

# 74LVC1G384

Bilateral switch

Rev. 01 — 26 February 2004

Product data sheet

## 1. General description

The 74LVC1G384 is a high-speed Si-gate CMOS device.

The 74LVC1G384 provides an analog switch. The switch has input and output terminals (pins Y and Z) and an active LOW enable input (pin  $\bar{E}$ ). When pin  $\bar{E}$  is HIGH, the analog switch is turned off.

## 2. Features

- Very low ON-resistance:
  - ◆ 7.5  $\Omega$  (typ) at  $V_{CC} = 2.7$  V
  - ◆ 6.5  $\Omega$  (typ) at  $V_{CC} = 3.3$  V
  - ◆ 6.0  $\Omega$  (typ) at  $V_{CC} = 5$  V.
- ESD protection:
  - ◆ HBM EIA/JESD22-A114-A exceeds 2 000 V
  - ◆ MM EIA/JESD22-A115-A exceeds 200 V.
- High noise immunity
- CMOS low power consumption
- Direct interface TTL-levels
- Latch-up performance meets requirements of JESD78 Class I
- Multiple package options
- Specified from  $-40$  °C to  $+80$  °C and  $-40$  °C to  $+125$  °C.

## 3. Quick reference data

**Table 1: Quick reference data**  
*Ground = 0 V;  $T_{amb} = 25$  °C;  $t_r = t_f \leq 3.0$  ns.*

| Symbol                | Parameter                 | Conditions                          | Min | Typ | Max | Unit |
|-----------------------|---------------------------|-------------------------------------|-----|-----|-----|------|
| $t_{PZH}$ , $t_{PZL}$ | turn-on time E to Y or Z  | $C_L = 50$ pF; $R_L = 500$ $\Omega$ |     |     |     |      |
|                       |                           | $V_{CC} = 3.3$ V                    | -   | 4.8 | -   | ns   |
|                       |                           | $V_{CC} = 5.0$ V                    | -   | 3.3 | -   | ns   |
| $t_{PHZ}$ , $t_{PLZ}$ | turn-off time E to Y or Z | $C_L = 50$ pF; $R_L = 500$ $\Omega$ |     |     |     |      |
|                       |                           | $V_{CC} = 3.3$ V                    | -   | 5.4 | -   | ns   |
|                       |                           | $V_{CC} = 5.0$ V                    | -   | 3.6 | -   | ns   |
| $C_i$                 | input capacitance         |                                     | -   | 2   | -   | pF   |

Table 1: Quick reference data ...continued  
Ground = 0 V;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $t_r = t_f \leq 3.0\text{ ns}$ .

| Symbol   | Parameter                     | Conditions                                                             | Min | Typ  | Max | Unit |
|----------|-------------------------------|------------------------------------------------------------------------|-----|------|-----|------|
| $C_{PD}$ | power dissipation capacitance | $C_L = 50\text{ pF}$ ; $f_i = 10\text{ MHz}$ ; $V_{CC} = 3.3\text{ V}$ | -   | 15.2 | -   | pF   |
| $C_S$    | switch capacitance            | OFF-state                                                              | -   | 5    | -   | pF   |
|          |                               | ON-state                                                               | -   | 9.5  | -   | pF   |

- [1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + (C_L + C_S) \times V_{CC}^2 \times f_o$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $C_L$  = output load capacitance in pF;  
 $C_S$  = maximum switch capacitance in pF;  
 $V_{CC}$  = supply voltage in V.
- [2] The condition is  $V_i = \text{GND to } V_{CC}$ .

4. Ordering information

Table 2: Ordering information

| Type number  | Package           |      |                                          |         |
|--------------|-------------------|------|------------------------------------------|---------|
|              | Temperature range | Name | Description                              | Version |
| 74LVC1G384GW | -40 °C to +125 °C | -    | plastic surface mounted package; 5 leads | SOT353  |
| 74LVC1G384GV | -40 °C to +125 °C | -    | plastic surface mounted package; 5 leads | SOT753  |

5. Marking

Table 3: Marking

| Type number  | Marking code |
|--------------|--------------|
| 74LVC1G384GW | YL           |
| 74LVC1G384GV | YL           |

6. Functional diagram

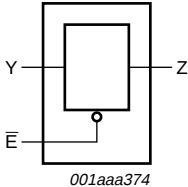


Fig 1. Logic symbol.

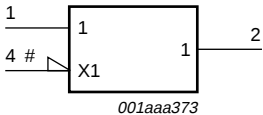
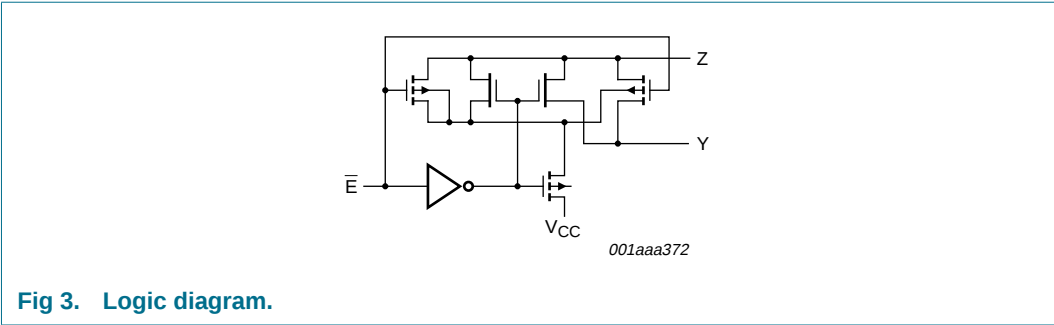
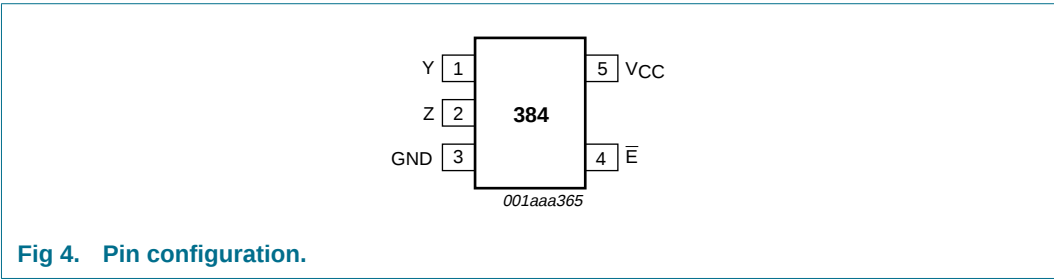


Fig 2. IEC logic symbol.



7. Pinning information

7.1 Pinning



7.2 Pin description

Table 4: Pin description

| Pin | Symbol          | Description                 |
|-----|-----------------|-----------------------------|
| 1   | Y               | independent input or output |
| 2   | Z               | independent output or input |
| 3   | GND             | ground (0 V)                |
| 4   | $\bar{E}$       | enable input (active LOW)   |
| 5   | V <sub>CC</sub> | supply voltage              |

8. Functional description

8.1 Function table

Table 5: Function table [\[1\]](#)

| Input $\bar{E}$ | Switch    |
|-----------------|-----------|
| L               | ON-state  |
| H               | OFF-state |

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

## 9. Limiting values

**Table 6: Limiting values**

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

| Symbol            | Parameter                        | Conditions                                  | Min                 | Max            | Unit |
|-------------------|----------------------------------|---------------------------------------------|---------------------|----------------|------|
| $V_{CC}$          | supply voltage                   |                                             | -0.5                | +6.5           | V    |
| $V_I$             | input voltage                    |                                             | <sup>[1]</sup> -0.5 | +6.5           | V    |
| $I_{IK}$          | input diode current              | $V_I < -0.5$ V or<br>$V_I > V_{CC} + 0.5$ V | -                   | -50            | mA   |
| $I_{SK}$          | switch diode current             | $V_I < -0.5$ V or<br>$V_I > V_{CC} + 0.5$ V | -                   | ±50            | mA   |
| $V_S$             | DC switch voltage range          | enable and disable mode                     | -0.5                | $V_{CC} + 0.5$ | V    |
| $I_S$             | DC switch source or sink current | $V_S > -0.5$ V or<br>$V_S < V_{CC} + 0.5$ V | -                   | ±50            | mA   |
| $I_{CC}, I_{GND}$ | $V_{CC}$ or GND current          |                                             | -                   | ±100           | mA   |
| $T_{stg}$         | storage temperature              |                                             | -65                 | +150           | °C   |
| $P_{tot}$         | power dissipation                | $T_{amb} = -40$ °C to +125 °C               | -                   | 250            | mW   |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## 10. Recommended operating conditions

