# 74LVC2G53

## 2-channel analog multiplexer/demultiplexer

Rev. 02 — 31 March 2006 Product data sheet

## 1. General description

The 74LVC2G53 is a high-performance, low-power, low-voltage, Si-gate CMOS device that provides superior performance to most advanced CMOS compatible TTL families.

The 74LVC2G53 provides one analog multiplexer/demultiplexer with a digital select input (S), two independent inputs/outputs (B0 and B1), a common input/output (A) and an active LOW enable input ($\overline{E}$). When pin $\overline{E}$ is HIGH, the switch is turned off.

The 74LVC2G53 can handle both analog and digital signals.

## 2. Features

- Wide supply voltage range from 1.65 V to 5.5 V
- Very low ON resistance:
  - 7.5 Ω (typical) at $V_{CC}$ = 2.7 V
  - 6.5 Ω (typical) at $V_{CC}$ = 3.3 V
  - 6 Ω (typical) at $V_{CC}$ = 5 V
- High noise immunity
- ESD protection:
  - HBM JESD22-A114-C exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101-C exceeds 1000 V
- CMOS low-power consumption
- Latch-up performance meets requirements of JESD 78 Class I
- Direct interface with TTL levels
- Control inputs accepts voltages up to 5 V
- Multiple package options
- Specified from –40 °C to +85 °C and from –40 °C to +125 °C

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## 3. Quick reference data

**Table 1. Quick reference data**

*GND = 0 V; $t_r = t_f \leq 2.5$ ns; minimum and maximum values at $T_{amb} = -40\,°C$ to $+85\,°C$; typical values at $T_{amb} = 25\,°C$.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $t_{on}$ | turn-on time | | | | | |
| | S to A or Bn | $C_L$ = 50 pF; $R_L$ = 500 Ω | | | | |
| | | $V_{CC}$ = 3.3 V | 1.8 | 3.4 | 5.0 | ns |
| | | $V_{CC}$ = 5.0 V | 1.3 | 2.6 | 3.8 | ns |
| | $\overline{E}$ to A or Bn | $C_L$ = 50 pF; $R_L$ = 500 Ω | | | | |
| | | $V_{CC}$ = 3.3 V | 1.2 | 2.2 | 3.8 | ns |
| | | $V_{CC}$ = 5.0 V | 1.0 | 1.7 | 2.6 | ns |
| $t_{off}$ | turn-off time | | | | | |
| | S to A or Bn | $C_L$ = 50 pF; $R_L$ = 500 Ω | | | | |
| | | $V_{CC}$ = 3.3 V | 1.1 | 4.0 | 5.4 | ns |
| | | $V_{CC}$ = 5.0 V | 1.0 | 2.9 | 3.8 | ns |
| | $\overline{E}$ to A or Bn | $C_L$ = 50 pF; $R_L$ = 500 Ω | | | | |
| | | $V_{CC}$ = 3.3 V | 2.0 | 3.7 | 5.0 | ns |
| | | $V_{CC}$ = 5.0 V | 1.3 | 2.9 | 3.8 | ns |
| $C_i$ | input capacitance | | - | 2.5 | - | pF |
| $C_{S(OFF)}$ | OFF-state capacitance | | - | 6.0 | - | pF |
| $C_{S(ON)}$ | ON-state capacitance | | - | 18 | - | pF |

## 4. Ordering information

**Table 2. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74LVC2G53DP | –40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm | SOT505-2 |
| 74LVC2G53DC | –40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74LVC2G53GT | –40 °C to +125 °C | XSON8 | plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm | SOT833-1 |

## 5. Marking

**Table 3. Marking**

| Type number | Marking code |
|---|---|
| 74LVC2G53DP | V53 |
| 74LVC2G53DC | V53 |
| 74LVC2G53GT | V53 |

# 6. Functional diagram

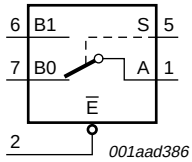



Fig 1. Logic symbol

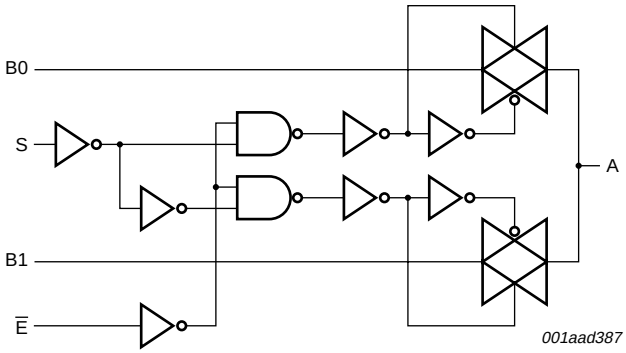



Fig 2. Logic diagram

# 7. Pinning information

## 7.1 Pinning

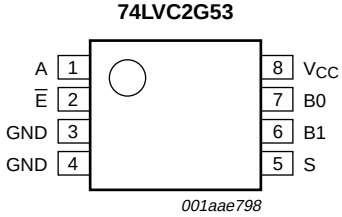
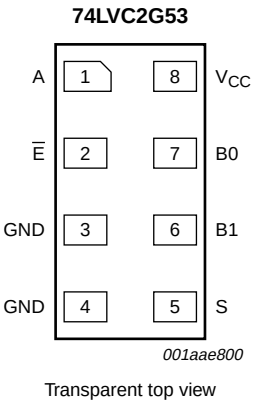



Fig 3. Pin configuration TSSOP8 and VSSOP8




Transparent top view

Fig 4. Pin configuration XSON8

## 7.2 Pin description

Table 4. Pin description

| Symbol | Pin | Description |
|---|---|---|
| A | 1 | common A output or input |
| $\overline{E}$ | 2 | enable input (active LOW) |
| GND | 3 | ground (0 V) |
| GND | 4 | ground (0 V) |
| S | 5 | select input |
| B1 | 6 | independent B1 input or output |
| B0 | 7 | independent B0 input or output |
| $V_{CC}$ | 8 | supply voltage |

# 8. Functional description

## 8.1 Function table

Table 5. Function table[1]

| Input | | Channel on |
|---|---|---|
| S | $\overline{E}$ | |
| L | L | B0 to A or A to B0 |
| H | L | B1 to A or A to B1 |
| X | H | Z (switch off) |

[1] H = HIGH voltage level;
L = LOW voltage level;
X = don't care;
Z = high-impedance OFF-state.

