

# 74HC4066; 74HCT4066

Quad single-pole single-throw analog switch

Rev. 7 — 2 April 2013

Product data sheet

## 1. General description

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The 74HC4066; 74HCT4066 is a quad single pole, single throw analog switch. Each switch features two input/output terminals (nY and nZ) and an active HIGH enable input (nE). When nE is LOW, the analog switch is 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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- Input levels nE inputs:
  - ◆ For 74HC4066: CMOS level
  - ◆ For 74HCT4066: TTL level
- Low ON resistance:
  - ◆ 50  $\Omega$  (typical) at  $V_{CC} = 4.5\text{ V}$
  - ◆ 45  $\Omega$  (typical) at  $V_{CC} = 6.0\text{ V}$
  - ◆ 35  $\Omega$  (typical) at  $V_{CC} = 9.0\text{ V}$
- Specified in compliance with JEDEC standard no. 7A
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

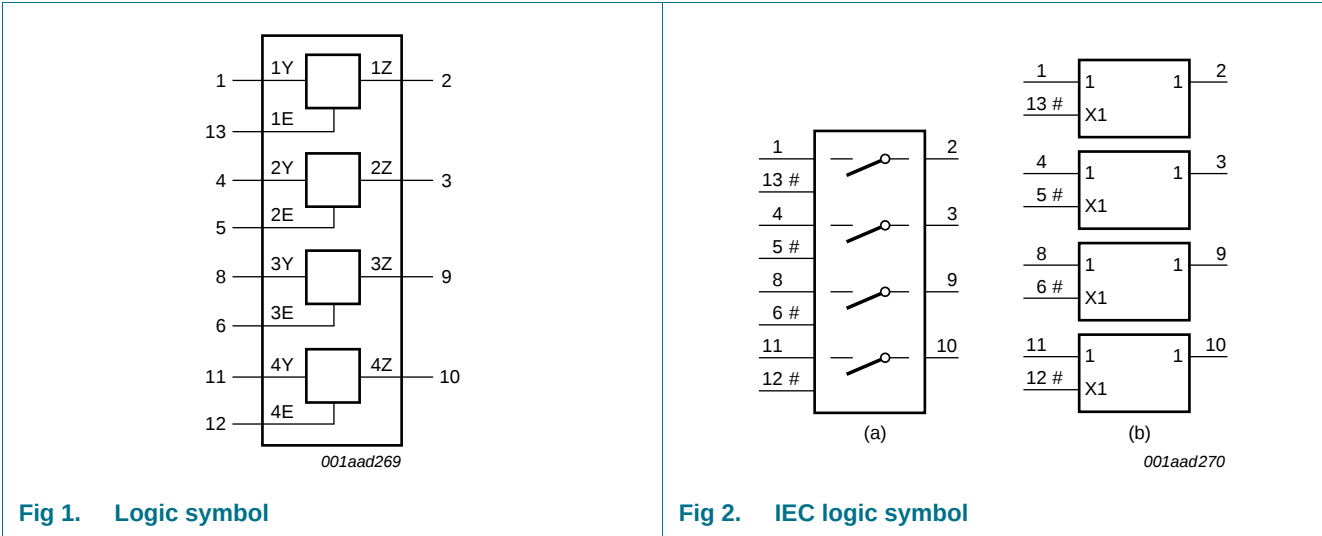


3. Ordering information

Table 1. Ordering information

| Type number | Package           |          |                                                                                                                              |          |
|-------------|-------------------|----------|------------------------------------------------------------------------------------------------------------------------------|----------|
|             | Temperature range | Name     | Description                                                                                                                  | Version  |
| 74HC4066N   | −40 °C to +125 °C | DIP14    | plastic dual in-line package; 14 leads (300 mil)                                                                             | SOT27-1  |
| 74HCT4066N  |                   |          |                                                                                                                              |          |
| 74HC4066D   | −40 °C to +125 °C | SO14     | plastic small outline package; 14 leads; body width 3.9 mm                                                                   | SOT108-1 |
| 74HCT4066D  |                   |          |                                                                                                                              |          |
| 74HC4066DB  | −40 °C to +125 °C | SSOP14   | plastic shrink small outline package; 14 leads; body width 5.3 mm                                                            | SOT337-1 |
| 74HCT4066DB |                   |          |                                                                                                                              |          |
| 74HC4066PW  | −40 °C to +125 °C | TSSOP14  | plastic thin shrink small outline package; 14 leads; body width 4.4 mm                                                       | SOT402-1 |
| 74HCT4066PW |                   |          |                                                                                                                              |          |
| 74HC4066BQ  | −40 °C to +125 °C | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm | SOT762-1 |
| 74HCT4066BQ |                   |          |                                                                                                                              |          |

4. Functional diagram



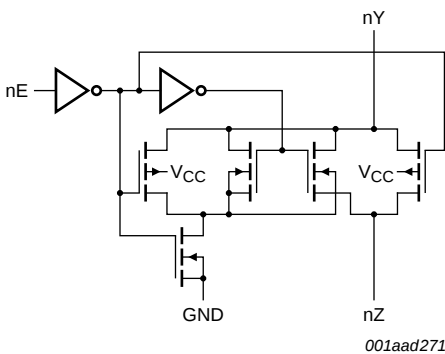


Fig 3. Schematic diagram (one switch)

5. Pinning information

5.1 Pinning

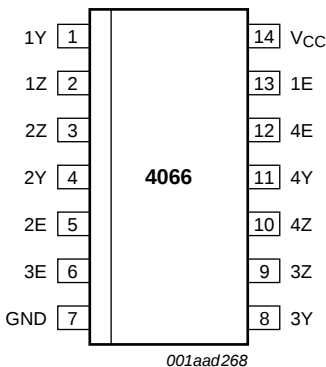
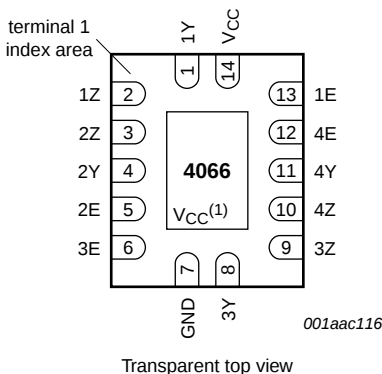


Fig 4. Pin configuration for DIP14, SO14, SSOP14 and TSSOP14



- (1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to VCC.

Fig 5. Pin configuration for DHVQFN14

5.2 Pin description

Table 2. Pin description

| Symbol          | Pin          | Description                 |
|-----------------|--------------|-----------------------------|
| 1Z, 2Z, 3Z, 4Z  | 2, 3, 9, 10  | independent input or output |
| 1Y, 2Y, 3Y, 4Y  | 1, 4, 8, 11  | independent input or output |
| GND             | 7            | ground (0 V)                |
| 1E, 2E, 3E, 4E  | 13, 5, 6, 12 | enable input (active HIGH)  |
| V <sub>CC</sub> | 14           | supply voltage              |

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

| Input nE | Switch |
|----------|--------|
| L        | OFF    |
| H        | ON     |

- [1] H = HIGH voltage level;  
L = LOW voltage level.

## 7. Limiting values

Table 4. Limiting values

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

| Symbol    | Parameter               | Conditions                                                   | Min              | Max      | Unit |
|-----------|-------------------------|--------------------------------------------------------------|------------------|----------|------|
| $V_{CC}$  | supply voltage          |                                                              | -0.5             | +11.0    | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$       | -                | $\pm 20$ | mA   |
| $I_{SK}$  | switch clamping current | $V_{SW} < -0.5\text{ V}$ or $V_{SW} > V_{CC} + 0.5\text{ V}$ | -                | $\pm 20$ | mA   |
| $I_{SW}$  | switch current          | $V_{SW} = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$          | <sup>[1]</sup> - | $\pm 25$ | mA   |
| $I_{CC}$  | supply current          |                                                              | -                | 50       | mA   |
| $I_{GND}$ | ground current          |                                                              | -                | -50      | mA   |
| $T_{stg}$ | storage temperature     |                                                              | -65              | +150     | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$                | <sup>[2]</sup>   |          |      |
|           |                         | DIP14 package                                                |                  | -        | 750  |
|           |                         | SO14, (T)SSOP14 and DHVQFN14 packages                        |                  | -        | 500  |
| P         | power dissipation       | per switch                                                   | -                | 100      | mW   |

- [1] To avoid drawing  $V_{CC}$  current out of terminal Z, when switch current flows in terminals Yn, 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 Yn. In this case there is no limit for the voltage drop across the switch, but the voltages at Yn and Z may not exceed  $V_{CC}$  or GND.
- [2] For DIP14 package:  $P_{tot}$  derates linearly with 12 mW/K above 70 °C.  
For SO14 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.  
For (T)SSOP14 packages:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.  
For DHVQFN14 packages:  $P_{tot}$  derates linearly with 4.5 mW/K above 60 °C.

