

# 74HC4053-Q100; 74HCT4053-Q100

Triple 2-channel analog multiplexer/demultiplexer

Rev. 3 — 5 March 2020

Product data sheet

## 1. General description

The 74HC4053-Q100; 74HCT4053-Q100 is a triple single-pole double-throw analog switch (3x SPDT) suitable for use in analog or digital 2:1 multiplexer/demultiplexer applications. Each switch features a digital select input ( $S_n$ ), two independent inputs/outputs ( $nY_0$  and  $nY_1$ ) and a common input/output ( $nZ$ ). A digital enable input ( $E$ ) is common to all switches. 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  $V_{CC}$ .

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide analog input voltage range from -5 V to +5 V
- 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:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V ( $C = 200$  pF,  $R = 0$   $\Omega$ )
  - CDM AEC-Q100-011 revision B exceeds 1000 V
- Multiple package options
- DHVQFN package with Side-Wettable Flanks enabling Automatic Optical Inspection (AOI) of solder joints

## 3. Applications

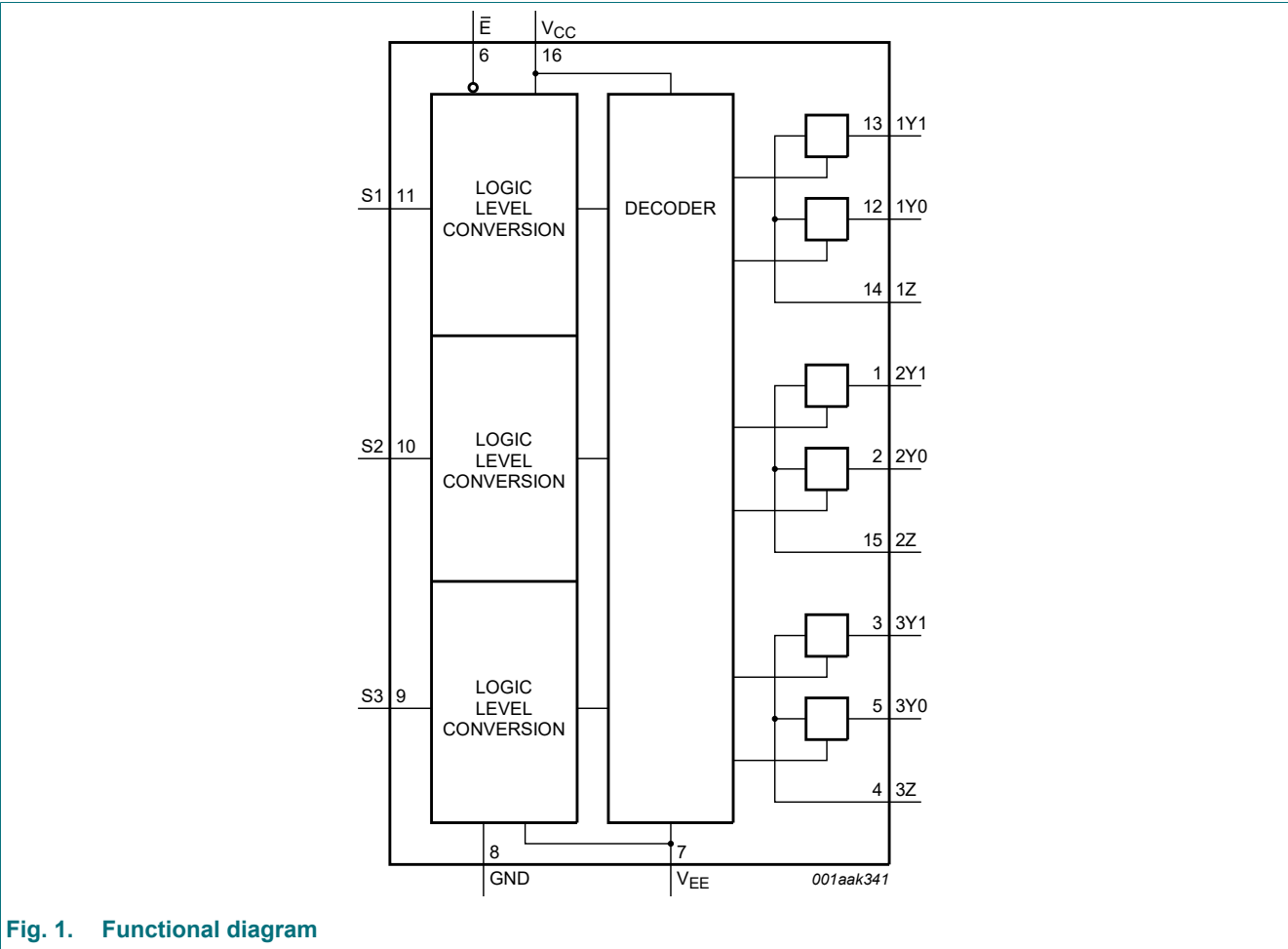
- Analog multiplexing and demultiplexing
- Digital multiplexing and demultiplexing
- Signal gating

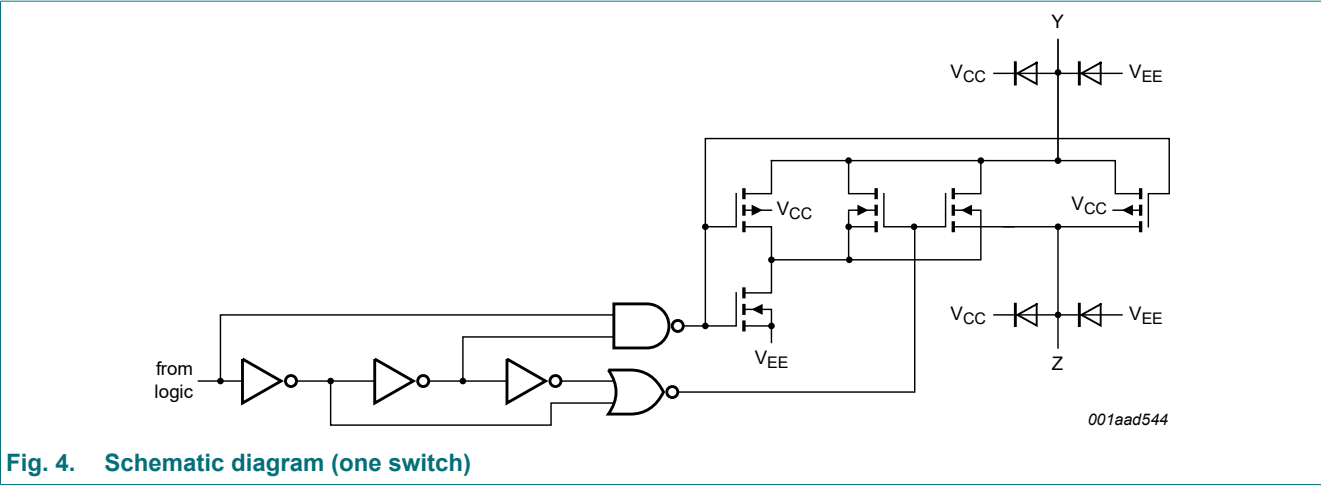
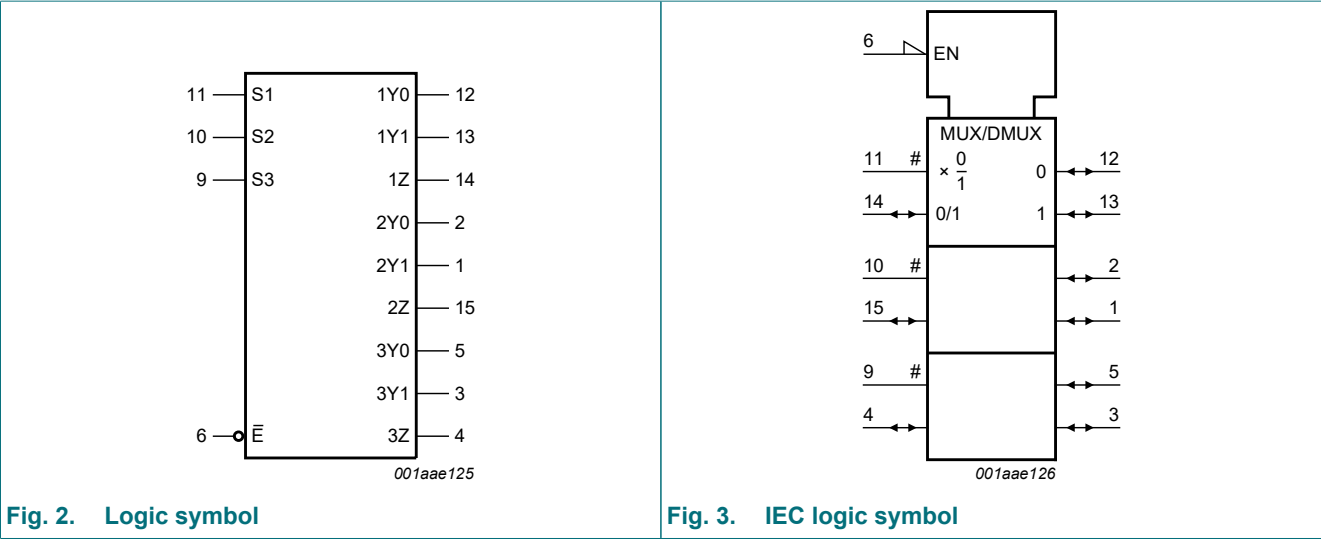
4. Ordering information

