

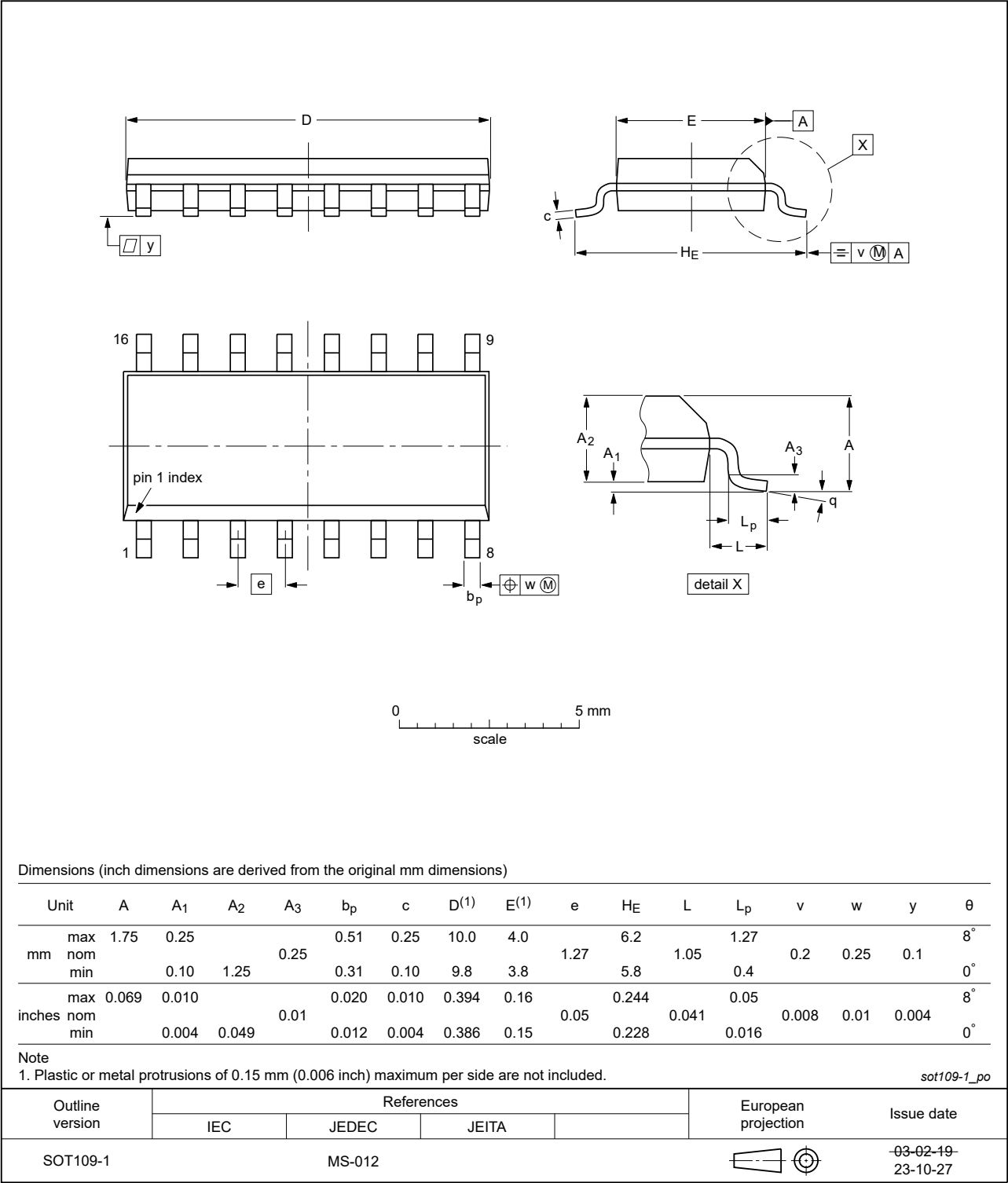


Fig. 18. Package outline SOT109-1 (SO16)

