

# 74LV4053

## Triple single-pole double-throw analog switch

Rev. 04 — 10 August 2009

Product data sheet

### 1. General description

The 74LV4053 is a triple single-pole double-throw (SPDT) analog switch, suitable for use as an analog or digital multiplexer/demultiplexer. It is a low-voltage Si-gate CMOS device and is pin and function compatible with the 74HC4053 and 74HCT4053. Each switch has a digital select input ( $S_n$ ), two independent inputs/outputs ( $nY_0$  and  $nY_1$ ) and a common input/output ( $nZ$ ). All three switches share an enable input ( $\bar{E}$ ). A HIGH on  $\bar{E}$  causes all switches into the high-impedance OFF-state, independent of  $S_n$ .

$V_{CC}$  and GND are the supply voltage connections for the digital control inputs ( $S_n$  and  $\bar{E}$ ). The  $V_{CC}$  to GND range is 1 V to 6 V. The analog inputs/outputs ( $nY_0$ ,  $nY_1$  and  $nZ$ ) can swing between  $V_{CC}$  as a positive limit and  $V_{EE}$  as a negative limit.  $V_{CC} - V_{EE}$  may not exceed 6 V. For operation as a digital multiplexer/demultiplexer,  $V_{EE}$  is connected to GND (typically ground).  $V_{EE}$  and  $V_{SS}$  are the supply voltage connections for the switches.

### 2. Features

- Optimized for low-voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between  $V_{CC} = 2.7$  V and  $V_{CC} = 3.6$  V
- Low ON resistance:
  - ◆ 180  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 2.0$  V
  - ◆ 100  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 3.0$  V
  - ◆ 75  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 4.5$  V
- Logic level translation:
  - ◆ To enable 3 V logic to communicate with  $\pm 3$  V analog signals
- Typical 'break before make' built in
- ESD protection:
  - ◆ HBM JESD22-A114-C 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			
	Temperature range	Name	Description	Version
74LV4053N	-40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil)	SOT38-4
74LV4053D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74LV4053DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74LV4053PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74LV4053BQ	-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