**Table 7: Recommended operating conditions**

| Symbol     | Parameter                 | Conditions                 | Min              | Typ | Max      | Unit |
|------------|---------------------------|----------------------------|------------------|-----|----------|------|
| $V_{CC}$   | supply voltage            |                            | 1.65             | -   | 5.5      | V    |
| $V_I$      | input voltage             |                            | 0                | -   | 5.5      | V    |
| $V_S$      | DC switch voltage range   |                            | <sup>[1]</sup> 0 | -   | $V_{CC}$ | V    |
| $T_{amb}$  | ambient temperature       |                            | -40              | -   | +125     | °C   |
| $t_r, t_f$ | input rise and fall times | $V_{CC} = 1.65$ V to 2.7 V | 0                | -   | 20       | ns/V |
|            |                           | $V_{CC} = 2.7$ V to 5.5 V  | 0                | -   | 10       | ns/V |

[1] To avoid drawing  $V_{CC}$  current out of terminal Z, when switch current flows in terminal Y, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no  $V_{CC}$  current will flow out of terminal Y. In this case there is no limit for the voltage drop across the switch.

## 11. Static characteristics

**Table 8: Static characteristics**

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

| Symbol                                        | Parameter                                           | Conditions                                                                                                                                             | Min                    | Typ  | Max                    | Unit |
|-----------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|------------------------|------|
| <b>T<sub>amb</sub> = –40 °C to +85 °C [1]</b> |                                                     |                                                                                                                                                        |                        |      |                        |      |
| V <sub>IH</sub>                               | HIGH-level input voltage                            | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                                                     | 0.65 × V <sub>CC</sub> | -    | -                      | V    |
|                                               |                                                     | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                                       | 1.7                    | -    | -                      | V    |
|                                               |                                                     | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                                                       | 2.0                    | -    | -                      | V    |
|                                               |                                                     | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                       | 0.7 × V <sub>CC</sub>  | -    | -                      | V    |
| V <sub>IL</sub>                               | LOW-level input voltage                             | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                                                     | -                      | -    | 0.35 × V <sub>CC</sub> | V    |
|                                               |                                                     | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                                       | -                      | -    | 0.7                    | V    |
|                                               |                                                     | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                                                       | -                      | -    | 0.8                    | V    |
|                                               |                                                     | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                       | -                      | -    | 0.3 × V <sub>CC</sub>  | V    |
| I <sub>LI</sub>                               | input leakage current on control pin                | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 5.5 V                                                                                                 | [2] -                  | ±0.1 | ±5                     | µA   |
| I <sub>S(OFF)</sub>                           | analog switch OFF-state current                     | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>S</sub>   = V <sub>CC</sub> – GND; V <sub>CC</sub> = 5.5 V; see <a href="#">Figure 5</a> | [2] -                  | ±0.1 | ±5                     | µA   |
| I <sub>S(ON)</sub>                            | analog switch ON-state current                      | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>S</sub>   = V <sub>CC</sub> – GND; V <sub>CC</sub> = 5.5 V; see <a href="#">Figure 6</a> | [2] -                  | ±0.1 | ±5                     | µA   |
| I <sub>CC</sub>                               | quiescent supply current                            | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>S</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V                       | [2] -                  | 0.1  | 10                     | µA   |
| ΔI <sub>CC</sub>                              | additional quiescent supply current per control pin | V <sub>I</sub> = V <sub>CC</sub> – 0.6 V; V <sub>S</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V                      | [2] -                  | 5    | 500                    | µA   |
| C <sub>I</sub>                                | input capacitance                                   |                                                                                                                                                        | -                      | 2    | -                      | pF   |
| R <sub>ON(peak)</sub>                         | switch ON-state resistance (peak)                   | V <sub>I</sub> = GND to V <sub>CC</sub> ; see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>                                                    |                        |      |                        |      |
|                                               |                                                     | I <sub>S</sub> = 4 mA; V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                              | -                      | 35   | 130                    | Ω    |
|                                               |                                                     | I <sub>S</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                | -                      | 14   | 30                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                                                                        | -                      | 11.5 | 25                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 24 mA; V <sub>CC</sub> = 3.0 V to 3.6 V                                                                                               | -                      | 8.5  | 20                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                               | -                      | 6.5  | 15                     | Ω    |
| R <sub>ON(rail)</sub>                         | switch ON-state resistance rail                     | V <sub>I</sub> = GND                                                                                                                                   |                        |      |                        |      |
|                                               |                                                     | I <sub>S</sub> = 4 mA; V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                              | -                      | 10   | 30                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                | -                      | 8.5  | 20                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                                                                        | -                      | 7.5  | 18                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 24 mA; V <sub>CC</sub> = 3.0 V to 3.6 V                                                                                               | -                      | 6.5  | 15                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                               | -                      | 6    | 10                     | Ω    |
|                                               |                                                     | V <sub>I</sub> = V <sub>CC</sub>                                                                                                                       |                        |      |                        |      |
|                                               |                                                     | I <sub>S</sub> = 4 mA; V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                              | -                      | 12   | 30                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                | -                      | 8.5  | 20                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                                                                        | -                      | 7.5  | 18                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 24 mA; V <sub>CC</sub> = 3.0 V to 3.6 V                                                                                               | -                      | 6.5  | 15                     | Ω    |
|                                               |                                                     | I <sub>S</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                               | -                      | 6    | 10                     | Ω    |

**Table 8:** Static characteristics ...continued

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

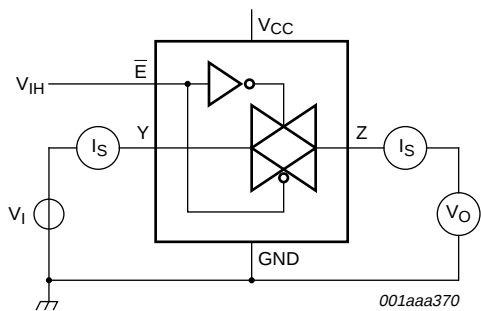
| Symbol                               | Parameter                                           | Conditions                                                                                                                                             | Min                    | Typ | Max                    | Unit |
|--------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----|------------------------|------|
| R <sub>ON(flat)</sub>                | switch ON-state resistance flatness                 | V <sub>I</sub> = GND to V <sub>CC</sub> ; see <a href="#">Figure 9</a>                                                                                 | [3]                    |     |                        |      |
|                                      |                                                     | I <sub>S</sub> = 4 mA; V <sub>CC</sub> = 1.8 V                                                                                                         | -                      | 100 | -                      | Ω    |
|                                      |                                                     | I <sub>S</sub> = 8 mA; V <sub>CC</sub> = 2.5 V                                                                                                         | -                      | 17  | -                      | Ω    |
|                                      |                                                     | I <sub>S</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                                                                        | -                      | 10  | -                      | Ω    |
|                                      |                                                     | I <sub>S</sub> = 24 mA; V <sub>CC</sub> = 3.3 V                                                                                                        | -                      | 5   | -                      | Ω    |
|                                      |                                                     | I <sub>S</sub> = 32 mA; V <sub>CC</sub> = 5.0 V                                                                                                        | -                      | 3   | -                      | Ω    |
| T <sub>amb</sub> = -40 °C to +125 °C |                                                     |                                                                                                                                                        |                        |     |                        |      |
| V <sub>IH</sub>                      | HIGH-level input voltage                            | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                                                     | 0.65 × V <sub>CC</sub> | -   | -                      | V    |
|                                      |                                                     | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                                       | 1.7                    | -   | -                      | V    |
|                                      |                                                     | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                                                       | 2.0                    | -   | -                      | V    |
|                                      |                                                     | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                       | 0.7 × V <sub>CC</sub>  | -   | -                      | V    |
| V <sub>IL</sub>                      | LOW-level input voltage                             | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                                                     | -                      | -   | 0.35 × V <sub>CC</sub> | V    |
|                                      |                                                     | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                                       | -                      | -   | 0.7                    | V    |
|                                      |                                                     | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                                                                       | -                      | -   | 0.8                    | V    |
|                                      |                                                     | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                       | -                      | -   | 0.3 × V <sub>CC</sub>  | V    |
| I <sub>LI</sub>                      | input leakage current on control pin                | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 5.5 V                                                                                                 | -                      | -   | 100                    | μA   |
| I <sub>S(OFF)</sub>                  | analog switch OFF-state current                     | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>S</sub>   = V <sub>CC</sub> – GND; V <sub>CC</sub> = 5.5 V; see <a href="#">Figure 5</a> | -                      | -   | 200                    | μA   |
| I <sub>S(ON)</sub>                   | analog switch ON-state current                      | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;  V <sub>S</sub>   = V <sub>CC</sub> – GND; V <sub>CC</sub> = 5.5 V; see <a href="#">Figure 6</a> | -                      | -   | 200                    | μA   |
| I <sub>CC</sub>                      | quiescent supply current                            | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>S</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V                       | -                      | -   | 200                    | μA   |
| ΔI <sub>CC</sub>                     | additional quiescent supply current per control pin | V <sub>I</sub> = V <sub>CC</sub> – 0.6 V; V <sub>S</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V                      | -                      | -   | 5000                   | μA   |
| R <sub>ON(peak)</sub>                | switch ON-state resistance (peak)                   | V <sub>I</sub> = GND to V <sub>CC</sub> ; see <a href="#">Figure 7</a>                                                                                 |                        |     |                        |      |
|                                      |                                                     | I <sub>S</sub> = 4 mA; V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                              | -                      | -   | 180                    | Ω    |
|                                      |                                                     | I <sub>S</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                | -                      | -   | 45                     | Ω    |
|                                      |                                                     | I <sub>S</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                                                                                                        | -                      | -   | 38                     | Ω    |
|                                      |                                                     | I <sub>S</sub> = 24 mA; V <sub>CC</sub> = 3.0 V to 3.6 V                                                                                               | -                      | -   | 30                     | Ω    |
|                                      |                                                     | I <sub>S</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                               | -                      | -   | 23                     | Ω    |