# 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 | | [1] | –0.5 | +6.5 | V |
| $I_{IK}$ | input clamping current | $V_I < –0.5$ V or $V_I > V_{CC} + 0.5$ | | - | –50 | mA |
| $I_{SK}$ | switch clamping current | $V_I < –0.5$ V or $V_I > V_{CC} + 0.5$ | | - | ±50 | mA |
| $V_{SW}$ | switch voltage | enable and disable mode | | –0.5 | $V_{CC} + 0.5$ | V |
| $I_{SW}$ | switch current | $V_{SW} = –0.5$ V to $(V_{CC} + 0.5$ V) | | - | ±50 | mA |
| $I_{CC}$ | quiescent supply current | | | - | 100 | mA |
| $I_{GND}$ | ground current | | | - | –100 | mA |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb} = –40$ °C to +125 °C | [2] | - | 300 | mW |

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

[2] For TSSOP8 package: above 55 °C the value of $P_{tot}$ derates linearly with 2.5 mW/K.
For VSSOP8 package: above 110 °C the value of $P_{tot}$ derates linearly with 8 mW/K.
For XSON8 package: above 45 °C the value of $P_{tot}$ derates linearly with 2.4 mW/K.

# 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 |
| $V_{SW}$ | switch voltage | enable and disable mode | [1] | 0 | - | $V_{CC}$ | V |
| $T_{amb}$ | ambient temperature | | | –40 | - | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.65$ V to 2.7 V | [2] | 0 | - | 20 | ns/V |
| | | $V_{CC} = 2.7$ V to 5.5 V | [2] | 0 | - | 10 | ns/V |

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

[2] Applies to control signal levels.

## 11. Static characteristics

**Table 8. Static characteristics**

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

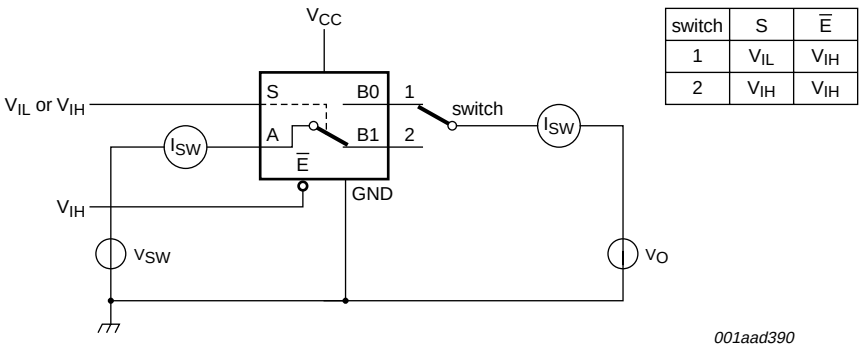
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = −40 °C to +85 °C[1]** | | | | | | |
| $V_{IH}$ | HIGH-state input voltage | $V_{CC}$ = 1.65 V to 1.95 V | $0.65V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.7 | - | - | V |
| | | $V_{CC}$ = 3 V to 3.6 V | 2.0 | - | - | V |
| | | $V_{CC}$ = 4.5 V to 5.5 V | $0.7V_{CC}$ | - | - | V |
| $V_{IL}$ | LOW-state input voltage | $V_{CC}$ = 1.65 V to 1.95 V | - | - | $0.35V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | $V_{CC}$ = 3 V to 3.6 V | - | - | 0.8 | V |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | - | $0.3V_{CC}$ | V |
| $I_{LI}$ | input leakage current | on pin S and pin $\overline{E}$; $V_I$ = 5.5 V or GND; $V_{CC}$ = 5.5 V | - | ±0.1 | ±2 | µA |
| $I_{S(OFF)}$ | OFF-state leakage current | per channel; $V_{SW}$ = GND and $V_O$ = $V_{CC}$ or $V_{SW}$ = $V_{CC}$ and $V_O$ = GND; $V_{CC}$ = 5.5 V; see Figure 5 | - | ±0.1 | ±5 | µA |
| $I_{S(ON)}$ | ON-state leakage current | per channel; $V_{SW}$ = GND or $V_{CC}$; $V_{CC}$ = 5.5 V; see Figure 6 | - | ±0.1 | ±5 | µA |
| $I_{CC}$ | quiescent supply current | $V_I$ = $V_{CC}$ or GND; $V_{SW}$ = GND or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | 0.1 | 10 | µA |
| $\Delta I_{CC}$ | additional quiescent supply current | per input pin; $V_I$ = $V_{CC}$ − 0.6 V; $V_{SW}$ = GND or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | 5 | 500 | µA |
| $C_i$ | input capacitance | | - | 2.5 | - | pF |
| $C_{S(OFF)}$ | OFF-state capacitance | | - | 6.0 | - | pF |
| $C_{S(ON)}$ | ON-state capacitance | | - | 18 | - | pF |
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | |
| $V_{IH}$ | HIGH-state input voltage | $V_{CC}$ = 1.65 V to 1.95 V | $0.65V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.7 | - | - | V |
| | | $V_{CC}$ = 3 V to 3.6 V | 2.0 | - | - | V |
| | | $V_{CC}$ = 4.5 V to 5.5 V | $0.7V_{CC}$ | - | - | V |
| $V_{IL}$ | LOW-state input voltage | $V_{CC}$ = 1.65 V to 1.95 V | - | - | $0.35V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | $V_{CC}$ = 3 V to 3.6 V | - | - | 0.8 | V |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | - | $0.3V_{CC}$ | V |
| $I_{LI}$ | input leakage current | on pin S and pin $\overline{E}$; $V_I$ = 5.5 V or GND; $V_{CC}$ = 5.5 V | - | - | ±10 | µA |
| $I_{S(OFF)}$ | OFF-state leakage current | per channel; $V_{SW}$ = GND and $V_O$ = $V_{CC}$ or $V_{SW}$ = $V_{CC}$ and $V_O$ = GND; $V_{CC}$ = 5.5 V; see Figure 5 | - | - | ±20 | µA |

**Table 8. Static characteristics** *…continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $I_{S(ON)}$ | ON-state leakage current | per channel; $V_{SW}$ = GND or $V_{CC}$; $V_{CC}$ = 5.5 V; see Figure 6 | - | - | ±20 | µA |
| $I_{CC}$ | quiescent supply current | $V_I$ = $V_{CC}$ or GND; $V_{SW}$ = GND or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | - | 40 | µA |
| $\Delta I_{CC}$ | additional quiescent supply current | per input pin; $V_I$ = $V_{CC}$ – 0.6 V; $V_{SW}$ = GND or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | - | 5000 | µA |