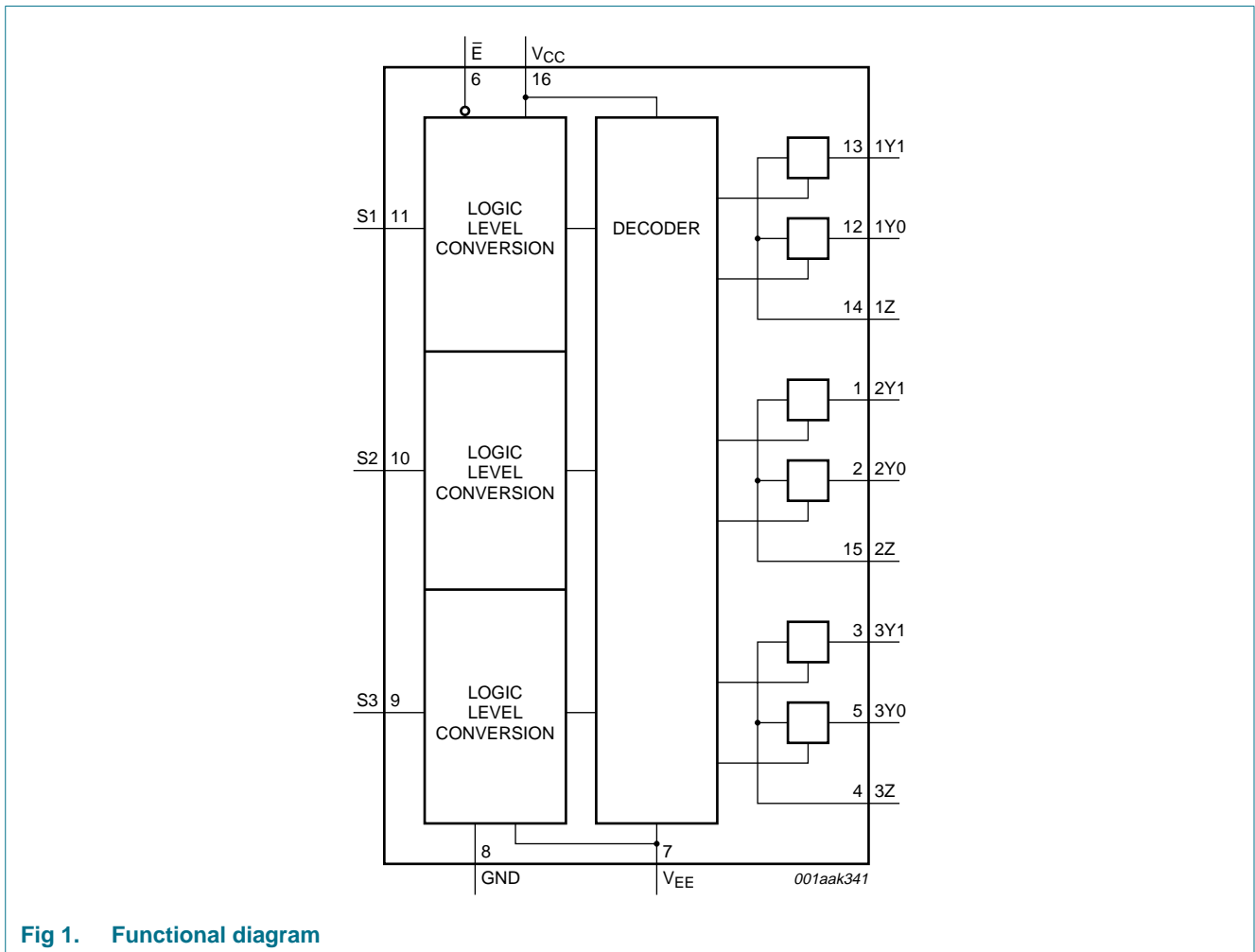


Fig 1. Functional diagram

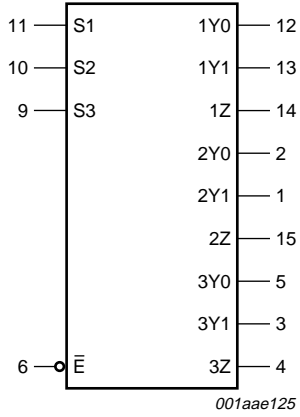


Fig 2. Logic symbol

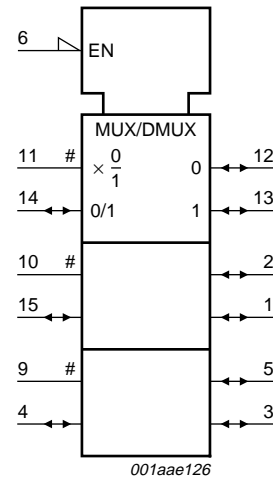


Fig 3. IEC logic symbol

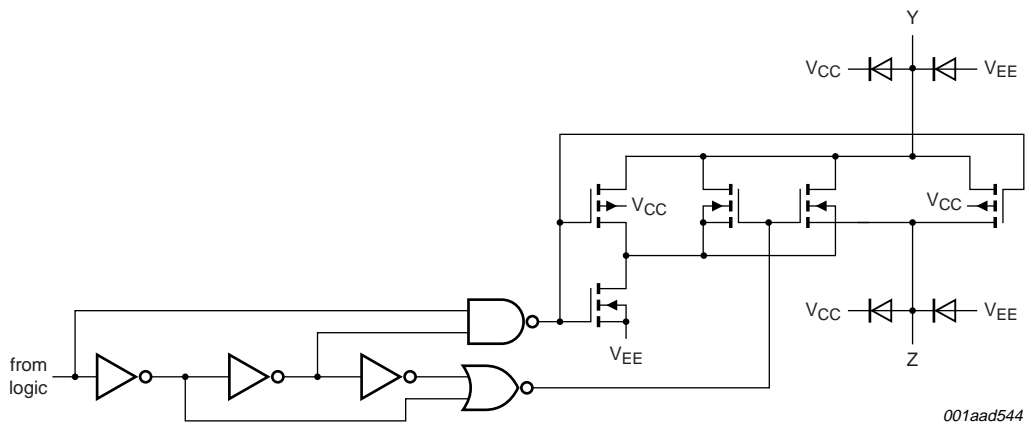
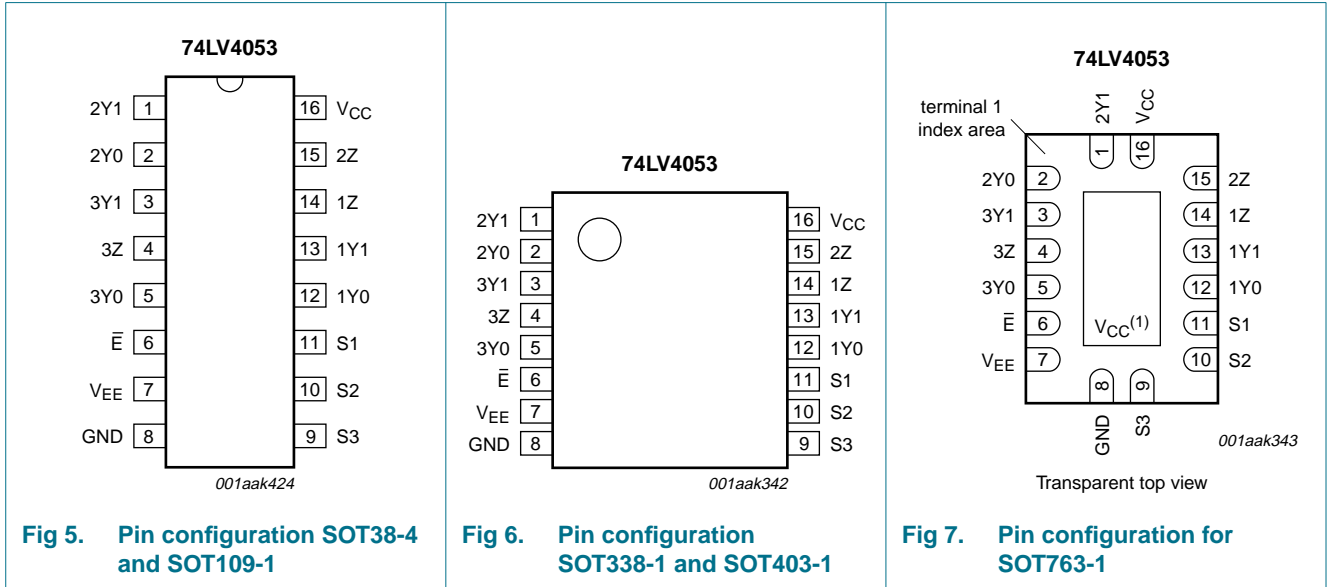


Fig 4. Schematic diagram (one switch)

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
S1, S2, S3	11, 10, 9	select input
1Y0, 2Y0, 3Y0	12, 2, 5	independent input or output
1Y1, 2Y1, 3Y1	13, 1, 3	independent input or output
1Z, 2Z, 3Z	14, 15, 4	common output or input
$V_{CC}$	16	supply voltage

## 6. Functional description

Table 3. Function table [1]

Inputs		Channel on
$\bar{E}$	Sn	
L	L	nY0 to nZ
L	H	nY1 to nZ
H	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  $V_{SS} = 0\text{ V}$  (ground).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		[1] -0.5	+7.0	V
$I_{IK}$	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	[2] -	$\pm 20$	mA
$I_{SK}$	switch clamping current	$V_{SW} < -0.5\text{ V}$ or $V_{SW} > V_{CC} + 0.5\text{ V}$	[2] -	$\pm 20$	mA
$I_{SW}$	switch current	$V_{SW} > -0.5\text{ V}$ or $V_{SW} < V_{CC} + 0.5\text{ V}$ ; source or sink current	[2] -	$\pm 25$	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$	[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 nZ, when switch current flows into terminals nYn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal nZ, no  $V_{CC}$  current will flow out of terminals nYn, and in this case there is no limit for the voltage drop across the switch, but the voltages at nYn and nZ may not exceed  $V_{CC}$  or  $V_{EE}$ .

[2] The minimum input voltage rating may be exceeded if the input current rating is observed.

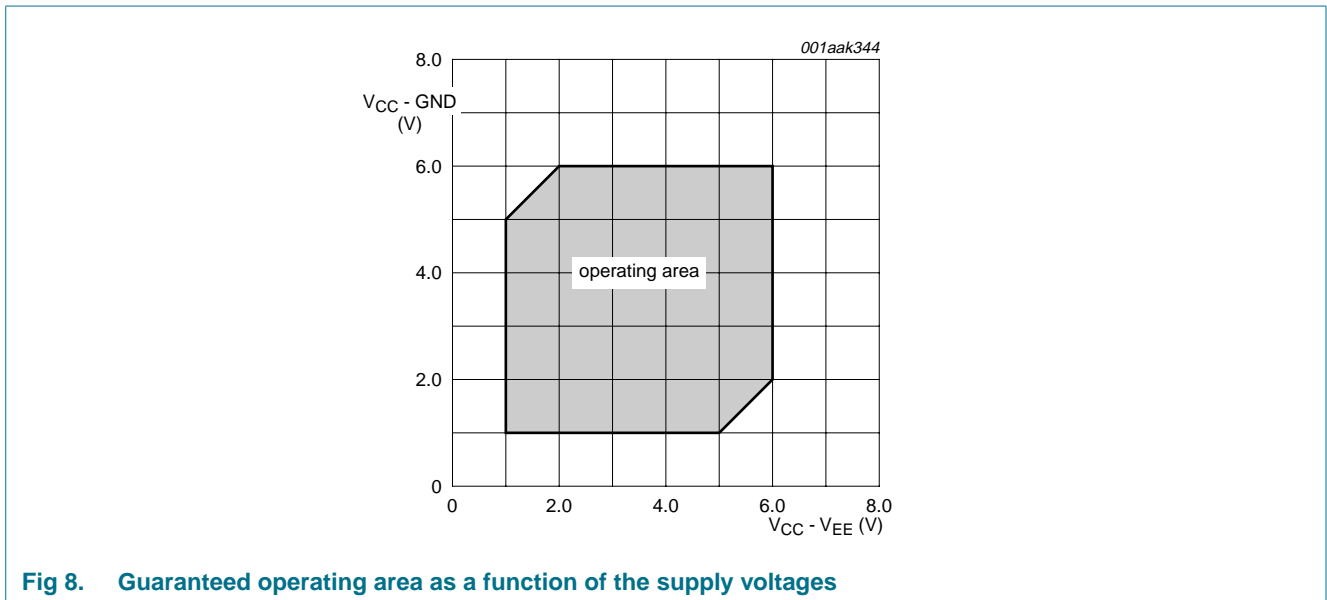
[3] For DIP16 packages: above 70 °C the value of  $P_{tot}$  derates linearly with 12 mW/K.  
 For SO16 packages: above 70 °C the value of  $P_{tot}$  derates linearly with 8 mW/K.  
 For SSOP16 and TSSOP16 packages: above 60 °C the value of  $P_{tot}$  derates linearly with 5.5 mW/K.  
 For DHVQFN16 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**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage	see <a href="#">Figure 8</a>	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

