

# 74LV4053

## Triple single-pole double-throw analog switch

Rev. 6 — 17 March 2016

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 and benefits

---

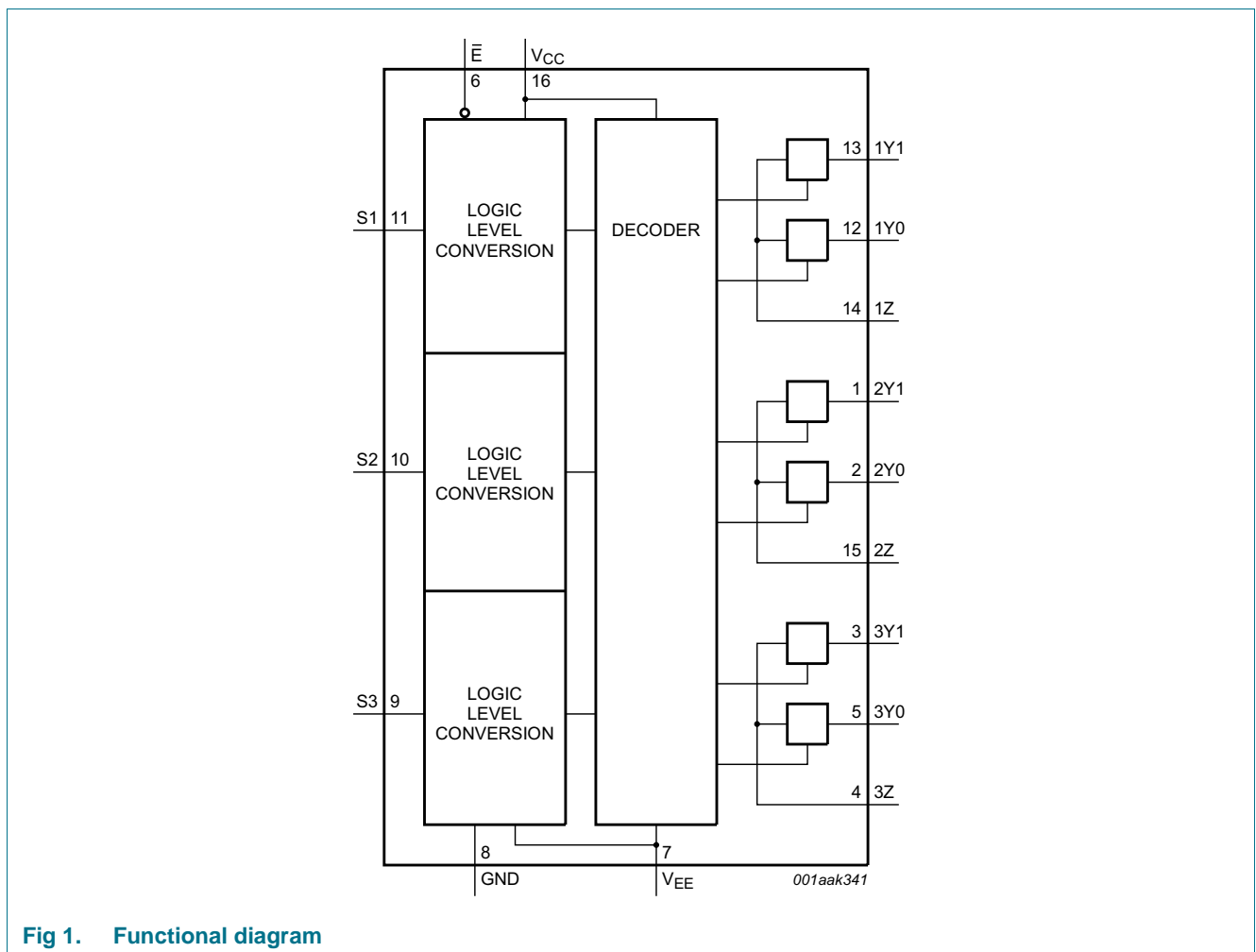
- Optimized for low-voltage applications: 1.0 V to 3.6 V
- Accepts TTL input levels between  $V_{CC} = 2.7$  V and  $V_{CC} = 3.6$  V
- Low ON resistance:
  - ◆ 180  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 2.0$  V
  - ◆ 100  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 3.0$  V
  - ◆ 75  $\Omega$  (typical) 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			Version
	Temperature range	Name	Description	
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



