

74LV4051

8-channel analog multiplexer/demultiplexer

Rev. 04 — 10 August 2009

Product data sheet

1. General description

The 74LV4051 is an 8-channel analog multiplexer/demultiplexer with three digital select inputs (S0 to S2), an active-LOW enable input (\bar{E}), eight independent inputs/outputs (Y0 to Y7) and a common input/output (Z). It is a low-voltage Si-gate CMOS device that is pin and function compatible with 74HC4051 and 74HCT4051. With \bar{E} LOW, one of the eight switches is selected (low impedance ON-state) by S0 to S2. With \bar{E} HIGH, all switches are in the high-impedance OFF-state, independent of S0 to S2.

V_{CC} and GND are the supply voltage pins for the digital control inputs (S0 to S2, and \bar{E}). The V_{CC} to GND ranges are 1.0 V to 6.0 V. The analog inputs/outputs (Y0 to Y7, and Z) can swing between V_{CC} as a positive limit and V_{EE} as a negative limit. $V_{CC} - V_{EE}$ may not exceed 6.0 V. For operation as a digital multiplexer/demultiplexer, V_{EE} is connected to GND (typically ground).

2. Features

- Optimized for low-voltage applications: 1.0 V to 6.0 V
- Accepts TTL input levels between $V_{CC} = 2.7$ V and $V_{CC} = 3.6$ V
- Low ON resistance:
 - ◆ 145 Ω (typical) at $V_{CC} - V_{EE} = 2.0$ V
 - ◆ 80 Ω (typical) at $V_{CC} - V_{EE} = 3.0$ V
 - ◆ 60 Ω (typical) at $V_{CC} - V_{EE} = 4.5$ V
- Logic level translation:
 - ◆ To enable 3 V logic to communicate with ± 3 V analog signals
- Typical 'break before make' built in
- ESD protection:
 - ◆ HBM JESD22-A114E exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and from -40 °C to $+125$ °C

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|-------------|-------------------|----------|--|----------|
| | Temperature range | Name | Description | |
| 74LV4051N | -40 °C to +125 °C | DIP16 | plastic dual in-line package; 16 leads (300 mil) | SOT38-4 |
| 74LV4051D | -40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74LV4051DB | -40 °C to +125 °C | SSOP16 | plastic shrink small outline package; 16 leads; body width 5.3 mm | SOT338-1 |
| 74LV4051PW | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74LV4051BQ | -40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm | SOT763-1 |