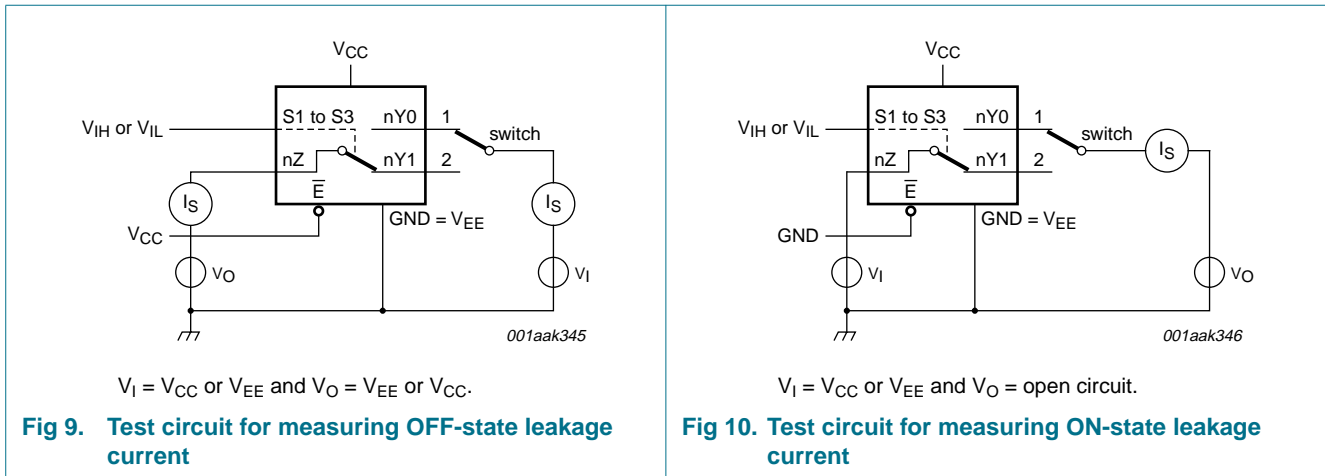
**Table 6. Static characteristics**

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 <sup>[1]</sup>	Max	Min	Max	
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.2 V	0.9	-	-	0.9	-	V
		V <sub>CC</sub> = 2.0 V	1.4	-	-	1.4	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
		V <sub>CC</sub> = 4.5 V	3.15	-	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.20	-	-	4.20	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.2 V	-	-	0.3	-	0.3	V
		V <sub>CC</sub> = 2.0 V	-	-	0.6	-	0.6	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
		V <sub>CC</sub> = 4.5 V	-	-	1.35	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	-	1.80	-	1.80	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND						
		V <sub>CC</sub> = 3.6 V	-	-	1.0	-	1.0	μA
		V <sub>CC</sub> = 6.0 V	-	-	2.0	-	2.0	μA
I <sub>S(OFF)</sub>	OFF-state leakage current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; see <a href="#">Figure 9</a>						
		V <sub>CC</sub> = 3.6 V	-	-	1.0	-	1.0	μA
		V <sub>CC</sub> = 6.0 V	-	-	2.0	-	2.0	μA
I <sub>S(ON)</sub>	ON-state leakage current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; see <a href="#">Figure 10</a>						
		V <sub>CC</sub> = 3.6 V	-	-	1.0	-	1.0	μA
		V <sub>CC</sub> = 6.0 V	-	-	2.0	-	2.0	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A						
		V <sub>CC</sub> = 3.6 V	-	-	20	-	40	μA
		V <sub>CC</sub> = 6.0 V	-	-	40	-	80	μA
ΔI <sub>CC</sub>	additional supply current	per input; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	500	-	850	μA
C <sub>I</sub>	input capacitance		-	3.5	-	-	-	pF
C <sub>SW</sub>	switch capacitance	independent pins nYn	-	5	-	-	-	pF
		common pins nZ	-	8	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C.

9.1 Test circuits



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 <sup>[1]</sup>	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]	-	-	-	-	-	$\Omega$
		$V_{CC} = 2.0 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	180	365	-	435	$\Omega$
		$V_{CC} = 2.7 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	115	225	-	270	$\Omega$
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	100	200	-	245	$\Omega$
		$V_{CC} = 4.5 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	75	150	-	180	$\Omega$
$\Delta R_{ON}$	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]	-	-	-	-	-	$\Omega$
		$V_{CC} = 2.0 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	5	-	-	-	$\Omega$
		$V_{CC} = 2.7 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	4	-	-	-	$\Omega$
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	4	-	-	-	$\Omega$
		$V_{CC} = 4.5 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	3	-	-	-	$\Omega$
		$V_{CC} = 6.0 \text{ V}; I_{SW} = 1000 \mu\text{A}$	-	2	-	-	-	$\Omega$



**Table 7. ON resistance ...continued**

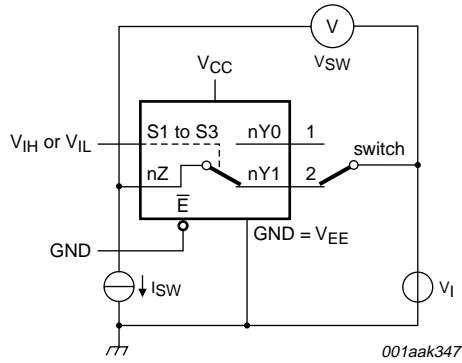
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see [Figure 11](#) and [Figure 12](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
R <sub>ON(rail)</sub>	ON resistance (rail)	V <sub>I</sub> = GND						
		V <sub>CC</sub> = 1.2 V; I <sub>SW</sub> = 100 μA <sup>[2]</sup>	-	250	-	-	-	Ω
		V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 1000 μA	-	120	280	-	325	Ω
		V <sub>CC</sub> = 2.7 V; I <sub>SW</sub> = 1000 μA	-	75	170	-	195	Ω
		V <sub>CC</sub> = 3.0 V to 3.6 V; I <sub>SW</sub> = 1000 μA	-	70	155	-	180	Ω
		V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 μA	-	50	120	-	135	Ω
		V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 μA	-	45	105	-	120	Ω
R <sub>ON(rail)</sub>	ON resistance (rail)	V <sub>I</sub> = V <sub>CC</sub> - V <sub>EE</sub>						
		V <sub>CC</sub> = 1.2 V; I <sub>SW</sub> = 100 μA <sup>[2]</sup>	-	350	-	-	-	Ω
		V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 1000 μA	-	170	340	-	400	Ω
		V <sub>CC</sub> = 2.7 V; I <sub>SW</sub> = 1000 μA	-	105	210	-	250	Ω
		V <sub>CC</sub> = 3.0 V to 3.6 V; I <sub>SW</sub> = 1000 μA	-	95	190	-	225	Ω
		V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 μA	-	70	140	-	165	Ω
		V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 μA	-	65	125	-	150	Ω

[1] Typical values are measured at T<sub>amb</sub> = 25 °C.

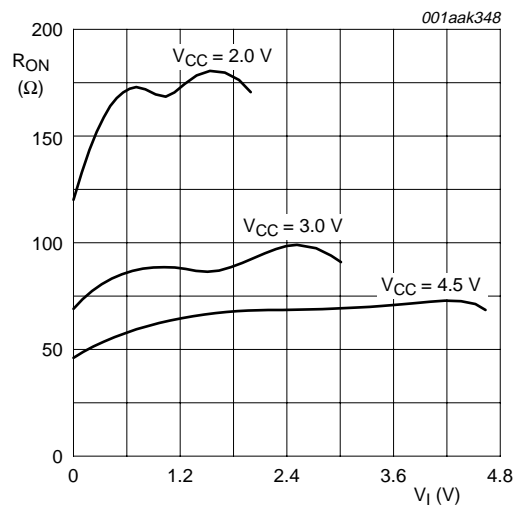
[2] When supply voltages (V<sub>CC</sub> - V<sub>EE</sub>) near 1.2 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 1.2 V, it is recommended to use these devices only for transmitting digital signals.