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

SOT403-1

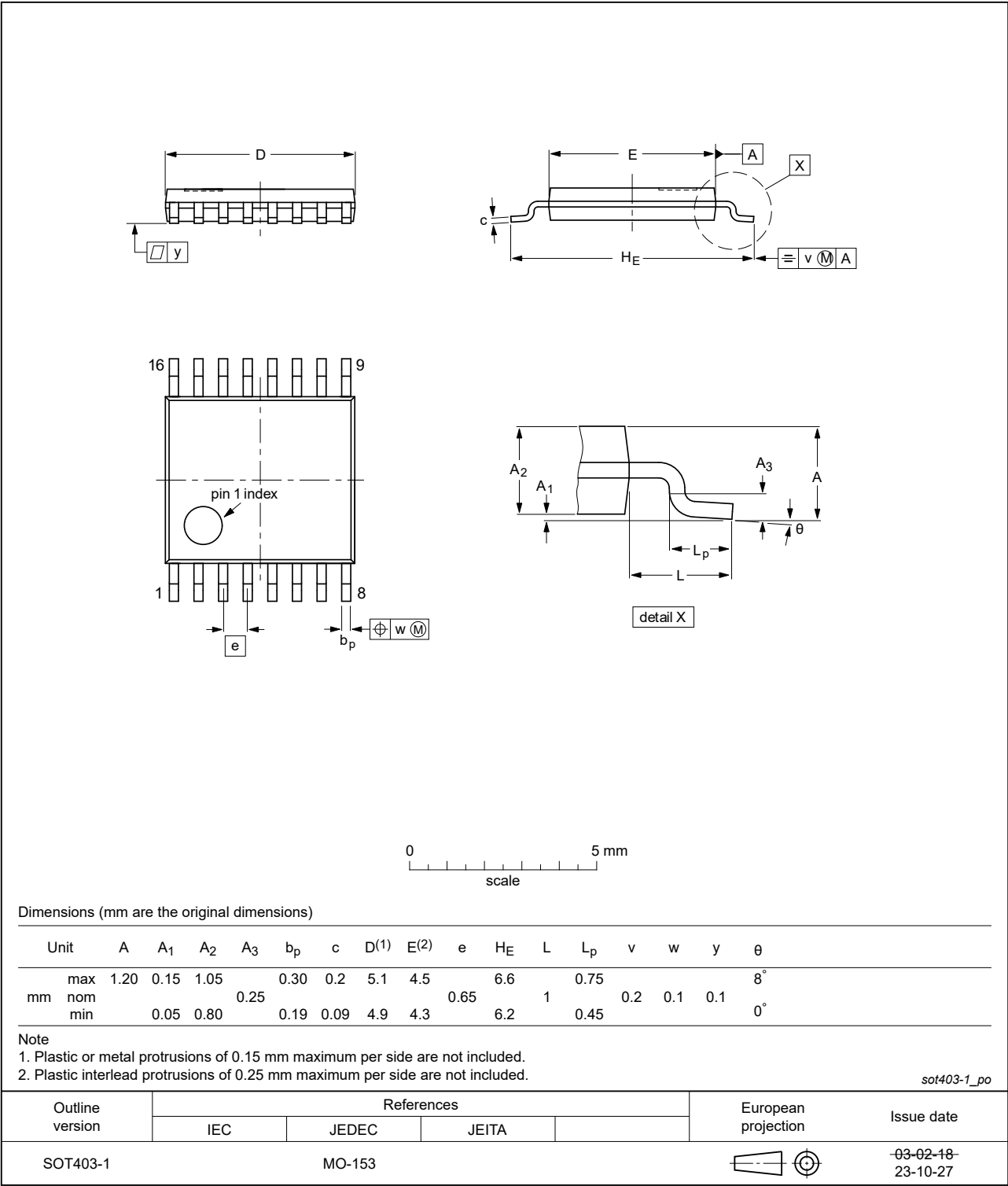


Fig. 19. Package outline SOT403-1 (TSSOP16)