4. Functional diagram

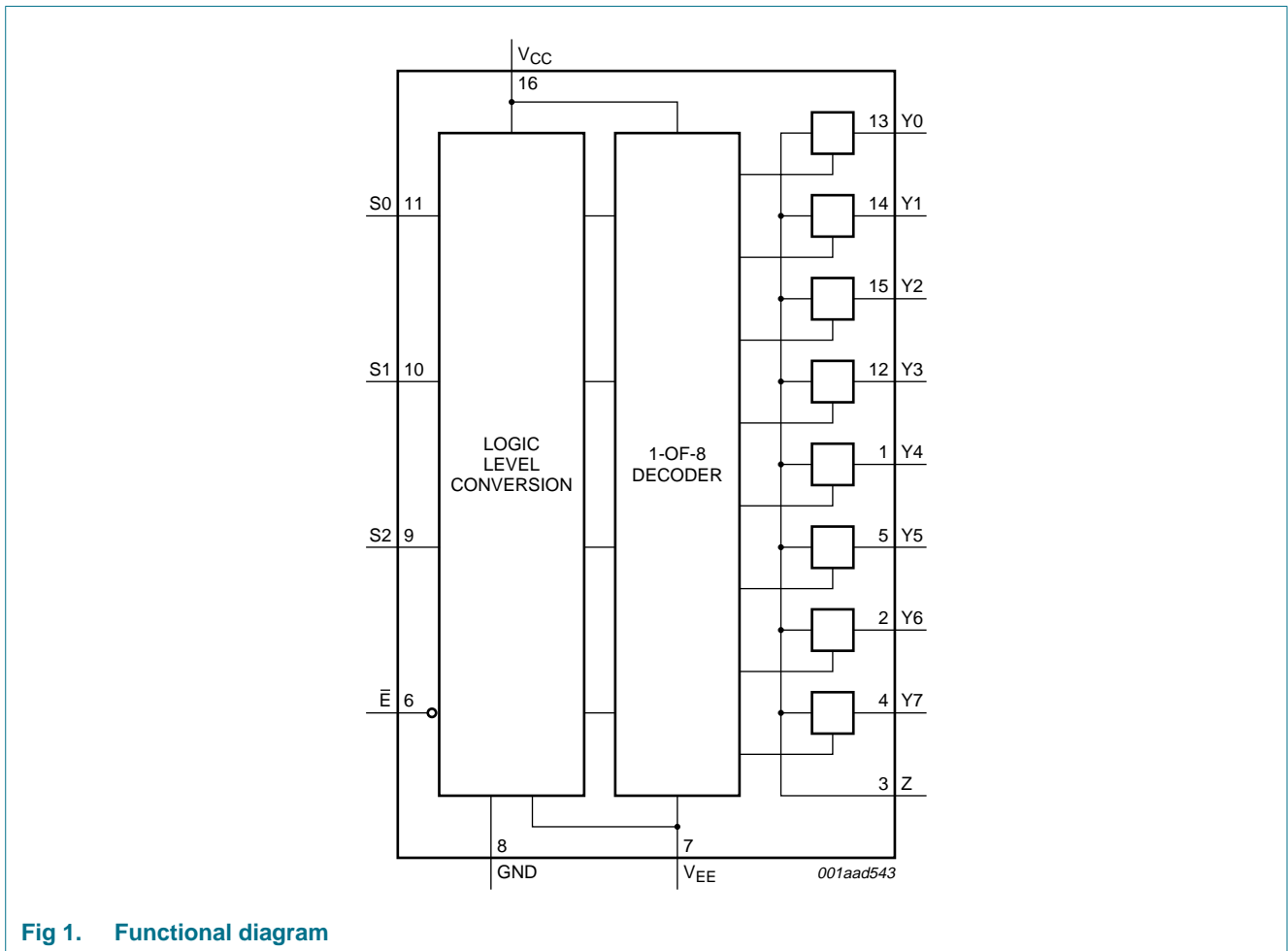


Fig 1. Functional diagram

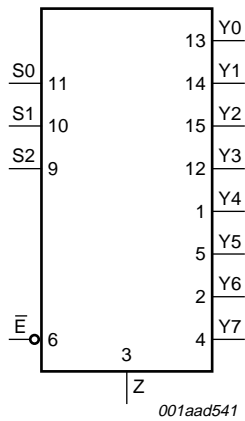


Fig 2. Logic symbol

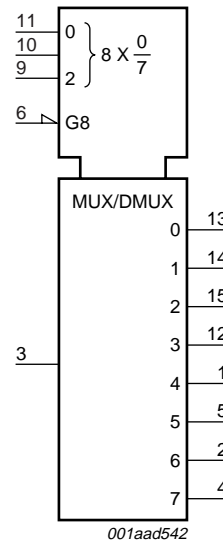


Fig 3. IEC logic symbol

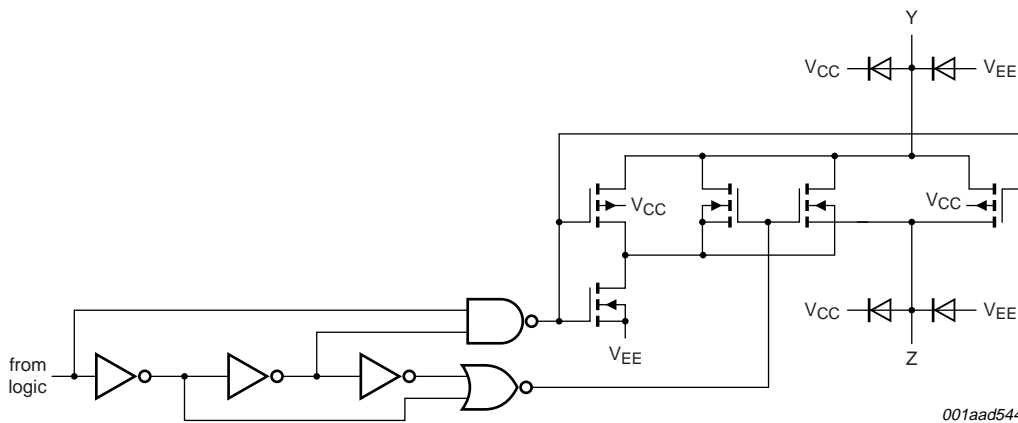
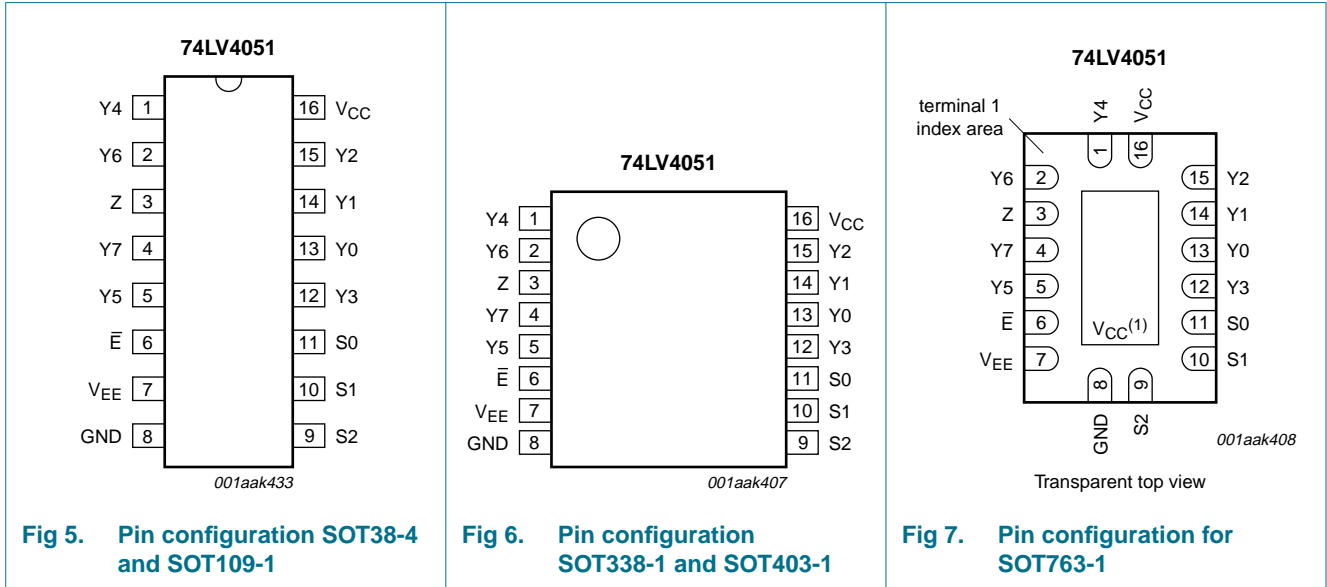


Fig 4. Schematic diagram (one switch)

5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

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

6. Functional description

6.1 Function table

Table 3. Function table^[1]

| Input | | | | Channel ON |
|-----------|----|----|----|--------------|
| \bar{E} | S2 | S1 | S0 | |
| L | L | L | L | Y0 to Z |
| L | L | L | H | Y1 to Z |
| L | L | H | L | Y2 to Z |
| L | L | H | H | Y3 to Z |
| L | H | L | L | Y4 to Z |
| L | H | L | H | Y5 to Z |
| L | H | H | L | Y6 to Z |
| L | H | H | H | Y7 to Z |
| H | X | X | X | switches off |

- [1] H = HIGH voltage level;
L = LOW voltage level;
X = don't care.

7. Limiting values

Table 4. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|-------------------------|---|----------|----------|------|
| V_{CC} | supply voltage | | [1] -0.5 | +7.0 | V |
| I_{IK} | input clamping current | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V | [2] - | ± 20 | mA |
| I_{SK} | switch clamping current | $V_{SW} < -0.5$ V or $V_{SW} > V_{CC} + 0.5$ V | [2] - | ± 20 | mA |
| I_{SW} | switch current | $V_{SW} > -0.5$ V or $V_{SW} < V_{CC} + 0.5$ V; source or sink current | [2] - | ± 25 | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | $T_{amb} = -40$ °C to +125 °C | [3] | | |
| | | DIP16 package | - | 750 | mW |
| | | SO16 package | - | 500 | mW |
| | | TSSOP16 package | - | 500 | mW |
| | | DHVQFN16 package | - | 500 | mW |

- [1] To avoid drawing V_{CC} current out of terminal Z, when switch current flows into terminals Y_n , the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no V_{CC} current will flow out of terminals Y_n , and in this case there is no limit for the voltage drop across the switch, but the voltages at Y_n and Z may not exceed V_{CC} or V_{EE} .
- [2] The minimum input voltage rating may be exceeded if the input current rating is observed.
- [3] For DIP16 packages: above 70 °C the value of P_{tot} derates linearly with 12 mW/K.
For SO16 packages: above 70 °C the value of P_{tot} derates linearly with 8 mW/K.
For SSOP16 and TSSOP16 packages: above 60 °C the value of P_{tot} derates linearly with 5.5 mW/K.
For DHVQFN16 packages: above 60 °C the value of P_{tot} derates linearly with 4.5 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions^[1]

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------|-------------------------------------|---|-----|-----|----------|------|
| V_{CC} | supply voltage | see Figure 8 | 1 | 3.3 | 6 | V |
| V_I | input voltage | | 0 | - | V_{CC} | V |
| V_{SW} | switch voltage | | 0 | - | V_{CC} | V |
| T_{amb} | ambient temperature | in free air | -40 | - | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.0\text{ V to }2.0\text{ V}$ | - | - | 500 | ns/V |
| | | $V_{CC} = 2.0\text{ V to }2.7\text{ V}$ | - | - | 200 | ns/V |
| | | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$ | - | - | 100 | ns/V |

[1] The static characteristics are guaranteed from $V_{CC} = 1.2\text{ V to }6.0\text{ V}$, but LV devices are guaranteed to function down to $V_{CC} = 1.0\text{ V}$ (with input levels GND or V_{CC}).