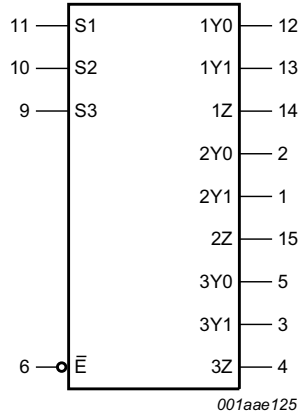


Fig 2. Logic symbol

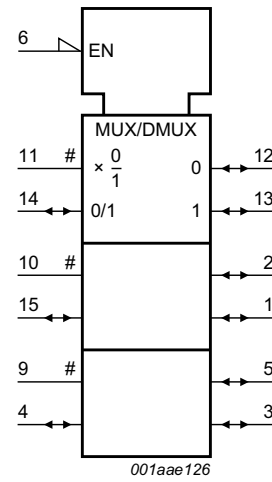


Fig 3. IEC logic symbol

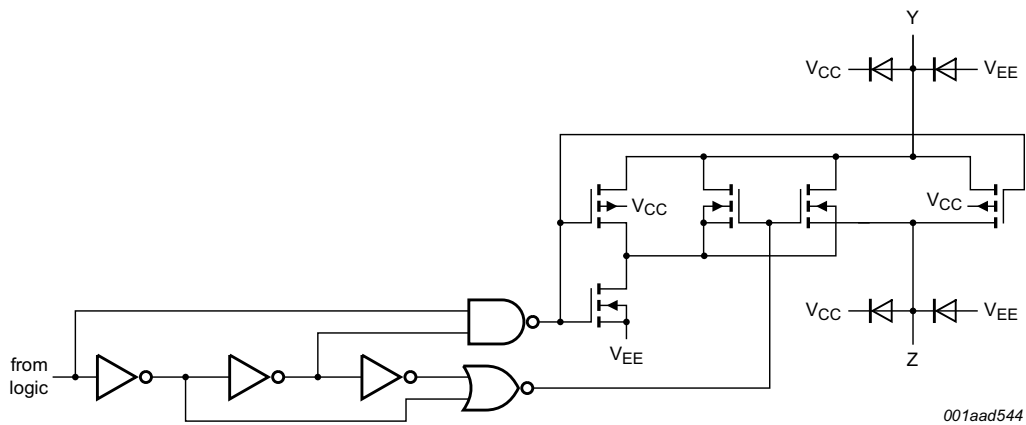
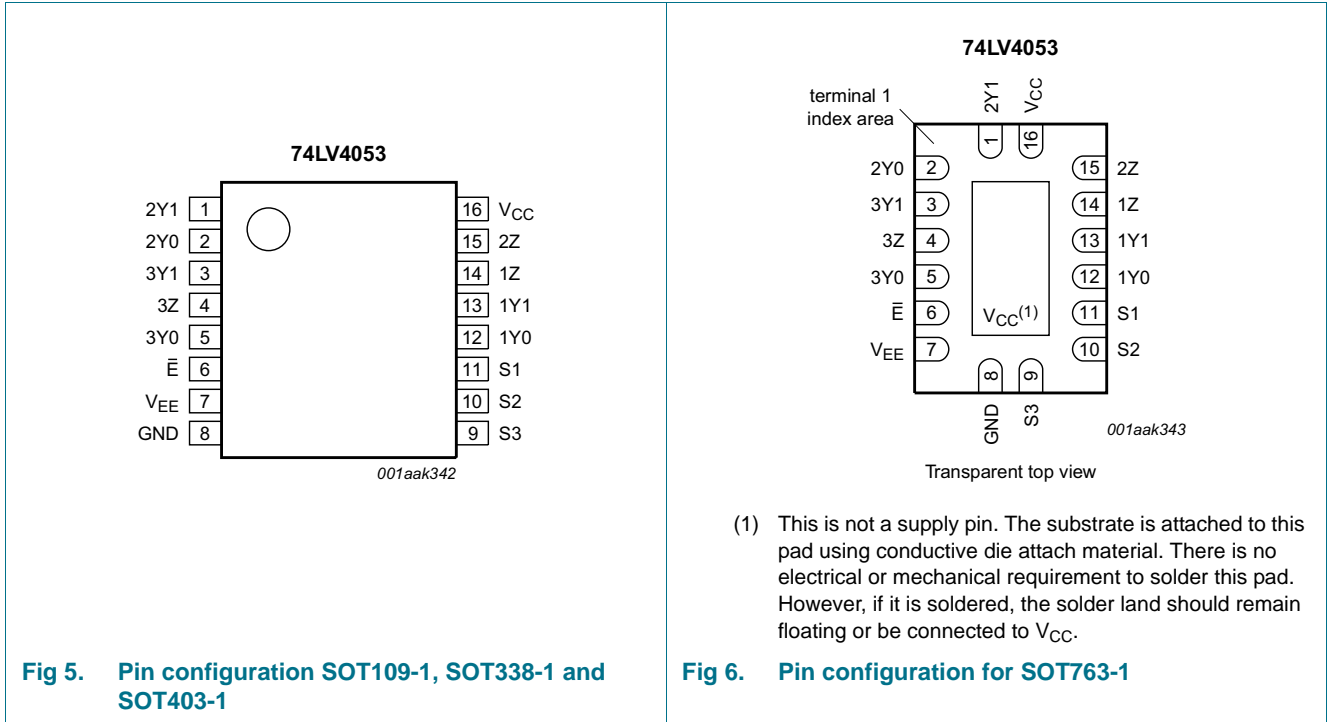


Fig 4. Schematic diagram (one switch)

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 <sub>EE</sub>	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 <sub>CC</sub>	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  $V_{SS} = 0$  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]	-	$\pm 20$	mA
$I_{SK}$	switch clamping current	$V_{SW} < -0.5$ V or $V_{SW} > V_{CC} + 0.5$ V [2]	-	$\pm 20$	mA
$I_{SW}$	switch current	$V_{SW} > -0.5$ V or $V_{SW} < V_{CC} + 0.5$ V; source or sink current [2]	-	$\pm 25$	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 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 7</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  $V_{CC}$ ).

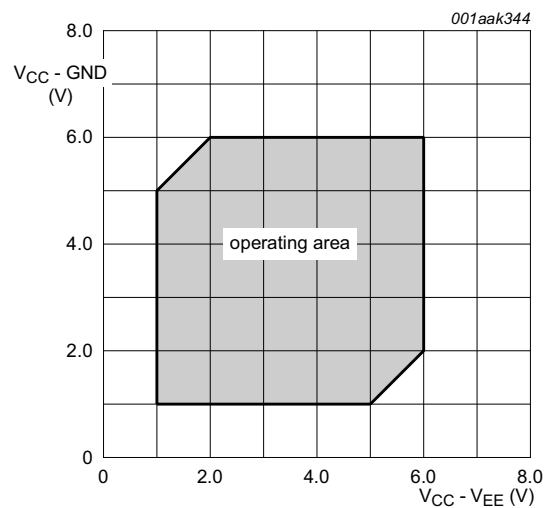


Fig 7. Guaranteed operating area as a function of the supply voltages

## 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 8</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 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>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