## 8. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol              | Parameter                           | Conditions               | 74HC4066 |      |          | 74HCT4066 |      |          | Unit |
|---------------------|-------------------------------------|--------------------------|----------|------|----------|-----------|------|----------|------|
|                     |                                     |                          | Min      | Typ  | Max      | Min       | Typ  | Max      |      |
| $V_{CC}$            | supply voltage                      |                          | 2.0      | 5.0  | 10.0     | 4.5       | 5.0  | 5.5      | V    |
| $V_I$               | input voltage                       |                          | GND      | -    | $V_{CC}$ | GND       | -    | $V_{CC}$ | V    |
| $V_{SW}$            | switch voltage                      |                          | GND      | -    | $V_{CC}$ | GND       | -    | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                          | -40      | +25  | +125     | -40       | +25  | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0\text{ V}$  | -        | -    | 625      | -         | -    | -        | ns/V |
|                     |                                     | $V_{CC} = 4.5\text{ V}$  | -        | 1.67 | 139      | -         | 1.67 | 139      | ns/V |
|                     |                                     | $V_{CC} = 6.0\text{ V}$  | -        | -    | 83       | -         | -    | -        | ns/V |
|                     |                                     | $V_{CC} = 10.0\text{ V}$ | -        | -    | 35       | -         | -    | -        | ns/V |

## 9. Static characteristics

Table 6.  $R_{ON}$  resistance per switch for types 74HC4066 and 74HCT4066

$V_I = V_{IH}$  or  $V_{IL}$ ; for test circuit see [Figure 6](#).

$V_{IS}$  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 74HC4066:  $V_{CC} - GND = 2.0\text{ V}$ ,  $4.5\text{ V}$ ,  $6.0\text{ V}$  and  $9.0\text{ V}$ .

For 74HCT4066:  $V_{CC} - GND = 4.5\text{ V}$ .

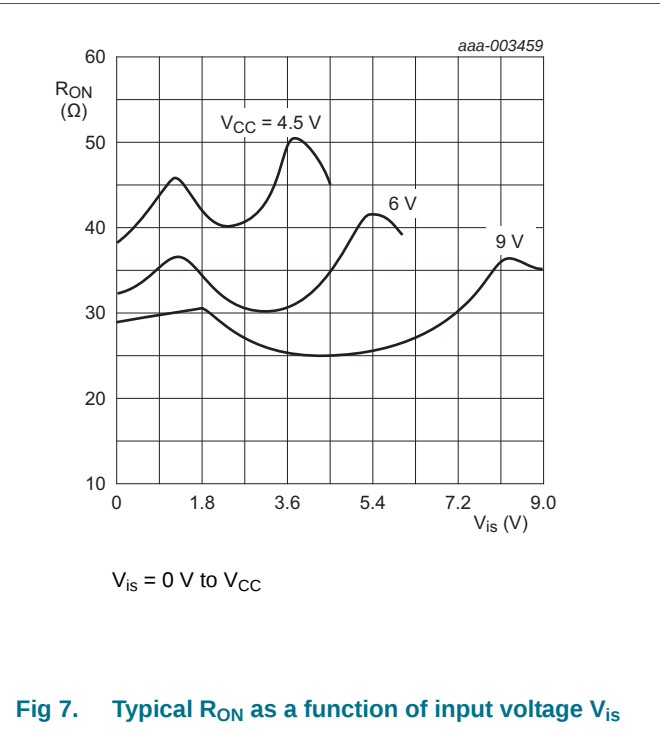
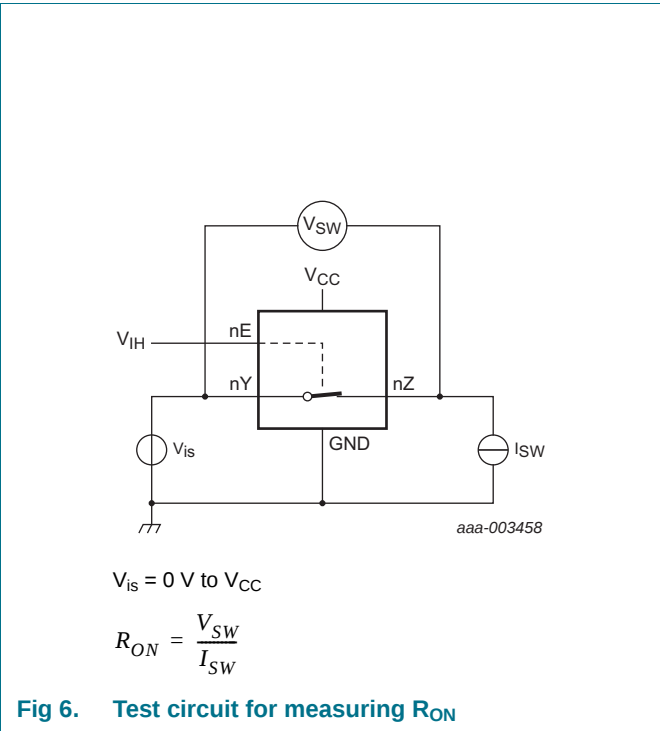
| Symbol         | Parameter            | Conditions                                                   | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit     |
|----------------|----------------------|--------------------------------------------------------------|------------------|--------------------|-----|-------------------|-----|----------|
|                |                      |                                                              | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |          |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_{IS} = V_{CC}$ to GND                                     |                  |                    |     |                   |     |          |
|                |                      | $V_{CC} = 2.0\text{ V}$ ; $I_{SW} = 100\text{ }\mu\text{A}$  | [2]              | -                  | -   | -                 | -   | $\Omega$ |
|                |                      | $V_{CC} = 4.5\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 54                 | -   | 118               | 142 | $\Omega$ |
|                |                      | $V_{CC} = 6.0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 42                 | -   | 105               | 126 | $\Omega$ |
|                |                      | $V_{CC} = 9.0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 32                 | -   | 88                | 105 | $\Omega$ |
| $R_{ON(rail)}$ | ON resistance (rail) | $V_{IS} = GND$                                               |                  |                    |     |                   |     |          |
|                |                      | $V_{CC} = 2.0\text{ V}$ ; $I_{SW} = 100\text{ }\mu\text{A}$  | [2]              | -                  | 80  | -                 | -   | $\Omega$ |
|                |                      | $V_{CC} = 4.5\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 35                 | -   | 95                | 115 | $\Omega$ |
|                |                      | $V_{CC} = 6.0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 27                 | -   | 82                | 100 | $\Omega$ |
|                |                      | $V_{CC} = 9.0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 20                 | -   | 70                | 85  | $\Omega$ |
|                |                      | $V_{IS} = V_{CC}$                                            |                  |                    |     |                   |     |          |
|                |                      | $V_{CC} = 2.0\text{ V}$ ; $I_{SW} = 100\text{ }\mu\text{A}$  | [2]              | -                  | 100 | -                 | -   | $\Omega$ |
|                |                      | $V_{CC} = 4.5\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 42                 | -   | 106               | 128 | $\Omega$ |
|                |                      | $V_{CC} = 6.0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 35                 | -   | 94                | 113 | $\Omega$ |
|                |                      | $V_{CC} = 9.0\text{ V}$ ; $I_{SW} = 1000\text{ }\mu\text{A}$ | -                | 20                 | -   | 78                | 95  | $\Omega$ |

Table 6.  $R_{ON}$  resistance per switch for types 74HC4066 and 74HCT4066 ...continued

$V_I = V_{IH}$  or  $V_{IL}$ ; for test circuit see Figure 6.  
 $V_{is}$  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 74HC4066:  $V_{CC} - GND = 2.0\text{ V}$ ,  $4.5\text{ V}$ ,  $6.0\text{ V}$  and  $9.0\text{ V}$ .  
For 74HCT4066:  $V_{CC} - GND = 4.5\text{ V}$ .

| Symbol          | Parameter                               | Conditions               | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit     |
|-----------------|-----------------------------------------|--------------------------|------------------|--------------------|-----|-------------------|-----|----------|
|                 |                                         |                          | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |          |
| $\Delta R_{ON}$ | ON resistance mismatch between channels | $V_{is} = V_{CC}$ to GND |                  |                    |     |                   |     |          |
|                 |                                         | $V_{CC} = 2.0\text{ V}$  | -                | -                  | -   | -                 | -   | $\Omega$ |
|                 |                                         | $V_{CC} = 4.5\text{ V}$  | -                | 5                  | -   | -                 | -   | $\Omega$ |
|                 |                                         | $V_{CC} = 6.0\text{ V}$  | -                | 4                  | -   | -                 | -   | $\Omega$ |
|                 |                                         | $V_{CC} = 9.0\text{ V}$  | -                | 3                  | -   | -                 | -   | $\Omega$ |

- [1] Typical values are measured at  $T_{amb} = 25\text{ °C}$ .  
[2] At supply voltages ( $V_{CC} - GND$ ) approaching 2 V, the analog switch ON resistance becomes extremely non-linear. Therefore it is recommended that these devices be used to transmit digital signals only, when using these supply voltages.