Table 1. Ordering information

| Type number      | Package           |          |                                                                                                                                      |          |
|------------------|-------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------|----------|
|                  | Temperature range | Name     | Description                                                                                                                          | Version  |
| 74HC4053D-Q100   | -40 °C to +125 °C | SO16     | plastic small outline package; 16 leads;<br>body width 3.9 mm                                                                        | SOT109-1 |
| 74HCT4053D-Q100  |                   |          |                                                                                                                                      |          |
| 74HC4053PW-Q100  | -40 °C to +125 °C | TSSOP16  | plastic thin shrink small outline package; 16 leads;<br>body width 4.4 mm                                                            | SOT403-1 |
| 74HCT4053PW-Q100 |                   |          |                                                                                                                                      |          |
| 74HC4053BQ-Q100  | -40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal<br>enhanced very thin quad flat package; no leads;<br>16 terminals; body 2.5 × 3.5 × 0.85 mm | SOT763-1 |
| 74HCT4053BQ-Q100 |                   |          |                                                                                                                                      |          |

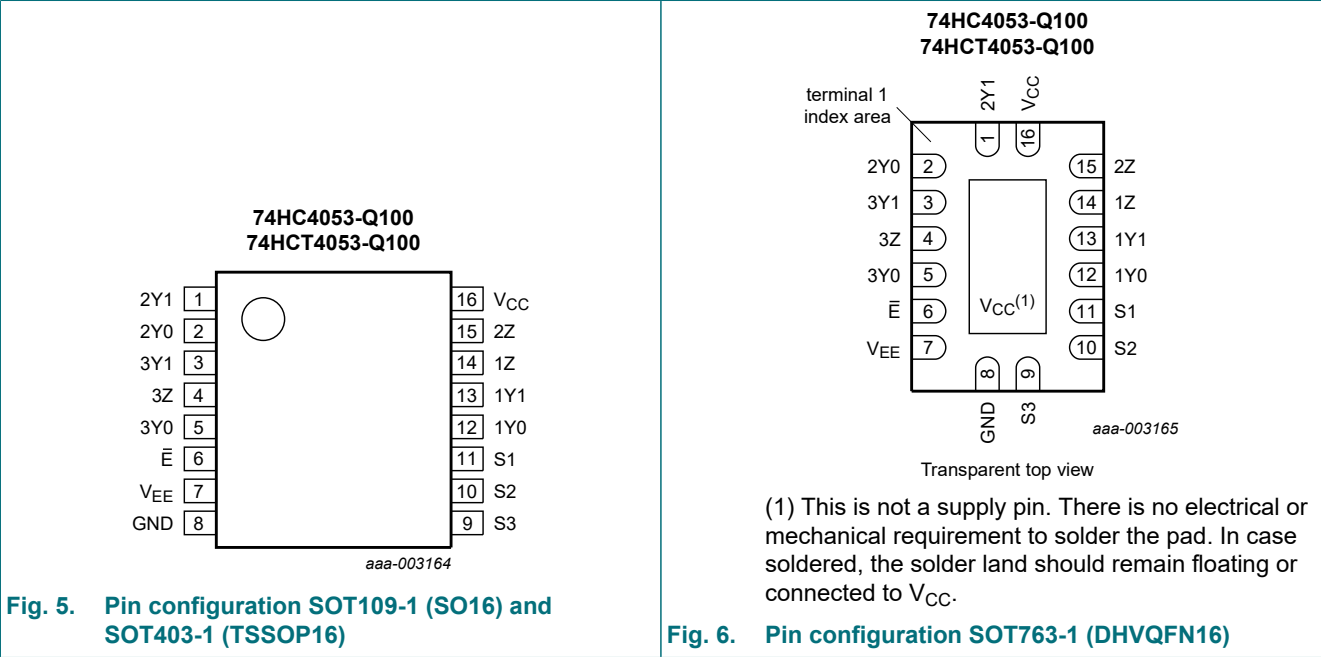
5. Functional diagram





6. Pinning information

6.1. Pinning



6.2. Pin description

Table 2. Pin description

| Symbol        | Pin       | Description                 |
|---------------|-----------|-----------------------------|
| $\bar{E}$     | 6         | enable input (active LOW)   |
| $V_{EE}$      | 7         | supply voltage              |
| GND           | 8         | ground supply voltage       |
| S1, S2, S3    | 11, 10, 9 | select input                |
| 1Y0, 2Y0, 3Y0 | 12, 2, 5  | independent input or output |
| 1Y1, 2Y1, 3Y1 | 13, 1, 3  | independent input or output |
| 1Z, 2Z, 3Z    | 14, 15, 4 | common output or input      |
| $V_{CC}$      | 16        | supply voltage              |

7. Functional description

Table 3. Function table

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

| Inputs    |                | Channel on   |
|-----------|----------------|--------------|
| $\bar{E}$ | S <sub>n</sub> |              |
| L         | L              | nY0 to nZ    |
| L         | H              | nY1 to nZ    |
| H         | X              | switches off |

## 8. Limiting values

**Table 4. Limiting values**

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

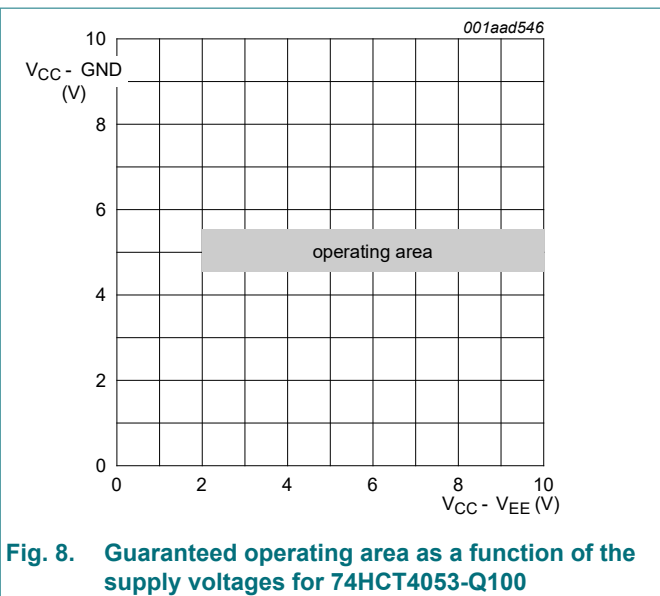
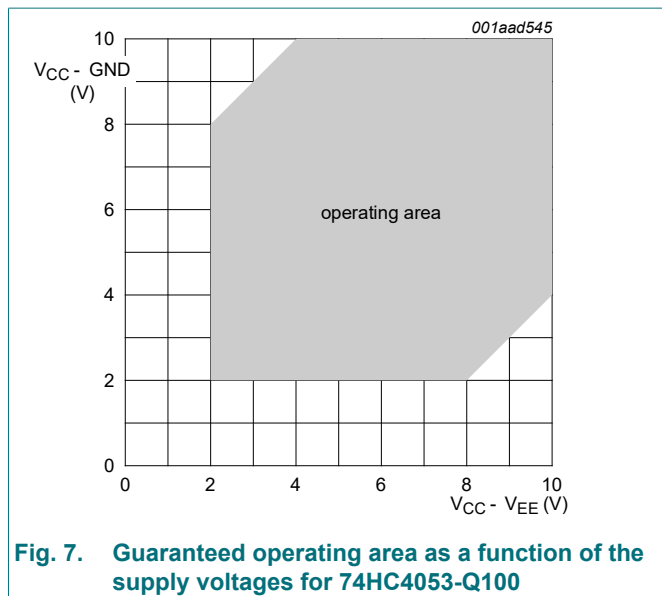
| Symbol    | Parameter               | Conditions                                     | Min  | Max      | Unit |
|-----------|-------------------------|------------------------------------------------|------|----------|------|
| $V_{CC}$  | supply voltage          | [1]                                            | -0.5 | +11.0    | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V       | -    | $\pm 20$ | mA   |
| $I_{SK}$  | switch clamping current | $V_{SW} < -0.5$ V or $V_{SW} > V_{CC} + 0.5$ V | -    | $\pm 20$ | mA   |
| $I_{SW}$  | switch current          | $-0.5$ V $< V_{SW} < V_{CC} + 0.5$ V           | -    | $\pm 25$ | mA   |
| $I_{EE}$  | supply current          |                                                | -    | $\pm 20$ | 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 | [2]                                            | -    | 500      | mW   |
| P         | power dissipation       | per switch                                     | -    | 100      | mW   |