001aak345

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

**Fig 8. Test circuit for measuring OFF-state leakage current**

001aak346

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

**Fig 9. 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 10](#) and [Figure 11](#).

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(peak)</sub>	ON resistance (peak)	$V_I = 0\text{ V to }V_{CC} - V_{EE}$						
		$V_{CC} = 1.2\text{ V}; I_{SW} = 100\text{ }\mu\text{A}$ [2]	-	-	-	-	-	$\Omega$
		$V_{CC} = 2.0\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	180	365	-	435	$\Omega$
		$V_{CC} = 2.7\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	115	225	-	270	$\Omega$
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	100	200	-	245	$\Omega$
		$V_{CC} = 4.5\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	75	150	-	180	$\Omega$
		$V_{CC} = 6.0\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	70	140	-	165	$\Omega$
$\Delta R_{ON}$	ON resistance mismatch between channels	$V_I = 0\text{ V to }V_{CC} - V_{EE}$						
		$V_{CC} = 1.2\text{ V}; I_{SW} = 100\text{ }\mu\text{A}$ [2]	-	-	-	-	-	$\Omega$
		$V_{CC} = 2.0\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	5	-	-	-	$\Omega$
		$V_{CC} = 2.7\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	4	-	-	-	$\Omega$
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	4	-	-	-	$\Omega$
		$V_{CC} = 4.5\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	3	-	-	-	$\Omega$
		$V_{CC} = 6.0\text{ V}; I_{SW} = 1000\text{ }\mu\text{A}$	-	2	-	-	-	$\Omega$



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

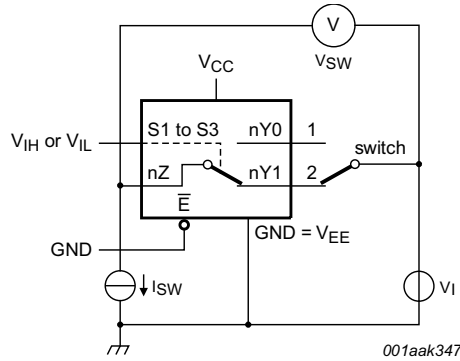
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see [Figure 10](#) and [Figure 11](#).

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.

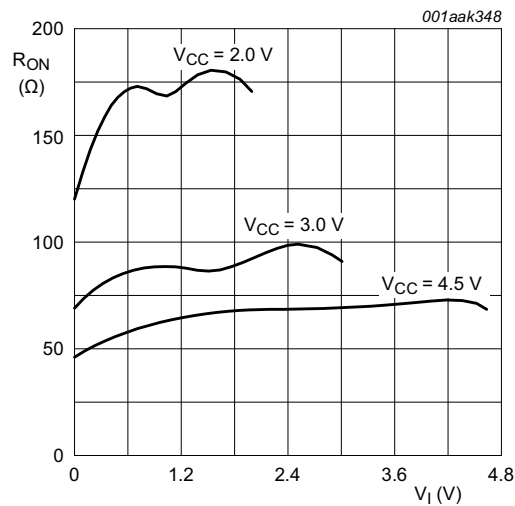
[2] When supply voltages (V<sub>CC</sub> - V<sub>EE</sub>) near 1.2 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 1.2 V, it is recommended to use these devices only for transmitting digital signals.

9.3 On resistance waveform and test circuit



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

Fig 10. Test circuit for measuring  $R_{ON}$



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

Fig 11. 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 14](#).

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 12</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 13</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 13</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 14](#).

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 13</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 13</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).

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

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

C<sub>L</sub> = output load capacitance in pF

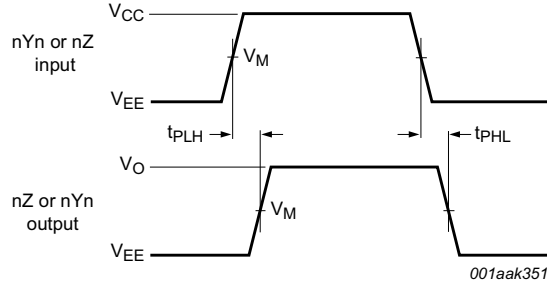
C<sub>SW</sub> = maximum switch capacitance in pF;

V<sub>CC</sub> = supply voltage in Volts

N = number of inputs switching

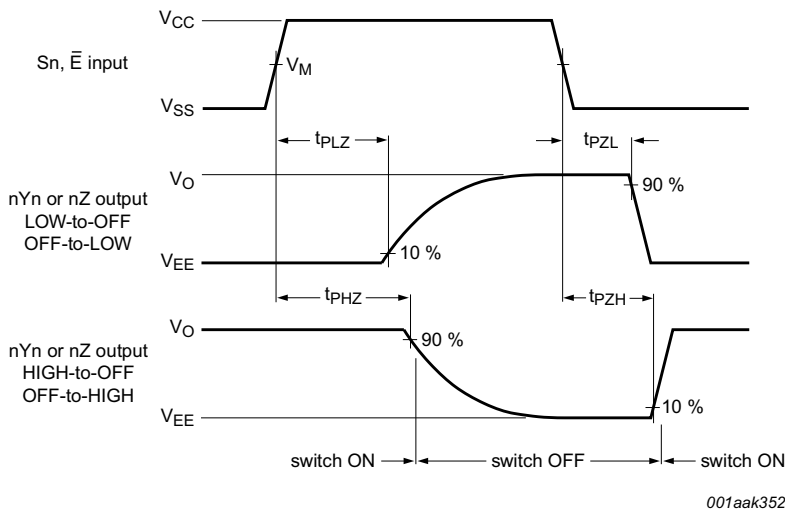
Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

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 12. Propagation delay input (nYn, nZ) to output (nZ, nYn)**

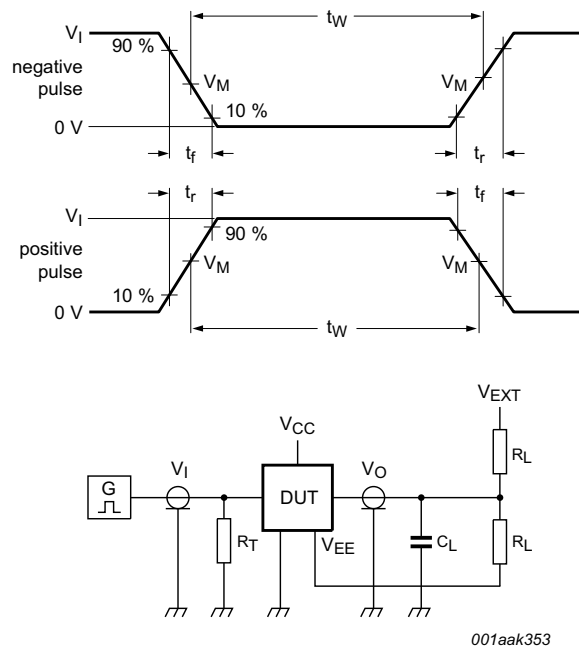


Measurement points are given in [Table 9](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