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 <sup>[1]</sup>	Max	Min	Max		
t <sub>pd</sub>	propagation delay	nYn, nZ to nZ, nYn; see <a href="#">Figure 13</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 1.2 V	-	25	-	-	-	ns	
		V <sub>CC</sub> = 2.0 V	-	9	17	-	20	ns	
		V <sub>CC</sub> = 2.7 V	-	6	13	-	15	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>	-	5	10	-	12	ns	
		V <sub>CC</sub> = 4.5 V	-	4	9	-	10	ns	
		V <sub>CC</sub> = 6.0 V	-	3	7	-	8	ns	
t <sub>en</sub>	enable time	$\bar{E}$ to nYn, nZ; see <a href="#">Figure 14</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 1.2 V	-	100	-	-	-	ns	
		V <sub>CC</sub> = 2.0 V	-	34	65	-	77	ns	
		V <sub>CC</sub> = 2.7 V	-	25	48	-	56	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF <sup>[3]</sup>	-	16	-	-	-	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>	-	19	38	-	45	ns	
		V <sub>CC</sub> = 4.5 V	-	17	32	-	38	ns	
		V <sub>CC</sub> = 6.0 V	-	13	25	-	29	ns	
		Sn to nYn, nZ; see <a href="#">Figure 14</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 1.2 V	-	125	-	-	-	ns	
		V <sub>CC</sub> = 2.0 V	-	43	82	-	97	ns	
		V <sub>CC</sub> = 2.7 V	-	31	60	-	71	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF <sup>[3]</sup>	-	20	-	-	-	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>	-	24	48	-	57	ns	
		V <sub>CC</sub> = 4.5 V	-	21	41	-	48	ns	
V <sub>CC</sub> = 6.0 V	-	16	31	-	37	ns			

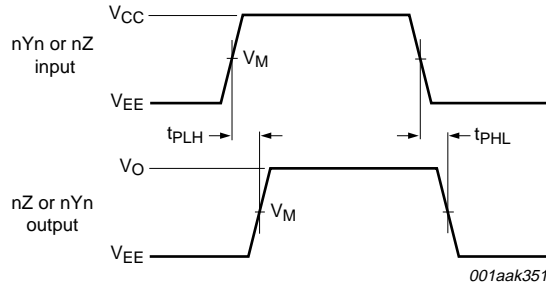
**Table 8. Dynamic characteristics ...continued**

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 <sup>[1]</sup>	Max	Min	Max		
t <sub>dis</sub>	disable time	$\bar{E}$ to nYn, nZ; see <a href="#">Figure 14</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 1.2 V	-	95	-	-	-	ns	
		V <sub>CC</sub> = 2.0 V	-	34	61	-	73	ns	
		V <sub>CC</sub> = 2.7 V	-	26	46	-	54	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF <sup>[3]</sup>	-	17	-	-	-	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>	-	20	37	-	44	ns	
		V <sub>CC</sub> = 4.5 V	-	18	32	-	38	ns	
		V <sub>CC</sub> = 6.0 V	-	15	25	-	30	ns	
		Sn to nYn, nZ; see <a href="#">Figure 14</a> <sup>[2]</sup>							
		V <sub>CC</sub> = 1.2 V	-	90	-	-	-	ns	
		V <sub>CC</sub> = 2.0 V	-	32	59	-	70	ns	
		V <sub>CC</sub> = 2.7 V	-	24	44	-	52	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF <sup>[3]</sup>	-	16	-	-	-	ns	
		V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[3]</sup>	-	19	36	-	42	ns	
V <sub>CC</sub> = 4.5 V	-	17	31	-	36	ns			
V <sub>CC</sub> = 6.0 V	-	14	24	-	28	ns			
C <sub>PD</sub>	power dissipation capacitance	C <sub>L</sub> = 50 pF; f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[4]</sup>	-	36	-	-	-	pF	

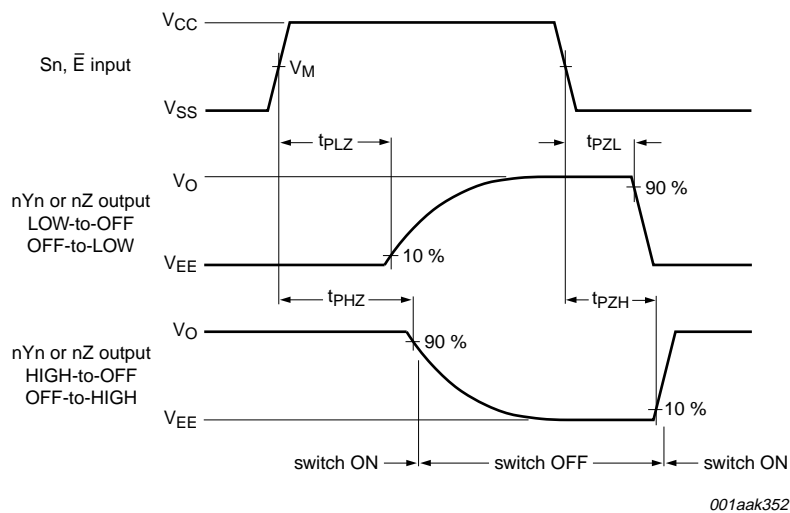
- [1] All typical values are measured at T<sub>amb</sub> = 25 °C.
- [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.  
t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.
- [3] Typical values are measured at nominal supply voltage (V<sub>CC</sub> = 3.3 V).
- [4] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N + Σ((C<sub>L</sub> + C<sub>SW</sub>) × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) where:  
f<sub>i</sub> = input frequency in MHz, f<sub>o</sub> = output frequency in MHz  
C<sub>L</sub> = output load capacitance in pF  
C<sub>SW</sub> = maximum switch capacitance in pF;  
V<sub>CC</sub> = supply voltage in Volts  
N = number of inputs switching  
Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = 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. nYn, nZ to nZ, nYn propagation delays

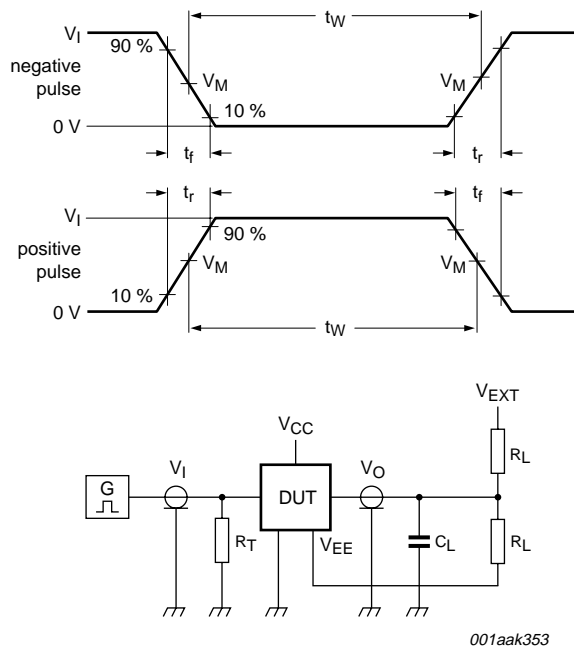


Measurement points are given in [Table 9](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

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	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.1V_{CC}$	$V_{OH} - 0.1V_{CC}$



001aak353

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	$V_{CC}$	$\leq 6$ ns	50 pF	1 k $\Omega$	open	$V_{EE}$	$2V_{CC}$
2.7 V to 3.6 V	2.7 V	$\leq 6$ ns	15 pF, 50 pF	1 k $\Omega$	open	$V_{EE}$	$2V_{CC}$
> 3.6 V	$V_{CC}$	$\leq 6$ ns	50 pF	1 k $\Omega$	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);  $V_I = GND$  or  $V_{CC}$  (unless otherwise specified);  $t_r = t_f \leq 6.0$  ns;  $T_{amb} = 25^\circ C$ .