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

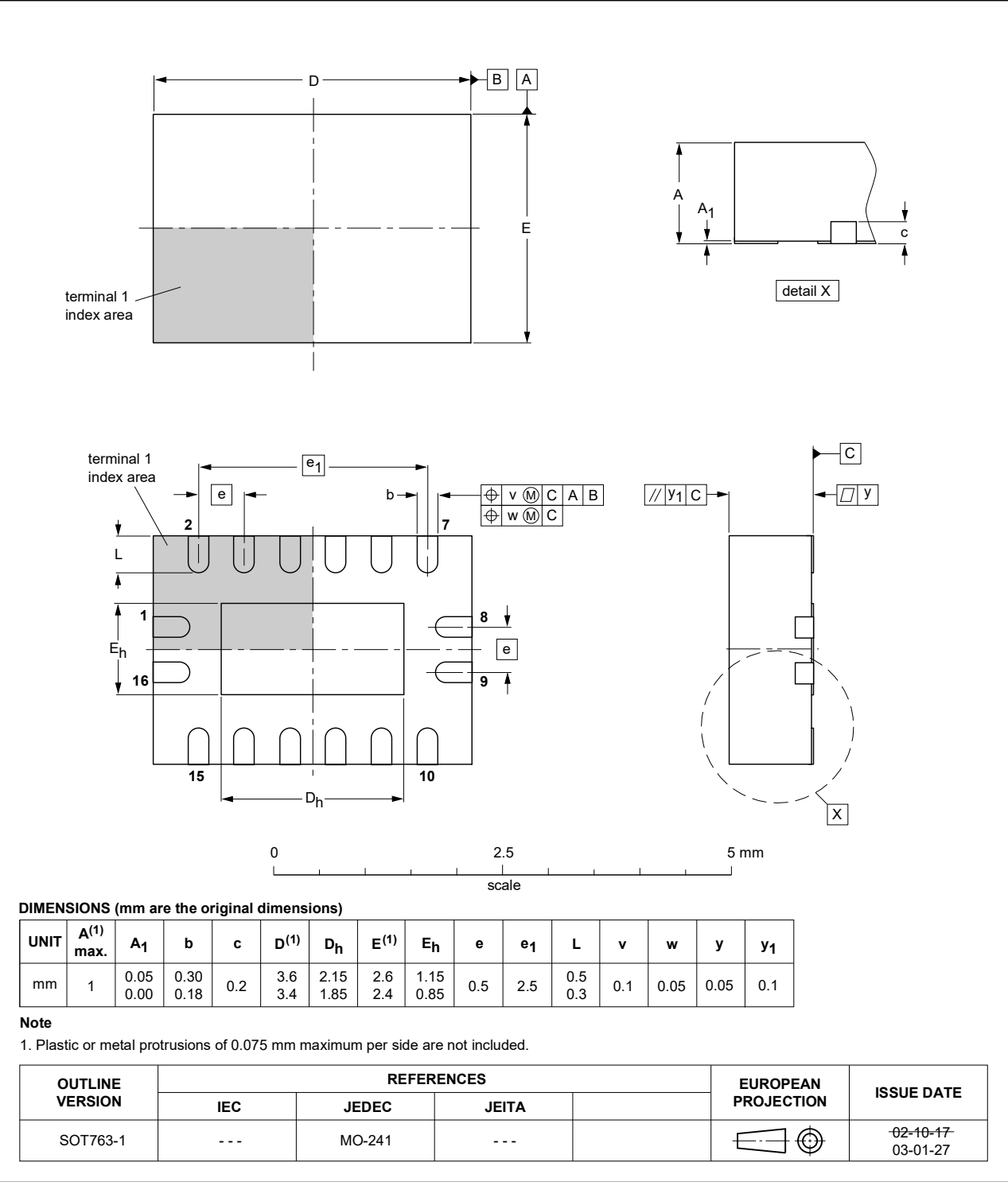


Fig. 20. Package outline SOT763-1 (DHVQFN16)