**Fig 13. Enable and disable times**

**Table 9. Measurement points**

Supply voltage	Input	Output		
		$V_M$	$V_X$	$V_Y$
< 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	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.1V_{CC}$	$V_{OH} - 0.1V_{CC}$



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 14. 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**

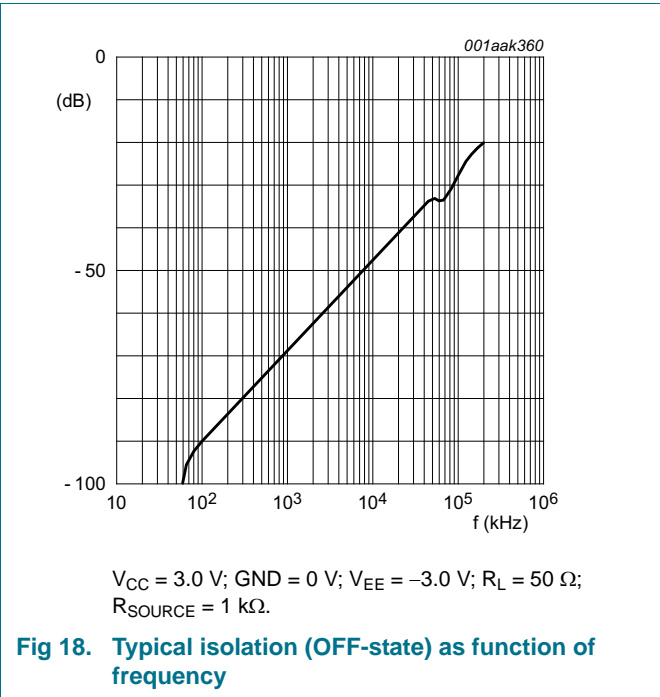
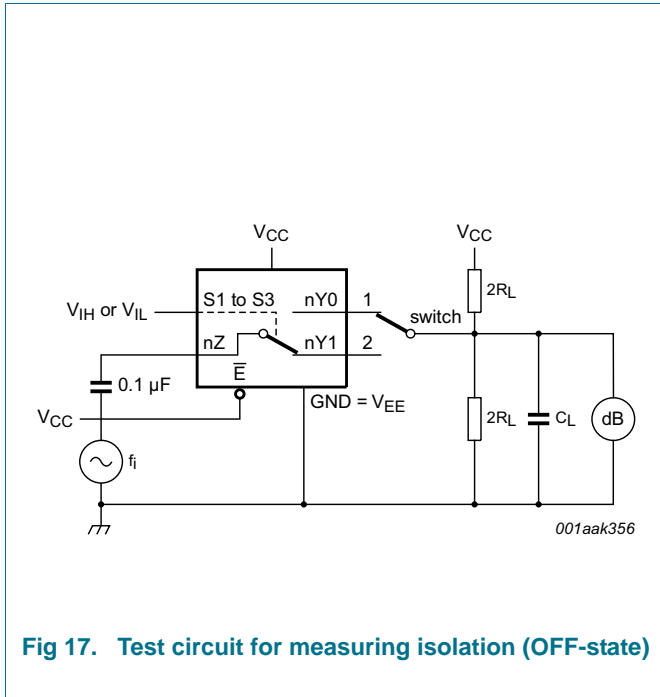
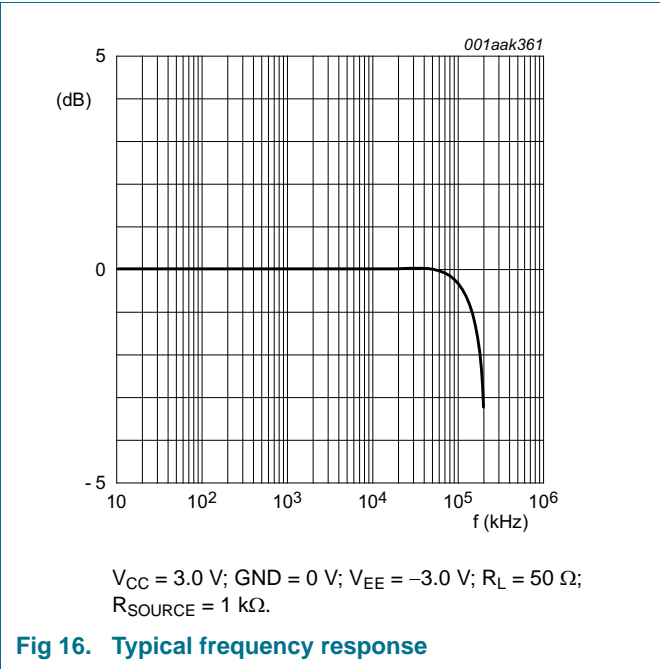
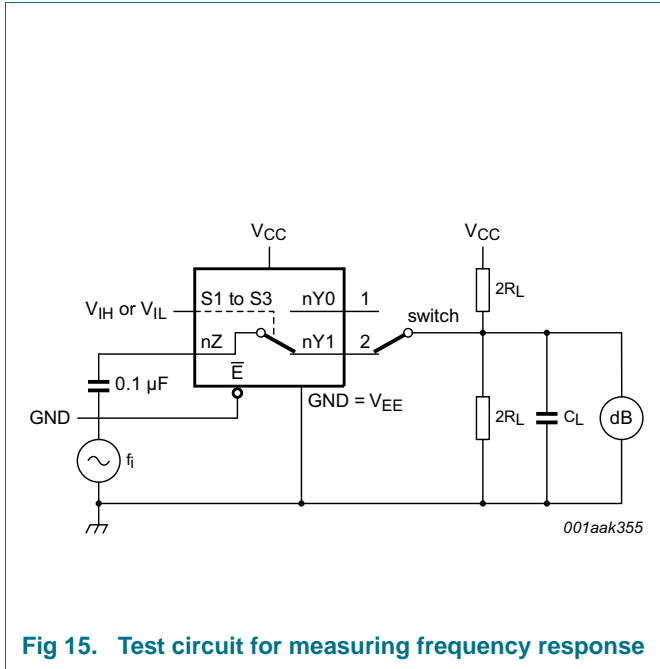
At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $V_I = \text{GND}$  or  $V_{CC}$  (unless otherwise specified);  $t_r = t_f \leq 6.0 \text{ ns}$ ;  $T_{amb} = 25 \text{ }^\circ\text{C}$ .