- [1] To avoid drawing  $V_{CC}$  current out of terminal nZ, when switch current flows into terminals nYn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal nZ, no  $V_{CC}$  current will flow out of terminals nYn, and in this case there is no limit for the voltage drop across the switch, but the voltages at nYn and nZ 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.  
 For SOT403-1 (TSSOP16) package:  $P_{tot}$  derates linearly with 8.5 mW/K above 91 °C.  
 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            | 74HC4053-Q100 |      |          | 74HCT4053-Q100 |      |          | Unit |
|---------------------|-------------------------------------|-----------------------|---------------|------|----------|----------------|------|----------|------|
|                     |                                     |                       | Min           | Typ  | Max      | Min            | Typ  | Max      |      |
| $V_{CC}$            | supply voltage                      | see Fig. 7 and Fig. 8 |               |      |          |                |      |          |      |
|                     |                                     | $V_{CC} - GND$        | 2.0           | 5.0  | 10.0     | 4.5            | 5.0  | 5.5      | V    |
|                     |                                     | $V_{CC} - V_{EE}$     | 2.0           | 5.0  | 10.0     | 2.0            | 5.0  | 10.0     | V    |
| $V_I$               | input voltage                       |                       | GND           | -    | $V_{CC}$ | GND            | -    | $V_{CC}$ | V    |
| $V_{SW}$            | switch voltage                      |                       | $V_{EE}$      | -    | $V_{CC}$ | $V_{EE}$       | -    | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                       | -40           | +25  | +125     | -40            | +25  | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0$ V      | -             | -    | 625      | -              | -    | -        | ns/V |
|                     |                                     | $V_{CC} = 4.5$ V      | -             | 1.67 | 139      | -              | 1.67 | 139      | ns/V |
|                     |                                     | $V_{CC} = 6.0$ V      | -             | -    | 83       | -              | -    | -        | ns/V |
|                     |                                     | $V_{CC} = 10.0$ V     | -             | -    | 31       | -              | -    | -        | ns/V |



## 10. Static characteristics

**Table 6.  $R_{ON}$  resistance per switch for 74HC4053-Q100 and 74HCT4053-Q100**

$V_I = V_{IH}$  or  $V_{IL}$ ; for test circuit see Fig. 9.

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

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

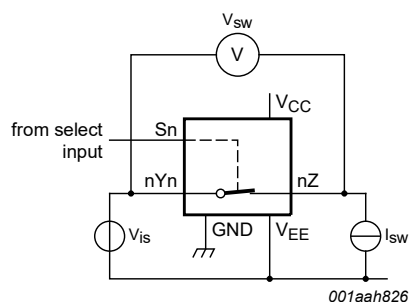
For 74HC4053-Q100:  $V_{CC} - GND$  or  $V_{CC} - V_{EE} = 2.0\text{ V}$ ,  $4.5\text{ V}$ ,  $6.0\text{ V}$  and  $9.0\text{ V}$ .

For 74HCT4053-Q100:  $V_{CC} - GND = 4.5\text{ V}$  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><math>T_{amb} = 25\text{ °C}</math></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   |     |      |

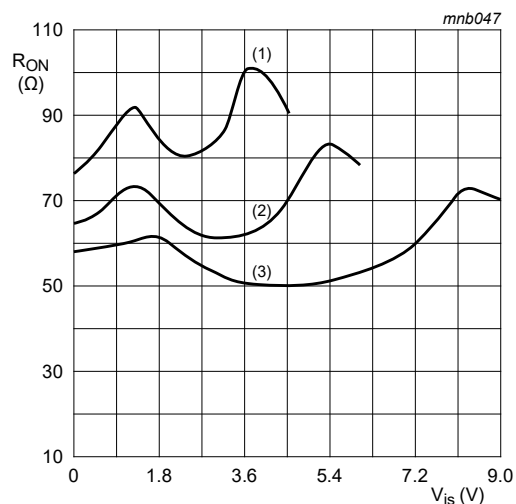
[1] When supply voltages (V<sub>CC</sub> - V<sub>EE</sub>) near 2.0 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 2 V, it is recommended to use these devices only for transmitting digital signals.



$V_{is} = 0 \text{ V to } (V_{CC} - V_{EE})$ .

$$R_{ON} = \frac{V_{SW}}{I_{SW}}$$

Fig. 9. Test circuit for measuring  $R_{ON}$



$V_{is} = 0 \text{ V to } (V_{CC} - V_{EE})$ .

(1)  $V_{CC} = 4.5 \text{ V}$

(2)  $V_{CC} = 6 \text{ V}$

(3)  $V_{CC} = 9 \text{ V}$

Fig. 10. Typical  $R_{ON}$  as a function of input voltage  $V_{is}$

Table 7. Static characteristics for 74HC4053-Q100

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

$V_{is}$  is the input voltage at pins nYn or nZ, whichever is assigned as an input.

$V_{os}$  is the output voltage at pins nZ or nYn, whichever is assigned as an output.

| Symbol                                      | Parameter                 | Conditions                                                                                                                        | Min  | Typ | Max       | Unit          |
|---------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|-----|-----------|---------------|
| <b><math>T_{amb} = 25 \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 | 1.8       | V             |
|                                             |                           | $V_{CC} = 9.0 \text{ V}$                                                                                                          | -    | 4.3 | 2.7       | V             |
| $I_I$                                       | input leakage current     | $V_{EE} = 0 \text{ V}; V_I = V_{CC} \text{ or GND}$                                                                               |      |     |           |               |
|                                             |                           | $V_{CC} = 6.0 \text{ V}$                                                                                                          | -    | -   | $\pm 0.1$ | $\mu\text{A}$ |
|                                             |                           | $V_{CC} = 10.0 \text{ V}$                                                                                                         | -    | -   | $\pm 0.2$ | $\mu\text{A}$ |
| $I_{S(OFF)}$                                | OFF-state leakage current | $V_{CC} = 10.0 \text{ V}; V_{EE} = 0 \text{ V}; V_I = V_{IH} \text{ or } V_{IL};  V_{SW}  = V_{CC} - V_{EE}; \text{ see Fig. 11}$ |      |     |           |               |
|                                             |                           | per channel                                                                                                                       | -    | -   | $\pm 0.1$ | $\mu\text{A}$ |
|                                             |                           | all channels                                                                                                                      | -    | -   | $\pm 0.1$ | $\mu\text{A}$ |
| $I_{S(ON)}$                                 | ON-state leakage current  | $V_{CC} = 10.0 \text{ V}; V_{EE} = 0 \text{ V}; V_I = V_{IH} \text{ or } V_{IL};  V_{SW}  = V_{CC} - V_{EE}; \text{ see Fig. 12}$ | -    | -   | $\pm 0.1$ | $\mu\text{A}$ |
| $I_{CC}$                                    | 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       | $\mu\text{A}$ |
|                                             |                           | $V_{CC} = 10.0 \text{ V}$                                                                                                         | -    | -   | 16.0      | $\mu\text{A}$ |
| $C_I$                                       | input capacitance         |                                                                                                                                   | -    | 3.5 | -         | pF            |

| Symbol                               | Parameter                 | Conditions                                                                                                                                                                                  | Min  | Typ | Max   | Unit |
|--------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|-------|------|
| C <sub>sw</sub>                      | switch capacitance        | independent pins nYn                                                                                                                                                                        | -    | 5   | -     | pF   |
|                                      |                           | common pins nZ                                                                                                                                                                              | -    | 8   | -     | 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> ; <a href="#">Fig. 11</a>     |      |     |       |      |
|                                      |                           | per channel                                                                                                                                                                                 | -    | -   | ±1.0  | µA   |
|                                      |                           | all channels                                                                                                                                                                                | -    | -   | ±1.0  | 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. 12</a> | -    | -   | ±1.0  | 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    |
| 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. 11</a> |      |     |       |      |
|                                      |                           | per channel                                                                                                                                                                                 | -    | -   | ±1.0  | µA   |
|                                      |                           | all channels                                                                                                                                                                                | -    | -   | ±1.0  | 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. 12</a> | -    | -   | ±1.0  | µA   |

| Symbol   | Parameter      | Conditions                                                                                                      | Min | Typ | Max   | Unit          |
|----------|----------------|-----------------------------------------------------------------------------------------------------------------|-----|-----|-------|---------------|
| $I_{CC}$ | supply current | $V_{EE} = 0\text{ V}$ ; $V_I = V_{CC}$ or GND; $V_{is} = V_{EE}$ or $V_{CC}$ ;<br>$V_{os} = V_{CC}$ or $V_{EE}$ |     |     |       |               |
|          |                | $V_{CC} = 6.0\text{ V}$                                                                                         | -   | -   | 160.0 | $\mu\text{A}$ |
|          |                | $V_{CC} = 10.0\text{ V}$                                                                                        | -   | -   | 320.0 | $\mu\text{A}$ |

**Table 8. Static characteristics for 74HCT4053-Q100**

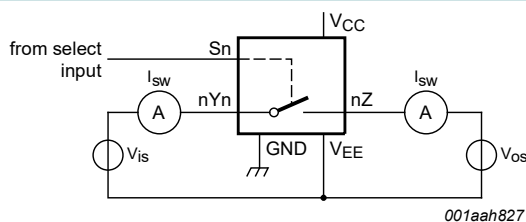
Voltages are referenced to GND (ground = 0 V).