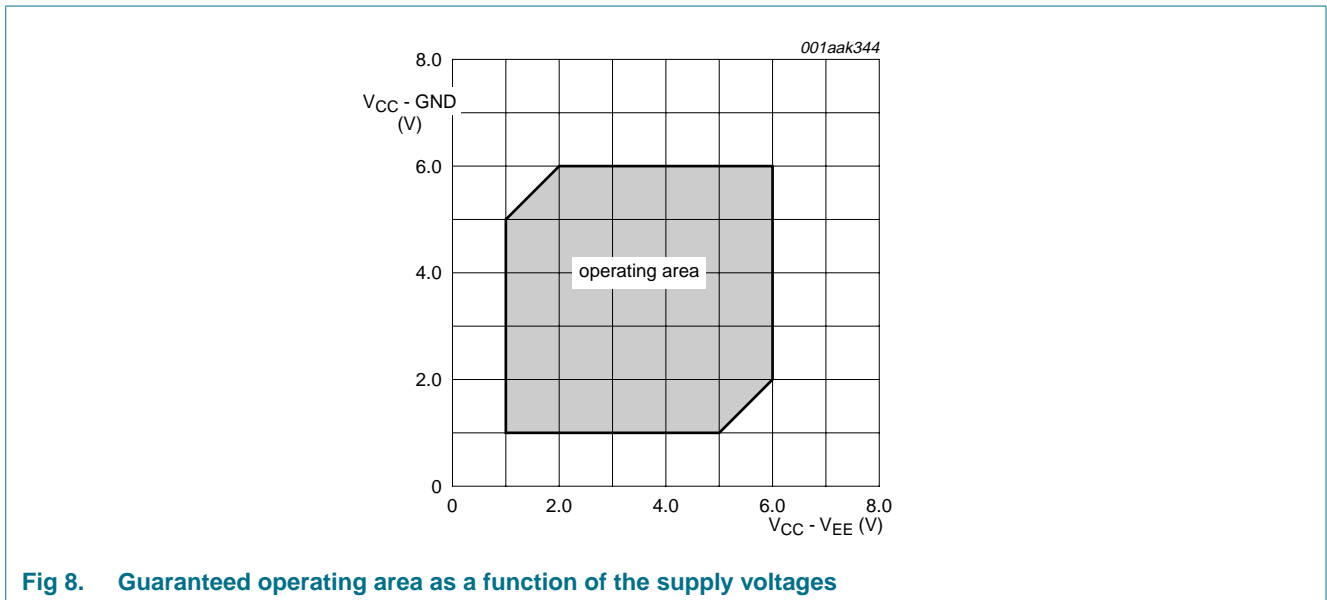


Fig 8. Guaranteed operating area as a function of the supply voltages

9. Static characteristics

Table 6. Static characteristics

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

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|---------------------|---------------------------|--|------------------|--------------------|------|-------------------|------|------|
| | | | Min | Typ ^[1] | Max | Min | Max | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 1.2 V | 0.9 | - | - | 0.9 | - | V |
| | | V _{CC} = 2.0 V | 1.4 | - | - | 1.4 | - | V |
| | | V _{CC} = 2.7 V to 3.6 V | 2.0 | - | - | 2.0 | - | V |
| | | V _{CC} = 4.5 V | 3.15 | - | - | 3.15 | - | V |
| | | V _{CC} = 6.0 V | 4.20 | - | - | 4.20 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 1.2 V | - | - | 0.3 | - | 0.3 | V |
| | | V _{CC} = 2.0 V | - | - | 0.6 | - | 0.6 | V |
| | | V _{CC} = 2.7 V to 3.6 V | - | - | 0.8 | - | 0.8 | V |
| | | V _{CC} = 4.5 V | - | - | 1.35 | - | 1.35 | V |
| | | V _{CC} = 6.0 V | - | - | 1.80 | - | 1.80 | V |
| I _I | input leakage current | V _I = V _{CC} or GND | | | | | | |
| | | V _{CC} = 3.6 V | - | - | 1.0 | - | 1.0 | μA |
| | | V _{CC} = 6.0 V | - | - | 2.0 | - | 2.0 | μA |
| I _{S(OFF)} | OFF-state leakage current | V _I = V _{IH} or V _{IL} ; see Figure 9 | | | | | | |
| | | V _{CC} = 3.6 V | - | - | 1.0 | - | 1.0 | μA |
| | | V _{CC} = 6.0 V | - | - | 2.0 | - | 2.0 | μA |
| I _{S(ON)} | ON-state leakage current | V _I = V _{IH} or V _{IL} ; see Figure 10 | | | | | | |
| | | V _{CC} = 3.6 V | - | - | 1.0 | - | 1.0 | μA |
| | | V _{CC} = 6.0 V | - | - | 2.0 | - | 2.0 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A | | | | | | |
| | | V _{CC} = 3.6 V | - | - | 20 | - | 40 | μA |
| | | V _{CC} = 6.0 V | - | - | 40 | - | 80 | μA |
| ΔI _{CC} | additional supply current | per input; V _I = V _{CC} - 0.6 V; V _{CC} = 2.7 V to 3.6 V | - | - | 500 | - | 850 | μA |
| C _I | input capacitance | | - | 3.5 | - | - | - | pF |
| C _{sw} | switch capacitance | independent pins Y _n | - | 5 | - | - | - | pF |
| | | common pin Z | - | 25 | - | - | - | pF |

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

9.1 Test circuits

$V_I = V_{CC}$ or V_{EE} and $V_O = V_{EE}$ or V_{CC} .

Fig 9. Test circuit for measuring OFF-state leakage current

$V_I = V_{CC}$ or V_{EE} and $V_O = \text{open circuit}$.

Fig 10. Test circuit for measuring ON-state leakage current

9.2 ON resistance

Table 7. ON resistance

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see [Figure 11](#) and [Figure 12](#).

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-----------------------|---|---|------------------|--------------------|-----|-------------------|-----|----------|
| | | | Min | Typ ^[1] | Max | Min | Max | |
| $R_{ON(\text{peak})}$ | ON resistance (peak) | $V_I = 0 \text{ V to } V_{CC} - V_{EE}$ | | | | | | |
| | | $V_{CC} = 1.2 \text{ V}; I_{SW} = 100 \mu\text{A}$ [2] | - | - | - | - | - | Ω |
| | | $V_{CC} = 2.0 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 145 | 325 | - | 375 | Ω |
| | | $V_{CC} = 2.7 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 90 | 200 | - | 235 | Ω |
| | | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 80 | 180 | - | 210 | Ω |
| | | $V_{CC} = 4.5 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 60 | 135 | - | 160 | Ω |
| ΔR_{ON} | ON resistance mismatch between channels | $V_I = 0 \text{ V to } V_{CC} - V_{EE}$ | | | | | | |
| | | $V_{CC} = 1.2 \text{ V}; I_{SW} = 100 \mu\text{A}$ [2] | - | - | - | - | - | Ω |
| | | $V_{CC} = 2.0 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 5 | - | - | - | Ω |
| | | $V_{CC} = 2.7 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 4 | - | - | - | Ω |
| | | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 4 | - | - | - | Ω |
| | | $V_{CC} = 4.5 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 3 | - | - | - | Ω |
| | | $V_{CC} = 6.0 \text{ V}; I_{SW} = 1000 \mu\text{A}$ | - | 2 | - | - | - | Ω |

Table 7. ON resistance ...continued

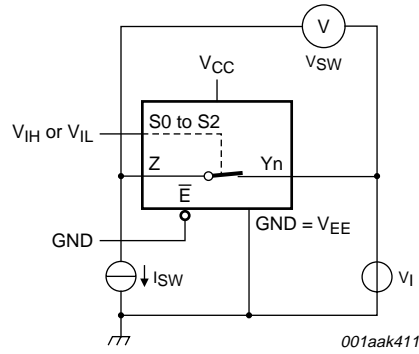
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see [Figure 11](#) and [Figure 12](#).

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-----------------------|----------------------|--|------------------|--------------------|-----|-------------------|-----|------|
| | | | Min | Typ ^[1] | Max | Min | Max | |
| R _{ON(rail)} | ON resistance (rail) | V _I = GND | | | | | | |
| | | V _{CC} = 1.2 V; I _{SW} = 100 μA ^[2] | - | 225 | - | - | - | Ω |
| | | V _{CC} = 2.0 V; I _{SW} = 1000 μA | - | 110 | 235 | - | 270 | Ω |
| | | V _{CC} = 2.7 V; I _{SW} = 1000 μA | - | 70 | 145 | - | 165 | Ω |
| | | V _{CC} = 3.0 V to 3.6 V; I _{SW} = 1000 μA | - | 60 | 130 | - | 150 | Ω |
| | | V _{CC} = 4.5 V; I _{SW} = 1000 μA | - | 45 | 100 | - | 115 | Ω |
| | | V _{CC} = 6.0 V; I _{SW} = 1000 μA | - | 40 | 85 | - | 100 | Ω |
| R _{ON(rail)} | ON resistance (rail) | V _I = V _{CC} - V _{EE} | | | | | | |
| | | V _{CC} = 1.2 V; I _{SW} = 100 μA ^[2] | - | 250 | - | - | - | Ω |
| | | V _{CC} = 2.0 V; I _{SW} = 1000 μA | - | 120 | 320 | - | 370 | Ω |
| | | V _{CC} = 2.7 V; I _{SW} = 1000 μA | - | 75 | 195 | - | 225 | Ω |
| | | V _{CC} = 3.0 V to 3.6 V; I _{SW} = 1000 μA | - | 70 | 175 | - | 205 | Ω |
| | | V _{CC} = 4.5 V; I _{SW} = 1000 μA | - | 50 | 130 | - | 150 | Ω |
| | | V _{CC} = 6.0 V; I _{SW} = 1000 μA | - | 45 | 120 | - | 135 | Ω |

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

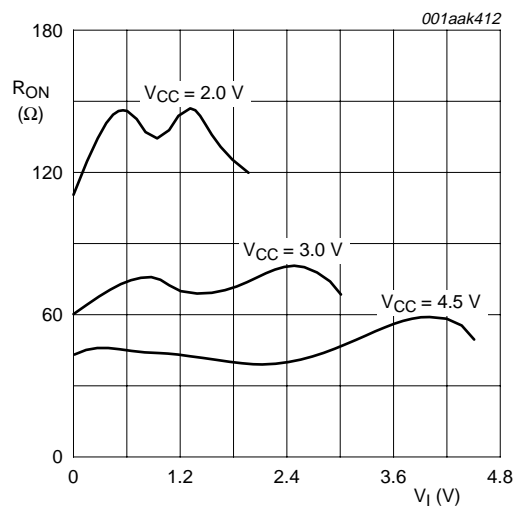
[2] When supply voltages (V_{CC} - V_{EE}) near 1.2 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 1.2 V, it is recommended to use these devices only for transmitting digital signals.

9.3 On resistance waveform and test circuit



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

Fig 11. Test circuit for measuring R_{ON}



$V_i = 0\text{ V to }V_{CC} - V_{EE}$

Fig 12. Typical R_{ON} as a function of input voltage

10. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 15](#).