**Table 7. Static characteristics 74HC4066**

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

$V_{IS}$  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 <sup>[1]</sup> | Max       | Unit          |
|--------------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------|------|--------------------|-----------|---------------|
| <b><math>T_{amb} = -40\text{ °C to }+85\text{ °C}</math></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                | 1.80      | V             |
|                                                              |                           | $V_{CC} = 9.0\text{ V}$                                                                                                    | -    | 4.3                | 2.70      | V             |
| $I_I$                                                        | input leakage current     | $V_I = V_{CC}$ or GND                                                                                                      |      |                    |           |               |
|                                                              |                           | $V_{CC} = 6.0\text{ V}$                                                                                                    | -    | -                  | $\pm 1.0$ | $\mu\text{A}$ |
|                                                              |                           | $V_{CC} = 10.0\text{ V}$                                                                                                   | -    | -                  | $\pm 2.0$ | $\mu\text{A}$ |
| $I_{S(OFF)}$                                                 | OFF-state leakage current | $V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 8</a> |      |                    |           |               |
|                                                              |                           | per channel                                                                                                                | -    | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(ON)}$                                                  | ON-state leakage current  | $V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 9</a> | -    | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{CC}$                                                     | supply current            | $V_I = V_{CC}$ or GND; $V_{IS} = \text{GND}$ or $V_{CC}$ ;<br>$V_{OS} = V_{CC}$ or GND                                     |      |                    |           |               |
|                                                              |                           | $V_{CC} = 6.0\text{ V}$                                                                                                    | -    | -                  | 20.0      | $\mu\text{A}$ |
|                                                              |                           | $V_{CC} = 10.0\text{ V}$                                                                                                   | -    | -                  | 40.0      | $\mu\text{A}$ |
| $C_I$                                                        | input capacitance         |                                                                                                                            | -    | 3.5                | -         | pF            |
| $C_{SW}$                                                     | switch capacitance        |                                                                                                                            | -    | 8                  | -         | pF            |

**$T_{amb} = -40\text{ °C to }+125\text{ °C}$**

|              |                           |                                                                                                                            |      |   |           |               |
|--------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------|------|---|-----------|---------------|
| $V_{IH}$     | HIGH-level input voltage  | $V_{CC} = 2.0\text{ V}$                                                                                                    | 1.5  | - | -         | V             |
|              |                           | $V_{CC} = 4.5\text{ V}$                                                                                                    | 3.15 | - | -         | V             |
|              |                           | $V_{CC} = 6.0\text{ V}$                                                                                                    | 4.2  | - | -         | V             |
|              |                           | $V_{CC} = 9.0\text{ V}$                                                                                                    | 6.3  | - | -         | V             |
| $V_{IL}$     | LOW-level input voltage   | $V_{CC} = 2.0\text{ V}$                                                                                                    | -    | - | 0.50      | V             |
|              |                           | $V_{CC} = 4.5\text{ V}$                                                                                                    | -    | - | 1.35      | V             |
|              |                           | $V_{CC} = 6.0\text{ V}$                                                                                                    | -    | - | 1.80      | V             |
|              |                           | $V_{CC} = 9.0\text{ V}$                                                                                                    | -    | - | 2.70      | V             |
| $I_I$        | input leakage current     | $V_I = V_{CC}$ or GND                                                                                                      |      |   |           |               |
|              |                           | $V_{CC} = 6.0\text{ V}$                                                                                                    | -    | - | $\pm 1.0$ | $\mu\text{A}$ |
|              |                           | $V_{CC} = 10.0\text{ V}$                                                                                                   | -    | - | $\pm 2.0$ | $\mu\text{A}$ |
| $I_{S(OFF)}$ | OFF-state leakage current | $V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 8</a> |      |   |           |               |
|              |                           | per channel                                                                                                                | -    | - | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(ON)}$  | ON-state leakage current  | $V_{CC} = 10.0\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 9</a> | -    | - | $\pm 1.0$ | $\mu\text{A}$ |

**Table 7.** Static characteristics 74HC4066 ...continued

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

$V_{IS}$  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 <sup>[1]</sup> | Max | Unit          |
|----------|----------------|---------------------------------------------------------------------------------------|-----|--------------------|-----|---------------|
| $I_{CC}$ | supply current | $V_I = V_{CC}$ or GND; $V_{IS} = \text{GND or } V_{CC}$ ;<br>$V_{OS} = V_{CC}$ or GND |     |                    |     |               |
|          |                | $V_{CC} = 6.0 \text{ V}$                                                              | -   | -                  | 40  | $\mu\text{A}$ |
|          |                | $V_{CC} = 10.0 \text{ V}$                                                             | -   | -                  | 80  | $\mu\text{A}$ |

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

**Table 8.** Static characteristics 74HCT4066

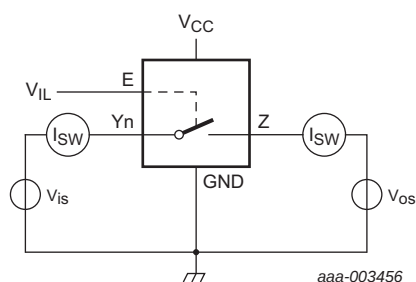
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

$V_{IS}$  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 <sup>[1]</sup> | Max       | Unit          |
|------------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----|--------------------|-----------|---------------|
| <b><math>T_{amb} = -40^\circ\text{C to } +85^\circ\text{C}</math></b>  |                           |                                                                                                                                   |     |                    |           |               |
| $V_{IH}$                                                               | HIGH-level input voltage  | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$                                                                                        | 2.0 | 1.6                | -         | V             |
| $V_{IL}$                                                               | LOW-level input voltage   | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$                                                                                        | -   | 1.2                | 0.8       | V             |
| $I_I$                                                                  | input leakage current     | $V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$                                                                                   | -   | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(OFF)}$                                                           | OFF-state leakage current | $V_{CC} = 5.5 \text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 8</a>        |     |                    |           |               |
|                                                                        |                           | per channel                                                                                                                       | -   | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(ON)}$                                                            | ON-state leakage current  | $V_{CC} = 5.5 \text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 9</a>        | -   | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{CC}$                                                               | supply current            | $V_I = V_{CC}$ or GND; $V_{IS} = \text{GND or } V_{CC}$ ;<br>$V_{OS} = V_{CC}$ or GND; $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ | -   | -                  | 20.0      | $\mu\text{A}$ |
| $\Delta I_{CC}$                                                        | additional supply current | per input pin; $V_I = V_{CC} - 2.1 \text{ V}$ ; other inputs<br>at $V_{CC}$ or GND; $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$    | -   | 100                | 450       | $\mu\text{A}$ |
| $C_I$                                                                  | input capacitance         |                                                                                                                                   | -   | 3.5                | -         | pF            |
| $C_{SW}$                                                               | switch capacitance        |                                                                                                                                   | -   | 8                  | -         | pF            |
| <b><math>T_{amb} = -40^\circ\text{C to } +125^\circ\text{C}</math></b> |                           |                                                                                                                                   |     |                    |           |               |
| $V_{IH}$                                                               | HIGH-level input voltage  | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$                                                                                        | 2.0 | -                  | -         | V             |
| $V_{IL}$                                                               | LOW-level input voltage   | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$                                                                                        | -   | -                  | 0.8       | V             |
| $I_I$                                                                  | input leakage current     | $V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$                                                                                   | -   | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(OFF)}$                                                           | OFF-state leakage current | $V_{CC} = 5.5 \text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 8</a>        |     |                    |           |               |
|                                                                        |                           | per channel                                                                                                                       | -   | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(ON)}$                                                            | ON-state leakage current  | $V_{CC} = 5.5 \text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ;<br>$ V_{SW}  = V_{CC} - \text{GND}$ ; see <a href="#">Figure 9</a>        | -   | -                  | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{CC}$                                                               | supply current            | $V_I = V_{CC}$ or GND; $V_{IS} = \text{GND or } V_{CC}$ ;<br>$V_{OS} = V_{CC}$ or GND; $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ | -   | -                  | 40        | $\mu\text{A}$ |
| $\Delta I_{CC}$                                                        | additional supply current | per input pin; $V_I = V_{CC} - 2.1 \text{ V}$ ; other inputs<br>at $V_{CC}$ or GND; $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$    | -   | -                  | 490       | $\mu\text{A}$ |

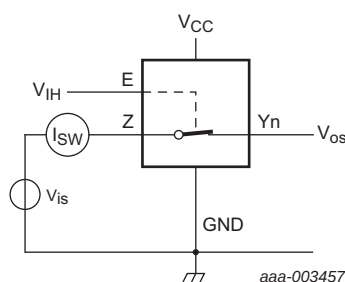
[1] Typical values are measured at  $T_{amb} = 25^\circ\text{C}$ .



$V_{IS} = V_{CC}$  and  $V_{OS} = GND$

$V_{IS} = GND$  and  $V_{OS} = V_{CC}$

**Fig 8. Test circuit for measuring OFF-state leakage current**



$V_{IS} = V_{CC}$  and  $V_{OS} = \text{open}$

$V_{IS} = GND$  and  $V_{OS} = \text{open}$

**Fig 9. Test circuit for measuring ON-state leakage current**

## 10. Dynamic characteristics

**Table 9. Dynamic characteristics 74HC4066**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$  unless specified otherwise; for test circuit see [Figure 12](#).