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 <a href="#">Figure 19</a>				
		$V_{CC} = 3.0 \text{ V}$ ; $V_I = 2.75 \text{ V (p-p)}$	-	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 <a href="#">Figure 19</a>				
		$V_{CC} = 3.0 \text{ V}$ ; $V_I = 2.75 \text{ V (p-p)}$	-	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	$C_L = 50 \text{ pF}$ ; $R_L = 50 \text{ }\Omega$ ; see <a href="#">Figure 15</a> <a href="#">[1]</a>				
		$V_{CC} = 3.0 \text{ V}$	-	180	-	MHz
		$V_{CC} = 6.0 \text{ V}$	-	200	-	MHz
$\alpha_{\text{iso}}$	isolation (OFF-state)	$f_i = 1 \text{ MHz}$ ; $C_L = 50 \text{ pF}$ ; $R_L = 600 \text{ }\Omega$ ; see <a href="#">Figure 17</a> <a href="#">[2]</a>				
		$V_{CC} = 3.0 \text{ V}$	-	-50	-	dB
		$V_{CC} = 6.0 \text{ V}$	-	-50	-	dB
$V_{\text{ct}}$	crosstalk voltage	between digital inputs and switch; <a href="#">[2]</a> $f_i = 1 \text{ MHz}$ ; $C_L = 50 \text{ pF}$ ; $R_L = 600 \text{ }\Omega$ ; see <a href="#">Figure 20</a>				
		$V_{CC} = 3.0 \text{ V}$	-	0.11	-	V
		$V_{CC} = 6.0 \text{ V}$	-	0.12	-	V
Xtalk	crosstalk	between switches; $f_i = 1 \text{ MHz}$ ; $C_L = 50 \text{ pF}$ ; $R_L = 600 \text{ }\Omega$ ; see <a href="#">Figure 21</a>				
		$V_{CC} = 3.0 \text{ V}$	-	-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  $\Omega$ ).

[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





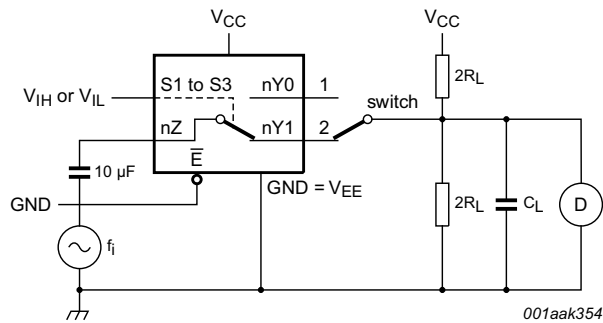
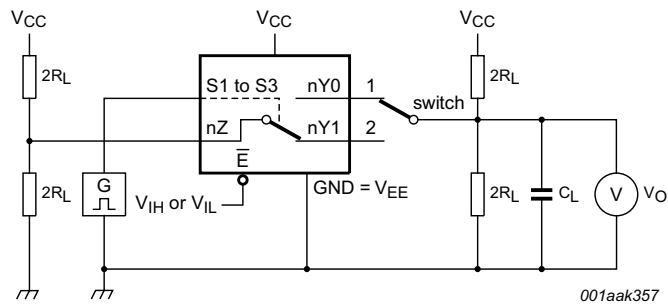
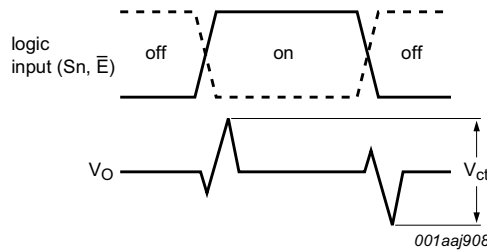


Fig 19. Test circuit for measuring total harmonic distortion



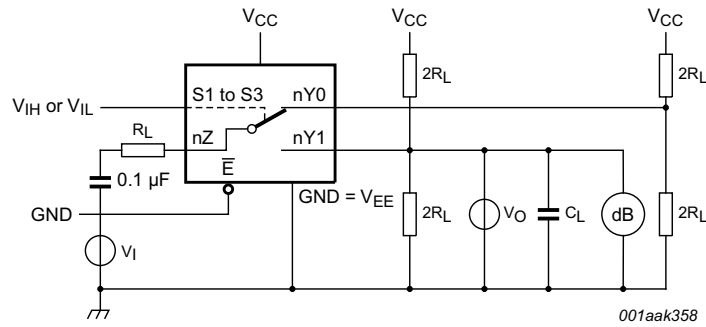
a. Test circuit



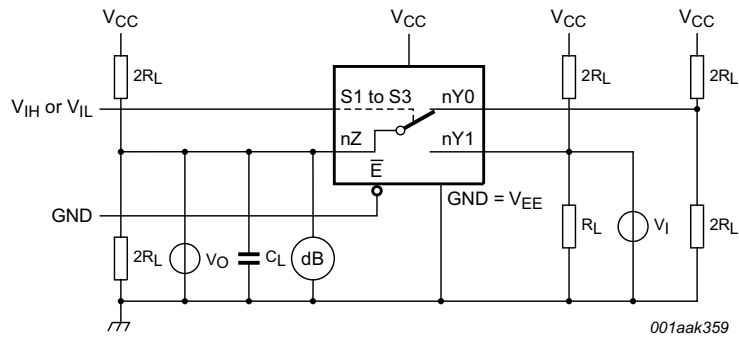
b. Input and output pulse definitions

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

Fig 20. Test circuit for measuring crosstalk voltage between digital inputs and switch