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit | |
|-------------------------|-------------------|---|------------------|--------------------|-----|-------------------|-----|------|--|
| | | | Min | Typ ^[1] | Max | Min | Max | | |
| t _{pd} | propagation delay | Y _n to Z, Z to Y _n ; see Figure 13 ^[2] | | | | | | | |
| | | V _{CC} = 1.2 V | - | 25 | - | - | - | ns | |
| | | V _{CC} = 2.0 V | - | 9 | 17 | - | 20 | ns | |
| | | V _{CC} = 2.7 V | - | 6 | 13 | - | 15 | ns | |
| | | V _{CC} = 3.0 V to 3.6 V ^[3] | - | 5 | 10 | - | 12 | ns | |
| | | V _{CC} = 4.5 V | - | 4 | 9 | - | 10 | ns | |
| | | V _{CC} = 6.0 V | - | 3 | 8 | - | 8 | ns | |
| t _{en} | enable time | \bar{E} to Y _n , Z; see Figure 14 ^[2] | | | | | | | |
| | | V _{CC} = 1.2 V | - | 145 | - | - | - | ns | |
| | | V _{CC} = 2.0 V | - | 49 | 94 | - | 112 | ns | |
| | | V _{CC} = 2.7 V | - | 36 | 69 | - | 83 | ns | |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF ^[3] | - | 23 | - | - | - | ns | |
| | | V _{CC} = 3.0 V to 3.6 V ^[3] | - | 28 | 55 | - | 66 | ns | |
| | | V _{CC} = 4.5 V | - | 25 | 47 | - | 56 | ns | |
| | | V _{CC} = 6.0 V | - | 19 | 38 | - | 43 | ns | |
| | | Sn to Y _n ; see Figure 14 ^[2] | | | | | | | |
| | | V _{CC} = 1.2 V | - | 140 | - | - | - | ns | |
| | | V _{CC} = 2.0 V | - | 48 | 90 | - | 107 | ns | |
| | | V _{CC} = 2.7 V | - | 35 | 66 | - | 79 | ns | |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF ^[3] | - | 22 | - | - | - | ns | |
| | | V _{CC} = 3.0 V to 3.6 V ^[3] | - | 27 | 53 | - | 63 | ns | |
| | | V _{CC} = 4.5 V | - | 24 | 45 | - | 54 | ns | |
| V _{CC} = 6.0 V | - | 18 | 34 | - | 41 | ns | | | |

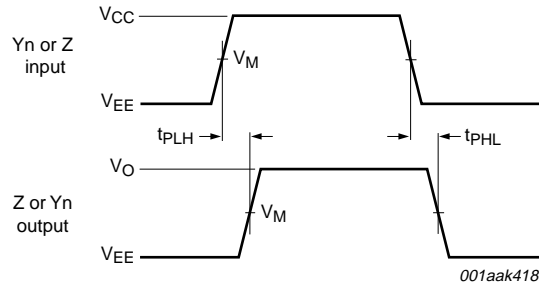
Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 15](#).

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-------------------------|-------------------------------|--|------------------|--------------------|-----|-------------------|-----|------|
| | | | Min | Typ ^[1] | Max | Min | Max | |
| t _{dis} | disable time | \bar{E} to Y _n , Z; see Figure 14 ^[2] | | | | | | |
| | | V _{CC} = 1.2 V | - | 145 | - | - | - | ns |
| | | V _{CC} = 2.0 V | - | 51 | 93 | - | 110 | ns |
| | | V _{CC} = 2.7 V | - | 38 | 69 | - | 82 | ns |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF ^[3] | - | 25 | - | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V ^[3] | - | 30 | 56 | - | 66 | ns |
| | | V _{CC} = 4.5 V | - | 29 | 48 | - | 56 | ns |
| | | V _{CC} = 6.0 V | - | 21 | 37 | - | 44 | ns |
| | | Sn to Y _n ; see Figure 14 ^[2] | | | | | | |
| | | V _{CC} = 1.2 V | - | 115 | - | - | - | ns |
| | | V _{CC} = 2.0 V | - | 41 | 73 | - | 90 | ns |
| | | V _{CC} = 2.7 V | - | 31 | 54 | - | 67 | ns |
| | | V _{CC} = 3.0 V to 3.6 V; C _L = 15 pF ^[3] | - | 20 | - | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V ^[3] | - | 24 | 44 | - | 54 | ns |
| V _{CC} = 4.5 V | - | 22 | 37 | - | 46 | ns | | |
| V _{CC} = 6.0 V | - | 17 | 29 | - | 36 | ns | | |
| C _{PD} | power dissipation capacitance | C _L = 50 pF; f _i = 1 MHz; V _I = GND to V _{CC} ^[4] | - | 25 | - | - | - | pF |

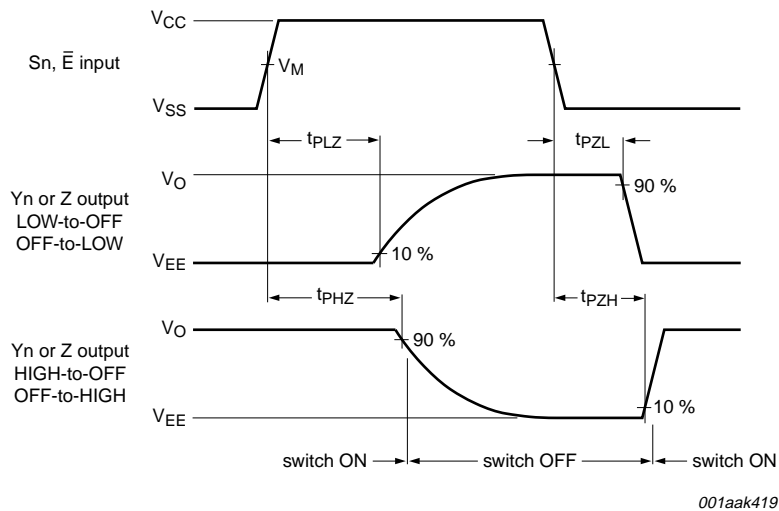
- [1] All typical values are measured at T_{amb} = 25 °C.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL}.
t_{en} is the same as t_{PZL} and t_{PZH}.
t_{dis} is the same as t_{PLZ} and t_{PHZ}.
- [3] Typical values are measured at nominal supply voltage (V_{CC} = 3.3 V).
- [4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
P_D = C_{PD} × V_{CC}² × f_i × N + Σ((C_L + C_{SW}) × V_{CC}² × f_o) where:
f_i = input frequency in MHz, f_o = output frequency in MHz
C_L = output load capacitance in pF
C_{SW} = maximum switch capacitance in pF;
V_{CC} = supply voltage in Volts
N = number of inputs switching
Σ(C_L × V_{CC}² × f_o) = sum of the outputs.

10.1 Waveforms



Measurement points are given in [Table 9](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 13. Propagation delay input (An) to output (Yn)

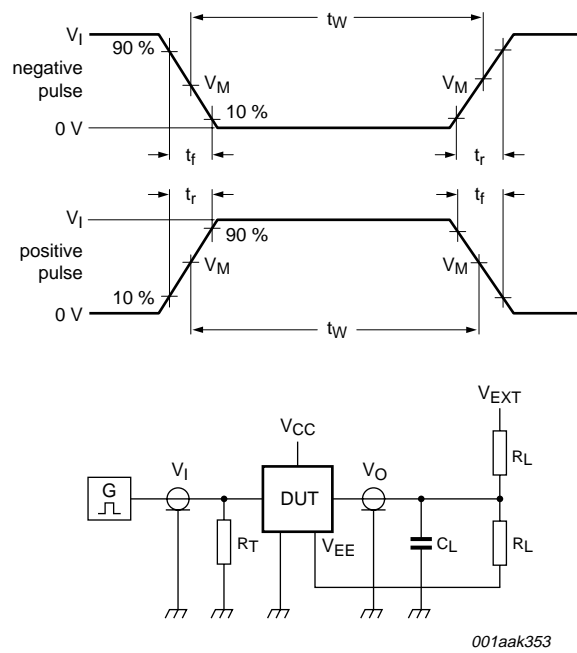


Measurement points are given in [Table 9](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 14. Enable and disable times

Table 9. Measurement points

| Supply voltage | Input | Output | | |
|----------------|-------------|-------------|----------------------|----------------------|
| V_{CC} | V_M | V_M | V_X | V_Y |
| < 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.1V_{CC}$ | $V_{OH} - 0.1V_{CC}$ |
| 2.7 V to 3.6 V | 1.5 V | 1.5 V | $V_{OL} + 0.3 V$ | $V_{OH} - 0.3 V$ |
| > 3.6 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.1V_{CC}$ | $V_{OH} - 0.1V_{CC}$ |



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Test data is given in [Table 10](#).