$V_{IS}$  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                                                                                  | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit |
|-----------|-------------------------------|---------------------------------------------------------------------------------------------|------------------|--------------------|-----|-------------------|-----|------|
|           |                               |                                                                                             | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| $t_{pd}$  | propagation delay             | nY to nZ or nZ to nY; $R_L = \infty\ \Omega$ ; see <a href="#">Figure 10</a> <sup>[2]</sup> |                  |                    |     |                   |     |      |
|           |                               | $V_{CC} = 2.0\text{ V}$                                                                     | -                | 8                  | 75  | -                 | 90  | ns   |
|           |                               | $V_{CC} = 4.5\text{ V}$                                                                     | -                | 3                  | 15  | -                 | 18  | ns   |
|           |                               | $V_{CC} = 6.0\text{ V}$                                                                     | -                | 2                  | 13  | -                 | 15  | ns   |
|           |                               | $V_{CC} = 9.0\text{ V}$                                                                     | -                | 2                  | 10  | -                 | 12  | ns   |
| $t_{off}$ | turn-off time                 | nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[4]</sup>                                |                  |                    |     |                   |     |      |
|           |                               | $V_{CC} = 2.0\text{ V}$                                                                     | -                | 44                 | 190 | -                 | 225 | ns   |
|           |                               | $V_{CC} = 4.5\text{ V}$                                                                     | -                | 16                 | 38  | -                 | 45  | ns   |
|           |                               | $V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$                                              | -                | 13                 | -   | -                 | -   | ns   |
|           |                               | $V_{CC} = 6.0\text{ V}$                                                                     | -                | 13                 | 33  | -                 | 38  | ns   |
|           |                               | $V_{CC} = 9.0\text{ V}$                                                                     | -                | 16                 | 26  | -                 | 30  | ns   |
| $t_{on}$  | turn-on time                  | nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[3]</sup>                                |                  |                    |     |                   |     |      |
|           |                               | $V_{CC} = 2.0\text{ V}$                                                                     | -                | 36                 | 125 | -                 | 150 | ns   |
|           |                               | $V_{CC} = 4.5\text{ V}$                                                                     | -                | 13                 | 25  | -                 | 30  | ns   |
|           |                               | $V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$                                              | -                | 11                 | -   | -                 | -   | ns   |
|           |                               | $V_{CC} = 6.0\text{ V}$                                                                     | -                | 10                 | 21  | -                 | 26  | ns   |
|           |                               | $V_{CC} = 9.0\text{ V}$                                                                     | -                | 8                  | 16  | -                 | 20  | ns   |
| $C_{PD}$  | power dissipation capacitance | per switch; $V_I = GND$ to $V_{CC}$ <sup>[5]</sup>                                          | 11               |                    | -   | -                 | -   | pF   |

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

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

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

- [4]  $t_{off}$  is the same as  $t_{pZH}$  and  $t_{pZL}$ .
- [5]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum \{(C_L + C_{SW}) \times V_{CC}^2 \times f_o\}$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $\sum \{(C_L + C_{SW}) \times V_{CC}^2 \times f_o\}$  = sum of outputs;  
 $C_L$  = output load capacitance in pF;  
 $C_{SW}$  = switch capacitance in pF;  
 $V_{CC}$  = supply voltage in V.

**Table 10. Dynamic characteristics 74HCT4066**

$GND = 0 V$ ;  $t_r = t_f = 6 ns$ ;  $C_L = 50 pF$  unless specified otherwise; for test circuit see [Figure 12](#).

$V_{is}$  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                                                                                 | –40 °C to +85 °C |                    |     | –40 °C to +125 °C |     | Unit |
|-----------|-------------------------------|--------------------------------------------------------------------------------------------|------------------|--------------------|-----|-------------------|-----|------|
|           |                               |                                                                                            | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| $t_{pd}$  | propagation delay             | nY to nZ or nZ to nY; $R_L = \infty \Omega$ ; see <a href="#">Figure 10</a> <sup>[2]</sup> |                  |                    |     |                   |     |      |
|           |                               | $V_{CC} = 4.5 V$                                                                           | -                | 3                  | 15  | -                 | 18  | ns   |
| $t_{off}$ | turn-off time                 | nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[4]</sup>                               |                  |                    |     |                   |     |      |
|           |                               | $V_{CC} = 4.5 V$                                                                           | -                | 20                 | 44  | -                 | 53  | ns   |
|           |                               | $V_{CC} = 5.0 V$ ; $C_L = 15 pF$                                                           | -                | 16                 | -   | -                 | -   | ns   |
| $t_{on}$  | turn-on time                  | nE to nY or nZ; see <a href="#">Figure 11</a> <sup>[3]</sup>                               |                  |                    |     |                   |     |      |
|           |                               | $V_{CC} = 4.5 V$                                                                           | -                | 12                 | 30  | -                 | 36  | ns   |
|           |                               | $V_{CC} = 5.0 V$ ; $C_L = 15 pF$                                                           | -                | 12                 | -   | -                 | -   | ns   |
| $C_{PD}$  | power dissipation capacitance | per switch; $V_i = GND$ to $(V_{CC} - 1.5 V)$ <sup>[5]</sup>                               | -                | 12                 | -   | -                 | -   | pF   |

- [1] Typical values are measured at  $T_{amb} = 25 ^\circ C$ .
- [2]  $t_{pd}$  is the same as  $t_{pHL}$  and  $t_{pLH}$ .
- [3]  $t_{on}$  is the same as  $t_{pHZ}$  and  $t_{pLZ}$ .
- [4]  $t_{off}$  is the same as  $t_{pZH}$  and  $t_{pZL}$ .
- [5]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu W$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum \{(C_L + C_{SW}) \times V_{CC}^2 \times f_o\}$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $\sum \{(C_L + C_{SW}) \times V_{CC}^2 \times f_o\}$  = sum of outputs;  
 $C_L$  = output load capacitance in pF;  
 $C_{SW}$  = switch capacitance in pF;  
 $V_{CC}$  = supply voltage in V.

11. Waveforms

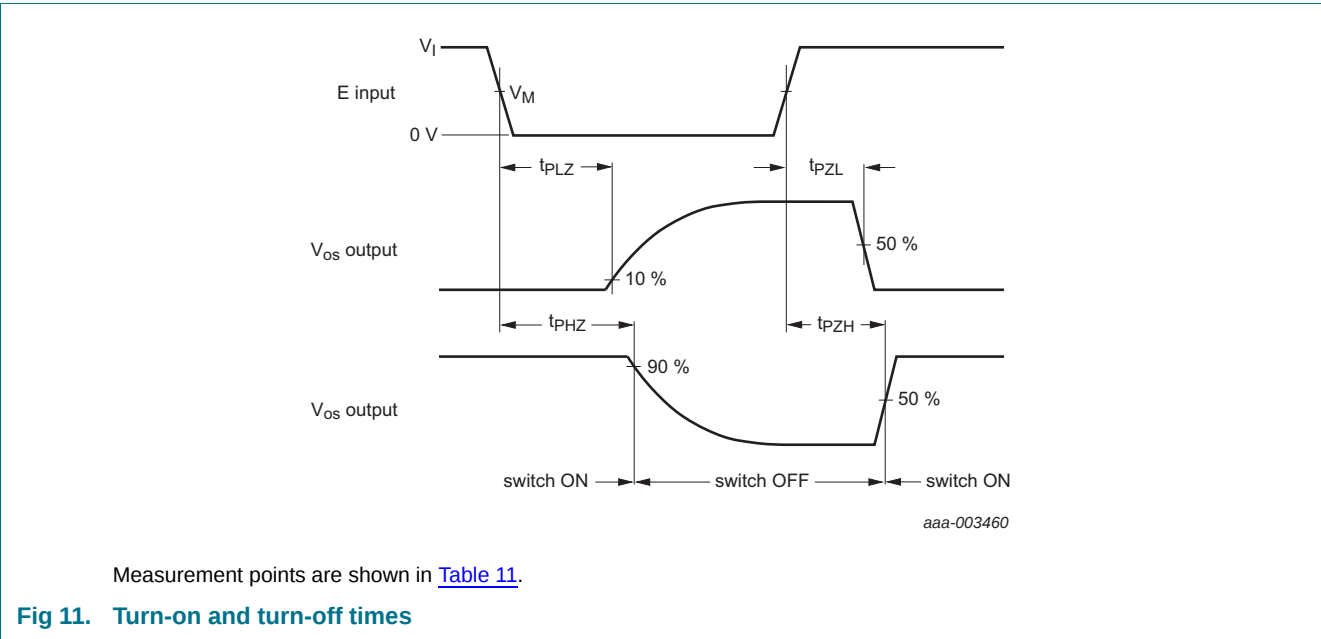
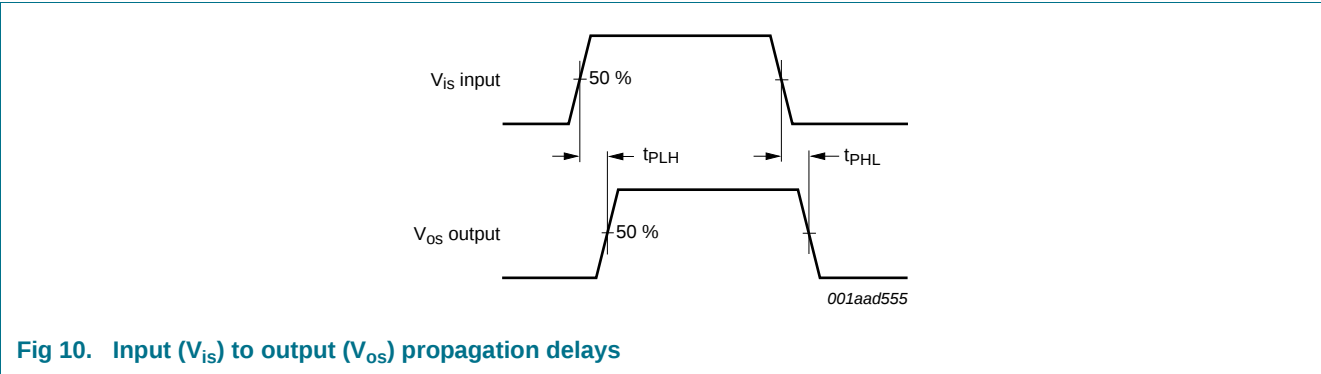


Table 11. Measurement points

| Type      | $V_I$    | $V_M$       |
|-----------|----------|-------------|
| 74HC4066  | $V_{CC}$ | $0.5V_{CC}$ |
| 74HCT4066 | 3.0 V    | 1.3 V       |