**Table 8:** Static characteristics ...continued

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

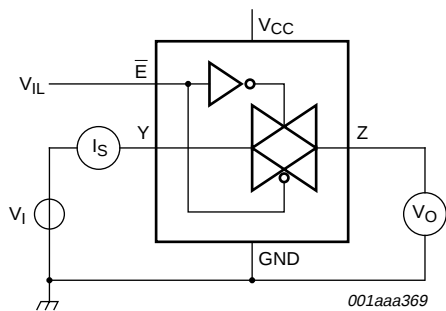
| Symbol         | Parameter                       | Conditions                                                   | Min | Typ | Max | Unit     |
|----------------|---------------------------------|--------------------------------------------------------------|-----|-----|-----|----------|
| $R_{ON(rail)}$ | switch ON-state resistance rail | $V_I = GND$                                                  |     |     |     |          |
|                |                                 | $I_S = 4\text{ mA}; V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | -   | -   | 45  | $\Omega$ |
|                |                                 | $I_S = 8\text{ mA}; V_{CC} = 2.3\text{ V to }2.7\text{ V}$   | -   | -   | 30  | $\Omega$ |
|                |                                 | $I_S = 12\text{ mA}; V_{CC} = 2.7\text{ V}$                  | -   | -   | 27  | $\Omega$ |
|                |                                 | $I_S = 24\text{ mA}; V_{CC} = 3.0\text{ V to }3.6\text{ V}$  | -   | -   | 23  | $\Omega$ |
|                |                                 | $I_S = 32\text{ mA}; V_{CC} = 4.5\text{ V to }5.5\text{ V}$  | -   | -   | 15  | $\Omega$ |
|                |                                 | $V_I = V_{CC}$                                               |     |     |     |          |
|                |                                 | $I_S = 4\text{ mA}; V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | -   | -   | 45  | $\Omega$ |
|                |                                 | $I_S = 8\text{ mA}; V_{CC} = 2.3\text{ V to }2.7\text{ V}$   | -   | -   | 30  | $\Omega$ |
|                |                                 | $I_S = 12\text{ mA}; V_{CC} = 2.7\text{ V}$                  | -   | -   | 27  | $\Omega$ |
|                |                                 | $I_S = 24\text{ mA}; V_{CC} = 3.0\text{ V to }3.6\text{ V}$  | -   | -   | 23  | $\Omega$ |
|                |                                 | $I_S = 32\text{ mA}; V_{CC} = 4.5\text{ V to }5.5\text{ V}$  | -   | -   | 15  | $\Omega$ |

[1] Typical values are measured at  $T_{amb} = 25\text{ }^\circ\text{C}$ .[2] These typical values are measured at  $V_{CC} = 3.3\text{ V}$ [3] These typical values are measured over the operating temperature range from  $-40\text{ }^\circ\text{C}$  to  $+125\text{ }^\circ\text{C}$ .



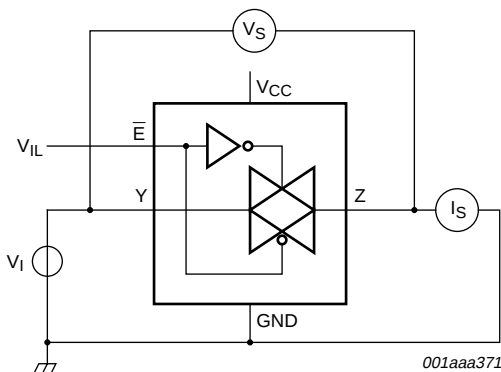
$V_I = V_{CC}$  and  $V_O = GND$ ;  
 $V_I = GND$  and  $V_O = V_{CC}$

Fig 5. Test circuit for measuring switch OFF-state current.



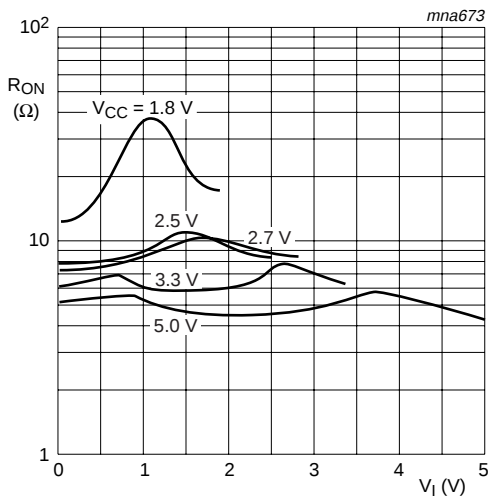
$V_I = V_{CC}$  and  $V_O = \text{open circuit}$ ;  
 $V_I = GND$  and  $V_O = \text{open circuit}$

Fig 6. Test circuit for measuring switch ON-state current.



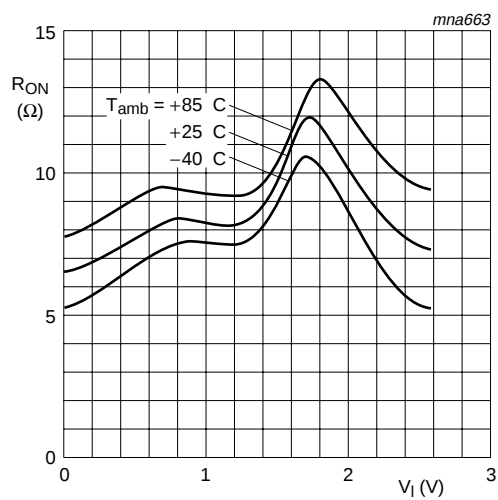
$V_I = GND \text{ to } V_{CC}$ ;  $R_{ON} = V_S/I_S$

Fig 7. Test circuit for measuring switch ON-resistance.

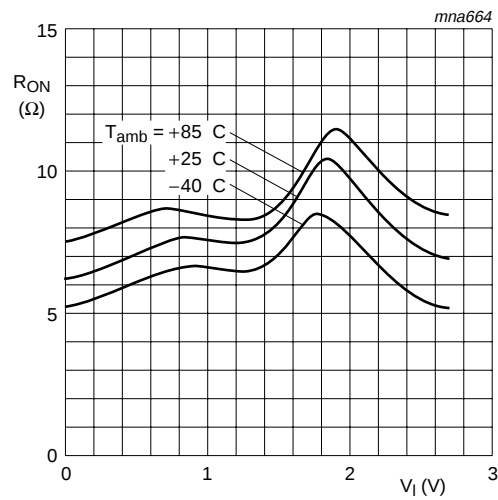


$V_S = GND \text{ to } V_{CC}$ .