$V_{is}$  is the input voltage at pins nYn or nZ, whichever is assigned as an input.

$V_{os}$  is the output voltage at pins nZ or nYn, whichever is assigned as an output.

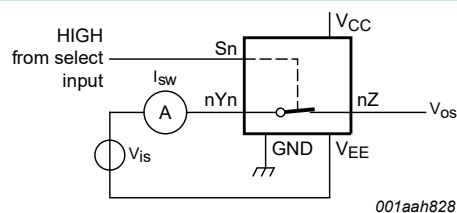
| Symbol                              | Parameter                 | Conditions                                                                                                                                                                  | Min | Typ | Max   | Unit |
|-------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|
| 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. 11 |     |     |       |      |
|                                     |                           | per channel                                                                                                                                                                 | -   | -   | ±0.1  | µA   |
|                                     |                           | all channels                                                                                                                                                                | -   | -   | ±0.1  | 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. 12 | -   | -   | ±0.1  | 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 nYn                                                                                                                                                        | -   | 5   | -     | pF   |
|                                     |                           | common pins nZ                                                                                                                                                              | -   | 8   | -     | pF   |
| T <sub>amb</sub> = -40 °C to +85 °C |                           |                                                                                                                                                                             |     |     |       |      |
| 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. 11 |     |     |       |      |
|                                     |                           | per channel                                                                                                                                                                 | -   | -   | ±1.0  | µA   |
|                                     |                           | all channels                                                                                                                                                                | -   | -   | ±1.0  | 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. 12 | -   | -   | ±1.0  | 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   |

| Symbol                                                                                                        | Parameter                 | Conditions                                                                                                                                    | Min | Typ | Max       | Unit          |
|---------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----------|---------------|
| $\Delta I_{CC}$                                                                                               | additional supply current | per input; $V_I = V_{CC} - 2.1\text{ V}$ ; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$ ; $V_{EE} = 0\text{ V}$ | -   | -   | 225       | $\mu\text{A}$ |
| <b><math>T_{\text{amb}} = -40\text{ }^{\circ}\text{C}</math> to <math>+125\text{ }^{\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; $V_{CC} = 5.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                                                        | -   | -   | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(\text{OFF})}$                                                                                           | OFF-state leakage current | $V_{CC} = 10.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} - V_{EE}$ ; see Fig. 11                    |     |     |           |               |
|                                                                                                               |                           | per channel                                                                                                                                   | -   | -   | $\pm 1.0$ | $\mu\text{A}$ |
|                                                                                                               |                           | all channels                                                                                                                                  | -   | -   | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{S(\text{ON})}$                                                                                            | ON-state leakage current  | $V_{CC} = 10.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $V_I = V_{IH}$ or $V_{IL}$ ; $ V_{SW}  = V_{CC} - V_{EE}$ ; see Fig. 12                    | -   | -   | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{CC}$                                                                                                      | supply current            | $V_I = V_{CC}$ or GND; $V_{is} = V_{EE}$ or $V_{CC}$ ; $V_{os} = V_{CC}$ or $V_{EE}$                                                          |     |     |           |               |
|                                                                                                               |                           | $V_{CC} = 5.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                                                                               | -   | -   | 160.0     | $\mu\text{A}$ |
|                                                                                                               |                           | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = -5.0\text{ V}$                                                                                            | -   | -   | 320.0     | $\mu\text{A}$ |
| $\Delta I_{CC}$                                                                                               | additional supply current | per input; $V_I = V_{CC} - 2.1\text{ V}$ ; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$ ; $V_{EE} = 0\text{ V}$ | -   | -   | 245       | $\mu\text{A}$ |



$V_{is} = V_{CC}$  and  $V_{os} = V_{EE}$ .  
 $V_{is} = V_{EE}$  and  $V_{os} = V_{CC}$ .

Fig. 11. Test circuit for measuring OFF-state current



$V_{is} = V_{CC}$  and  $V_{os}$  is open-circuit.  
 $V_{is} = V_{EE}$  and  $V_{os}$  is open-circuit.

Fig. 12. Test circuit for measuring ON-state current

## 11. Dynamic characteristics

Table 9. Dynamic characteristics for 74HC4053-Q100

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; for test circuit see Fig. 15.

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

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

| Symbol                                                          | Parameter         | Conditions                                                        | Min | Typ | Max | Unit |
|-----------------------------------------------------------------|-------------------|-------------------------------------------------------------------|-----|-----|-----|------|
| <b><math>T_{\text{amb}} = 25\text{ }^{\circ}\text{C}</math></b> |                   |                                                                   |     |     |     |      |
| $t_{pd}$                                                        | propagation delay | $V_{is}$ to $V_{os}$ ; $R_L = \infty\text{ }\Omega$ ; see Fig. 13 | [1] |     |     |      |
|                                                                 |                   | $V_{CC} = 2.0\text{ V}$ ; $V_{EE} = 0\text{ V}$                   | -   | 15  | 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   |

| Symbol                                                                                              | Parameter                     | Conditions                                                                | Min | Typ | Max | Unit |
|-----------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------|-----|-----|-----|------|
| $t_{on}$                                                                                            | turn-on time                  | $\bar{E}$ to $V_{os}$ ; $R_L = \infty \Omega$ ; see Fig. 14 [2]           |     |     |     |      |
|                                                                                                     |                               | $V_{CC} = 2.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 60  | 220 | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 20  | 44  | ns   |
|                                                                                                     |                               | $V_{CC} = 5.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$ ; $C_L = 15 \text{ pF}$ | -   | 17  | -   | ns   |
|                                                                                                     |                               | $V_{CC} = 6.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 16  | 37  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = -4.5 \text{ V}$                      | -   | 15  | 31  | ns   |
|                                                                                                     |                               | Sn to $V_{os}$ ; $R_L = \infty \Omega$ ; see Fig. 14 [2]                  |     |     |     |      |
|                                                                                                     |                               | $V_{CC} = 2.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 75  | 220 | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 25  | 44  | ns   |
|                                                                                                     |                               | $V_{CC} = 5.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$ ; $C_L = 15 \text{ pF}$ | -   | 21  | -   | ns   |
|                                                                                                     |                               | $V_{CC} = 6.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 20  | 37  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = -4.5 \text{ V}$                      | -   | 15  | 31  | ns   |
| $t_{off}$                                                                                           | turn-off time                 | $\bar{E}$ to $V_{os}$ ; $R_L = 1 \text{ k}\Omega$ ; see Fig. 14 [3]       |     |     |     |      |
|                                                                                                     |                               | $V_{CC} = 2.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 63  | 210 | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 21  | 42  | ns   |
|                                                                                                     |                               | $V_{CC} = 5.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$ ; $C_L = 15 \text{ pF}$ | -   | 18  | -   | ns   |
|                                                                                                     |                               | $V_{CC} = 6.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 17  | 36  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = -4.5 \text{ V}$                      | -   | 15  | 29  | ns   |
|                                                                                                     |                               | Sn to $V_{os}$ ; $R_L = 1 \text{ k}\Omega$ ; see Fig. 14 [3]              |     |     |     |      |
|                                                                                                     |                               | $V_{CC} = 2.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 60  | 210 | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 20  | 42  | ns   |
|                                                                                                     |                               | $V_{CC} = 5.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$ ; $C_L = 15 \text{ pF}$ | -   | 17  | -   | ns   |
|                                                                                                     |                               | $V_{CC} = 6.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | 16  | 36  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = -4.5 \text{ V}$                      | -   | 15  | 29  | ns   |
| $C_{PD}$                                                                                            | power dissipation capacitance | per switch; $V_I = \text{GND}$ to $V_{CC}$ [4]                            | -   | 36  | -   | pF   |
| <b><math>T_{amb} = -40 \text{ }^\circ\text{C}</math> to <math>+85 \text{ }^\circ\text{C}</math></b> |                               |                                                                           |     |     |     |      |
| $t_{pd}$                                                                                            | propagation delay             | $V_{is}$ to $V_{os}$ ; $R_L = \infty \Omega$ ; see Fig. 13 [1]            |     |     |     |      |
|                                                                                                     |                               | $V_{CC} = 2.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 75  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 15  | ns   |
|                                                                                                     |                               | $V_{CC} = 6.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 13  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = -4.5 \text{ V}$                      | -   | -   | 10  | ns   |
| $t_{on}$                                                                                            | turn-on time                  | $\bar{E}$ to $V_{os}$ ; $R_L = \infty \Omega$ ; see Fig. 14 [2]           |     |     |     |      |
|                                                                                                     |                               | $V_{CC} = 2.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 275 | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 55  | ns   |
|                                                                                                     |                               | $V_{CC} = 6.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 47  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = -4.5 \text{ V}$                      | -   | -   | 39  | ns   |
|                                                                                                     |                               | Sn to $V_{os}$ ; $R_L = \infty \Omega$ ; see Fig. 14 [2]                  |     |     |     |      |
|                                                                                                     |                               | $V_{CC} = 2.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 275 | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 55  | ns   |
|                                                                                                     |                               | $V_{CC} = 6.0 \text{ V}$ ; $V_{EE} = 0 \text{ V}$                         | -   | -   | 47  | ns   |
|                                                                                                     |                               | $V_{CC} = 4.5 \text{ V}$ ; $V_{EE} = -4.5 \text{ V}$                      | -   | -   | 39  | ns   |