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

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

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

10.2.1 Test circuits

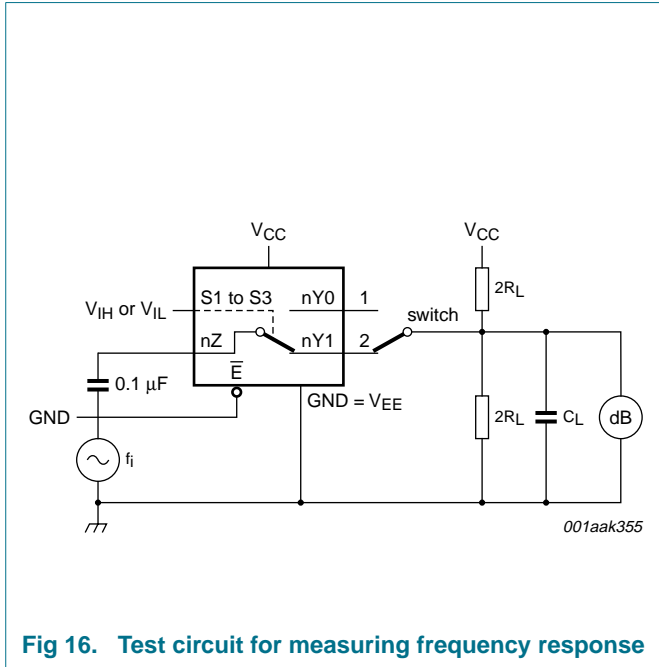


Fig 16. Test circuit for measuring frequency response

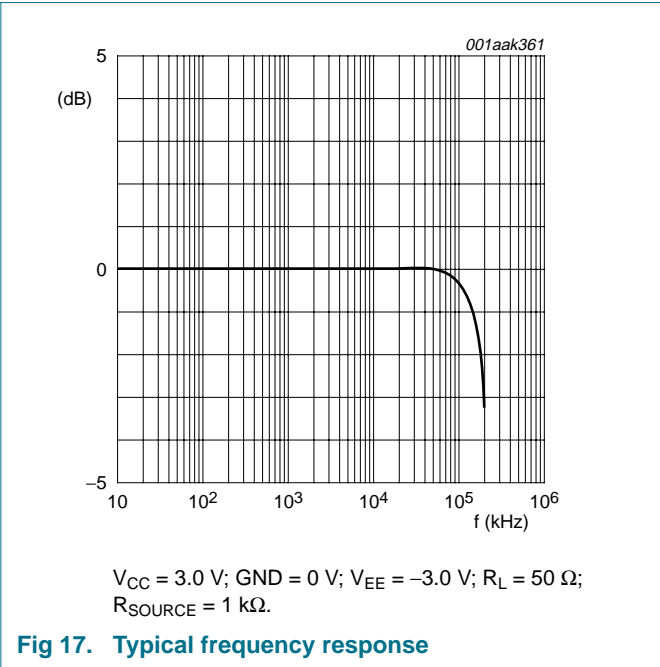


Fig 17. Typical frequency response

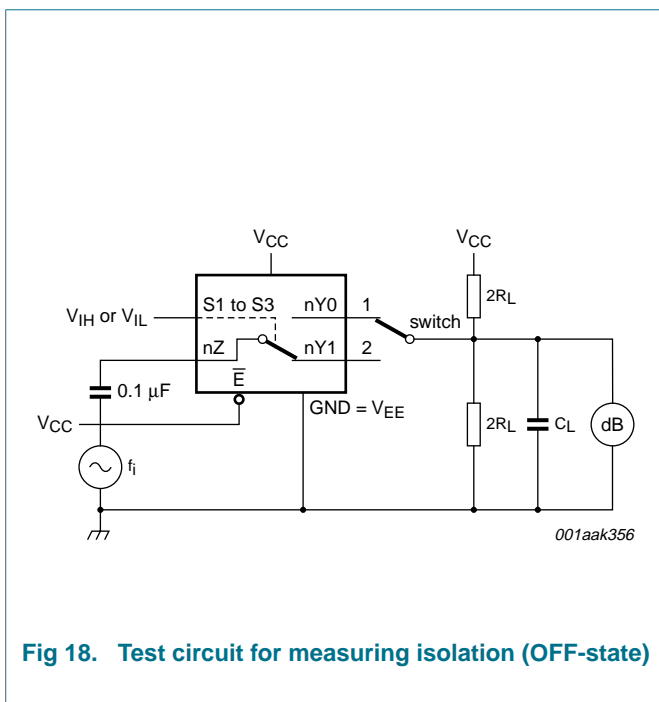


Fig 18. Test circuit for measuring isolation (OFF-state)

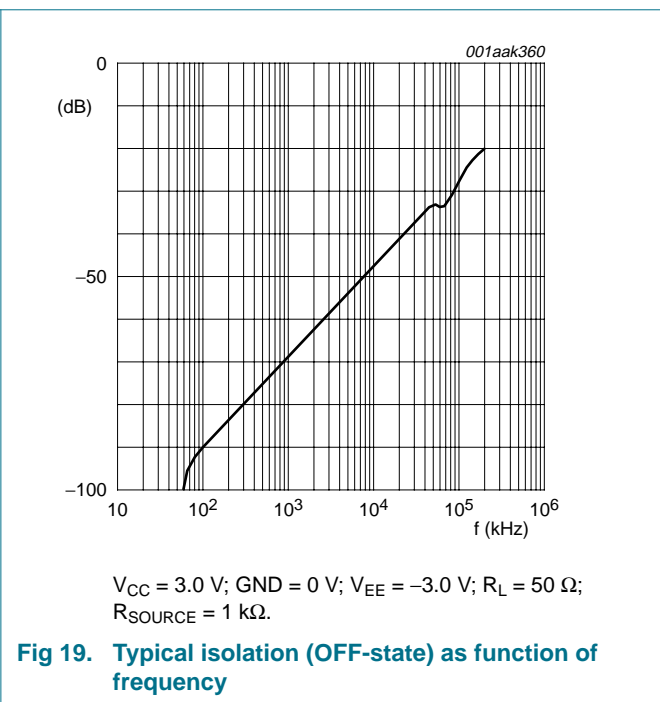


Fig 19. Typical isolation (OFF-state) as function of frequency



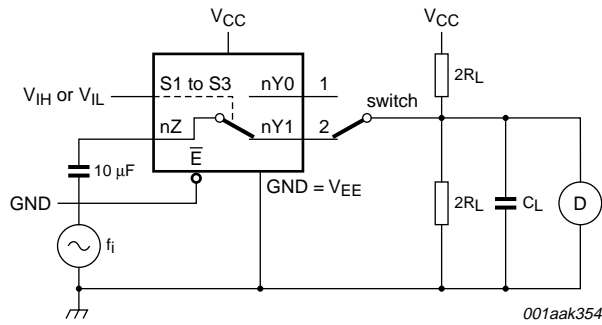
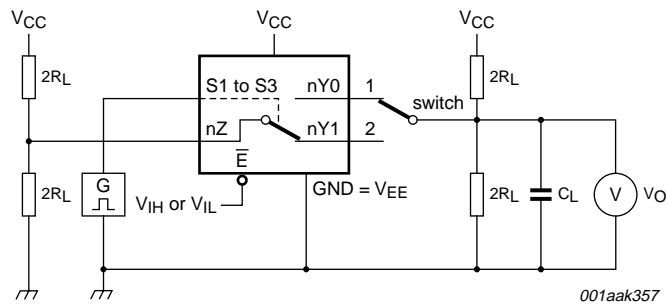
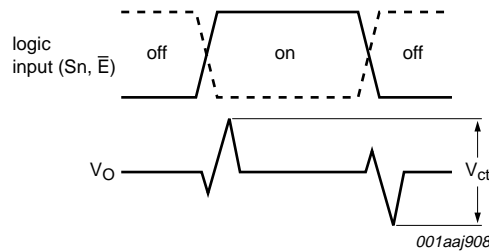