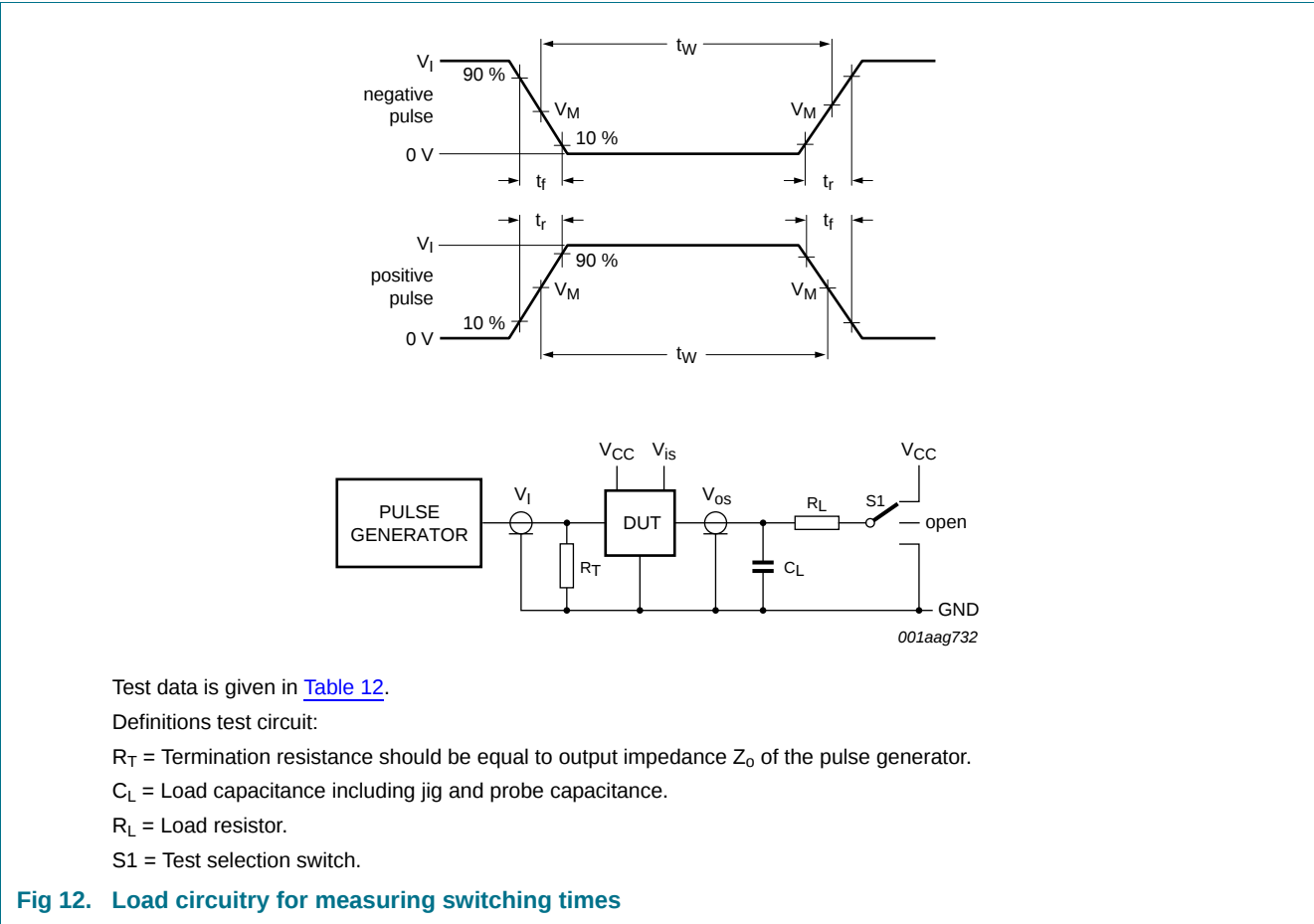


Table 12. Test data

| Test                                | Input                         |                        |                                 | Output         |                | S1 position     |
|-------------------------------------|-------------------------------|------------------------|---------------------------------|----------------|----------------|-----------------|
|                                     | Control E                     | Switch Yn (Z)          | t <sub>r</sub> , t <sub>f</sub> | Switch Z (Yn)  |                |                 |
|                                     | V <sub>I</sub> <sup>[1]</sup> | V <sub>is</sub>        |                                 | C <sub>L</sub> | R <sub>L</sub> |                 |
| t <sub>PHL</sub> , t <sub>PLH</sub> | GND                           | GND to V <sub>CC</sub> | 6 ns                            | 50 pF          | -              | open            |
| t <sub>PHZ</sub> , t <sub>PZH</sub> | GND to V <sub>CC</sub>        | V <sub>CC</sub>        | 6 ns                            | 50 pF, 15 pF   | 1 kΩ           | GND             |
| t <sub>PLZ</sub> , t <sub>PZL</sub> | GND to V <sub>CC</sub>        | GND                    | 6 ns                            | 50 pF, 15 pF   | 1 kΩ           | V <sub>CC</sub> |

[1] For 74HCT4066: maximum input voltage  $V_I = 3.0\text{ V}$ .

## 12. Additional dynamic characteristics

**Table 13. Additional dynamic characteristics**

Recommended conditions and typical values;  $GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

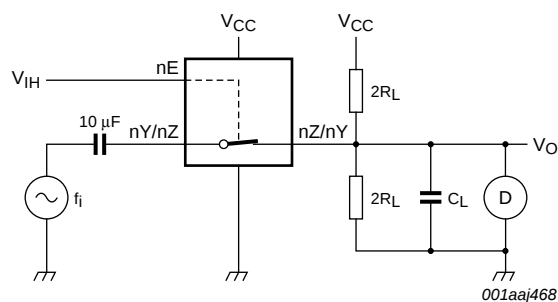
$V_{is}$  is the input voltage at a Yn or Z terminal, whichever is assigned as an input.

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

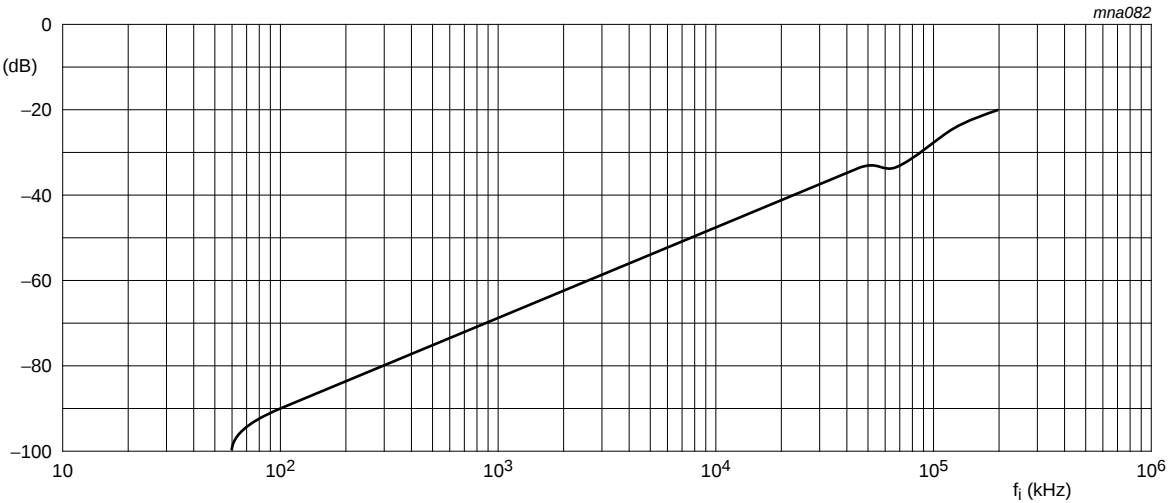
| Symbol         | Parameter                 | Conditions                                                                                                                                                           | Min                 | Typ  | Max | Unit |
|----------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|-----|------|
| THD            | total harmonic distortion | $f_i = 1\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; $C_L = 50\text{ pF}$ ;<br>see <a href="#">Figure 13</a>                                                           |                     |      |     | %    |
|                |                           | $V_{CC} = 4.5\text{ V}$ ; $V_i = 4.0\text{ V (p-p)}$                                                                                                                 | -                   | 0.04 | -   | %    |
|                |                           | $V_{CC} = 9.0\text{ V}$ ; $V_i = 8.0\text{ V (p-p)}$                                                                                                                 | -                   | 0.02 | -   | %    |
|                |                           | $f_i = 10\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; $C_L = 50\text{ pF}$ ;<br>see <a href="#">Figure 13</a>                                                          |                     |      |     |      |
|                |                           | $V_{CC} = 4.5\text{ V}$ ; $V_i = 4.0\text{ V (p-p)}$                                                                                                                 | -                   | 0.12 | -   | %    |
|                |                           | $V_{CC} = 9.0\text{ V}$ ; $V_i = 8.0\text{ V (p-p)}$                                                                                                                 | -                   | 0.06 | -   | %    |
| $f_{(-3dB)}$   | -3 dB frequency response  | $R_L = 50\text{ }\Omega$ ; $C_L = 10\text{ pF}$ ; see <a href="#">Figure 15</a>                                                                                      | <a href="#">[2]</a> |      |     |      |
|                |                           | $V_{CC} = 4.5\text{ V}$                                                                                                                                              | -                   | 180  | -   | MHz  |
|                |                           | $V_{CC} = 9.0\text{ V}$                                                                                                                                              | -                   | 200  | -   | MHz  |
| $\alpha_{iso}$ | isolation (OFF-state)     | $R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ;<br>see <a href="#">Figure 14</a>                                                           | <a href="#">[1]</a> |      |     |      |
|                |                           | $V_{CC} = 4.5\text{ V}$                                                                                                                                              | -                   | -50  | -   | dB   |
|                |                           | $V_{CC} = 9.0\text{ V}$                                                                                                                                              | -                   | -50  | -   | dB   |
| $V_{ct}$       | crosstalk voltage         | between digital input and switch (peak to<br>peak value); $R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ;<br>$f_i = 1\text{ MHz}$ ; see <a href="#">Figure 16</a> |                     |      |     |      |
|                |                           | $V_{CC} = 4.5\text{ V}$                                                                                                                                              | -                   | 110  | -   | mV   |
|                |                           | $V_{CC} = 9.0\text{ V}$                                                                                                                                              | -                   | 220  | -   | mV   |
| Xtalk          | crosstalk                 | between switches; $R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ;<br>$f_i = 1\text{ MHz}$ ; see <a href="#">Figure 17</a>                                         | <a href="#">[1]</a> |      |     |      |
|                |                           | $V_{CC} = 4.5\text{ V}$                                                                                                                                              | -                   | -60  | -   | dB   |
|                |                           | $V_{CC} = 9.0\text{ V}$                                                                                                                                              | -                   | -60  | -   | dB   |