DHXQFN16: plastic, leadless dual in-line compatible thermal enhanced extreme thin quad flat package;  
no leads; 16 terminals; 0.4 mm pitch; body 2 mm x 2.4 mm x 0.48 mm

SOT8016-1

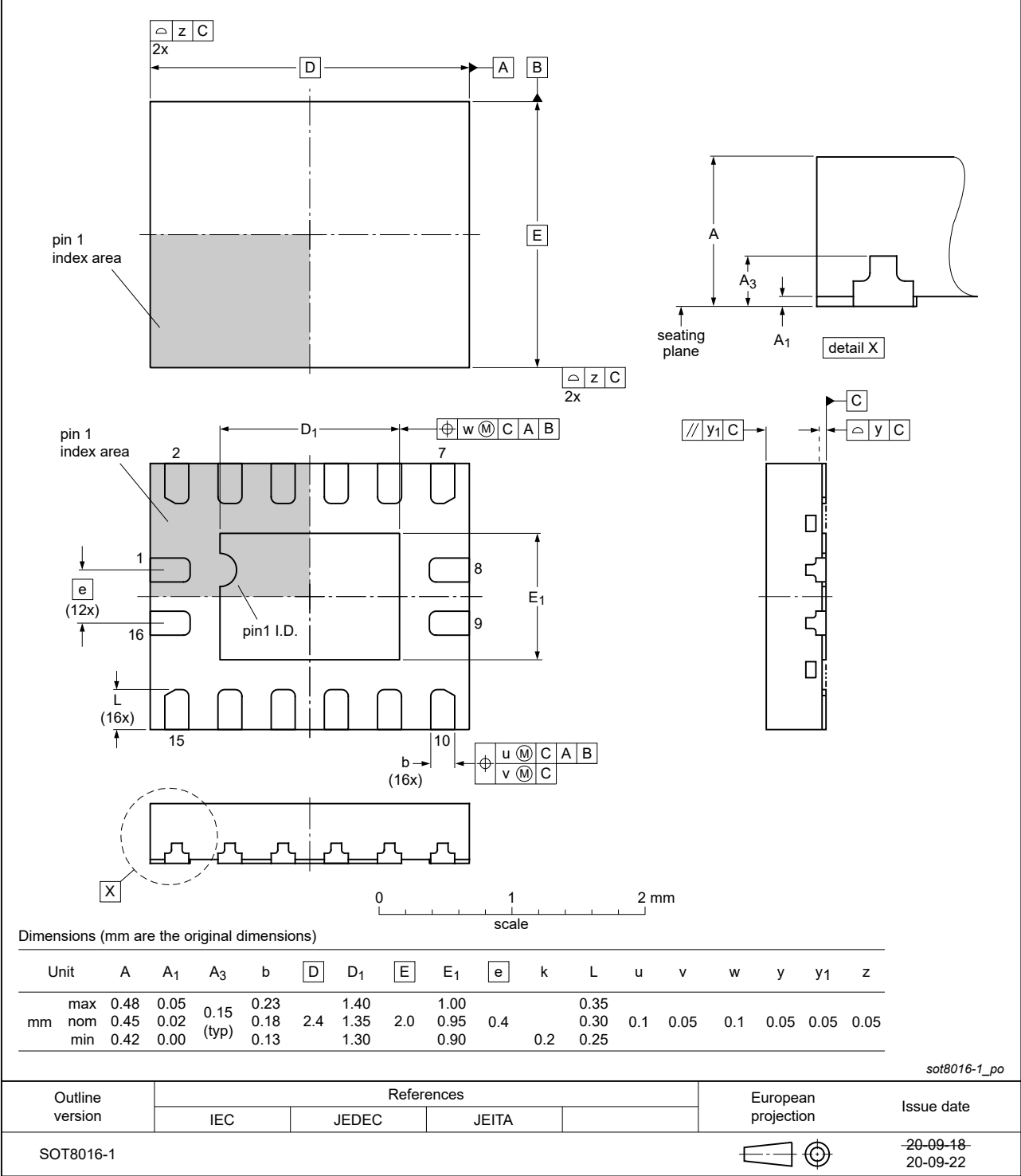


Fig. 21. Package outline SOT8016-1 (DHXQFN16)

13. Abbreviations

Table 13. Abbreviations

| Acronym | Description             |
|---------|-------------------------|
| CDM     | Charged Device Model    |
| DUT     | Device Under Test       |
| ESD     | ElectroStatic Discharge |
| HBM     | Human Body Model        |

14. Revision history

Table 14. Revision history

| Document ID       | Release date                                                                                                                                                                                                                                    | Data sheet status     | Change notice | Supersedes         |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|--------------------|
| 74HC_HCT4051 v.12 | 20240321                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.11  |
| Modifications:    | <ul style="list-style-type: none"><li>Fig. 18, Fig. 19: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153.</li><li>Section 2: ESD specification updated according to the latest JEDEC standard.</li></ul>                |                       |               |                    |
| 74HC_HCT4051 v.11 | 20221205                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.10  |
| Modifications:    | <ul style="list-style-type: none"><li>Type numbers 74HC4051BZ and 74HCT4051BZ (SOT8016-1/DHXQFN16) added.</li></ul>                                                                                                                             |                       |               |                    |
| 74HC_HCT4051 v.10 | 20210908                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.9   |
| Modifications:    | <ul style="list-style-type: none"><li>Type numbers 74HC4051DB and 74HCT4051DB (SOT338-1/SSOP16) removed.</li><li>Section 2 updated.</li><li>Section 8: Derating values for P<sub>tot</sub> total power dissipation have been updated.</li></ul> |                       |               |                    |
| 74HC_HCT4051 v.9  | 20170926                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.8   |
| Modifications:    | <ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul>          |                       |               |                    |
| 74HC_HCT4051 v.8  | 20160205                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.7   |