Fig 20. Test circuit for measuring total harmonic distortion



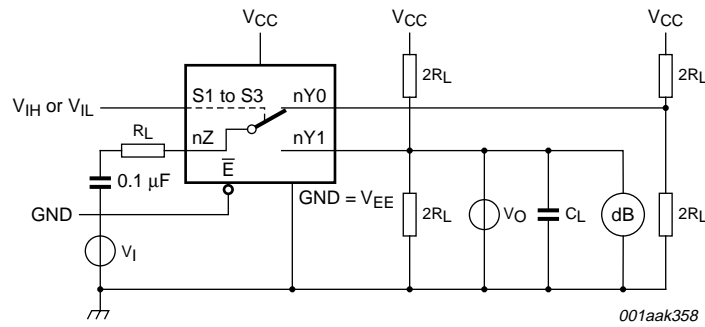
a. Test circuit



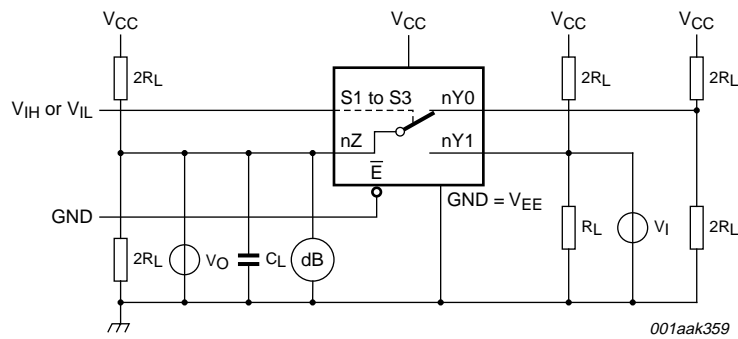
b. Input and output pulse definitions

$V_I$  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

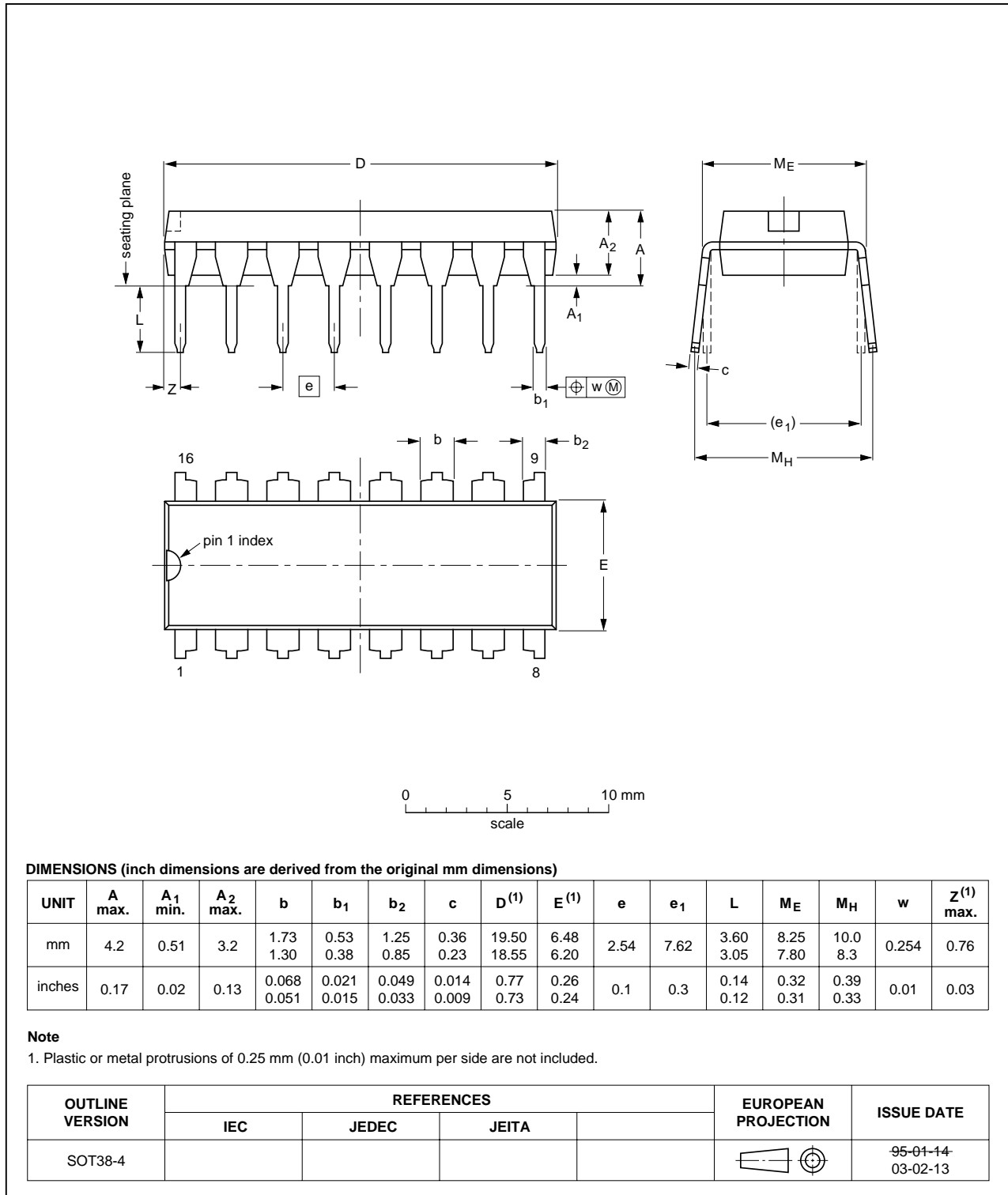


Fig 23. Package outline SOT38-4 (DIP16)