[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  $f_i = 1\text{ MHz}$  (0 dBm = 1 mW into 50  $\Omega$ ). After set-up,  $f_i$  is increased to obtain a reading of -3 dB at  $V_{os}$ .



**Fig 13. Test circuit for measuring total harmonic distortion**



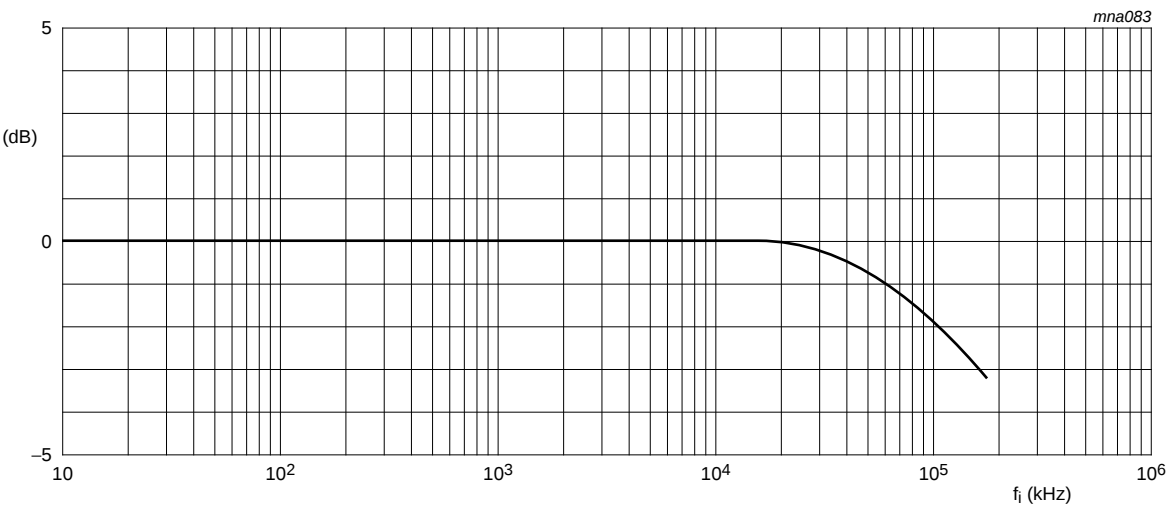
a. Isolation (OFF-state)



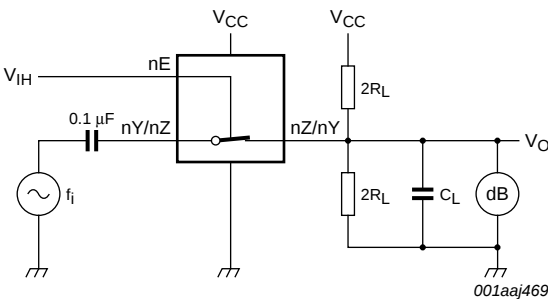
b. Test circuit

$V_{CC} = 4.5\text{ V}$ ;  $\text{GND} = 0\text{ V}$ ;  $R_L = 600\text{ }\Omega$ ;  $R_{\text{source}} = 1\text{ k}\Omega$ .

Fig 14. Isolation (OFF-state) as a function of frequency



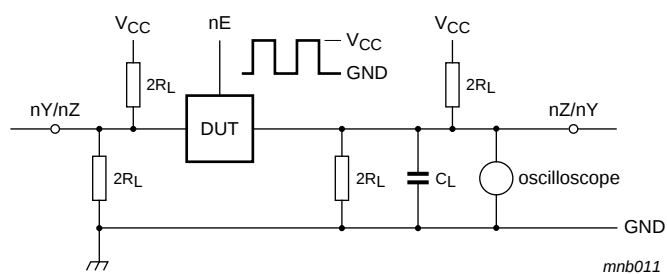
a. Typical -3 dB frequency response



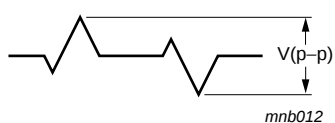
b. Test circuit

$V_{CC} = 4.5\text{ V}$ ;  $\text{GND} = 0\text{ V}$ ;  $R_L = 50\ \Omega$ ;  $R_{\text{source}} = 1\text{ k}\Omega$ .