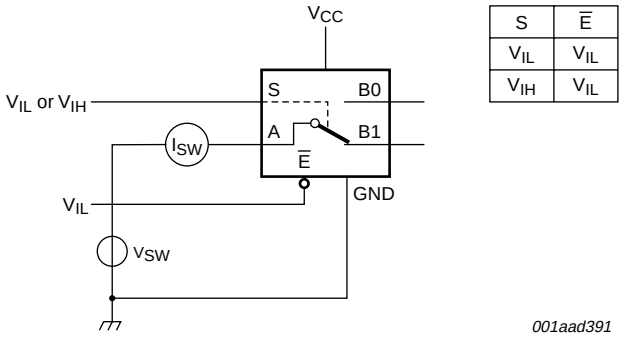
[1] Typical values are measured at $T_{amb}$ = 25 °C.




| switch | S | $\overline{E}$ |
|---|---|---|
| 1 | $V_{IL}$ | $V_{IH}$ |
| 2 | $V_{IH}$ | $V_{IH}$ |

$V_{SW}$ = $V_{CC}$ or GND; $V_O$ = GND or $V_{CC}$.

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




| S | $\overline{E}$ |
|---|---|
| $V_{IL}$ | $V_{IL}$ |
| $V_{IH}$ | $V_{IL}$ |

$V_{SW}$ = $V_{CC}$ or GND.

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

**Table 9. Resistance $R_{on}$**

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V); see test circuit Figure 7.*

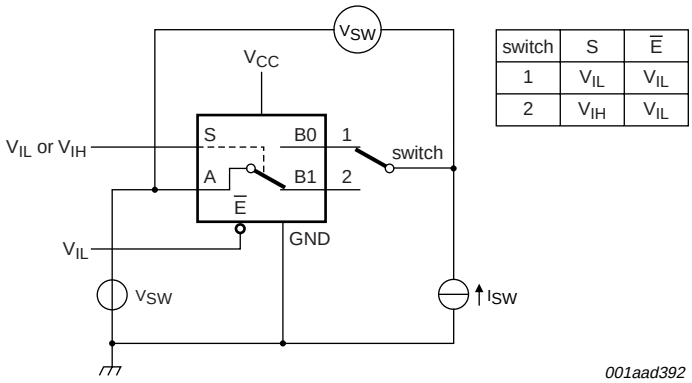
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = −40 °C to +85 °C[1]** | | | | | | |
| $R_{ON(rail)}$ | ON resistance (rail) | $V_{SW}$ = GND | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 8.7 | 18 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 7.2 | 16 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 7.0 | 14 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 6.5 | 12 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 5.9 | 10 | Ω |
| | | $V_{SW}$ = $V_{CC}$ | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 12 | 30 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 8.3 | 20 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 7.8 | 18 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 6.7 | 15 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 5.2 | 10 | Ω |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_{SW}$ = GND to $V_{CC}$ | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 57 | 130 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 15 | 30 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 13 | 25 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 9.0 | 20 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 6.0 | 15 | Ω |
| $R_{ON(flat)}$ | ON resistance (flatness) | $V_{SW}$ = GND to $V_{CC}$; see Figure 9 | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 100 | - | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 17 | - | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 10 | - | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 5 | - | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 3 | - | Ω |
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | |
| $R_{ON(rail)}$ | ON resistance (rail) | $V_{SW}$ = GND | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | - | 27 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | - | 24 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | - | 21 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | - | 18 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | - | 15 | Ω |
| | | $V_{SW}$ = $V_{CC}$ | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | - | 45 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | - | 30 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | - | 27 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | - | 23 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | - | 15 | Ω |

**Table 9. Resistance $R_{on}$** *...continued*

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V); see test circuit Figure 7.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{ON(peak)}$ | ON resistance (peak) | $V_{SW}$ = GND to $V_{CC}$ | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | - | 130 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | - | 55 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | - | 35 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | - | 25 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | - | 20 | Ω |

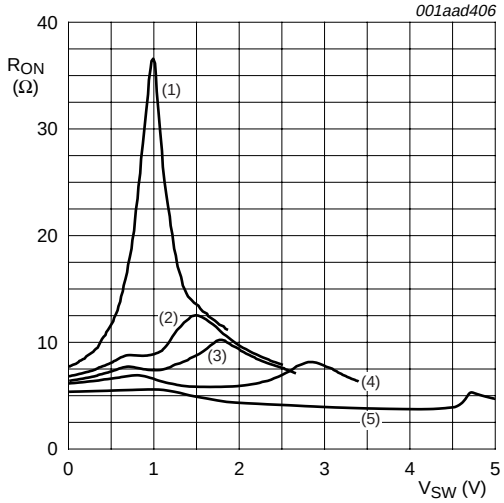
[1] Typical values are measured at $T_{amb}$ = 25 °C and nominal $V_{CC}$.




| switch | S | $\overline{E}$ |
|---|---|---|
| 1 | $V_{IL}$ | $V_{IL}$ |
| 2 | $V_{IH}$ | $V_{IL}$ |

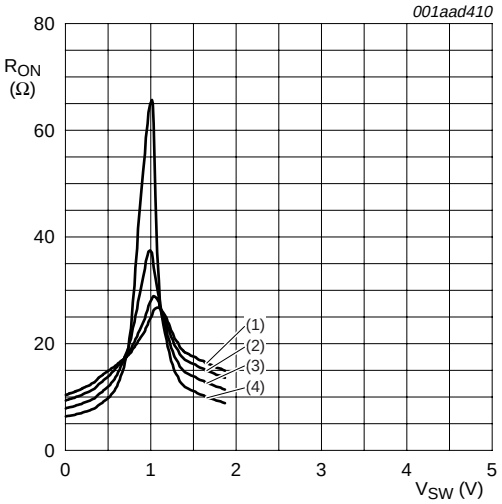
$R_{ON} = V_{SW} / I_{SW}$

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



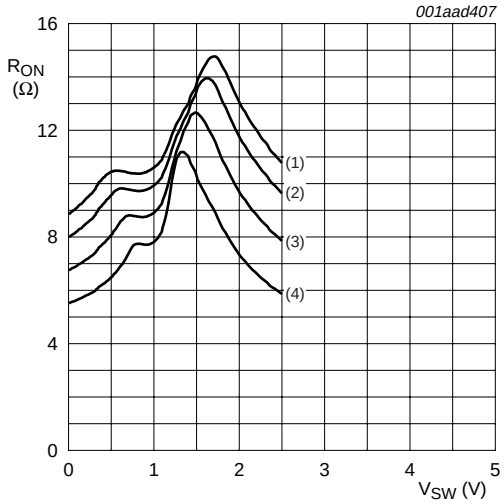

(1) $V_{CC}$ = 1.8 V
(2) $V_{CC}$ = 2.5 V
(3) $V_{CC}$ = 2.7 V
(4) $V_{CC}$ = 3.3 V
(5) $V_{CC}$ = 5.0 V
$T_{amb}$ = 25 °C