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

SOT109-1

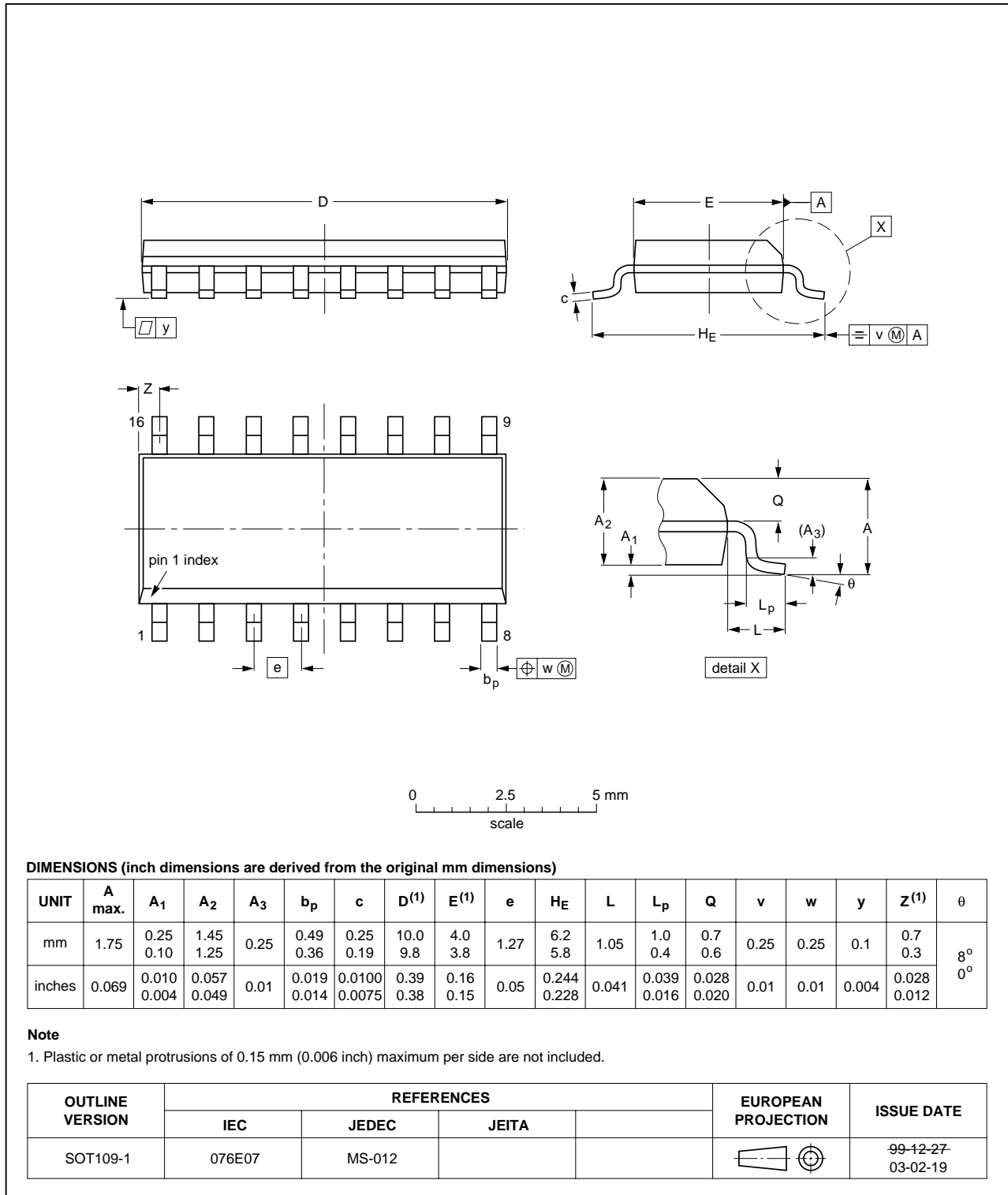


Fig 24. Package outline SOT109-1 (SO16)

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

SOT338-1

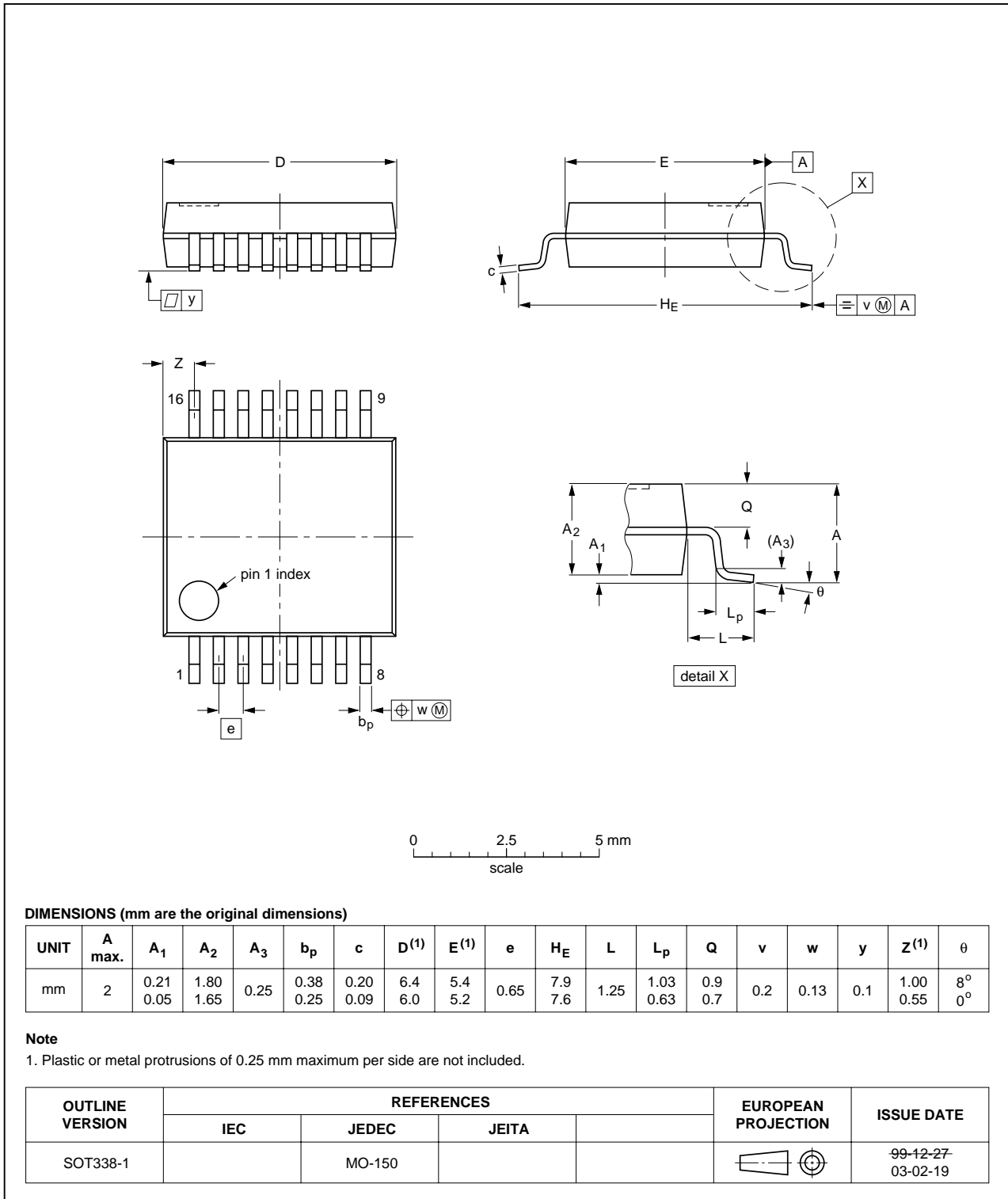


Fig 25. Package outline SOT338-1 (SSOP16)