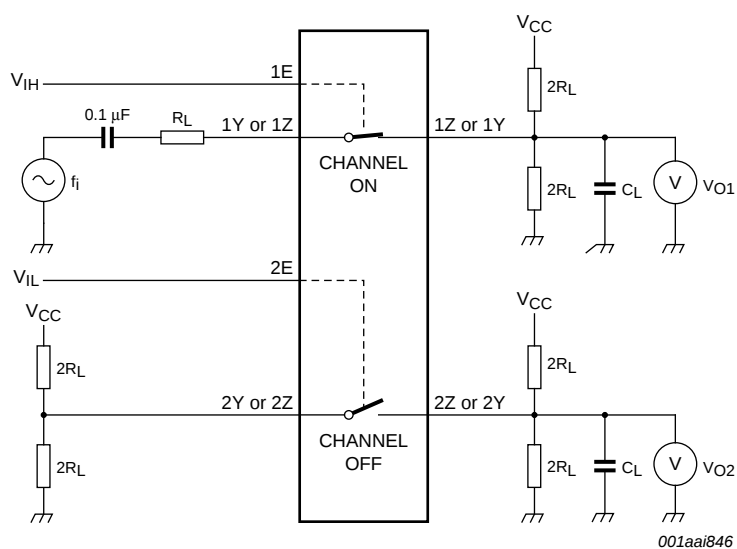
Fig 15. -3 dB frequency response



a. Circuit



b. Crosstalk voltage

**Fig 16. Test circuit for measuring crosstalk voltage (between the digital input and the switch)**

**Fig 17. Test circuit for measuring crosstalk (between the switches)**

13. Package outline

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1

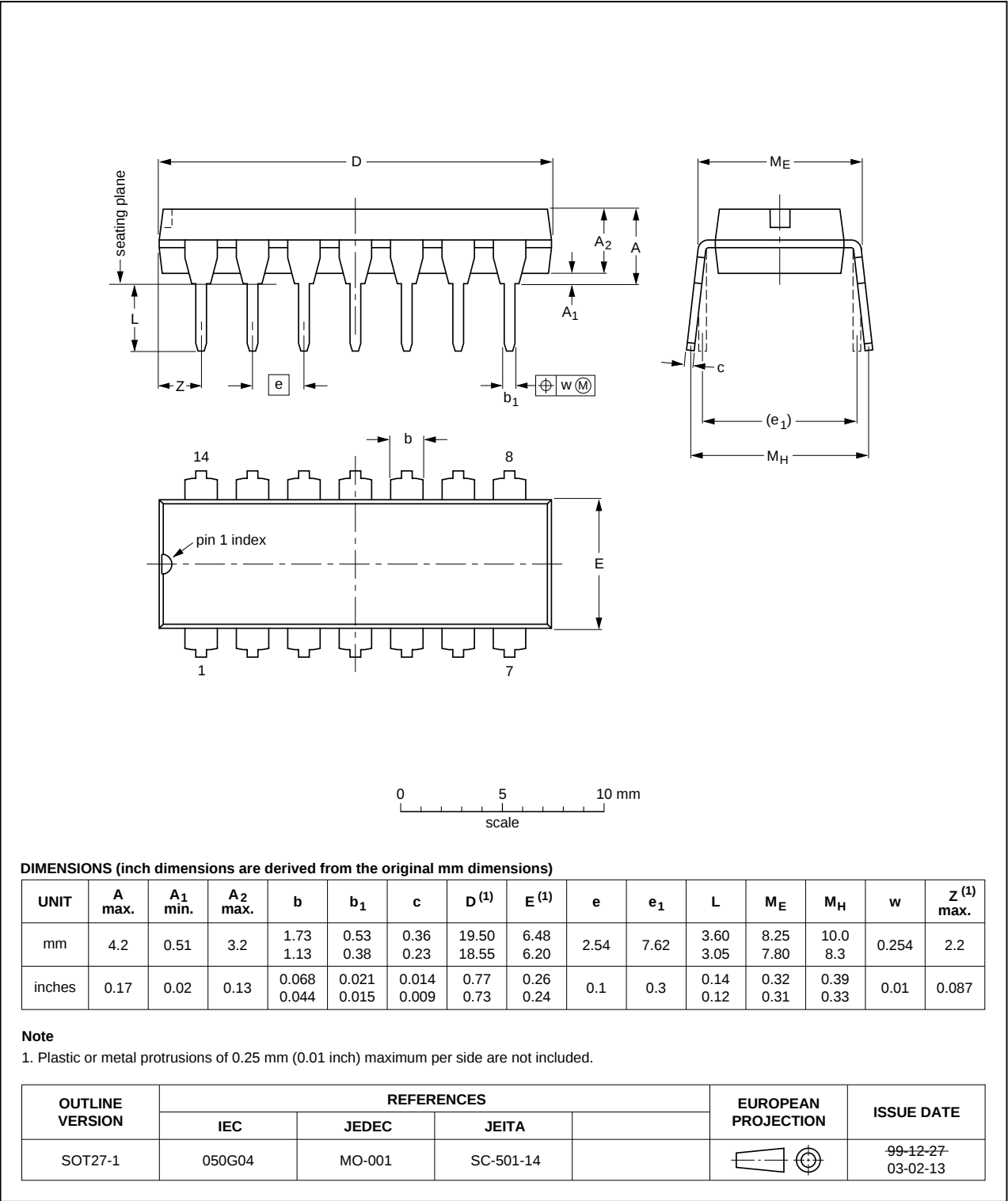


Fig 18. Package outline SOT27-1 (DIP14)

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

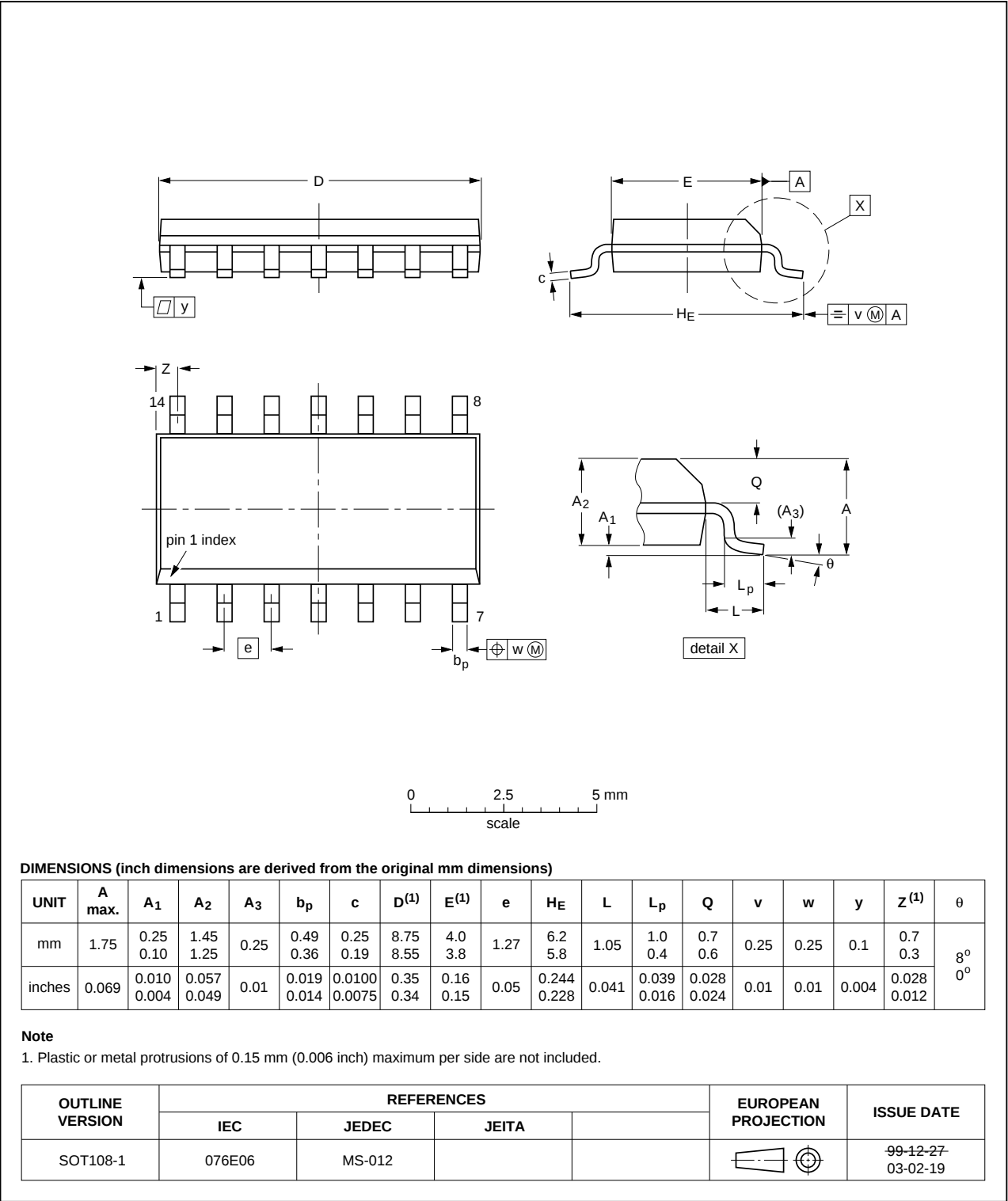


Fig 19. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

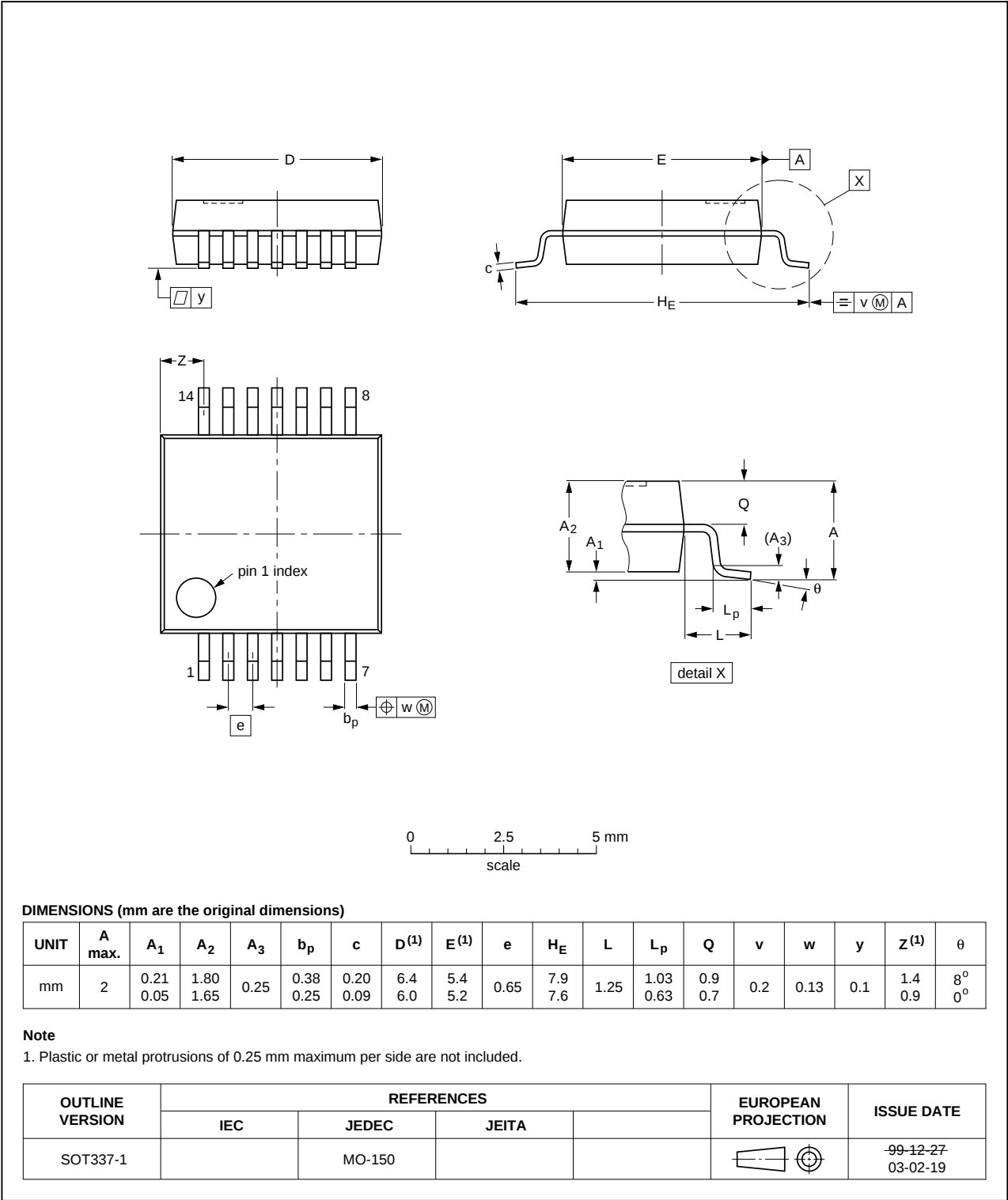
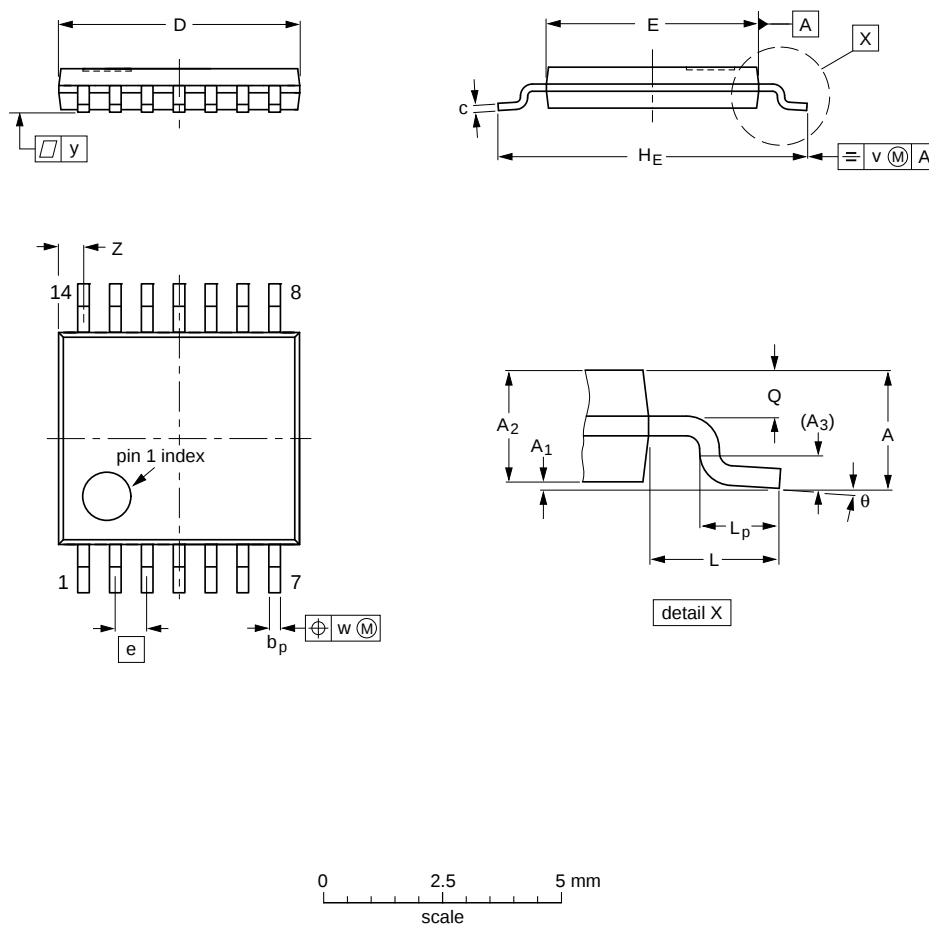