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



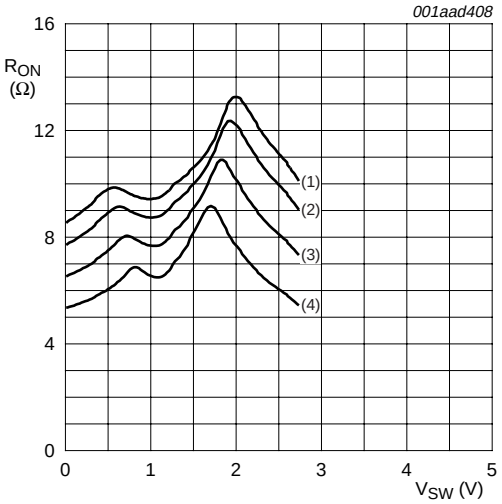

(1) $T_{amb}$ = 125 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = –40 °C

a. $V_{CC}$ = 1.8 V



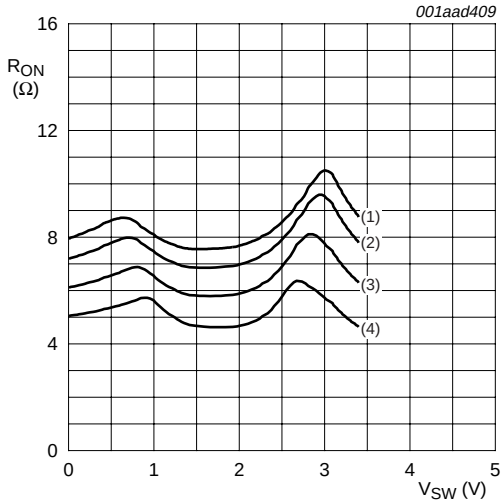

(1) $T_{amb}$ = 125 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = –40 °C

b. $V_{CC}$ = 2.5 V




(1) $T_{amb}$ = 125 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = –40 °C

c. $V_{CC}$ = 2.7 V




(1) $T_{amb}$ = 125 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = –40 °C

d. $V_{CC}$ = 3.3 V

**Fig 9. Switch ON resistance as a function of switch voltage**

## 12. Dynamic characteristics

**Table 10. 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 |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = −40 °C to +85 °C[1]** | | | | | | |
| $t_{PHL}$ | HIGH-to-LOW propagation delay | see Figure 10 | | | | |
| | A to Bn or Bn to A | $V_{CC}$ = 1.65 V to 1.95 V | - | - | 2 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 1.2 | ns |
| | | $V_{CC}$ = 2.7 V | - | - | 1.0 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | - | - | 0.8 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 0.6 | ns |
| $t_{PLH}$ | LOW-to-HIGH propagation delay | see Figure 10 | | | | |
| | A to Bn or Bn to A | $V_{CC}$ = 1.65 V to 1.95 V | - | - | 2 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 1.2 | ns |
| | | $V_{CC}$ = 2.7 V | - | - | 1.0 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | - | - | 0.8 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 0.6 | ns |
| $t_{on}$ | turn-on time | see Figure 11 | | | | |
| | S to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 2.6 | 6.7 | 10.3 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.9 | 4.1 | 6.4 | ns |
| | | $V_{CC}$ = 2.7 V | 1.9 | 4.0 | 5.5 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 1.8 | 3.4 | 5.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.3 | 2.6 | 3.8 | ns |
| | $\overline{E}$ to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 1.9 | 4.0 | 7.3 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.4 | 2.5 | 4.4 | ns |
| | | $V_{CC}$ = 2.7 V | 1.1 | 2.6 | 3.9 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 1.2 | 2.2 | 3.8 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.0 | 1.7 | 2.6 | ns |
| $t_{off}$ | turn-off time | see Figure 11 | | | | |
| | S to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 2.1 | 6.8 | 10.0 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.4 | 3.7 | 6.1 | ns |
| | | $V_{CC}$ = 2.7 V | 1.4 | 4.9 | 6.2 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 1.1 | 4.0 | 5.4 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.0 | 2.9 | 3.8 | ns |
| | $\overline{E}$ to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 2.3 | 5.6 | 8.6 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.2 | 3.2 | 4.8 | ns |
| | | $V_{CC}$ = 2.7 V | 1.4 | 4.0 | 5.2 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 2.0 | 3.7 | 5.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.3 | 2.9 | 3.8 | ns |