a. Switch closed condition



b. Switch open condition

**Fig 21. Test circuit for measuring crosstalk between switches**

11. Package outline

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

SOT109-1

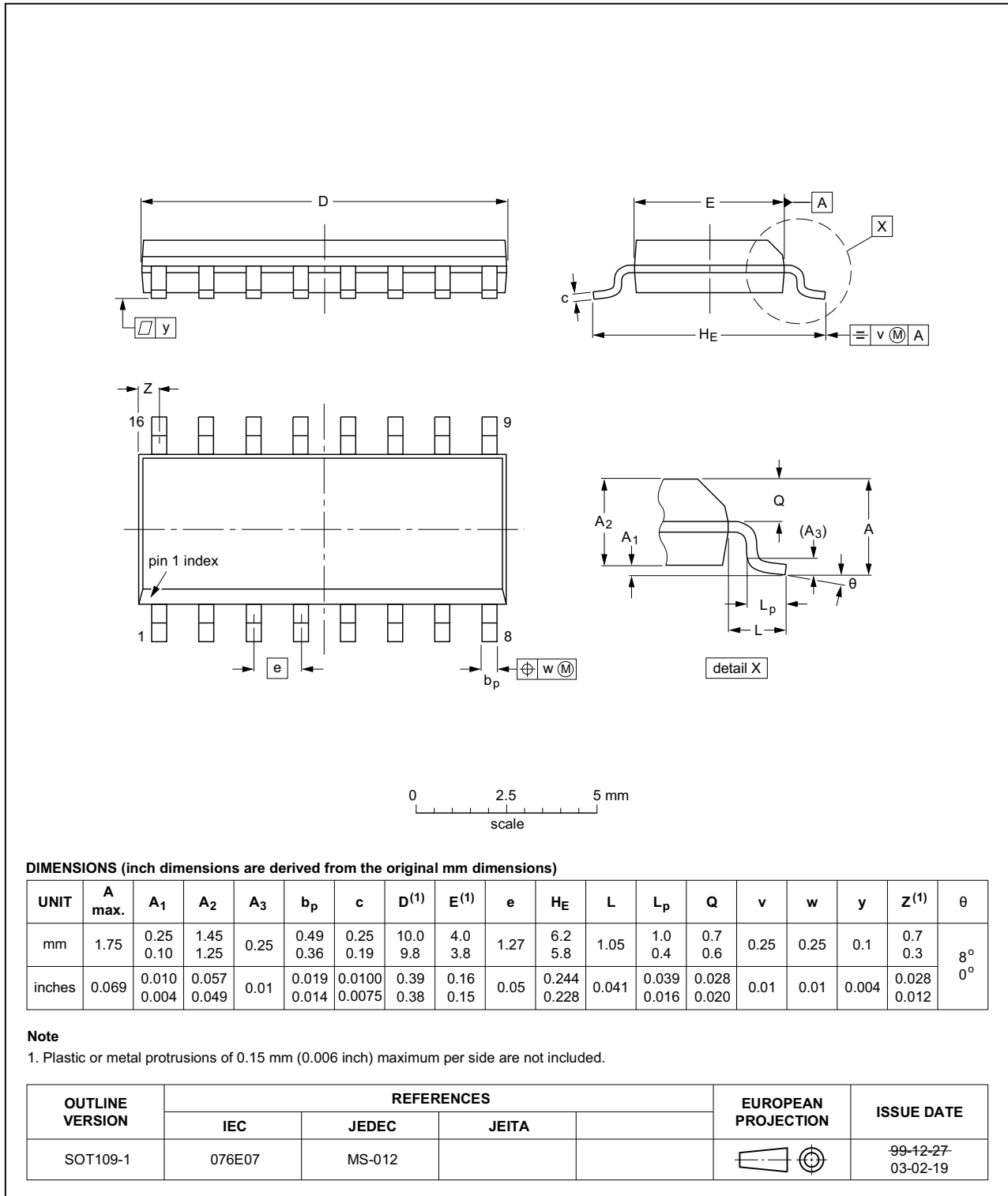


Fig 22. Package outline SOT109-1 (SO16)