| Symbol                               | Parameter         | Conditions                                                                 | Min | Typ | Max | Unit |
|--------------------------------------|-------------------|----------------------------------------------------------------------------|-----|-----|-----|------|
| t <sub>off</sub>                     | turn-off time     | E to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 14 [3]              |     |     |     |      |
|                                      |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 265 | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 53  | ns   |
|                                      |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 45  | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 36  | ns   |
|                                      |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 14 [3]             |     |     |     |      |
|                                      |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 265 | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 53  | ns   |
|                                      |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 45  | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 36  | ns   |
| T <sub>amb</sub> = -40 °C to +125 °C |                   |                                                                            |     |     |     |      |
| t <sub>pd</sub>                      | propagation delay | V <sub>is</sub> to V <sub>os</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 13 [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. 14 [2]               |     |     |     |      |
|                                      |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 330 | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 66  | ns   |
|                                      |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 56  | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 47  | ns   |
|                                      |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = ∞ Ω; see Fig. 14 [2]              |     |     |     |      |
|                                      |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 330 | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 66  | ns   |
|                                      |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 56  | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 47  | ns   |
| t <sub>off</sub>                     | turn-off time     | E to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 14 [3]              |     |     |     |      |
|                                      |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 315 | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 63  | ns   |
|                                      |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 54  | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 44  | ns   |
|                                      |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 14 [3]             |     |     |     |      |
|                                      |                   | V <sub>CC</sub> = 2.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 315 | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 63  | ns   |
|                                      |                   | V <sub>CC</sub> = 6.0 V; V <sub>EE</sub> = 0 V                             | -   | -   | 54  | ns   |
|                                      |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 44  | ns   |

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

[2]  $t_{\text{on}}$  is the same as  $t_{\text{PZH}}$  and  $t_{\text{PZL}}$ .

[3]  $t_{\text{off}}$  is the same as  $t_{\text{PHZ}}$  and  $t_{\text{PLZ}}$ .

[4]  $C_{\text{PD}}$  is used to determine the dynamic power dissipation ( $P_{\text{D}}$  in  $\mu\text{W}$ ).

$P_{\text{D}} = C_{\text{PD}} \times V_{\text{CC}}^2 \times f_i \times N + \Sigma\{(C_L + C_{\text{sw}}) \times V_{\text{CC}}^2 \times f_o\}$  where:

$f_i$  = input frequency in MHz;  $f_o$  = output frequency in MHz;

$N$  = number of inputs switching;  $\Sigma\{(C_L + C_{\text{sw}}) \times V_{\text{CC}}^2 \times f_o\}$  = sum of outputs;

$C_L$  = output load capacitance in pF;  $C_{\text{sw}}$  = switch capacitance in pF;

$V_{\text{CC}}$  = supply voltage in V.

**Table 10. Dynamic characteristics for 74HCT4053-Q100**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; for test circuit see [Fig. 15](#).

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

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

| Symbol                                    | Parameter                     | Conditions                                                                         | Min | Typ | Max | Unit |
|-------------------------------------------|-------------------------------|------------------------------------------------------------------------------------|-----|-----|-----|------|
| <b>T<sub>amb</sub> = 25 °C</b>            |                               |                                                                                    |     |     |     |      |
| $t_{pd}$                                  | propagation delay             | $V_{is}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see <a href="#">Fig. 13</a> [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 <a href="#">Fig. 14</a> [2] |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | 27  | 48  | ns   |
|                                           |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$             | -   | 23  | -   | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | 16  | 34  | ns   |
|                                           |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see <a href="#">Fig. 14</a> [2]        |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | 25  | 48  | ns   |
|                                           |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$             | -   | 21  | -   | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | 16  | 34  | ns   |
|                                           |                               |                                                                                    |     |     |     |      |
| $t_{off}$                                 | turn-off time                 | $\bar{E}$ to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see <a href="#">Fig. 14</a> [3] |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | 24  | 44  | ns   |
|                                           |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$             | -   | 20  | -   | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | 15  | 31  | ns   |
|                                           |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see <a href="#">Fig. 14</a> [3]        |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | 22  | 44  | ns   |
|                                           |                               | $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$             | -   | 19  | -   | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | 15  | 31  | ns   |
|                                           |                               |                                                                                    |     |     |     |      |
| $C_{PD}$                                  | power dissipation capacitance | per switch; $V_I = GND$ to $V_{CC} - 1.5\text{ V}$ [4]                             | -   | 36  | -   | pF   |
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b> |                               |                                                                                    |     |     |     |      |
| $t_{pd}$                                  | propagation delay             | $V_{is}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see <a href="#">Fig. 13</a> [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 <a href="#">Fig. 14</a> [2] |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | -   | 60  | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | -   | 43  | ns   |
|                                           |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see <a href="#">Fig. 14</a> [2]        |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | -   | 60  | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | -   | 43  | ns   |
| $t_{off}$                                 | turn-off time                 | $\bar{E}$ to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see <a href="#">Fig. 14</a> [3] |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | -   | 55  | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | -   | 39  | ns   |
|                                           |                               | Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see <a href="#">Fig. 14</a> [3]        |     |     |     |      |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$                                    | -   | -   | 55  | ns   |
|                                           |                               | $V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$                                 | -   | -   | 39  | 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. 13 [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. 14 [2]      |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 72  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 51  | ns   |
|                                            |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 14 [2]             |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 72  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 51  | ns   |
| t <sub>off</sub>                           | turn-off time     | $\bar{E}$ to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 14 [3]      |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 66  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 47  | ns   |
|                                            |                   | Sn to V <sub>os</sub> ; R <sub>L</sub> = 1 kΩ; see Fig. 14 [3]             |     |     |     |      |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V                             | -   | -   | 66  | ns   |
|                                            |                   | V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V                          | -   | -   | 47  | 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).

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

f<sub>i</sub> = input frequency in MHz; f<sub>o</sub> = output frequency in MHz;

N = number of inputs switching;  $\sum \{(C_L + C_{sw}) \times V_{CC}^2 \times f_o\}$  = 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.