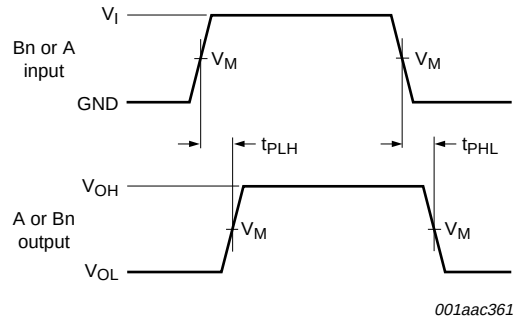
**Table 10. Dynamic characteristics** *...continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = −40 °C to +125 °C** | | | | | | |
| $t_{PHL}$ | HIGH-to-LOW propagation delay | see Figure 10 | | | | |
| | A to Bn or Bn to A | $V_{CC}$ = 1.65 V to 1.95 V | - | - | 2.5 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 1.5 | ns |
| | | $V_{CC}$ = 2.7 V | - | - | 1.25 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | - | - | 1.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 0.8 | ns |
| $t_{PLH}$ | LOW-to-HIGH propagation delay | see Figure 10 | | | | |
| | A to Bn or Bn to A | $V_{CC}$ = 1.65 V to 1.95 V | - | - | 2.5 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 1.5 | ns |
| | | $V_{CC}$ = 2.7 V | - | - | 1.25 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | - | - | 1.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 0.8 | ns |
| $t_{on}$ | turn-on time | see Figure 11 | | | | |
| | S to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 2.6 | - | 12.9 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.9 | - | 8.0 | ns |
| | | $V_{CC}$ = 2.7 V | 1.8 | - | 7.0 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 1.8 | - | 6.3 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.3 | | 4.8 | ns |
| | $\overline{E}$ to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 1.9 | - | 9.2 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.4 | - | 5.5 | ns |
| | | $V_{CC}$ = 2.7 V | 1.1 | - | 4.9 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 1.2 | - | 4.8 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.0 | - | 3.3 | ns |
| $t_{off}$ | turn-off time | see Figure 11 | | | | |
| | S to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 2.1 | - | 12.5 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.4 | - | 7.7 | ns |
| | | $V_{CC}$ = 2.7 V | 1.4 | - | 7.8 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 1.1 | - | 6.8 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.0 | | 4.8 | ns |
| | $\overline{E}$ to A or Bn | $V_{CC}$ = 1.65 V to 1.95 V | 2.3 | - | 11.0 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.2 | - | 6.0 | ns |
| | | $V_{CC}$ = 2.7 V | 1.4 | - | 6.5 | ns |
| | | $V_{CC}$ = 3 V to 3.6 V | 2.0 | - | 6.3 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.3 | - | 4.8 | ns |

[1] Typical values are measured at $T_{amb}$ = 25 °C and nominal $V_{CC}$.

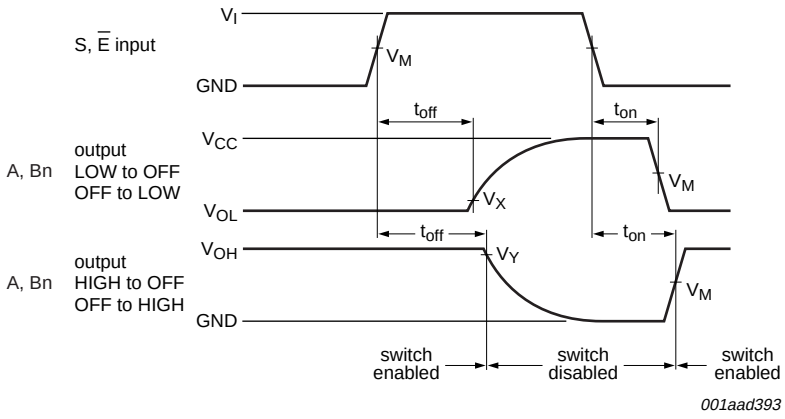
## 13. Waveforms




Measurement points are given in Table 11.

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

**Fig 10. Input (Bn or A) to output (A or Bn) propagation delays**



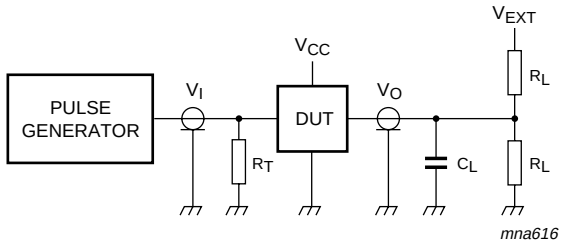

Measurement points are given in Table 11.

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

**Fig 11. Turn-on and turn-off times**

**Table 11. Measurement points**

| Supply voltage | Input | Output | | |
|---|---|---|---|---|
| $V_{CC}$ | $V_M$ | $V_M$ | $V_X$ | $V_Y$ |
| 1.65 V to 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.15 V | $V_{OH}$ − 0.15 V |
| 2.7 V to 5.5 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.3 V | $V_{OH}$ − 0.3 V |




Test data is given in Table 12.

Definitions test circuit:

$R_T$ = termination resistance (should be equal to output impedance $Z_o$ of the pulse generator).

$C_L$ = load capacitance (including jig and probe capacitance).

$R_L$ = load resistance.

$V_{EXT}$ = external voltage for measuring switching times.

**Fig 12. Load circuitry for switching times**

**Table 12. Test data**

| Supply voltage | Input | | Load | | $V_{EXT}$ | | |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PLH}$, $t_{PHL}$ | $t_{on}$, $t_{off}$ | |
| | | | | | | HIGH to OFF OFF to HIGH | LOW to OFF OFF to LOW |
| 1.65 V to 1.95 V | $V_{CC}$ | ≤ 2.0 ns | 30 pF | 1 kΩ | open | GND | $2 \times V_{CC}$ |
| 2.3 V to 2.7 V | $V_{CC}$ | ≤ 2.0 ns | 30 pF | 500 Ω | open | GND | $2 \times V_{CC}$ |
| 2.7 V | $V_{CC}$ | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | $2 \times V_{CC}$ |
| 3 V to 3.6 V | $V_{CC}$ | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | $2 \times V_{CC}$ |
| 4.5 V to 5.5 V | $V_{CC}$ | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | $2 \times V_{CC}$ |

## 14. Additional dynamic characteristics

**Table 13. Additional dynamic characteristics**

*At recommended operating conditions; typical values measured at $T_{amb}$ = 25 °C.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| THD | total harmonic distortion | $f_i$ = 600 Hz to 20 kHz; $R_L$ = 600 Ω; $C_L$ = 50 pF; $V_i$ = 0.5 V (p-p); see Figure 13 | | | | |
| | | $V_{CC}$ = 1.65 V | - | 0.260 | - | % |
| | | $V_{CC}$ = 2.3 V | - | 0.078 | - | % |
| | | $V_{CC}$ = 3.0 V | - | 0.078 | - | % |
| | | $V_{CC}$ = 4.5 V | - | 0.078 | - | % |
| $f_{(-3dB)}$ | −3 dB frequency response | $R_L$ = 50 Ω; $C_L$ = 5 pF; see Figure 14 [1] | | | | |
| | | $V_{CC}$ = 1.65 V | - | 200 | - | MHz |
| | | $V_{CC}$ = 2.3 V | - | 300 | - | MHz |
| | | $V_{CC}$ = 3.0 V | - | 300 | - | MHz |
| | | $V_{CC}$ = 4.5 V | - | 300 | - | MHz |