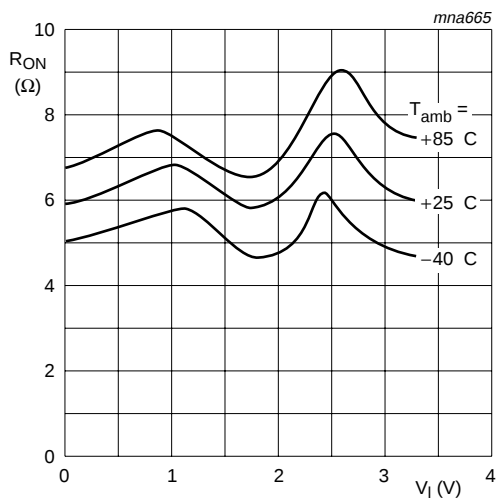
Fig 8. Typical switch ON-resistance as a function of input voltage.



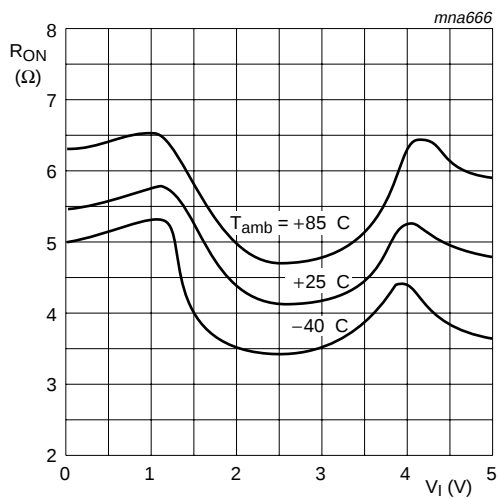
a.  $V_{CC} = 2.5$  V



b.  $V_{CC} = 2.7$  V



c.  $V_{CC} = 3.3$  V



d.  $V_{CC} = 5.0$  V

Fig 9. Switch ON-resistance at various supply voltages as a function of input voltage.

## 12. Dynamic characteristics

**Table 9: Dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); test circuit [Figure 12](#).

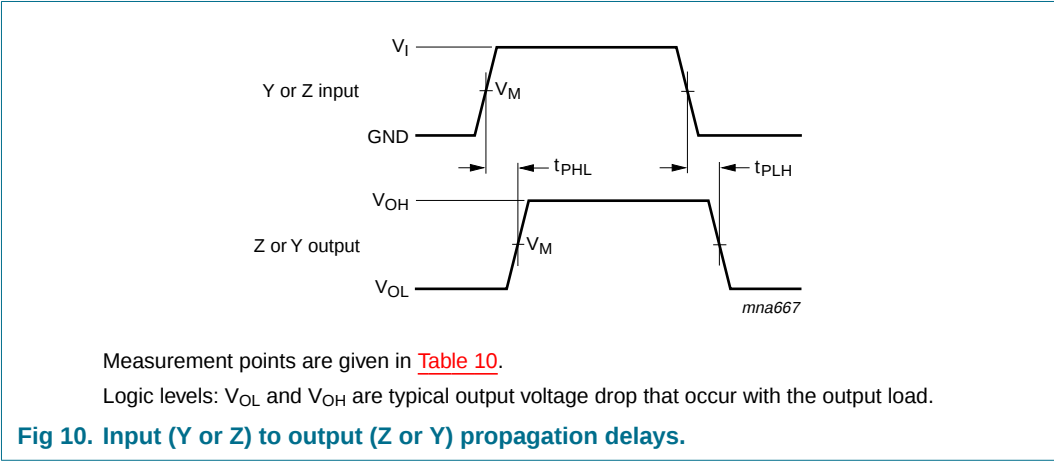
| Symbol                                  | Parameter                          | Conditions                                                                               | Min     | Typ  | Max  | Unit |
|-----------------------------------------|------------------------------------|------------------------------------------------------------------------------------------|---------|------|------|------|
| T <sub>amb</sub> = –40 °C to +85 °C [1] |                                    |                                                                                          |         |      |      |      |
| t <sub>PHL</sub> , t <sub>PLH</sub>     | propagation delay Y to Z or Z to Y | see Figure 10                                                                            | [2]     |      |      |      |
|                                         |                                    | V <sub>CC</sub> = 1.65 V to 1.95 V                                                       | -       | 0.8  | 2.0  | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                                                         | -       | 0.4  | 1.2  | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.7 V                                                                  | -       | 0.4  | 1.0  | ns   |
|                                         |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V                                                         | -       | 0.3  | 0.8  | ns   |
|                                         |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                                                         | -       | 0.2  | 0.6  | ns   |
| t <sub>PZH</sub> , t <sub>PZL</sub>     | turn-on time $\bar{E}$ to Y or Z   | see Figure 11                                                                            |         |      |      |      |
|                                         |                                    | V <sub>CC</sub> = 1.65 V to 1.95 V                                                       | 1.0     | 10.0 | 12.0 | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                                                         | 1.0     | 5.7  | 6.5  | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.7 V                                                                  | 1.0     | 5.4  | 6.0  | ns   |
|                                         |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V                                                         | 1.0     | 4.8  | 5.0  | ns   |
|                                         |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                                                         | 1.0     | 3.3  | 4.2  | ns   |
| t <sub>PHZ</sub> , t <sub>PLZ</sub>     | turn-off time $\bar{E}$ to Y or Z  | see Figure 11                                                                            |         |      |      |      |
|                                         |                                    | V <sub>CC</sub> = 1.65 V to 1.95 V                                                       | 1.0     | 7.4  | 10.0 | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                                                         | 1.0     | 4.1  | 6.9  | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.7 V                                                                  | 1.0     | 4.9  | 7.5  | ns   |
|                                         |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V                                                         | 1.0     | 5.4  | 6.5  | ns   |
|                                         |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                                                         | 1.0     | 3.6  | 5.0  | ns   |
| C <sub>PD</sub>                         | power dissipation capacitance      | C <sub>L</sub> = 50 pF; f <sub>i</sub> = 10 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> | [3] [4] |      |      |      |
|                                         |                                    | V <sub>CC</sub> = 2.5 V                                                                  | -       | 13.7 | -    | pF   |
|                                         |                                    | V <sub>CC</sub> = 3.3 V                                                                  | -       | 15.2 | -    | pF   |
|                                         |                                    | V <sub>CC</sub> = 5.0 V                                                                  | -       | 18.3 | -    | pF   |
| T <sub>amb</sub> = –40 °C to +125 °C    |                                    |                                                                                          |         |      |      |      |
| t <sub>PHL</sub> , t <sub>PLH</sub>     | propagation delay Y to Z or Z to Y | see Figure 10                                                                            | [2]     |      |      |      |
|                                         |                                    | V <sub>CC</sub> = 1.65 V to 1.95 V                                                       | -       | -    | 3.0  | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                                                         | -       | -    | 2.0  | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.7 V                                                                  | -       | -    | 1.5  | ns   |
|                                         |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V                                                         | -       | -    | 1.5  | ns   |
|                                         |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                                                         | -       | -    | 1.0  | ns   |
| t <sub>PZH</sub> , t <sub>PZL</sub>     | turn-on time $\bar{E}$ to Y or Z   | see Figure 11                                                                            |         |      |      |      |
|                                         |                                    | V <sub>CC</sub> = 1.65 V to 1.95 V                                                       | 1.0     | -    | 15.5 | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                                                         | 1.0     | -    | 8.5  | ns   |
|                                         |                                    | V <sub>CC</sub> = 2.7 V                                                                  | 1.0     | -    | 8.0  | ns   |
|                                         |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V                                                         | 1.0     | -    | 6.5  | ns   |
|                                         |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                                                         | 1.0     | -    | 5.5  | ns   |

**Table 9: Dynamic characteristics ...continued**  
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); test circuit [Figure 12](#).

| Symbol             | Parameter                         | Conditions                                | Min | Typ | Max  | Unit |
|--------------------|-----------------------------------|-------------------------------------------|-----|-----|------|------|
| $t_{PHZ}, t_{PLZ}$ | turn-off time $\bar{E}$ to Y or Z | see <a href="#">Figure 11</a>             |     |     |      |      |
|                    |                                   | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | 1.0 | -   | 13.0 | ns   |
|                    |                                   | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$   | 1.0 | -   | 9.0  | ns   |
|                    |                                   | $V_{CC} = 2.7\text{ V}$                   | 1.0 | -   | 9.5  | ns   |
|                    |                                   | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$   | 1.0 | -   | 8.5  | ns   |
|                    |                                   | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$   | 1.0 | -   | 6.5  | ns   |

- [1] All typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .
- [2]  $t_{PHL}$  and  $t_{PLH}$  propagation delay is the calculated RC time constant of the typical switch ON-resistance of the switch and the specified capacitance when driven by an ideal voltage source (zero output impedance).
- [3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).
- $P_D = C_{PD} \times V_{CC}^2 \times f_i + (C_L + C_S) \times V_{CC}^2 \times f_o$  where:
- $f_i$  = input frequency in MHz;
- $f_o$  = output frequency in MHz;
- $C_L$  = output load capacitance in pF;
- $C_S$  = maximum switch capacitance in pF;
- $V_{CC}$  = supply voltage in V.
- [4] The condition is  $V_i = \text{GND to } V_{CC}$ .