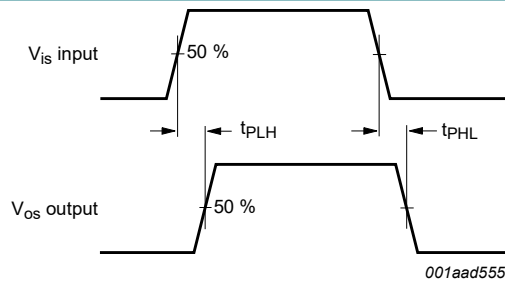
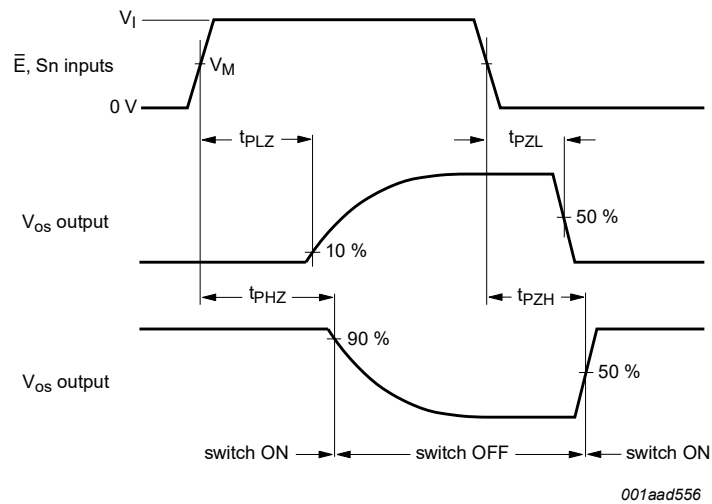


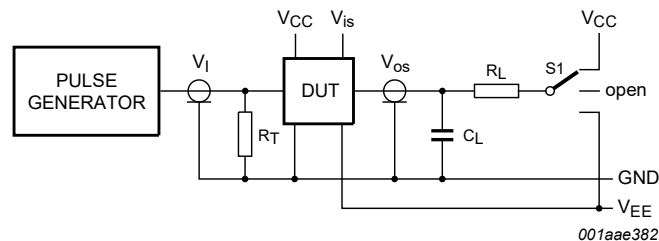
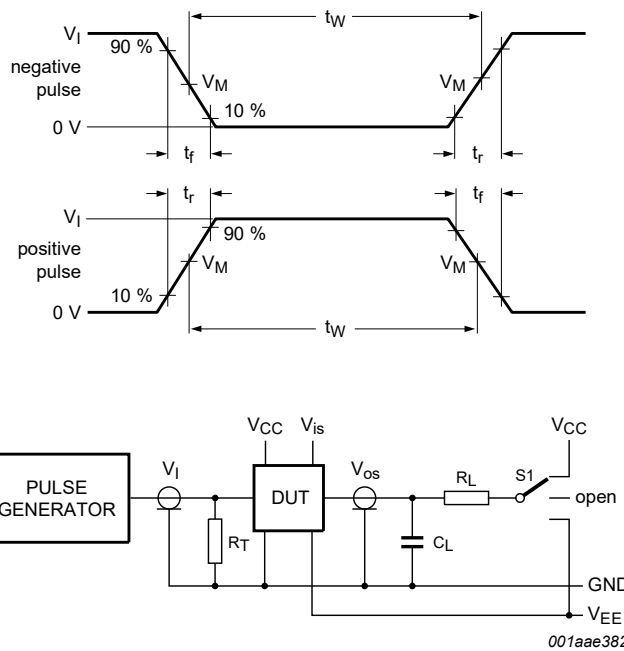
Fig. 13. Input (V<sub>is</sub>) to output (V<sub>os</sub>) propagation delays



For 74HC4053-Q100:  $V_M = 0.5 \times V_{CC}$ .

For 74HCT4053-Q100:  $V_M = 1.3 \text{ V}$ .

**Fig. 14. 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. 15. Test circuit for measuring AC performance**

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 74HCT4053-Q100:  $V_I = 3$  V

[2]  $t_r = t_f = 6$  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;  $GND = 0$  V;  $T_{amb} = 25$  °C;  $C_L = 50$  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     | $f_i = 1$ kHz; $R_L = 10$ k $\Omega$ ; see Fig. 16                                                                                                                                          |     |      |     |      |
|                |                          | $V_{is} = 4.0$ V (p-p); $V_{CC} = 2.25$ V; $V_{EE} = -2.25$ V                                                                                                                               | -   | 0.04 | -   | %    |
|                |                          | $V_{is} = 8.0$ V (p-p); $V_{CC} = 4.5$ V; $V_{EE} = -4.5$ V                                                                                                                                 | -   | 0.02 | -   | %    |
|                |                          | $f_i = 10$ kHz; $R_L = 10$ k $\Omega$ ; see Fig. 16                                                                                                                                         |     |      |     |      |
|                |                          | $V_{is} = 4.0$ V (p-p); $V_{CC} = 2.25$ V; $V_{EE} = -2.25$ V                                                                                                                               | -   | 0.12 | -   | %    |
|                |                          | $V_{is} = 8.0$ V (p-p); $V_{CC} = 4.5$ V; $V_{EE} = -4.5$ V                                                                                                                                 | -   | 0.06 | -   | %    |
| $\alpha_{iso}$ | isolation (OFF-state)    | $R_L = 600$ $\Omega$ ; $f_i = 1$ MHz; see Fig. 17                                                                                                                                           |     |      |     |      |
|                |                          | $V_{CC} = 2.25$ V; $V_{EE} = -2.25$ V [1]                                                                                                                                                   | -   | -50  | -   | dB   |
|                |                          | $V_{CC} = 4.5$ V; $V_{EE} = -4.5$ V [1]                                                                                                                                                     | -   | -50  | -   | dB   |
| Xtalk          | crosstalk                | between two switches/multiplexers; $R_L = 600$ $\Omega$ ; $f_i = 1$ MHz; see Fig. 18                                                                                                        |     |      |     |      |
|                |                          | $V_{CC} = 2.25$ V; $V_{EE} = -2.25$ V [1]                                                                                                                                                   | -   | -60  | -   | dB   |
|                |                          | $V_{CC} = 4.5$ V; $V_{EE} = -4.5$ V [1]                                                                                                                                                     | -   | -60  | -   | dB   |
| $V_{ct}$       | crosstalk voltage        | peak-to-peak value;<br>between control and any switch;<br>$R_L = 600$ $\Omega$ ; $f_i = 1$ MHz; $\bar{E}$ or<br>Sn square wave between $V_{CC}$ and GND;<br>$t_r = t_f = 6$ ns; see Fig. 19 |     |      |     |      |
|                |                          | $V_{CC} = 4.5$ V; $V_{EE} = 0$ V                                                                                                                                                            | -   | 110  | -   | mV   |
|                |                          | $V_{CC} = 4.5$ V; $V_{EE} = -4.5$ V                                                                                                                                                         | -   | 220  | -   | mV   |
| $f_{(-3dB)}$   | -3 dB frequency response | $R_L = 50$ $\Omega$ ; see Fig. 20                                                                                                                                                           |     |      |     |      |
|                |                          | $V_{CC} = 2.25$ V; $V_{EE} = -2.25$ V [2]                                                                                                                                                   | -   | 160  | -   | MHz  |
|                |                          | $V_{CC} = 4.5$ V; $V_{EE} = -4.5$ V [2]                                                                                                                                                     | -   | 170  | -   | 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  $\Omega$ ).

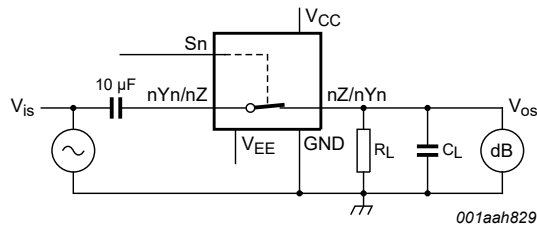
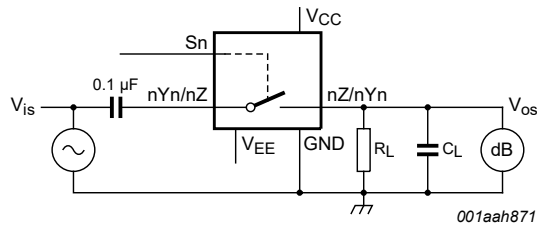
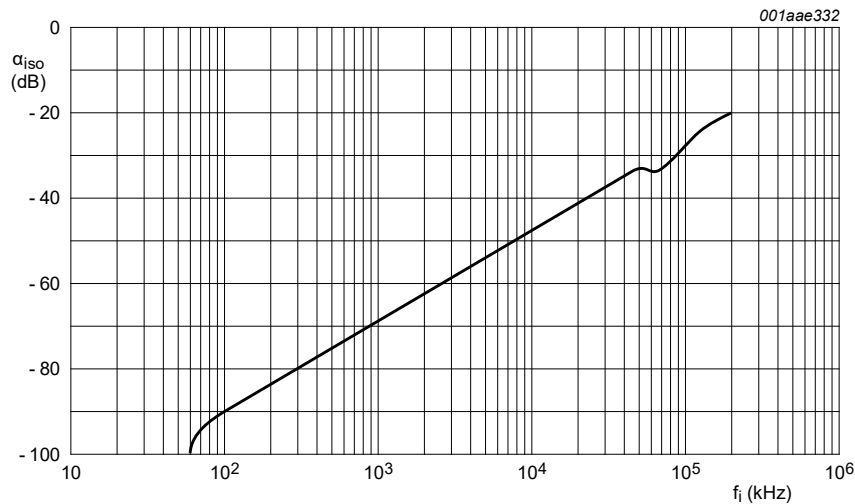