| Modifications:    | <ul style="list-style-type: none"><li>Type numbers 74HC4051N and 74HCT4051N (SOT38-4) removed.</li></ul>                                                                                                                                        |                       |               |                    |
| 74HC_HCT4051 v.7  | 20120719                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.6   |
| Modifications:    | <ul style="list-style-type: none"><li>CDM added to features.</li></ul>                                                                                                                                                                          |                       |               |                    |
| 74HC_HCT4051 v.6  | 20111213                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.5   |
| Modifications:    | <ul style="list-style-type: none"><li>Legal pages updated.</li></ul>                                                                                                                                                                            |                       |               |                    |
| 74HC_HCT4051 v.5  | 20110513                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.4   |
| 74HC_HCT4051 v.4  | 20110117                                                                                                                                                                                                                                        | Product data sheet    | -             | 74HC_HCT4051 v.3   |
| 74HC_HCT4051 v.3  | 20051219                                                                                                                                                                                                                                        | Product specification | -             | 74HC_HCT4051_CNV_2 |

## 15. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [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".
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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Ordering information.....2

5. Functional diagram.....2

6. Pinning information.....4

6.1. Pinning.....4

6.2. Pin description.....4

7. Function description..... 5

8. Limiting values..... 5

9. Recommended operating conditions.....6

10. Static characteristics.....7

11. Dynamic characteristics.....13

11.1. Additional dynamic characteristics..... 19

12. Package outline..... 22

13. Abbreviations.....26

14. Revision history.....26

15. Legal information.....27

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