13. Waveforms



**Table 10: Measurement points**

| Supply voltage   | Input               | Output              |
|------------------|---------------------|---------------------|
| $V_{CC}$         | $V_M$               | $V_M$               |
| 1.65 V to 1.95 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 2.3 V to 2.7 V   | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 2.7 V            | 1.5 V               | 1.5 V               |
| 3.0 V to 3.6 V   | 1.5 V               | 1.5 V               |
| 4.5 V to 5.5 V   | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |

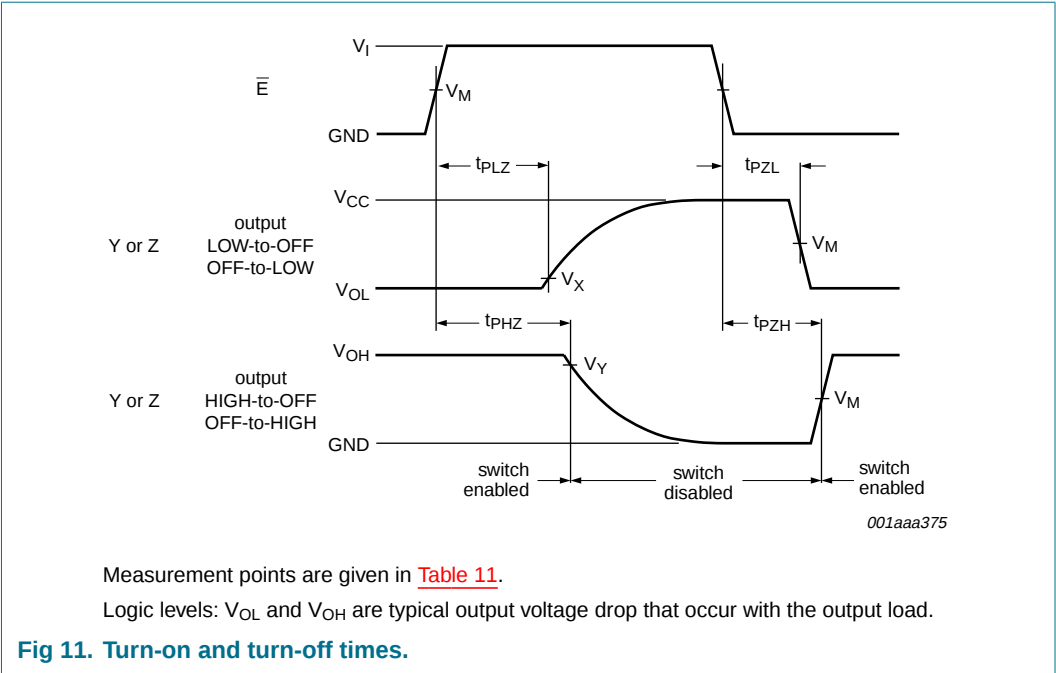


Table 11: Measurement points

| Supply voltage   | Input               | Output              |                              |                              |
|------------------|---------------------|---------------------|------------------------------|------------------------------|
| $V_{CC}$         | $V_M$               | $V_M$               | $V_X$                        | $V_Y$                        |
| 1.65 V to 1.95 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.1 \times V_{CC}$ | $V_{OH} - 0.1 \times V_{CC}$ |
| 2.3 V to 2.7 V   | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.1 \times V_{CC}$ | $V_{OH} - 0.1 \times V_{CC}$ |
| 2.7 V            | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$     | $V_{OH} - 0.3 \text{ V}$     |
| 3.0 V to 3.6 V   | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$     | $V_{OH} - 0.3 \text{ V}$     |
| 4.5 V to 5.5 V   | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.3 \text{ V}$     | $V_{OH} - 0.3 \text{ V}$     |

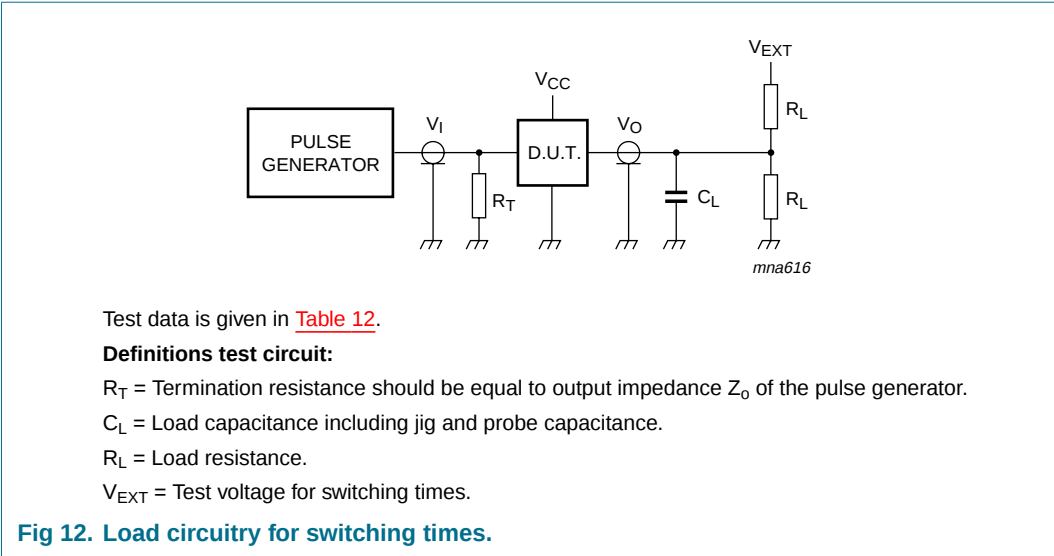


Table 12: Test data

| Supply voltage   | Input           |                                 | Load           |                | V <sub>EXT</sub>                    |                                     |                                     |
|------------------|-----------------|---------------------------------|----------------|----------------|-------------------------------------|-------------------------------------|-------------------------------------|
| V <sub>CC</sub>  | V <sub>I</sub>  | t <sub>r</sub> , t <sub>f</sub> | C <sub>L</sub> | R <sub>L</sub> | t <sub>PLH</sub> , t <sub>PHL</sub> | t <sub>PZH</sub> , t <sub>PHZ</sub> | t <sub>PZL</sub> , t <sub>PLZ</sub> |
| 1.65 V to 1.95 V | V <sub>CC</sub> | ≤ 2.0 ns                        | 30 pF          | 1 kΩ           | open                                | GND                                 | 2 × V <sub>CC</sub>                 |
| 2.3 V to 2.7 V   | V <sub>CC</sub> | ≤ 2.0 ns                        | 30 pF          | 500 Ω          | open                                | GND                                 | 2 × V <sub>CC</sub>                 |
| 2.7 V            | 2.7 V           | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | open                                | GND                                 | 6.0 V                               |
| 3.0 V to 3.6 V   | 2.7 V           | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | open                                | GND                                 | 6.0 V                               |
| 4.5 V to 5.5 V   | V <sub>CC</sub> | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | open                                | GND                                 | 2 × V <sub>CC</sub>                 |

## 14. Additional dynamic characteristics

**Table 13: Additional dynamic characteristics**

At recommended conditions; typical values measured at  $T_{amb} = 25^{\circ}\text{C}$ .