Fig. 16. Test circuit for measuring sine-wave distortion



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



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

Fig. 17. Test circuit for measuring isolation (OFF-state)

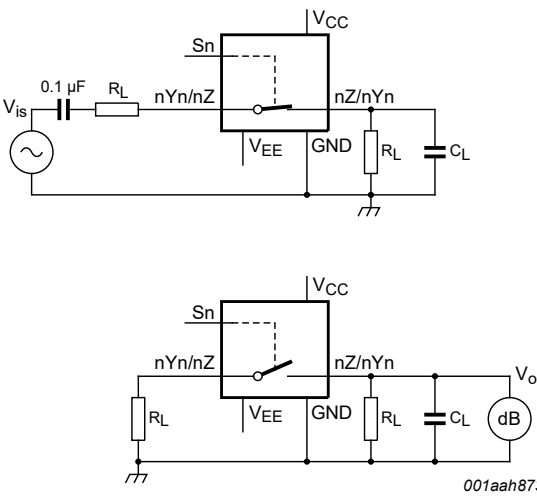
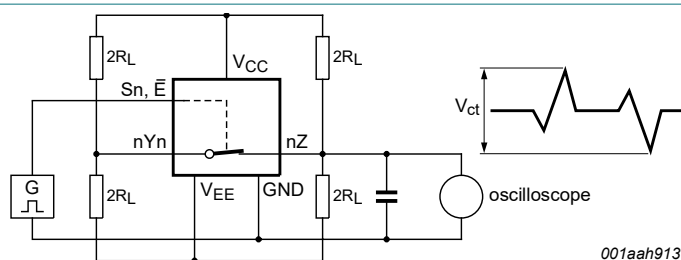
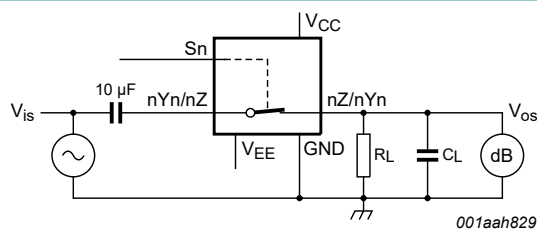


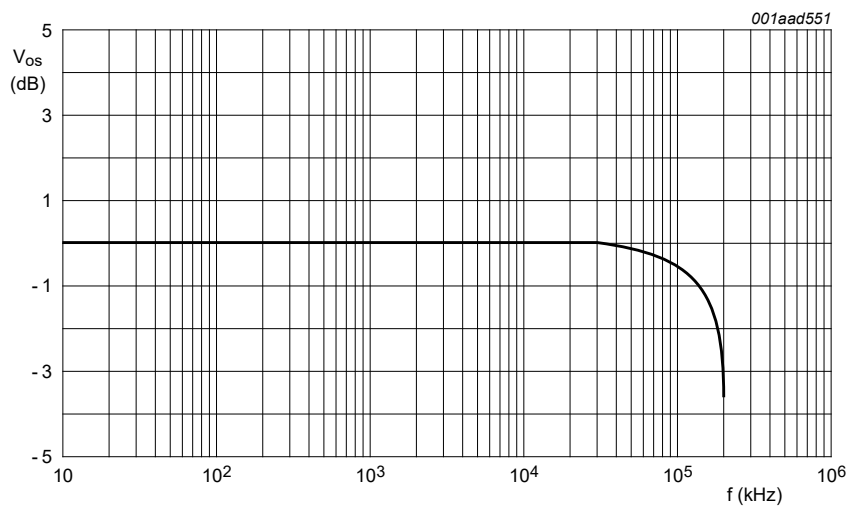
Fig. 18. Test circuits for measuring crosstalk between any two switches/multiplexers



**Fig. 19. Test circuit for measuring crosstalk between control input and any switch**


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

a. Test circuit



b. Typical frequency response

**Fig. 20. Test circuit for frequency response**

12. Package outline

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

SOT109-1

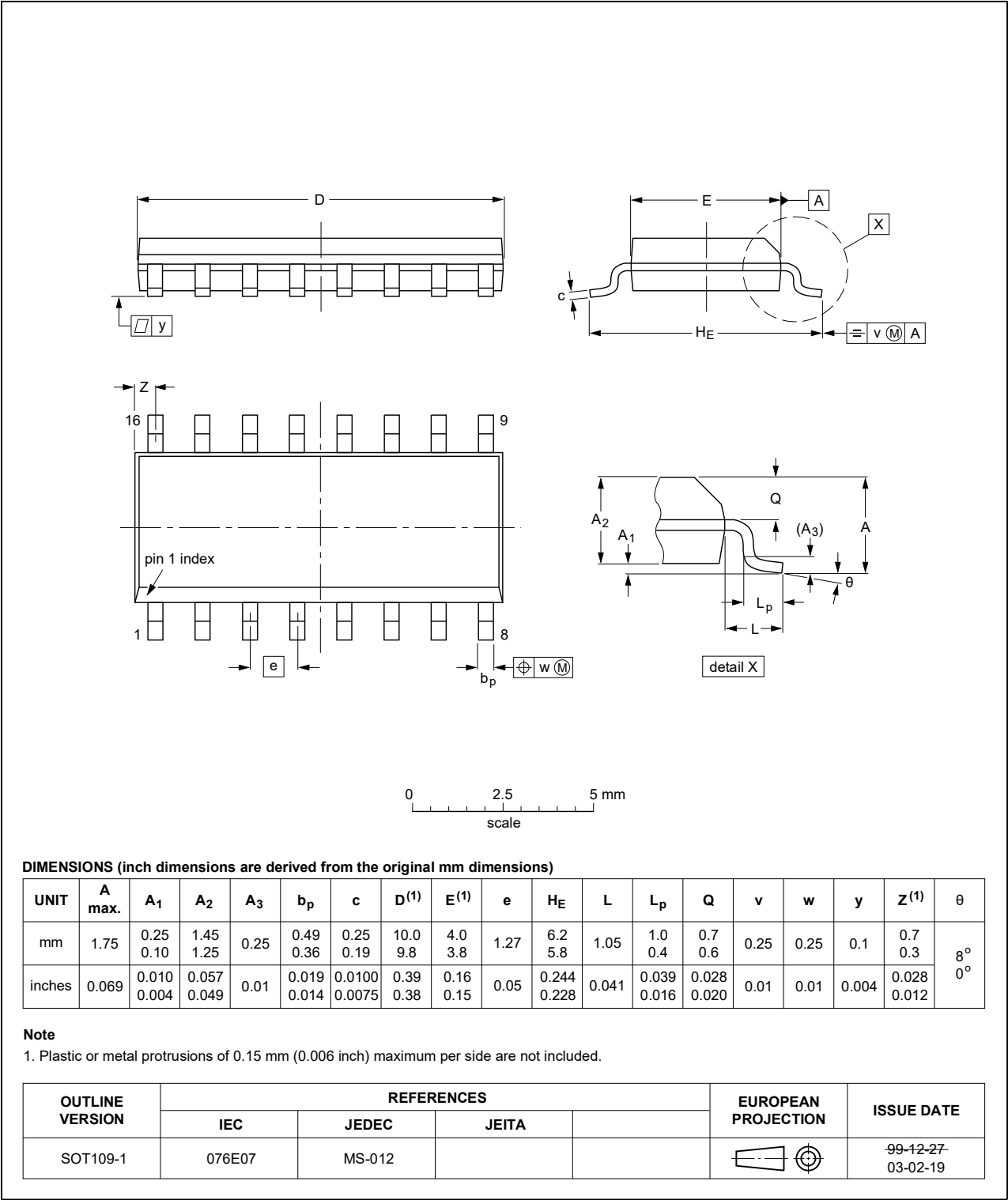


Fig. 21. Package outline SOT109-1 (SO16)