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

SOT338-1

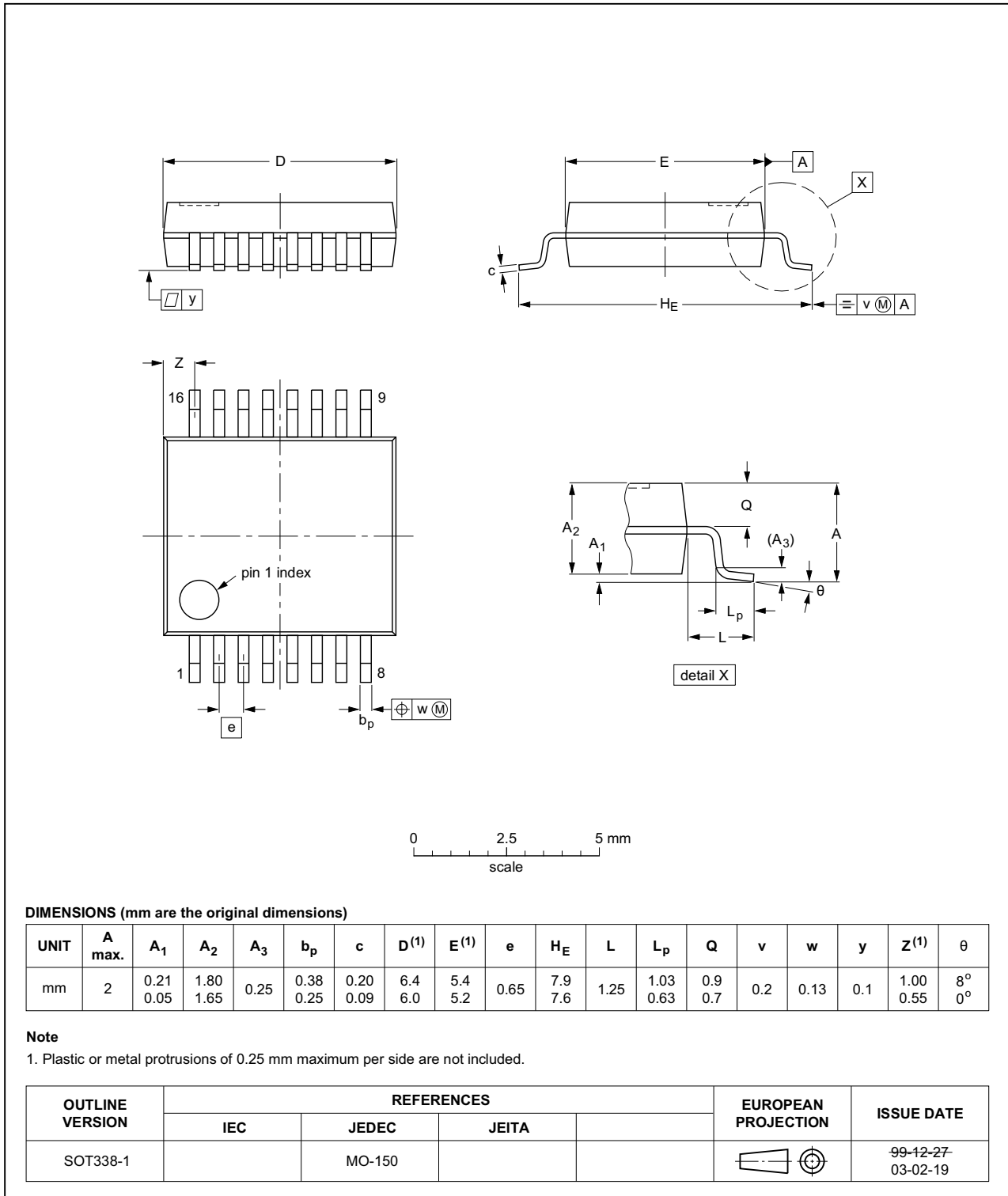


Fig 23. Package outline SOT338-1 (SSOP16)

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

SOT403-1

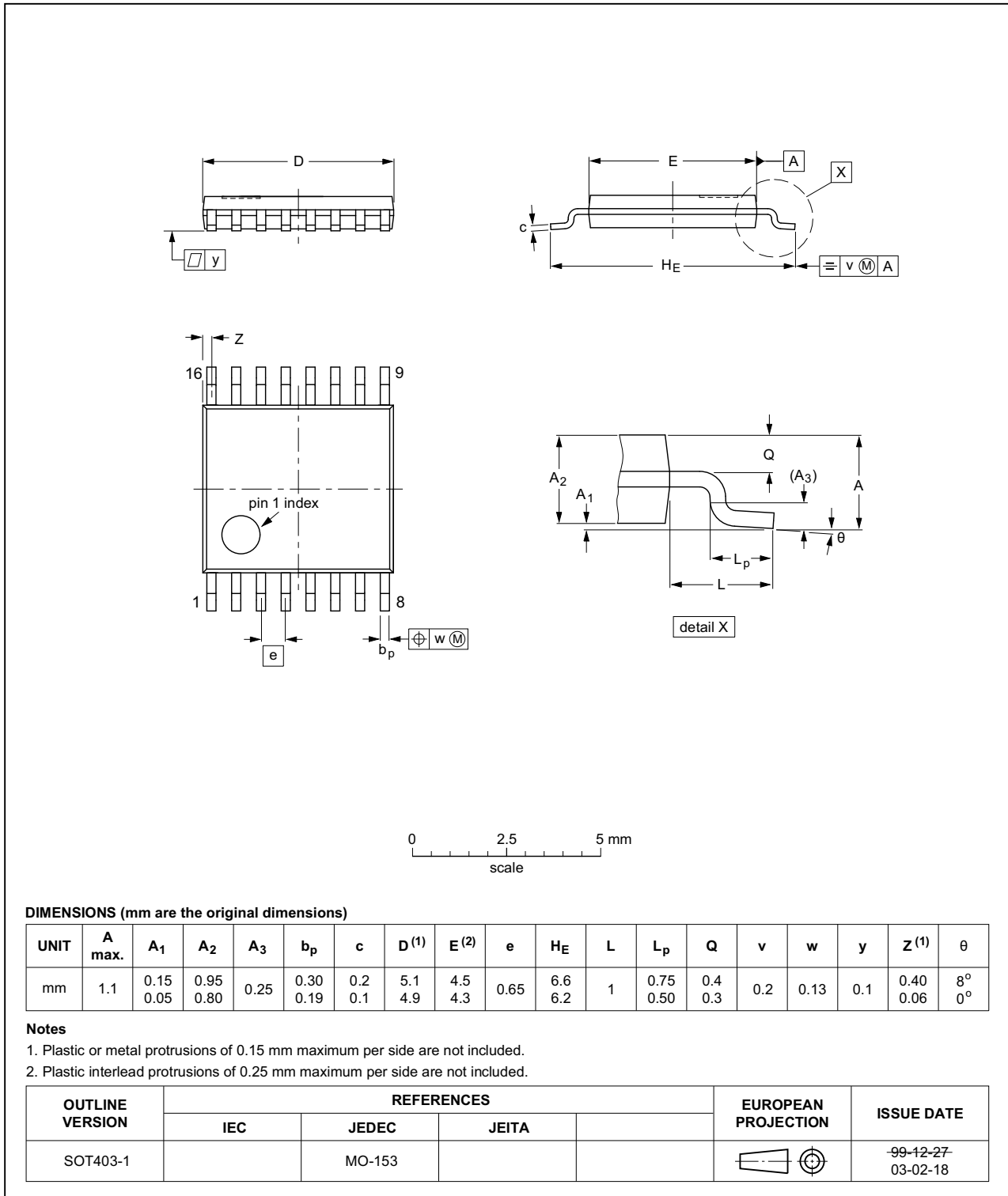


Fig 24. Package outline SOT403-1 (TSSOP16)