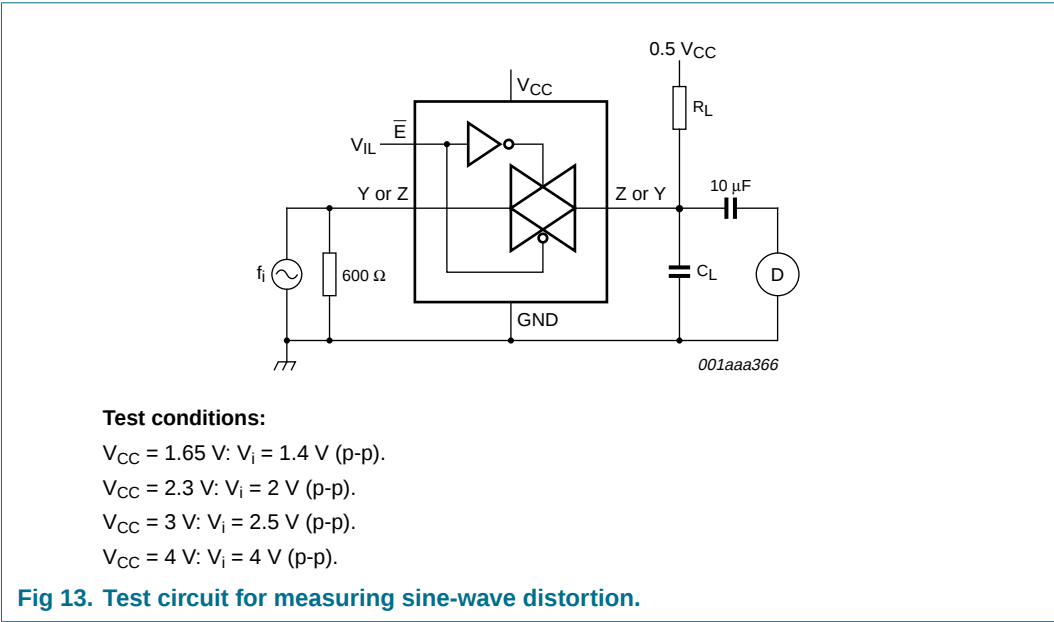
| Symbol                     | Parameter                                              | Conditions                                                                                                  | Min | Typ   | Max | Unit |
|----------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----|-------|-----|------|
| $d_{\text{sin}}$           | sine-wave distortion                                   | $f_i = 1\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; $C_L = 50\text{ pF}$ ;<br>see <a href="#">Figure 13</a>  |     |       |     |      |
|                            |                                                        | $V_{CC} = 1.65\text{ V}$                                                                                    | -   | 0.032 | -   | %    |
|                            |                                                        | $V_{CC} = 2.3\text{ V}$                                                                                     | -   | 0.008 | -   | %    |
|                            |                                                        | $V_{CC} = 3.0\text{ V}$                                                                                     | -   | 0.006 | -   | %    |
|                            |                                                        | $V_{CC} = 4.5\text{ V}$                                                                                     | -   | 0.001 | -   | %    |
|                            |                                                        | $f_i = 10\text{ kHz}$ ; $R_L = 10\text{ k}\Omega$ ; $C_L = 50\text{ pF}$ ;<br>see <a href="#">Figure 13</a> |     |       |     |      |
|                            |                                                        | $V_{CC} = 1.65\text{ V}$                                                                                    | -   | 0.068 | -   | %    |
|                            |                                                        | $V_{CC} = 2.3\text{ V}$                                                                                     | -   | 0.009 | -   | %    |
|                            |                                                        | $V_{CC} = 3.0\text{ V}$                                                                                     | -   | 0.008 | -   | %    |
|                            |                                                        | $V_{CC} = 4.5\text{ V}$                                                                                     | -   | 0.006 | -   | %    |
| $f_{\text{ON-state(res)}}$ | switch ON-state<br>signal frequency<br>response        | $R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ;<br>see <a href="#">Figure 14</a>  | [1] |       |     |      |
|                            |                                                        | $V_{CC} = 1.65\text{ V}$                                                                                    | -   | 135   | -   | MHz  |
|                            |                                                        | $V_{CC} = 2.3\text{ V}$                                                                                     | -   | 145   | -   | MHz  |
|                            |                                                        | $V_{CC} = 3.0\text{ V}$                                                                                     | -   | 150   | -   | MHz  |
|                            |                                                        | $V_{CC} = 4.5\text{ V}$                                                                                     | -   | 155   | -   | MHz  |
|                            |                                                        | $R_L = 50\text{ }\Omega$ ; $C_L = 5\text{ pF}$ ; $f_i = 1\text{ MHz}$ ;<br>see <a href="#">Figure 14</a>    | [1] |       |     |      |
|                            |                                                        | $V_{CC} = 1.65\text{ V}$                                                                                    | -   | >500  | -   | MHz  |
|                            |                                                        | $V_{CC} = 2.3\text{ V}$                                                                                     | -   | >500  | -   | MHz  |
|                            |                                                        | $V_{CC} = 3.0\text{ V}$                                                                                     | -   | >500  | -   | MHz  |
|                            |                                                        | $V_{CC} = 4.5\text{ V}$                                                                                     | -   | >500  | -   | MHz  |
| $\alpha_{\text{OFF(ft)}}$  | switch OFF-state<br>signal feed-through<br>attenuation | $R_L = 600\text{ }\Omega$ ; $C_L = 50\text{ pF}$ ; $f_i = 1\text{ MHz}$ ;<br>see <a href="#">Figure 15</a>  | [2] |       |     |      |
|                            |                                                        | $V_{CC} = 1.65\text{ V}$                                                                                    | -   | -46   | -   | dB   |
|                            |                                                        | $V_{CC} = 2.3\text{ V}$                                                                                     | -   | -46   | -   | dB   |
|                            |                                                        | $V_{CC} = 3.0\text{ V}$                                                                                     | -   | -46   | -   | dB   |
|                            |                                                        | $V_{CC} = 4.5\text{ V}$                                                                                     | -   | -46   | -   | dB   |
|                            |                                                        | $R_L = 50\text{ }\Omega$ ; $C_L = 5\text{ pF}$ ; $f_i = 1\text{ MHz}$ ;<br>see <a href="#">Figure 15</a>    | [2] |       |     |      |
|                            |                                                        | $V_{CC} = 1.65\text{ V}$                                                                                    | -   | -37   | -   | dB   |
|                            |                                                        | $V_{CC} = 2.3\text{ V}$                                                                                     | -   | -37   | -   | dB   |
|                            |                                                        | $V_{CC} = 3.0\text{ V}$                                                                                     | -   | -37   | -   | dB   |
|                            |                                                        | $V_{CC} = 4.5\text{ V}$                                                                                     | -   | -37   | -   | dB   |