**Table 13. Additional dynamic characteristics** *...continued*

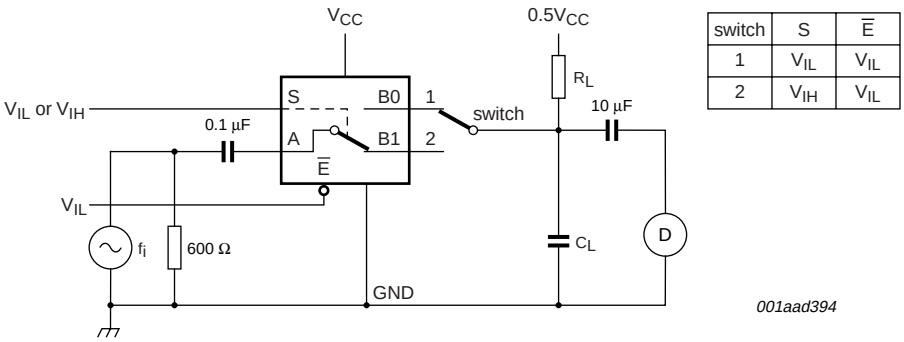
*At recommended operating conditions; typical values measured at $T_{amb}$ = 25 °C.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $\alpha_{OFF(ft)}$ | OFF-state feed-through attenuation | $R_L$ = 50 Ω; $C_L$ = 5 pF; $f_i$ = 10 MHz; see Figure 15 | [2] | | | | |
| | | $V_{CC}$ = 1.65 V | | - | –42 | - | dB |
| | | $V_{CC}$ = 2.3 V | | - | –42 | - | dB |
| | | $V_{CC}$ = 3.0 V | | - | –40 | - | dB |
| | | $V_{CC}$ = 4.5 V | | - | –40 | - | dB |
| $V_{ct(sw-sw)}$ | crosstalk between switches | $R_L$ = 50 Ω; $C_L$ = 5 pF; $f_i$ = 10 MHz; see Figure 16 | | | | | |
| | | $V_{CC}$ = 1.65 V | | - | –68 | - | dBV |
| | | $V_{CC}$ = 2.3 V | | - | –70 | - | dBV |
| | | $V_{CC}$ = 3.0 V | | - | –70 | - | dBV |
| | | $V_{CC}$ = 4.5 V | | - | –70 | - | dBV |
| $Q_{inj}$ | charge injection | $C_L$ = 0.1 nF; $V_{gen}$ = 0 V; $R_{gen}$ = 0 Ω; $f_i$ = 1 MHz; $R_L$ = 1 MΩ; see Figure 17 | [3] | | | | |
| | | $V_{CC}$ = 1.8 V | | - | < 0.003 | - | pC |
| | | $V_{CC}$ = 2.5 V | | - | 0.004 | - | pC |
| | | $V_{CC}$ = 3.3 V | | - | 0.0045 | - | pC |
| | | $V_{CC}$ = 4.5 V | | - | 0.0045 | - | pC |
| | | $V_{CC}$ = 5.5 V | | - | 0.0045 | - | pC |

[1] Adjust $f_i$ voltage to obtain 0 dBm level at output. Increase $f_i$ frequency until dB meter reads –3 dB.

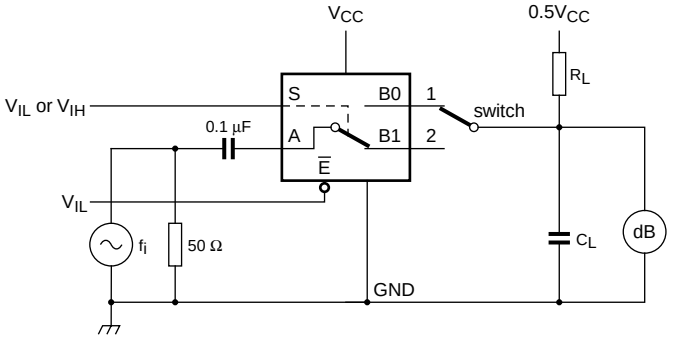
[2] Adjust $f_i$ voltage to obtain 0 dBm level at input.

[3] Definition: $Q_{inj} = \Delta V_O \times C_L$. Guaranteed by design.



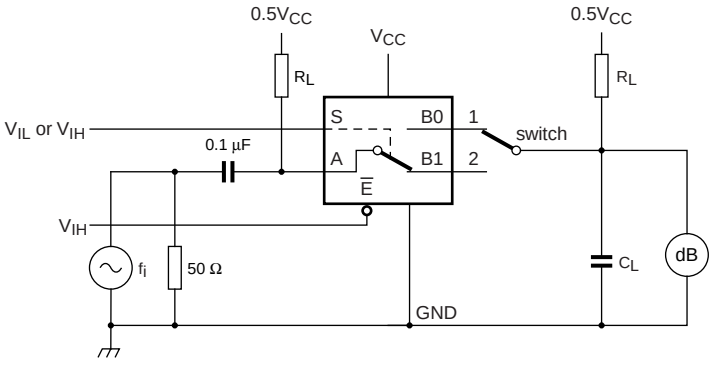

| switch | S | $\overline{E}$ |
|---|---|---|
| 1 | $V_{IL}$ | $V_{IL}$ |
| 2 | $V_{IH}$ | $V_{IL}$ |

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



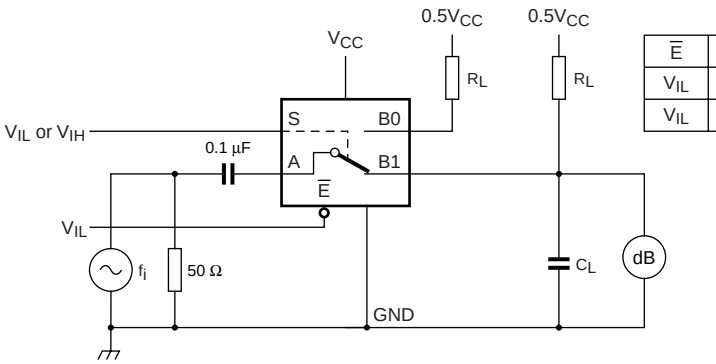

| switch | S | $\overline{E}$ |
|---|---|---|
| 1 | $V_{IL}$ | $V_{IL}$ |
| 2 | $V_{IH}$ | $V_{IL}$ |