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

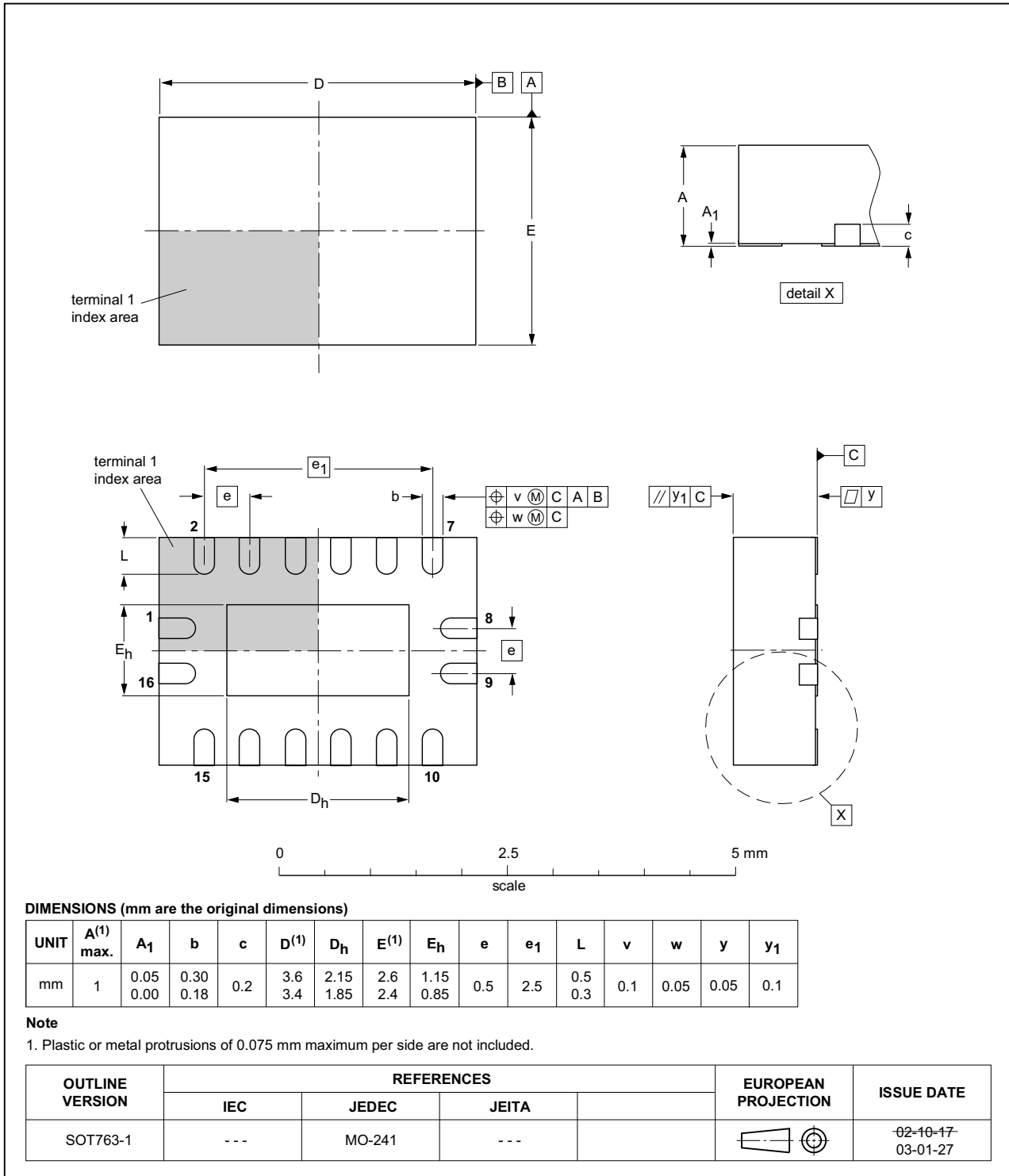


Fig 25. Package outline SOT763-1 (DHVQFN16)

## 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 v.6	20160317	Product data sheet	-	74LV4053 v.5
Modifications:	<ul style="list-style-type: none"> <li>Type number 74LV4053N (SOT38-4) removed.</li> </ul>			
74LV4053 v.5	20140918	Product data sheet	-	74LV4053 v.4
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Figure 6</a>: Figure note added for DHVQFN16 package.</li> </ul>			
74LV4053 v.4	20090810	Product data sheet	-	74LV4053 v.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 Figure 23.</li> </ul>			
74LV4053 v.3	19980623	Product specification	-	74LV4053 v.2
74LV4053 v.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.nexperia.com>.

### 14.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

### 14.3 Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of Nexperia.

**Right to make changes** — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

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

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.



**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

**Non-automotive qualified products** — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

**Translations** — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

## 14.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 15. Contact information

For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

## 16. Contents

<b>1</b>	<b>General description</b> . . . . .	<b>1</b>
<b>2</b>	<b>Features and benefits</b> . . . . .	<b>1</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Functional diagram</b> . . . . .	<b>2</b>
<b>5</b>	<b>Pinning information</b> . . . . .	<b>4</b>
5.1	Pinning . . . . .	4
5.2	Pin description . . . . .	4
<b>6</b>	<b>Functional description</b> . . . . .	<b>5</b>
<b>7</b>	<b>Limiting values</b> . . . . .	<b>5</b>
<b>8</b>	<b>Recommended operating conditions</b> . . . . .	<b>6</b>
<b>9</b>	<b>Static characteristics</b> . . . . .	<b>7</b>
9.1	Test circuits . . . . .	8
9.2	ON resistance . . . . .	8
9.3	On resistance waveform and test circuit . . . . .	10
<b>10</b>	<b>Dynamic characteristics</b> . . . . .	<b>11</b>
10.1	Waveforms . . . . .	13
10.2	Additional dynamic parameters . . . . .	15
10.2.1	Test circuits . . . . .	16
<b>11</b>	<b>Package outline</b> . . . . .	<b>19</b>
<b>12</b>	<b>Abbreviations</b> . . . . .	<b>23</b>
<b>13</b>	<b>Revision history</b> . . . . .	<b>23</b>
<b>14</b>	<b>Legal information</b> . . . . .	<b>24</b>
14.1	Data sheet status . . . . .	24
14.2	Definitions . . . . .	24
14.3	Disclaimers . . . . .	24
14.4	Trademarks . . . . .	25
<b>15</b>	<b>Contact information</b> . . . . .	<b>25</b>
<b>16</b>	<b>Contents</b> . . . . .	<b>26</b>

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А