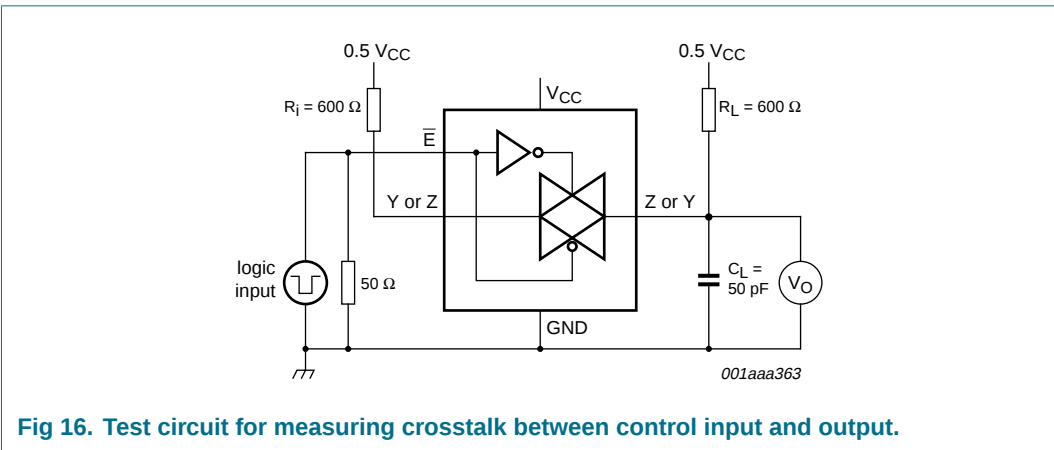
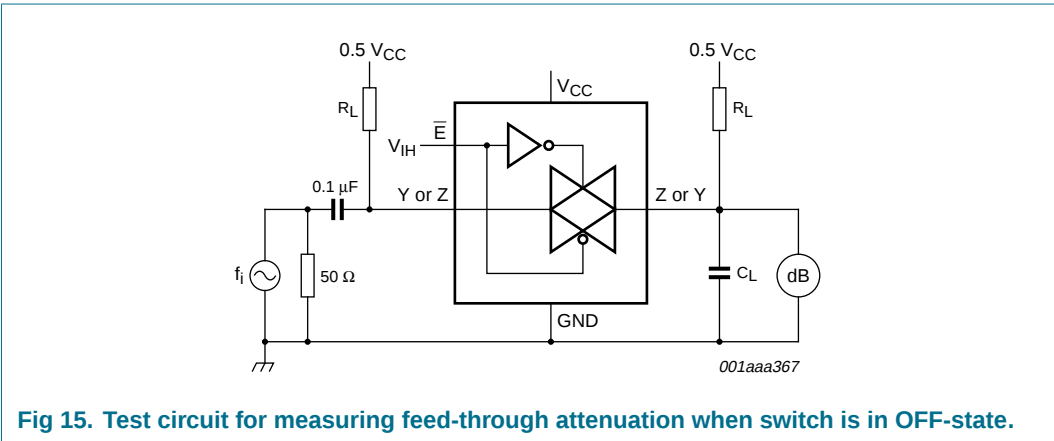
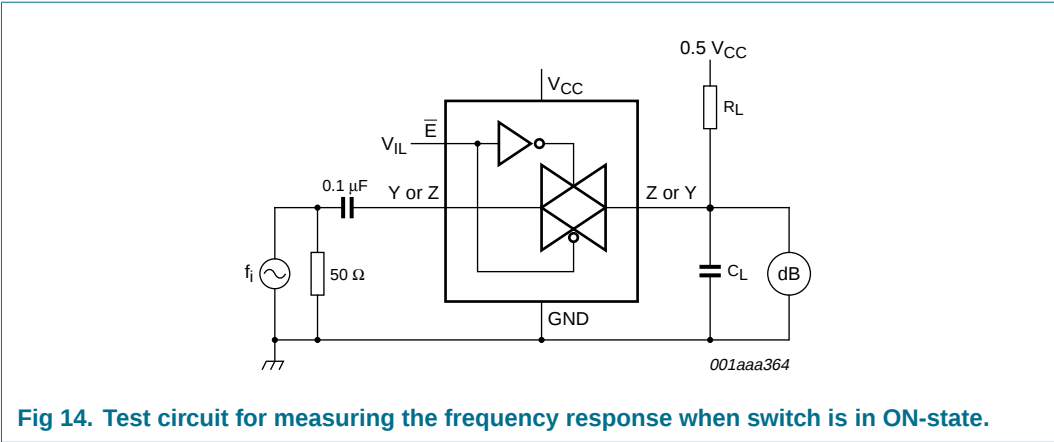


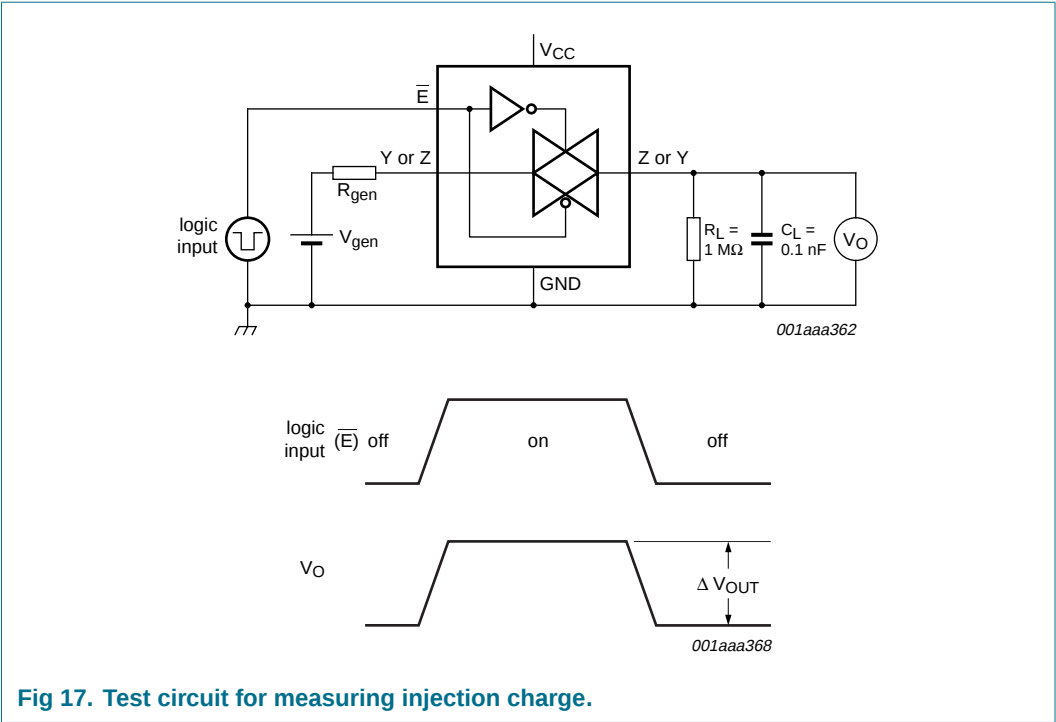
Table 13: Additional dynamic characteristics ...continued  
At recommended conditions; typical values measured at  $T_{amb} = 25^{\circ}C$ .

| Symbol    | Parameter                                        | Conditions                                                                                                                                                                                                      | Min | Typ | Max  | Unit |
|-----------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| $V_{ct}$  | crosstalk between control input to signal output | $R_L = 600\ \Omega$ ; $C_L = 50\ \text{pF}$ ; $f_i = 1\ \text{MHz}$ ;<br>$t_r = t_f = 2\ \text{ns}$ ; see <a href="#">Figure 16</a>                                                                             |     |     |      |      |
|           |                                                  | $V_{CC} = 1.65\ \text{V}$                                                                                                                                                                                       | -   | 69  | -    | mV   |
|           |                                                  | $V_{CC} = 2.3\ \text{V}$                                                                                                                                                                                        | -   | 87  | -    | mV   |
|           |                                                  | $V_{CC} = 3.0\ \text{V}$                                                                                                                                                                                        | -   | 156 | -    | mV   |
| $f_{max}$ | frequency response (-3 dB)                       | $R_L = 50\ \Omega$ ; $C_L = 10\ \text{pF}$ ; see <a href="#">Figure 14</a>                                                                                                                                      | [1] |     |      |      |
|           |                                                  | $V_{CC} = 1.65\ \text{V}$                                                                                                                                                                                       | -   | 200 | -    | MHz  |
|           |                                                  | $V_{CC} = 2.3\ \text{V}$                                                                                                                                                                                        | -   | 350 | -    | MHz  |
|           |                                                  | $V_{CC} = 3.0\ \text{V}$                                                                                                                                                                                        | -   | 410 | -    | MHz  |
| $Q$       | injection charge                                 | $C_L = 0.1\ \text{nF}$ ; $V_{gen} = 0\ \text{V}$ ; $R_{gen} = 0\ \Omega$ ;<br>$f = 1\ \text{MHz}$ ; $R_L = 1\ \text{M}\Omega$ ;<br>$V_{CC} = 1.65\ \text{V}$ to $5.5\ \text{V}$ ; see <a href="#">Figure 17</a> | [3] | -   | 0.05 | pC   |
|           |                                                  |                                                                                                                                                                                                                 |     |     |      |      |
|           |                                                  |                                                                                                                                                                                                                 |     |     |      |      |
|           |                                                  |                                                                                                                                                                                                                 |     |     |      |      |

- [1] Adjust  $f_i$  voltage to obtain 0 dBm level at output. Increase  $f_i$  frequency until dB meter reads -3 dB.  
[2] Adjust  $f_i$  voltage to obtain 0 dBm level at input.  
[3] Definition:  $Q = \Delta V_{out} \times C_L$ . Guaranteed by design.