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

V_{EXT} = External voltage for measuring switching times.

Fig 15. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage | Input | | Load | | V_{EXT} | | |
|----------------|----------|-------------|--------------|--------------|--------------------|--------------------|--------------------|
| V_{CC} | V_I | t_r, t_f | C_L | R_L | t_{PHL}, t_{PLH} | t_{PZH}, t_{PHZ} | t_{PZL}, t_{PLZ} |
| < 2.7 V | V_{CC} | ≤ 6 ns | 50 pF | 1 k Ω | open | V_{EE} | $2V_{CC}$ |
| 2.7 V to 3.6 V | 2.7 V | ≤ 6 ns | 15 pF, 50 pF | 1 k Ω | open | V_{EE} | $2V_{CC}$ |
| > 3.6 V | V_{CC} | ≤ 6 ns | 50 pF | 1 k Ω | open | V_{EE} | $2V_{CC}$ |

10.2 Additional dynamic parameters

Table 11. Additional dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); $V_I = \text{GND}$ or V_{CC} (unless otherwise specified); $t_r = t_f \leq 6.0 \text{ ns}$; $T_{amb} = 25^\circ\text{C}$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---------------------------|---|-----|------|-----|------|
| THD | total harmonic distortion | $f_i = 1 \text{ kHz}$; $C_L = 50 \text{ pF}$; $R_L = 10 \text{ k}\Omega$; see Figure 20 | | | | |
| | | $V_{CC} = 3.0 \text{ V}$; $V_I = 2.75 \text{ V}$ (p-p) | - | 0.8 | - | % |
| | | $V_{CC} = 6.0 \text{ V}$; $V_I = 5.5 \text{ V}$ (p-p) | - | 0.4 | - | % |
| | | $f_i = 10 \text{ kHz}$; $C_L = 50 \text{ pF}$; $R_L = 10 \text{ k}\Omega$; see Figure 20 | | | | |
| | | $V_{CC} = 3.0 \text{ V}$; $V_I = 2.75 \text{ V}$ (p-p) | - | 2.4 | - | % |
| | | $V_{CC} = 6.0 \text{ V}$; $V_I = 5.5 \text{ V}$ (p-p) | - | 1.2 | - | % |
| $f_{(-3\text{dB})}$ | -3 dB frequency response | $C_L = 50 \text{ pF}$; $R_L = 50 \Omega$; see Figure 16 | [1] | | | |
| | | $V_{CC} = 3.0 \text{ V}$ | - | 180 | - | MHz |
| | | $V_{CC} = 6.0 \text{ V}$ | - | 200 | - | MHz |
| α_{iso} | isolation (OFF-state) | $f_i = 1 \text{ MHz}$; $C_L = 50 \text{ pF}$; $R_L = 600 \Omega$; see Figure 18 | [2] | | | |
| | | $V_{CC} = 3.0 \text{ V}$ | - | -50 | - | dB |
| | | $V_{CC} = 6.0 \text{ V}$ | - | -50 | - | dB |
| V_{ct} | crosstalk voltage | between digital inputs and switch; | [2] | | | |
| | | $f_i = 1 \text{ MHz}$; $C_L = 50 \text{ pF}$; $R_L = 600 \Omega$; see Figure 21 | | | | |
| | | $V_{CC} = 3.0 \text{ V}$ | - | 0.11 | - | V |
| | | $V_{CC} = 6.0 \text{ V}$ | - | 0.12 | - | V |
| Xtalk | crosstalk | between switches; $f_i = 1 \text{ MHz}$; $C_L = 50 \text{ pF}$; | | | | |
| | | $R_L = 600 \Omega$; see Figure 22 | | | | |
| | | $V_{CC} = 3.0 \text{ V}$ | - | -60 | - | dB |
| | | $V_{CC} = 6.0 \text{ V}$ | - | -60 | - | dB |

[1] Adjust f_i voltage to obtain 0 dBm level at output for 1 MHz (0 dBm = 1 mW into 50 Ω).

[2] Adjust f_i voltage to obtain 0 dBm level at output for 1 MHz (0 dBm = 1 mW into 600 Ω).

10.2.1 Test circuits

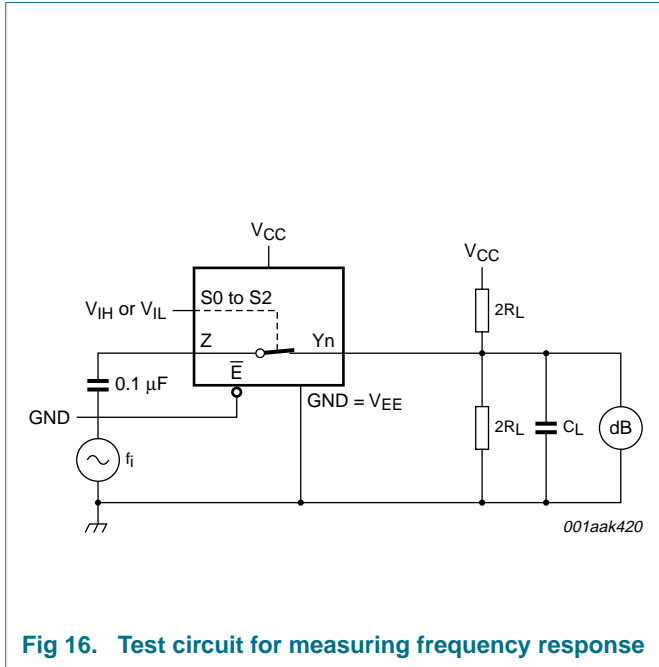


Fig 16. Test circuit for measuring frequency response

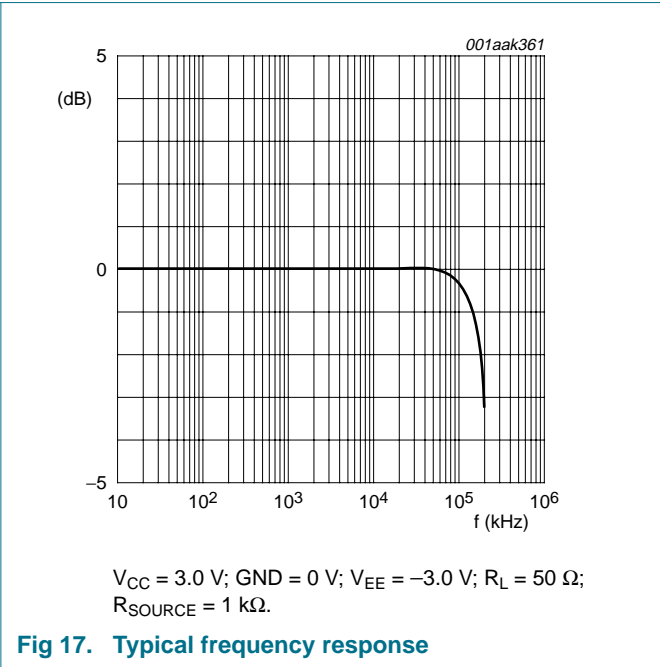


Fig 17. Typical frequency response

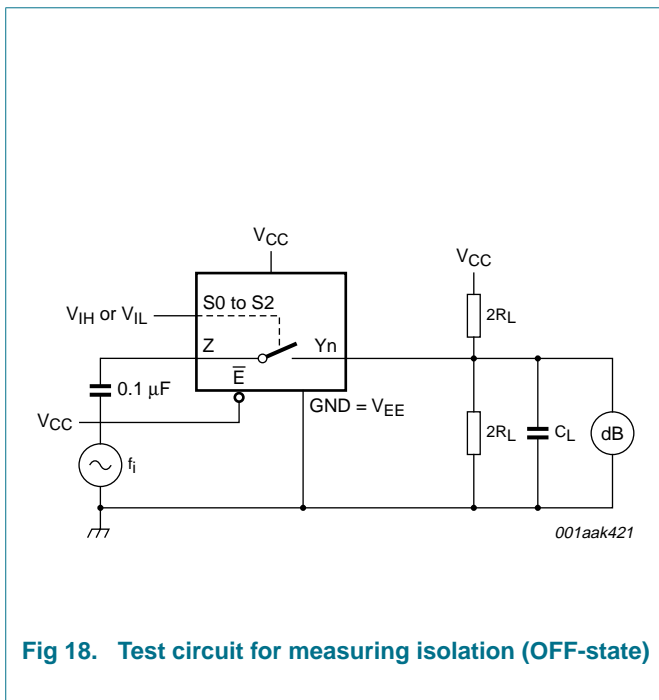


Fig 18. Test circuit for measuring isolation (OFF-state)