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

SOT403-1

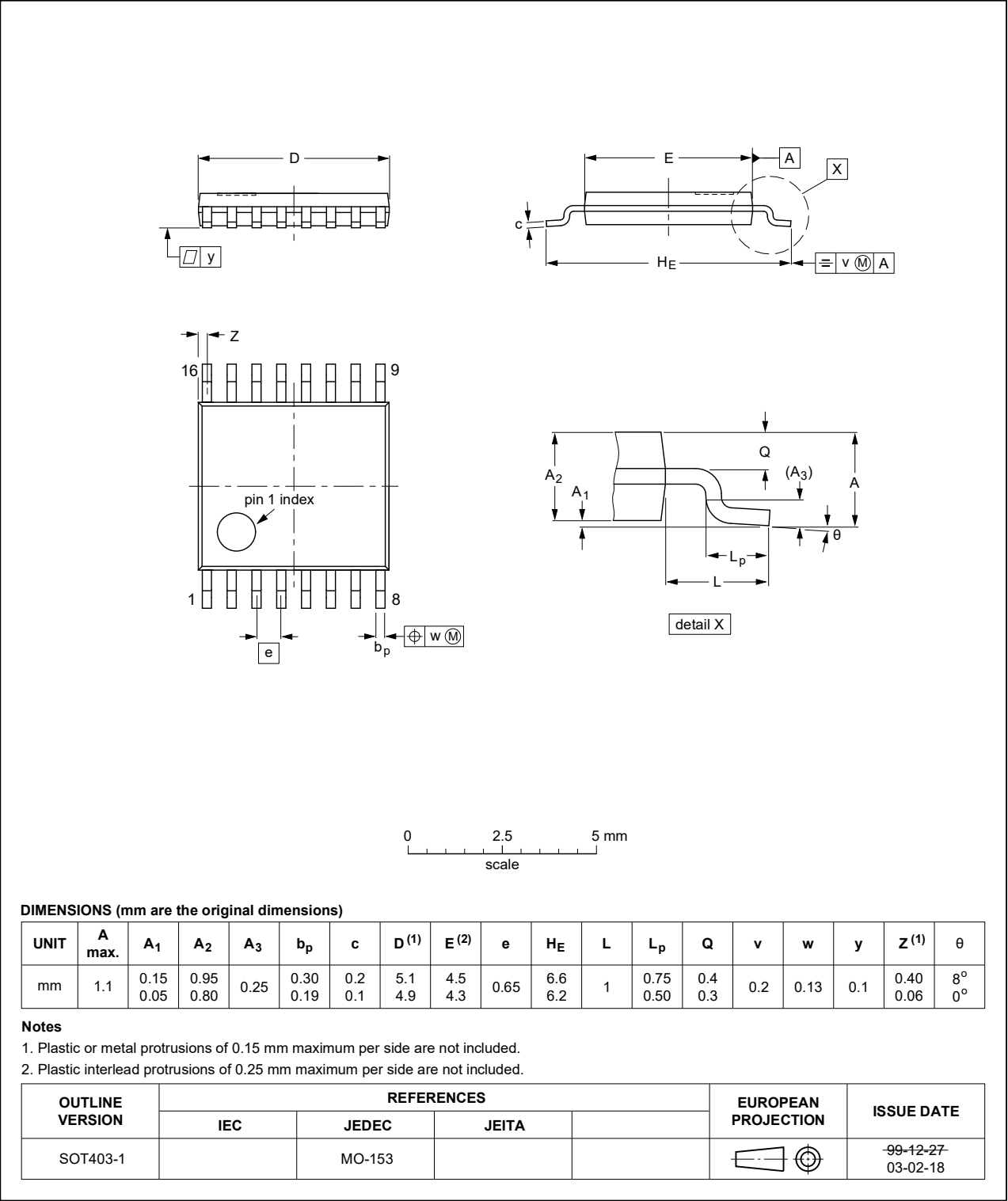


Fig. 22. Package outline SOT403-1 (TSSOP16)

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

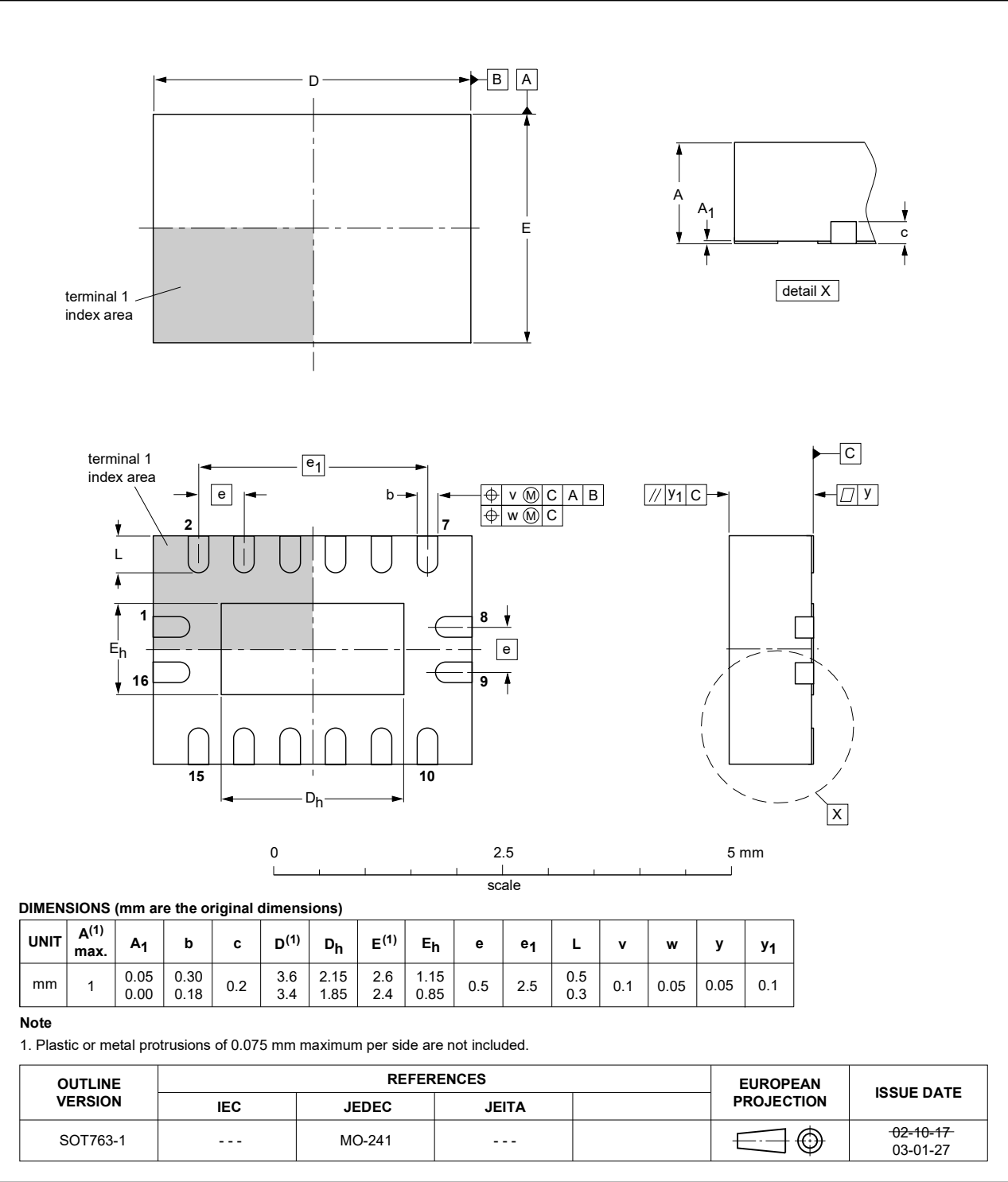


Fig. 23. Package outline SOT763-1 (DHVQFN16)

## 13. Abbreviations

**Table 13. Abbreviations**

| Acronym | Description             |
|---------|-------------------------|
| CDM     | Charged Device Model    |
| ESD     | ElectroStatic Discharge |
| HBM     | Human Body Model        |
| MIL     | Military                |
| MM      | Machine Model           |

## 14. Revision history

**Table 14. Revision history**

| Document ID           | Release date                                                                                                                                                                                                                                                                                                                                                                                                                            | Data sheet status  | Change notice | Supersedes            |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------------|
| 74HC_HCT4053_Q100 v.3 | 20200305                                                                                                                                                                                                                                                                                                                                                                                                                                | Product data sheet | -             | 74HC_HCT4053_Q100 v.2 |
| 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><li><a href="#">Section 1</a> updated.</li><li><a href="#">Section 2</a> updated.</li><li><a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li></ul> |                    |               |                       |
| 74HC_HCT4053_Q100 v.2 | 20121122                                                                                                                                                                                                                                                                                                                                                                                                                                | Product data sheet | -             | 74HC_HCT4053_Q100 v.1 |
| Modifications:        | <ul style="list-style-type: none"><li>CDM added to features.</li></ul>                                                                                                                                                                                                                                                                                                                                                                  |                    |               |                       |
| 74HC_HCT4053_Q100 v.1 | 20120720                                                                                                                                                                                                                                                                                                                                                                                                                                | Product data sheet | -             | -                     |

## 15. Legal information

### Data sheet status

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

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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Date of release: 5 March 2020