15. Package outline

Plastic surface mounted package; 5 leads

SOT353

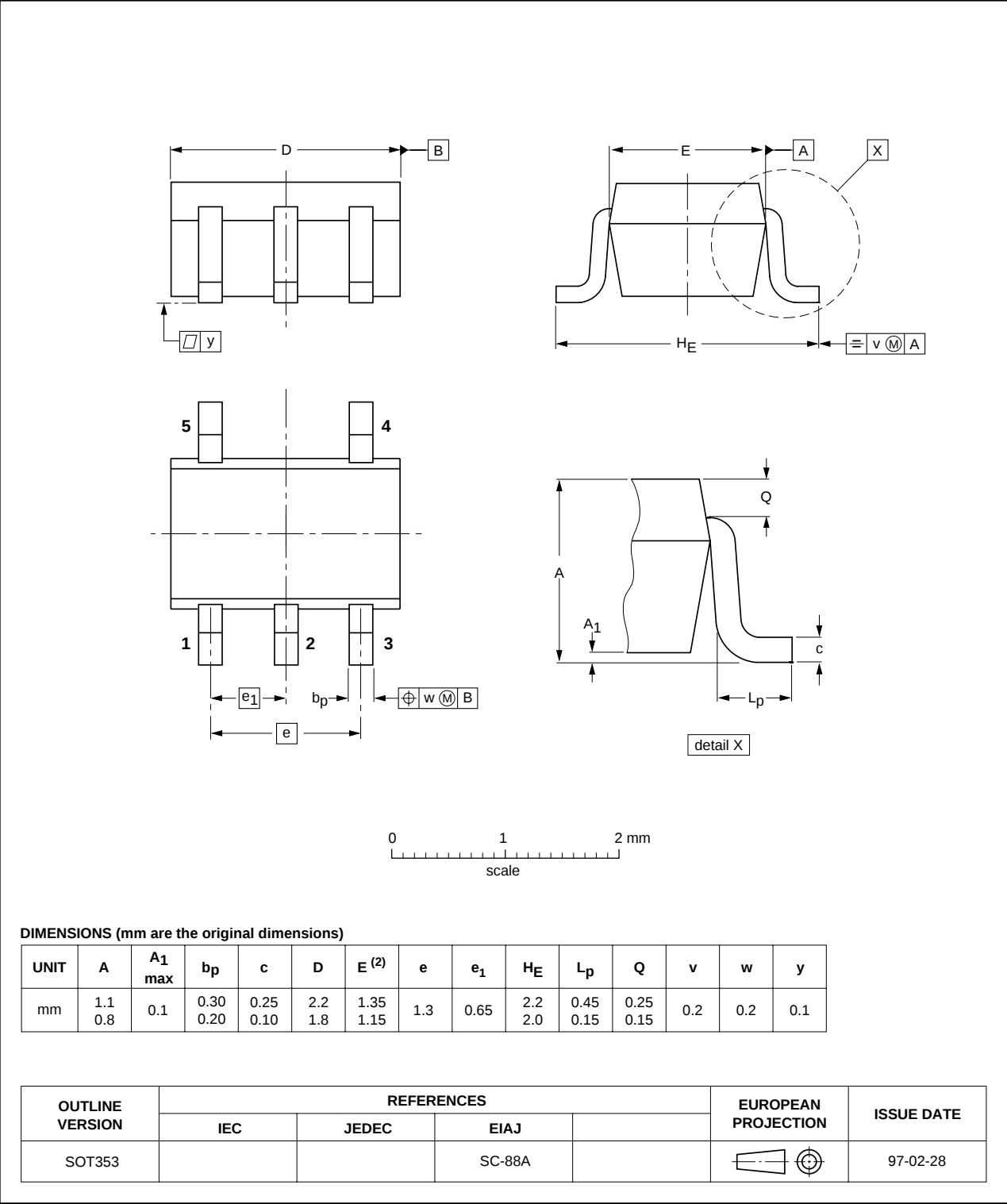
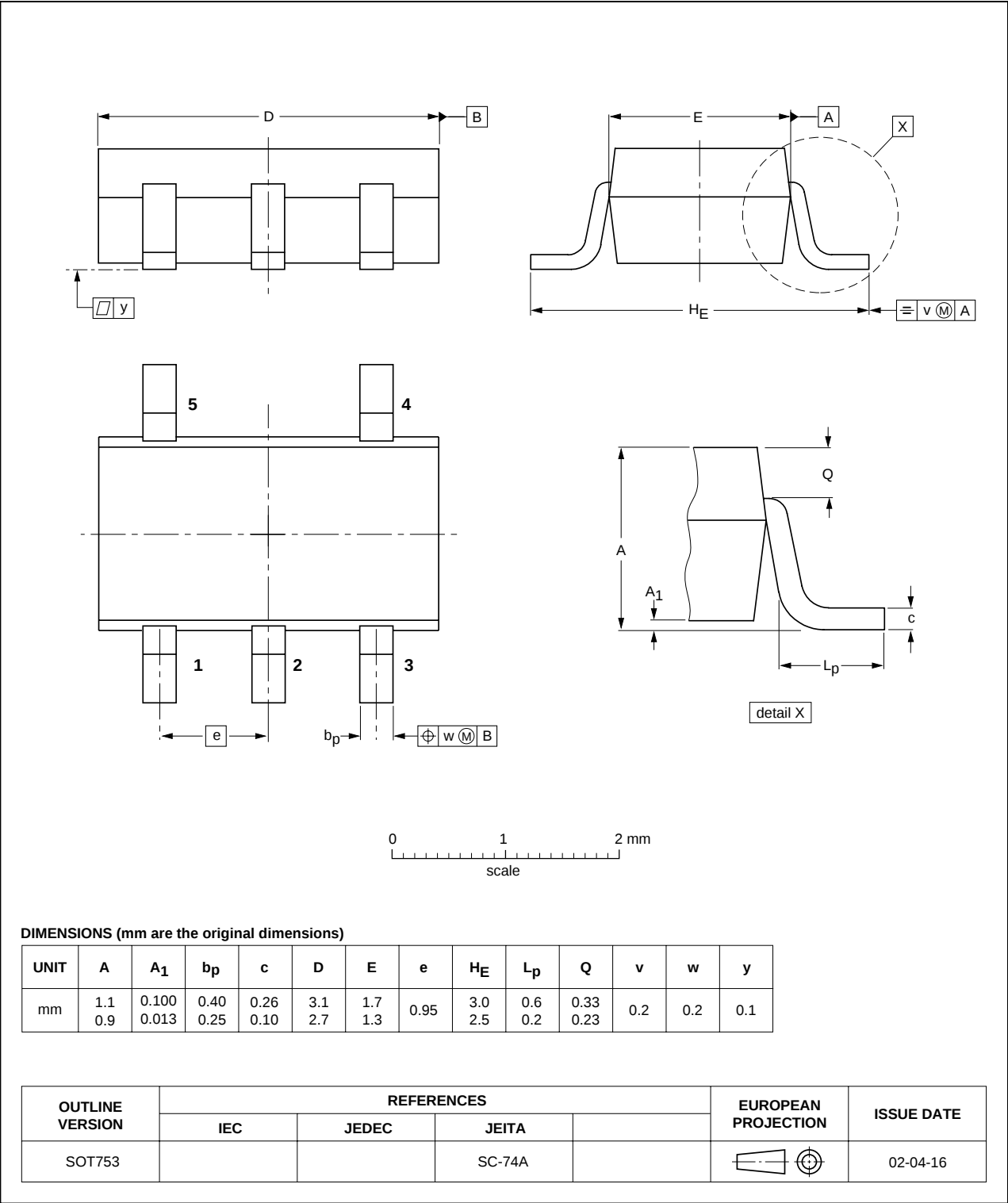


Fig 18. Package outline SOT353.

Plastic surface mounted package; 5 leads

SOT753



16. Revision history

Table 14: Revision history

| Document ID  | Release date | Data sheet status | Change notice | Order number   | Supersedes |
|--------------|--------------|-------------------|---------------|----------------|------------|
| 74LVC1G384_1 | 20040226     | Product data      | -             | 9397 750 12675 | -          |

## 17. Data sheet status

| Level | Data sheet status <sup>[1]</sup> | Product status <sup>[2]</sup> <sup>[3]</sup> | Definition                                                                                                                                                                                                                                                                                     |
|-------|----------------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I     | Objective data                   | Development                                  | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.                                                                                                    |
| II    | Preliminary data                 | Qualification                                | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
| III   | Product data                     | Production                                   | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## 18. Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Application information** — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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