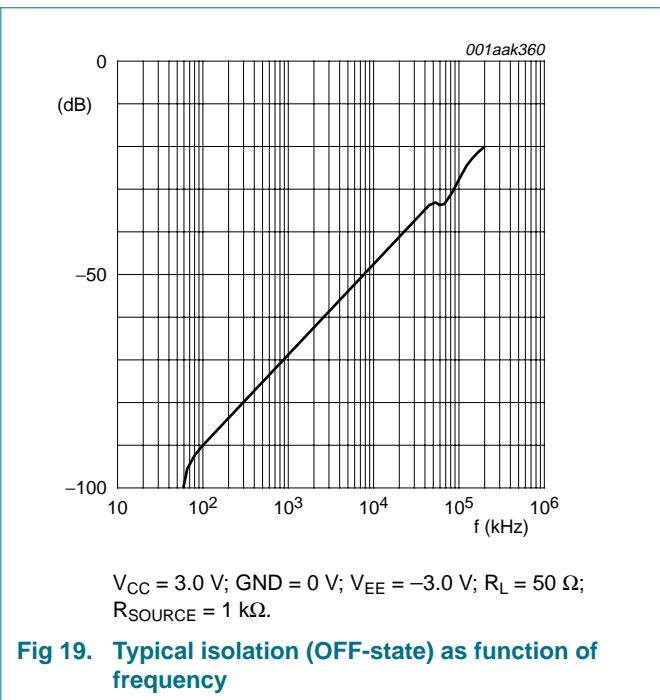


Fig 19. Typical isolation (OFF-state) as function of frequency

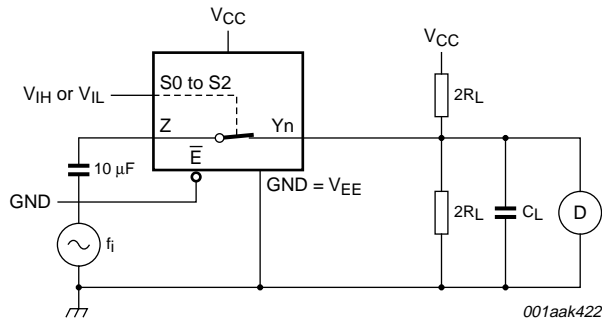
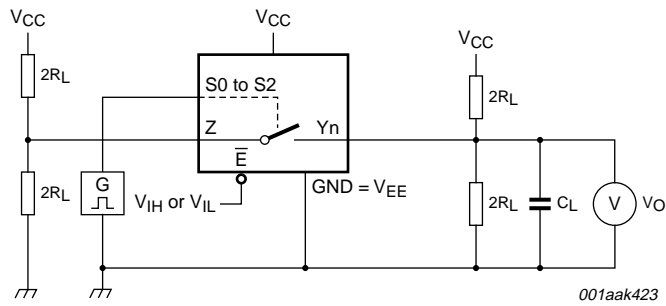
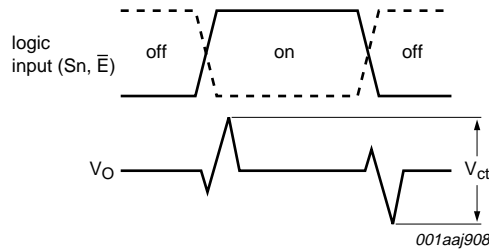


Fig 20. Test circuit for measuring total harmonic distortion



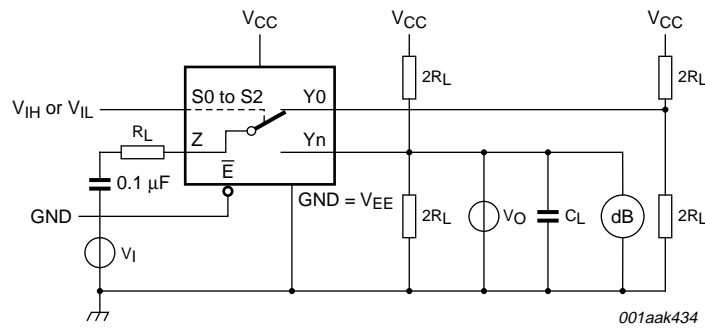
a. Test circuit



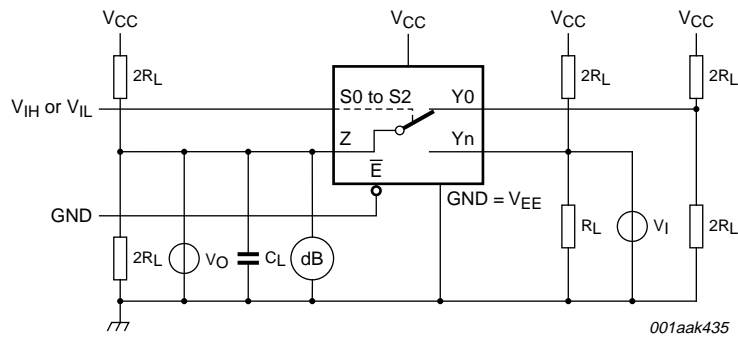
b. Input and output pulse definitions

V_I may be connected to S_n or \bar{E} .

Fig 21. Test circuit for measuring crosstalk voltage between digital inputs and switch



a. Switch closed condition



b. Switch open condition

Fig 22. Test circuit for measuring crosstalk between switches

11. Package outline

DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4

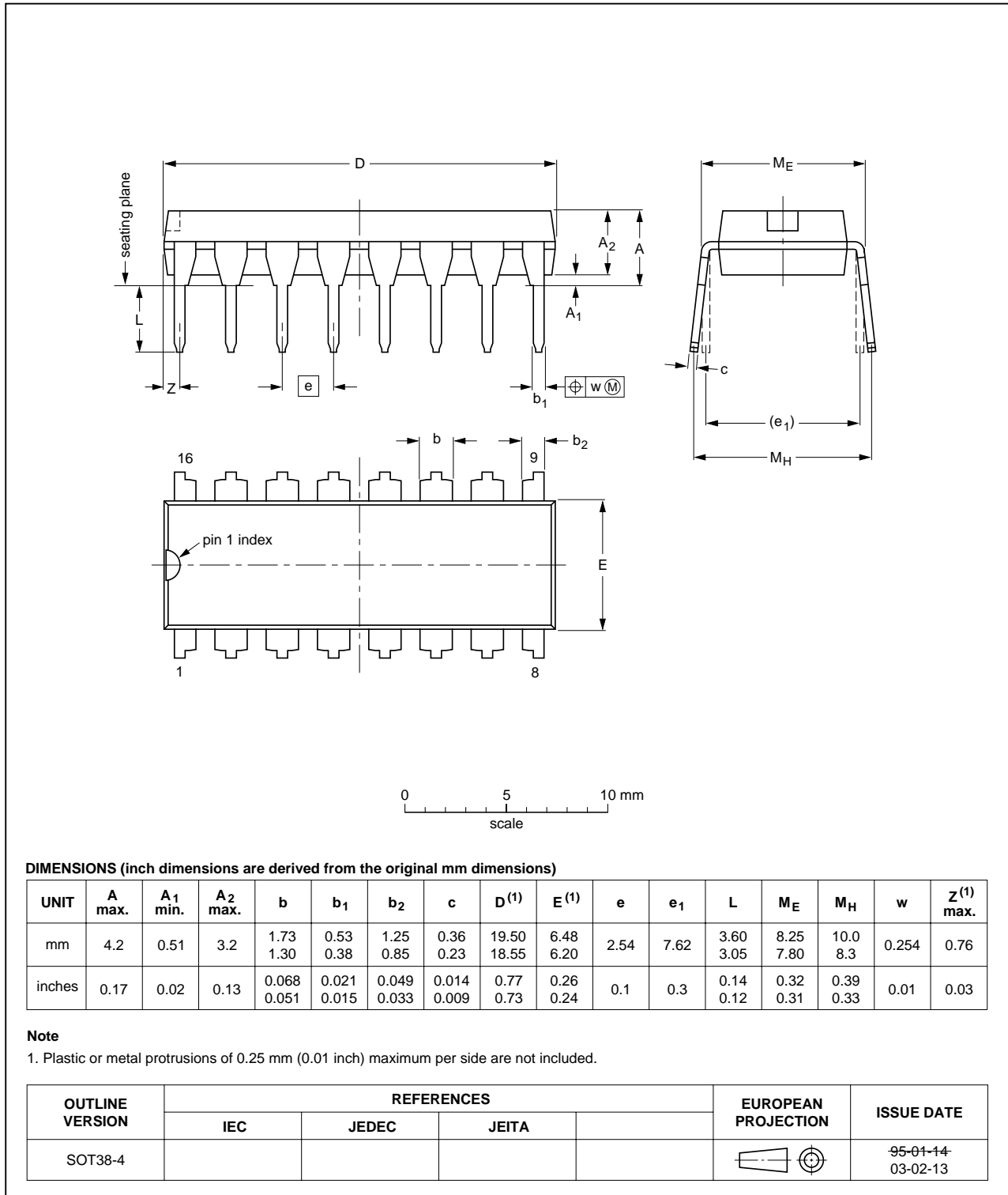


Fig 23. Package outline SOT38-4 (DIP16)