**Fig 14. Test circuit for measuring the frequency response when switch is in ON-state**



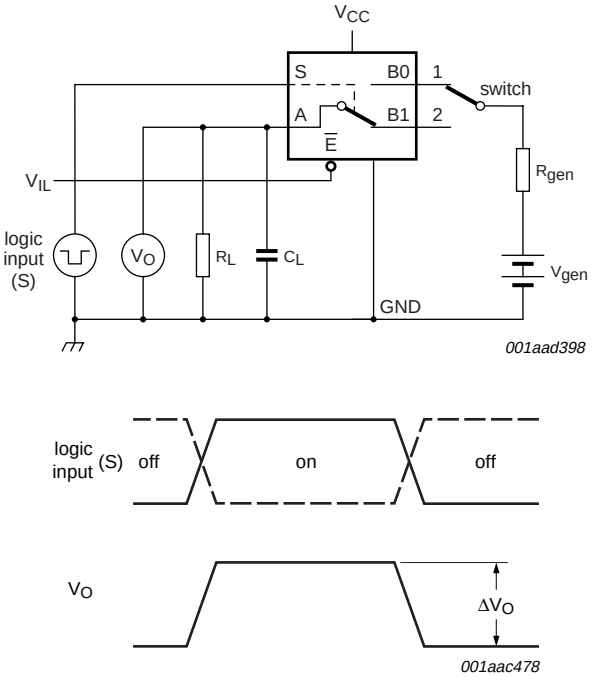

| switch | S | $\overline{E}$ |
|---|---|---|
| 1 | $V_{IL}$ | $V_{IH}$ |
| 2 | $V_{IH}$ | $V_{IH}$ |

**Fig 15. Test circuit for measuring feed-through attenuation when switch is in OFF-state**




| $\overline{E}$ | S | test condition |
|---|---|---|
| $V_{IL}$ | $V_{IL}$ | $20\log10(V_{B1}/V_I)$ |
| $V_{IL}$ | $V_{IH}$ | $20\log10(V_{B0}/V_I)$ |

**Fig 16. Test circuit for measuring crosstalk between switches**




$\Delta V_O$ = output voltage variation

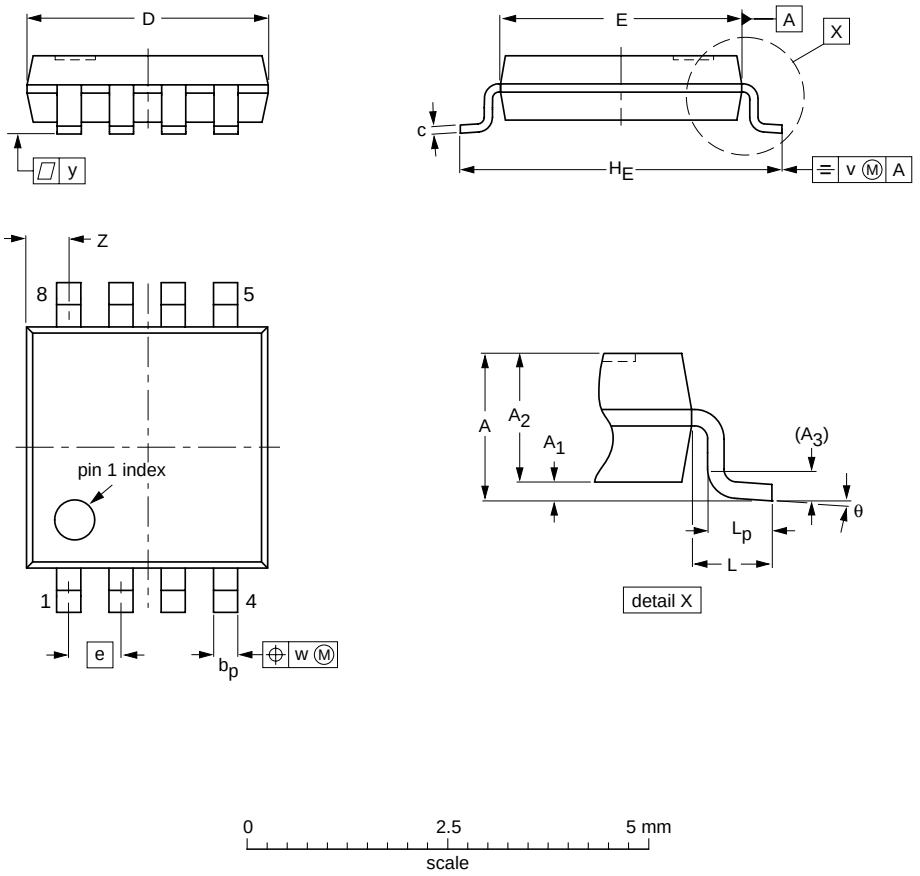
$R_{gen}$ = generator resistance

$V_{gen}$ = generator voltage

**Fig 17. Test circuit for measuring charge injection**

## 15. Package outline

**TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2**




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

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.15<br>0.00 | 0.95<br>0.75 | 0.25 | 0.38<br>0.22 | 0.18<br>0.08 | 3.1<br>2.9 | 3.1<br>2.9 | 0.65 | 4.1<br>3.9 | 0.5 | 0.47<br>0.33 | 0.2 | 0.13 | 0.1 | 0.70<br>0.35 | 8°<br>0° |

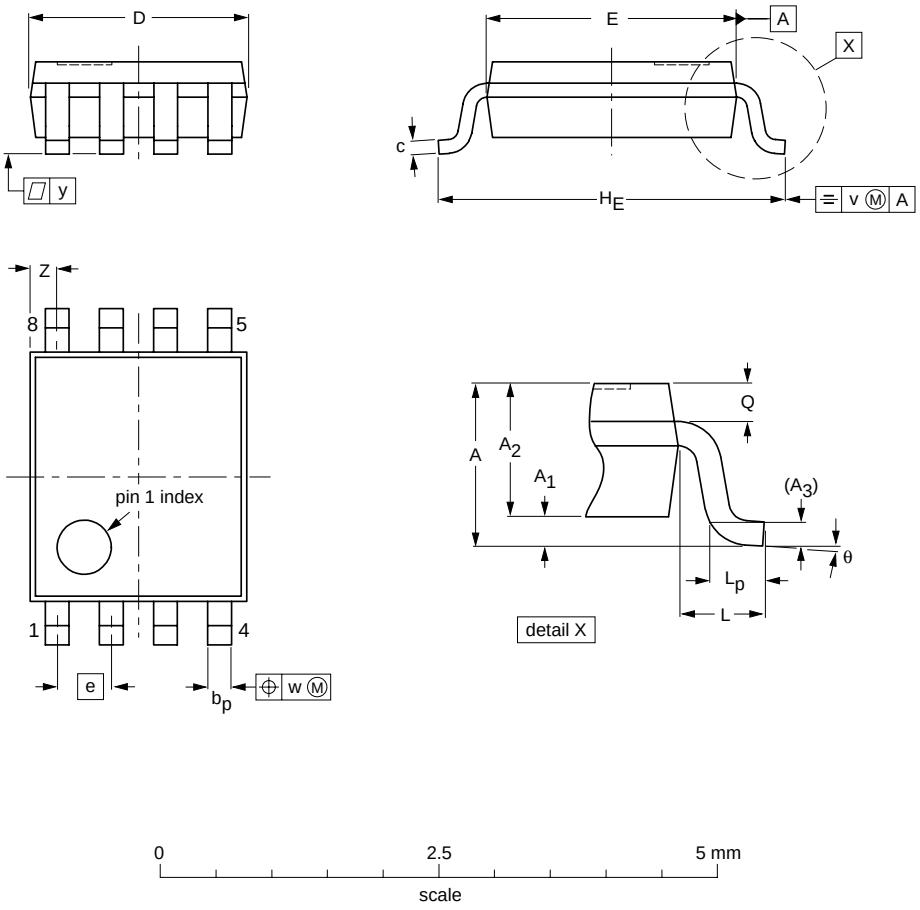
**Note**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT505-2 | | - - - | | | | 02-01-16 |