Fig 20. Package outline SOT337-1 (SSOP14)

**TSSOP14:** plastic thin shrink small outline package; 14 leads; body width 4.4 mm

**SOT402-1**



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

| UNIT | A <sub>max.</sub> | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c          | D <sup>(1)</sup> | E <sup>(2)</sup> | e    | H <sub>E</sub> | L | L <sub>p</sub> | Q          | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|-------------------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 1.1               | 0.15<br>0.05   | 0.95<br>0.80   | 0.25           | 0.30<br>0.19   | 0.2<br>0.1 | 5.1<br>4.9       | 4.5<br>4.3       | 0.65 | 6.6<br>6.2     | 1 | 0.75<br>0.50   | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.72<br>0.38     | 8°<br>0° |

## Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE                      |
|--------------------|------------|--------|-------|--|---------------------------------------------------------------------------------------|---------------------------------|
|                    | IEC        | JEDEC  | JEITA |  |                                                                                       |                                 |
| SOT402-1           |            | MO-153 |       |  |  | <del>99-12-27</del><br>03-02-18 |

**Fig 21. Package outline SOT402-1 (TSSOP14)**

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1

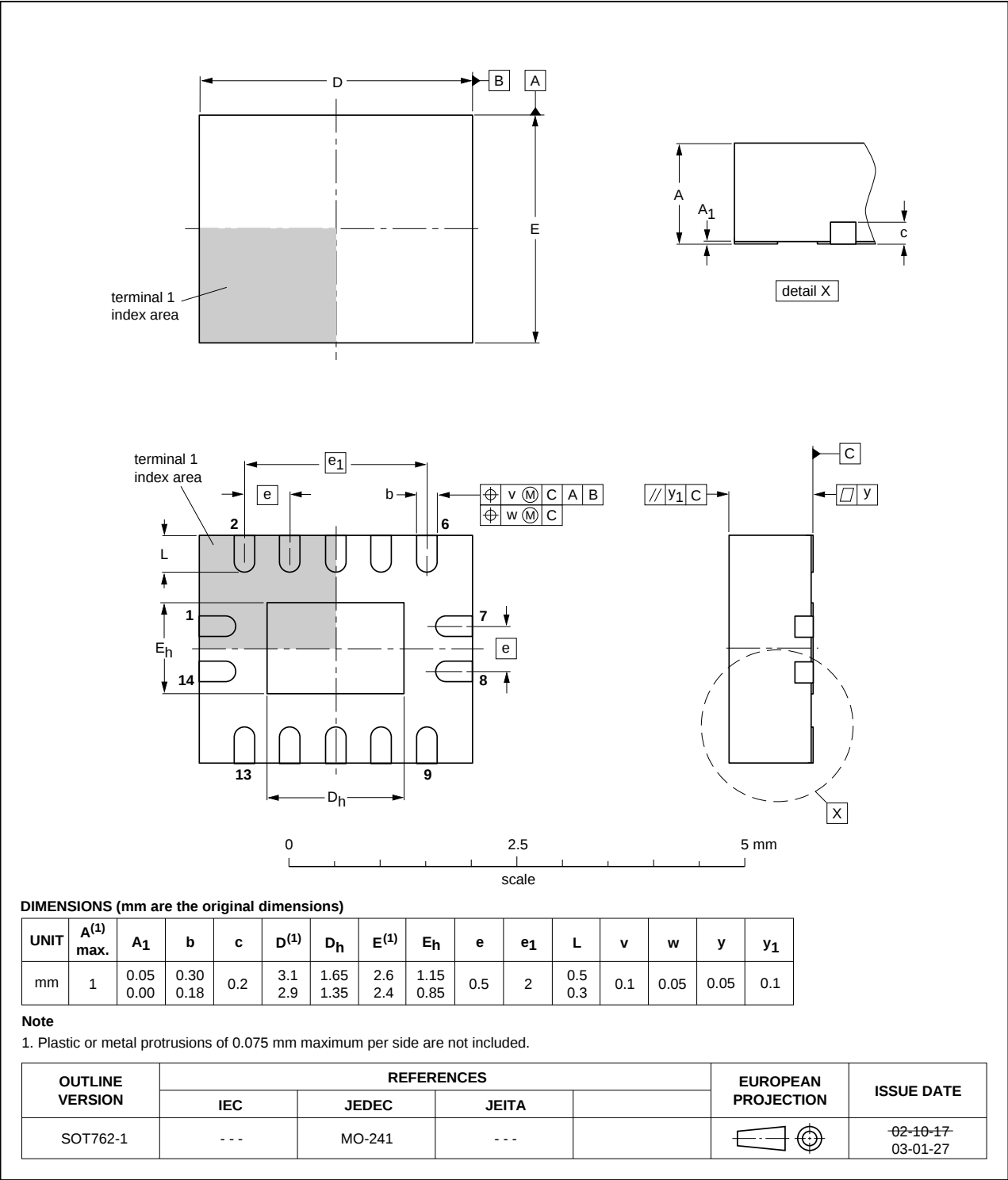


Fig 22. Package outline SOT762-1 (DHVQFN14)

## 14. Abbreviations

Table 14. Abbreviations

| Acronym | Description                             |
|---------|-----------------------------------------|
| CMOS    | Complementary Metal Oxide Semiconductor |
| ESD     | ElectroStatic Discharge                 |
| HBM     | Human Body Model                        |
| MM      | Machine Model                           |

## 15. Revision history

Table 15. Revision history

| Document ID          | Release date                                                                                                                                                                                                                                             | Data sheet status     | Change notice | Supersedes           |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|----------------------|
| 74HC_HCT4066 v.7     | 20130402                                                                                                                                                                                                                                                 | Product data sheet    | -             | 74HC_HCT4066 v.6     |
| Modifications:       | <ul style="list-style-type: none"><li>• Descriptive title corrected (errata).</li><li>• New general description (errata).</li></ul>                                                                                                                      |                       |               |                      |
| 74HC_HCT4066 v.6     | 20120718                                                                                                                                                                                                                                                 | Product data sheet    | -             | 74HC_HCT4066 v.5     |
| Modifications:       | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li></ul> |                       |               |                      |
| 74HC_HCT4066 v.5     | 20041111                                                                                                                                                                                                                                                 | Product data sheet    | -             | 74HC_HCT4066 v.4     |
| 74HC_HCT4066 v.4     | 20030617                                                                                                                                                                                                                                                 | Product data sheet    | -             | 74HC_HCT4066_CNV v.3 |
| 74HC_HCT4067_CNV v.3 | 19981110                                                                                                                                                                                                                                                 | Product data sheet    | -             | 74HC_HCT4066_CNV v.2 |
| 74HC_HCT4066_CNV v.2 | 19981002                                                                                                                                                                                                                                                 | Product specification | -             | -                    |

## 16. Legal information

### 16.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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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