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

SOT109-1

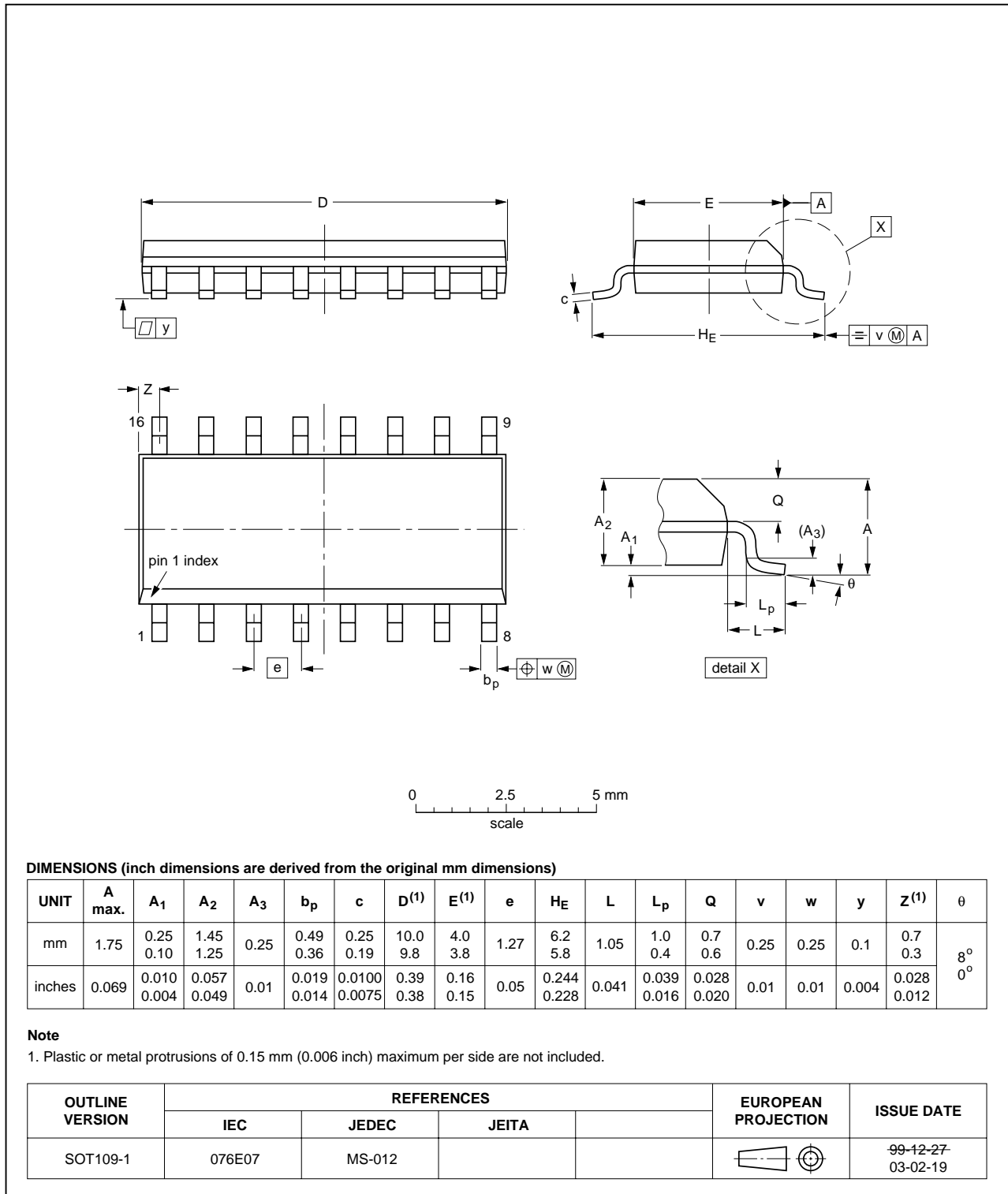


Fig 24. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

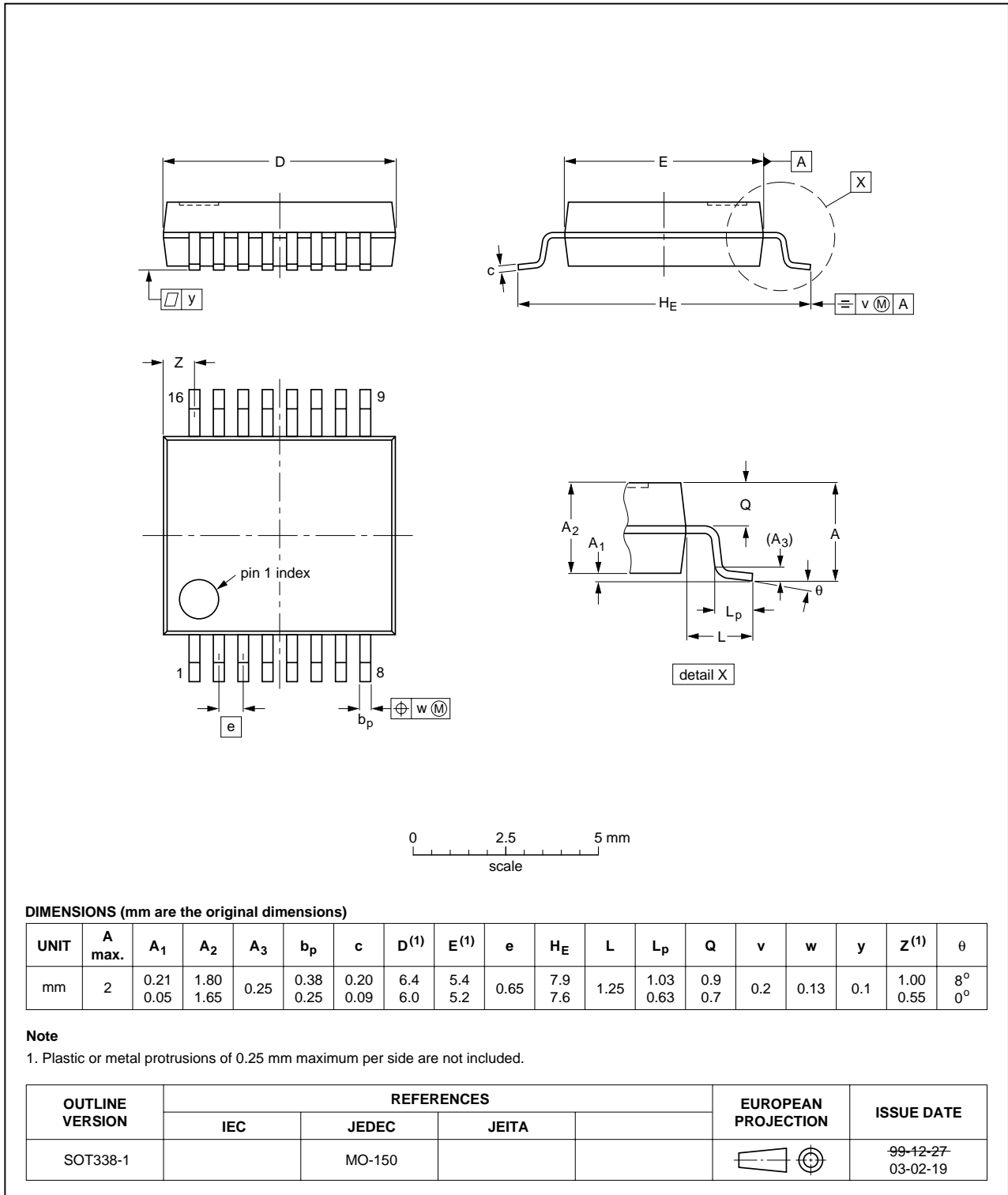


Fig 25. Package outline SOT338-1 (SSOP16)