**Fig 18. Package outline SOT505-2 (TSSOP8)**

**VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm** **SOT765-1**




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

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(2)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1 | 0.15<br>0.00 | 0.85<br>0.60 | 0.12 | 0.27<br>0.17 | 0.23<br>0.08 | 2.1<br>1.9 | 2.4<br>2.2 | 0.5 | 3.2<br>3.0 | 0.4 | 0.40<br>0.15 | 0.21<br>0.19 | 0.2 | 0.13 | 0.1 | 0.4<br>0.1 | 8°<br>0° |

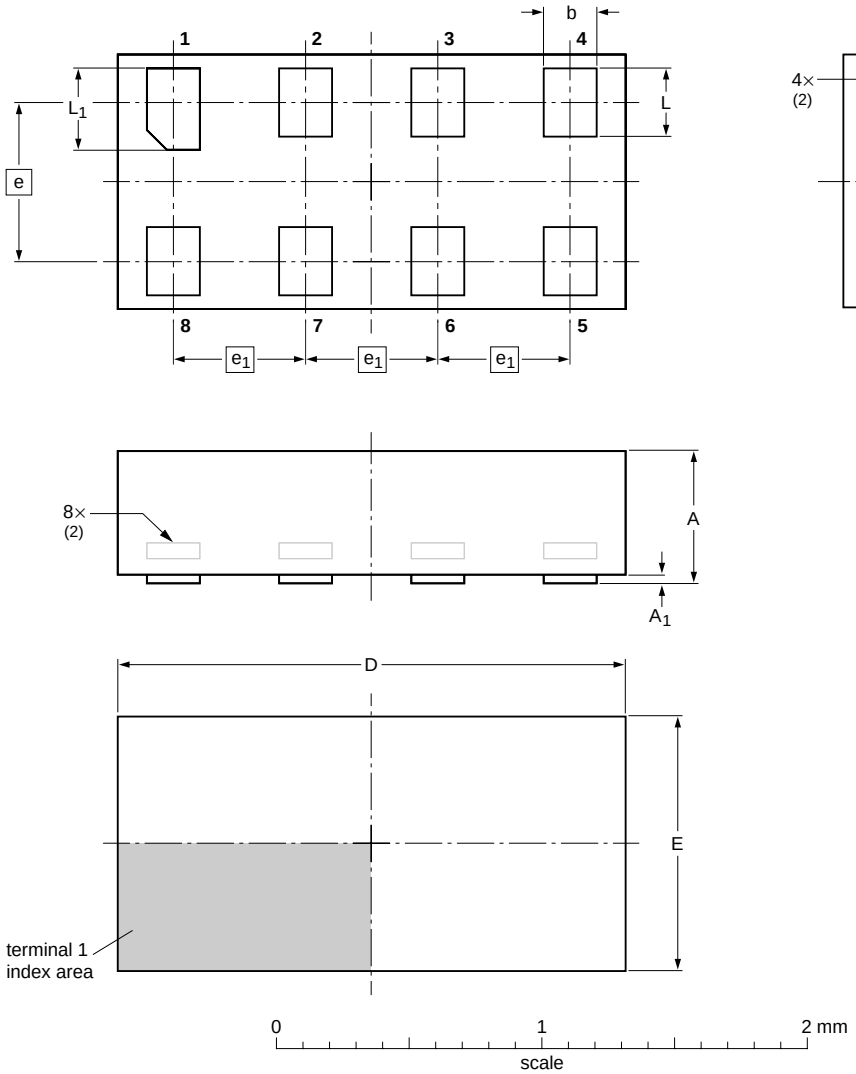
**Notes**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT765-1 | | MO-187 | | | | 02-06-07 |

**Fig 19. Package outline SOT765-1 (VSSOP8)**

**XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm** **SOT833-1**




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

| UNIT | A(1) max | A1 max | b | D | E | e | e1 | L | L1 |
|---|---|---|---|---|---|---|---|---|---|
| mm | 0.5 | 0.04 | 0.25<br>0.17 | 2.0<br>1.9 | 1.05<br>0.95 | 0.6 | 0.5 | 0.35<br>0.27 | 0.40<br>0.32 |

**Notes**

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT833-1 | - - - | MO-252 | - - - | | | ~~04-07-22~~<br>04-11-09 |

**Fig 20. Package outline SOT833-1 (XSON8)**

## 16. Abbreviations

Table 14. Abbreviations

| Acronym | Description |
|---|---|
| CMOS | Complementary Metal Oxide Semiconductor |
| TTL | Transistor-Transistor Logic |
| HBM | Human Body Model |
| ESD | ElectroStatic Discharge |
| MM | Machine Model |
| CDM | Charged Device Model |
| DUT | Device Under Test |

## 17. Revision history

Table 15. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74LVC2G53_2 | 20060331 | Product data sheet | - | 74LVC2G53_1 |
| Modifications: | • Added: type number 74LVC2G53DP (TSSOP8 package) | | | |
| 74LVC2G53_1 | 20060110 | Product data sheet | - | - |

# 18. Legal information

## 18.1 Data sheet status

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

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

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.semiconductors.philips.com.

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