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

SOT403-1

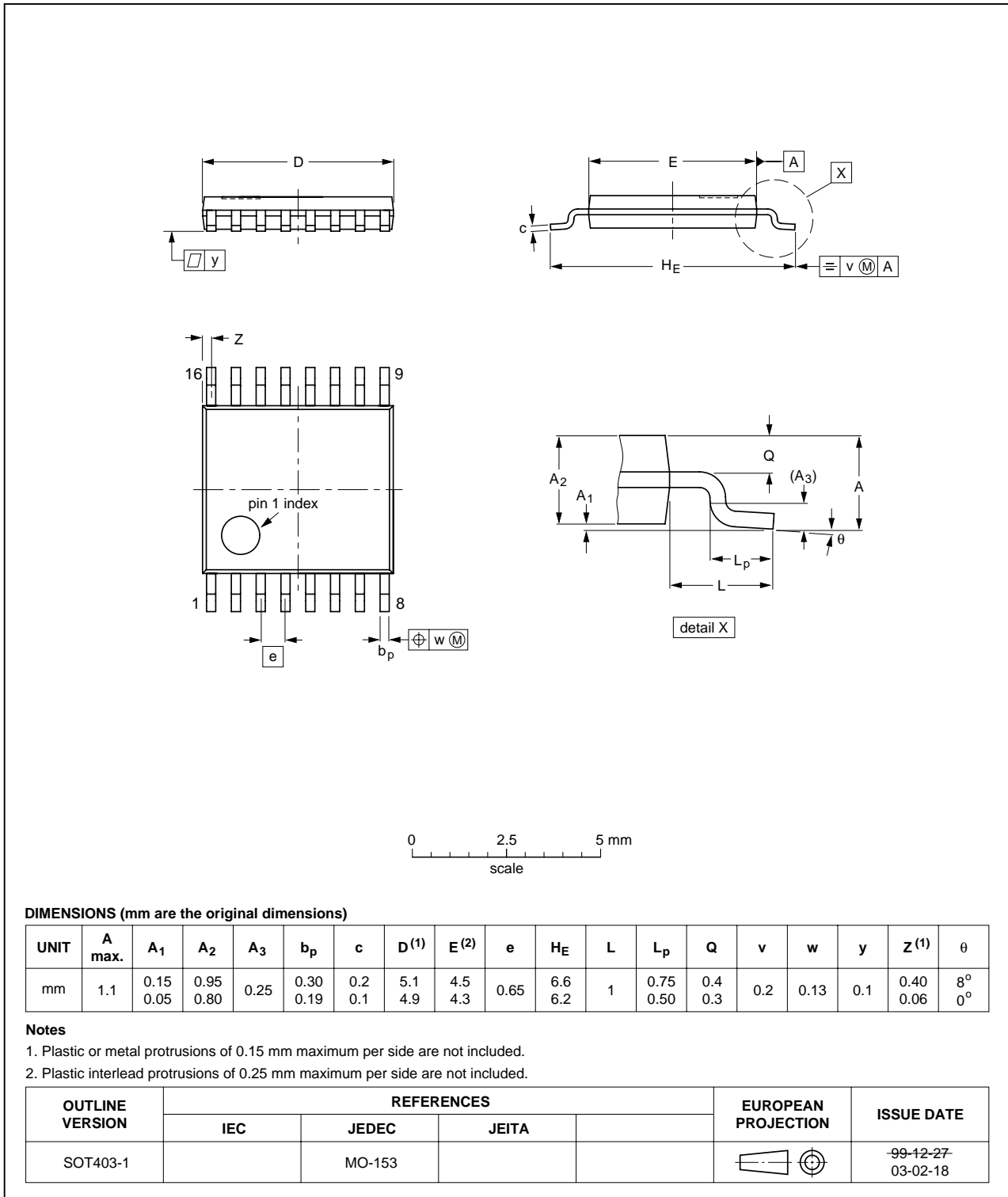


Fig 26. Package outline SOT403-1 (TSSOP16)

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

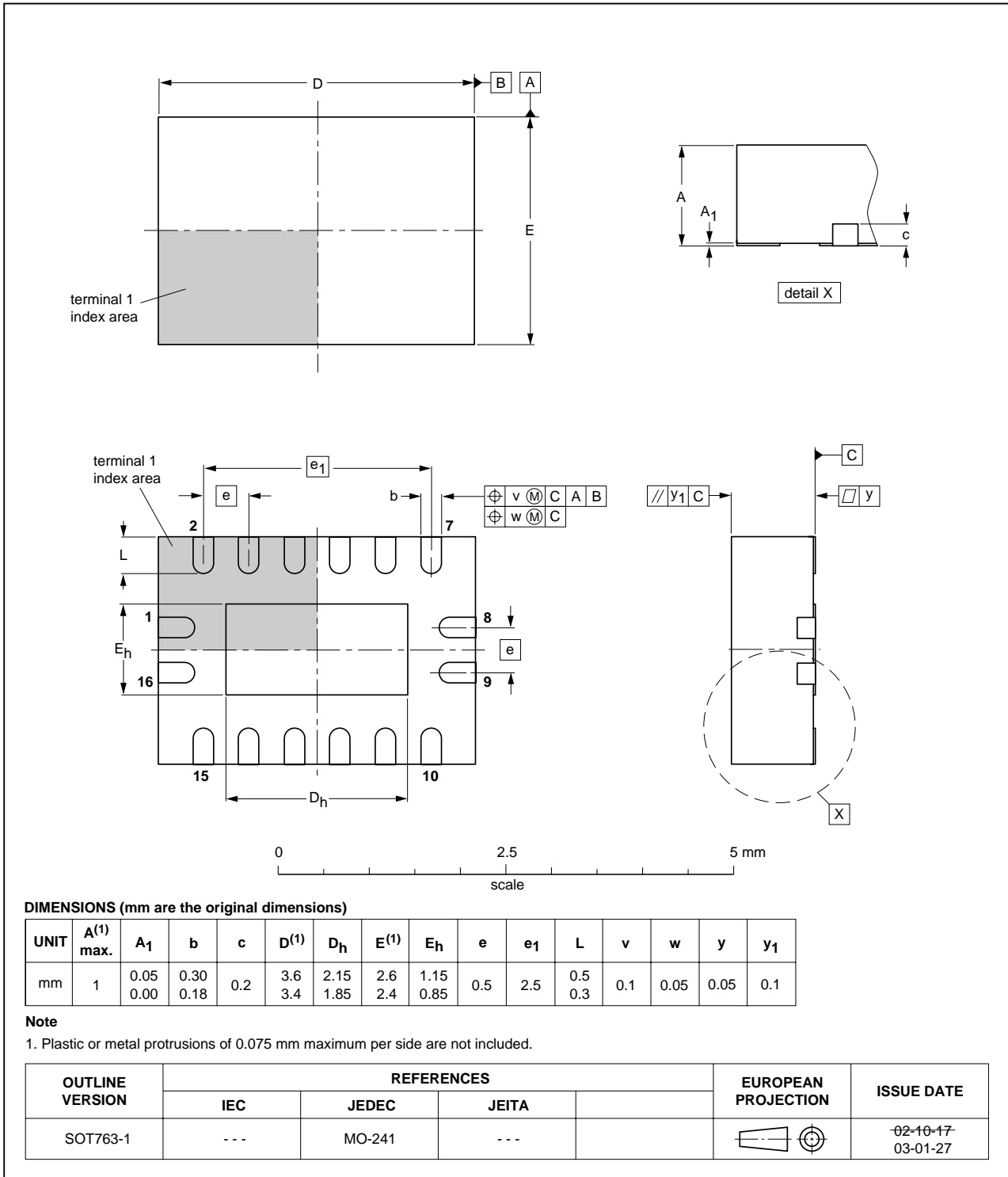


Fig 27. Package outline SOT763-1 (DHVQFN16)

## 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
74LV4053_4	20090810	Product data sheet	-	74LV4053_3
Modifications:		<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Added type number 74LV4053BQ (DHVQFN16 package)</li> <li>R<sub>ON</sub> values changed in <a href="#">Section 2</a>.</li> <li>Package version SOT38-1 changed to SOT38-4 in <a href="#">Section 3</a>, and <a href="#">Figure 23</a>.</li> </ul>		
74LV4053_3	19980623	Product specification	-	74LV4053_2
74LV4053_2	19970715	Product specification	-	-



## 14. Legal information

### 14.1 Data sheet status

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

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

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

[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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