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

SOT403-1

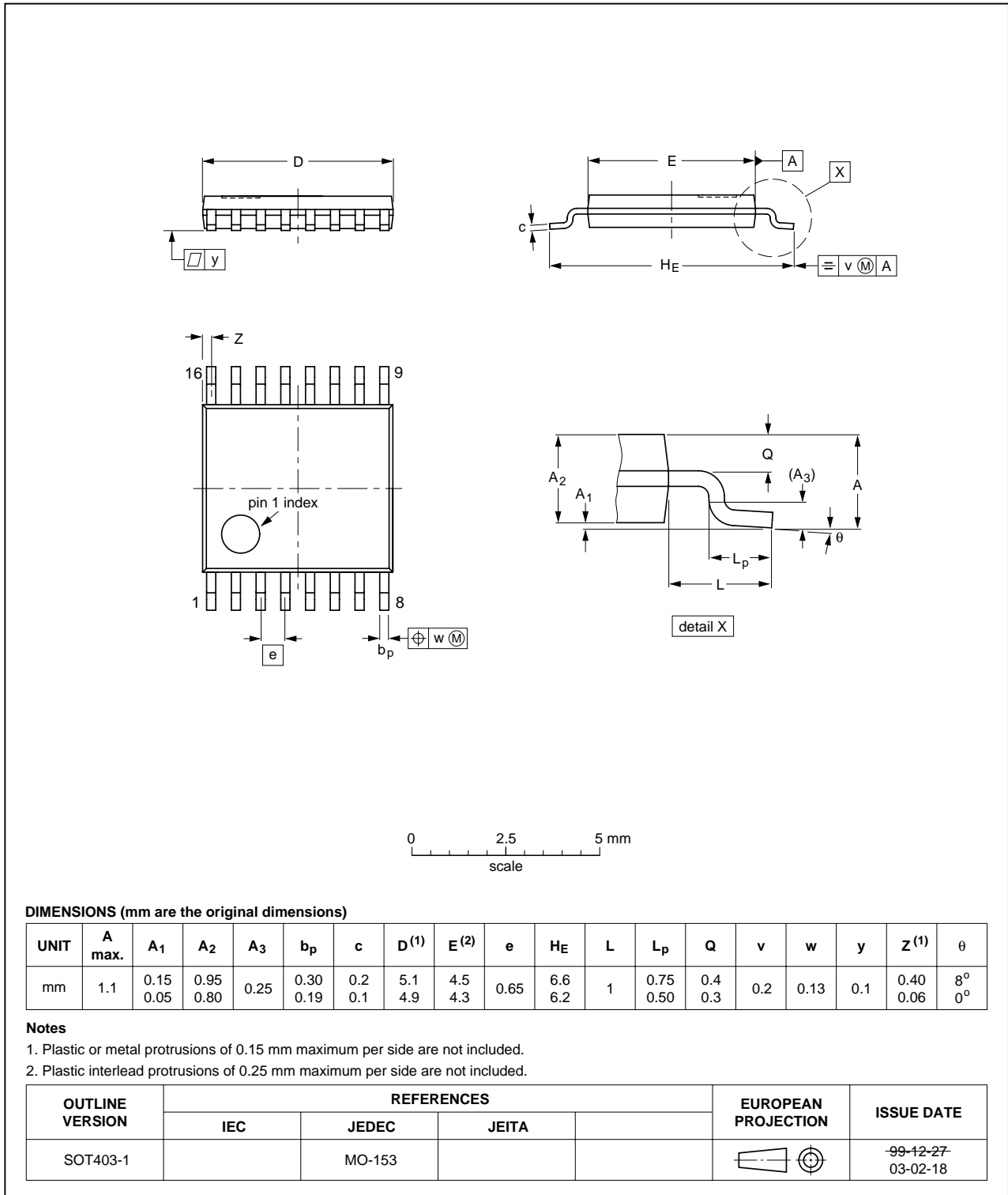


Fig 26. Package outline SOT403-1 (TSSOP16)

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm

SOT763-1

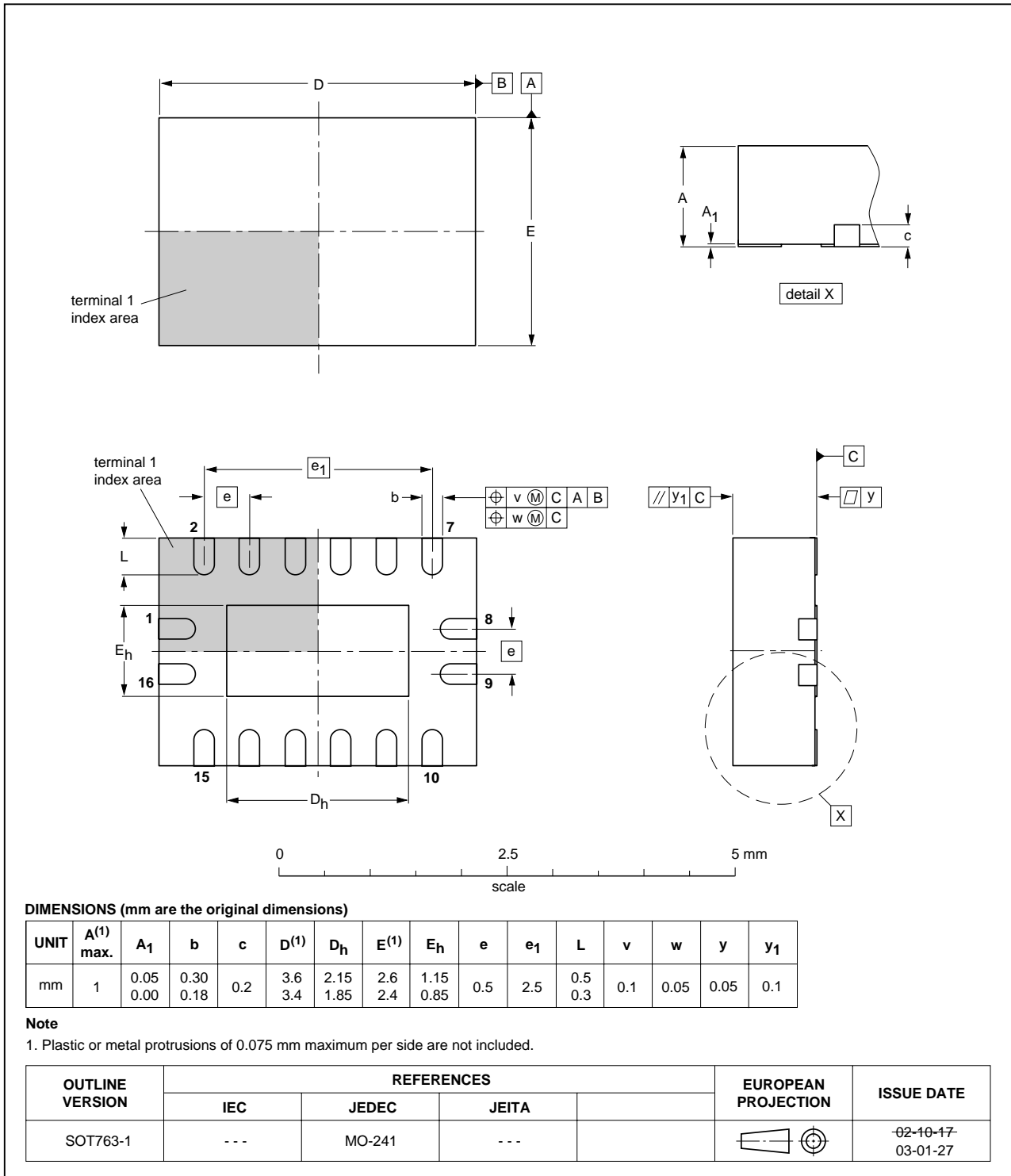


Fig 27. Package outline SOT763-1 (DHVQFN16)

12. Abbreviations

Table 12. Abbreviations

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

13. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--------------|-----------------------|---------------|--|
| 74LV4051_4 | 20090810 | Product data sheet | - | 74LV4051_3 |
| Modifications: | | | | |
| | | | | <ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.• Legal texts have been adapted to the new company name where appropriate.• Added type number 74LV4051BQ (DHVQFN16 package) |
| 74LV4051_3 | 19960623 | Product specification | - | 74LV4051_2 |
| 74LV4051_2 | 19970715 | Product specification | - | 74LV4051_1 |

14. Legal information

14.1 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.nxp.com>.

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