74LV4052

Dual 4-channel analog multiplexer/demultiplexer

Rev. 4 — 1 July 2013 Product data sheet

1. General description

The 74LV4052 is a low-voltage CMOS device and is pin and function compatible with the 74HC/HCT4052.

The 74LV4052 is a dual 4-channel analog multiplexer/demultiplexer with a common select logic. Each multiplexer has four independent inputs/outputs (nY0 to nY3) and a common input/output (nZ). The common channel select logics include two digital select inputs (S0 and S1) and an active LOW enable input ($\overline{E}$). With $\overline{E}$ LOW, one of the four switches is selected (low impedance ON-state) by S0 and S1. With $\overline{E}$ HIGH, all switches are in the high impedance OFF-state, independent of S0 and S1. V_{CC} and GND are the supply voltage pins for the digital control inputs (S0, S1 and $\overline{E}$). The V_{CC} to GND ranges are 1.0 V to 6.0 V. The analog inputs/outputs (nY0, to nY3, 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 6.0 V. For operation as a digital multiplexer/demultiplexer, V_{EE} is connected to GND (typically ground).

2. Features and benefits

- 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
  - 90 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			
	Temperature range	Name	Description	Version
74LV4052N	−40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil)	SOT38-4
74LV4052D	−40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74LV4052DB	−40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74LV4052PW	−40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

4. Functional diagram

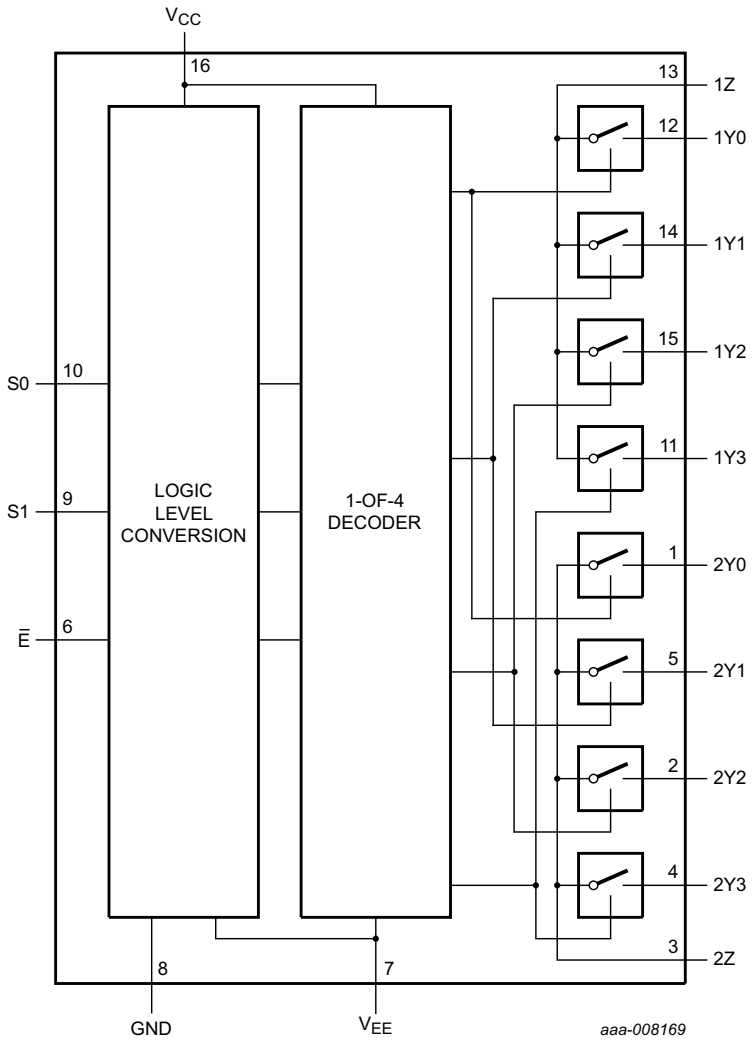


Fig 1. Functional diagram

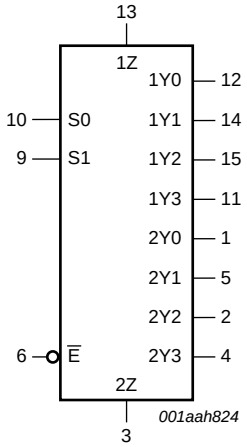


Fig 2. Logic symbol

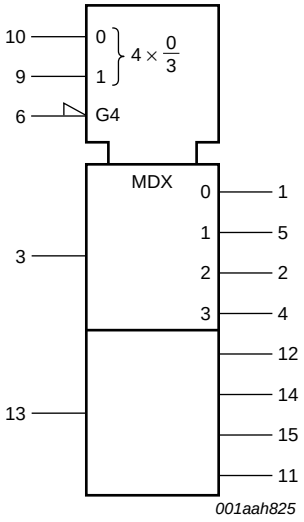


Fig 3. IEC logic symbol

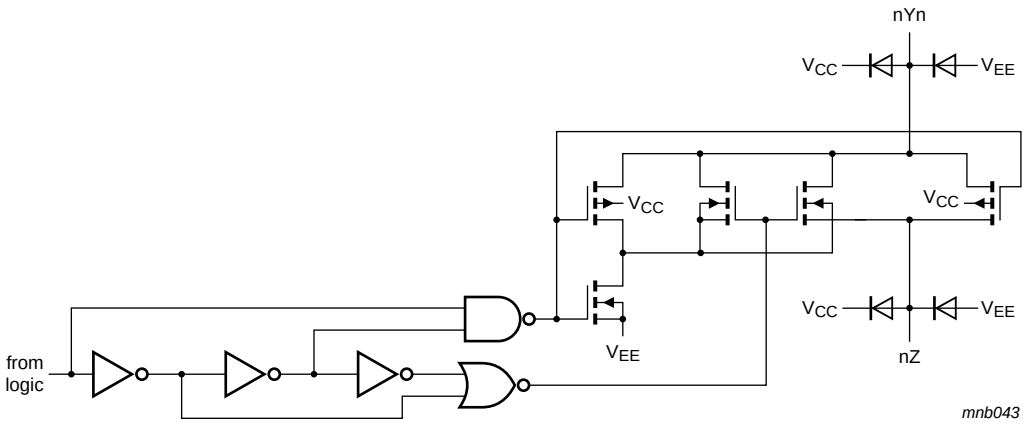


Fig 4. Schematic diagram (one switch)

5. Pinning information

5.1 Pinning

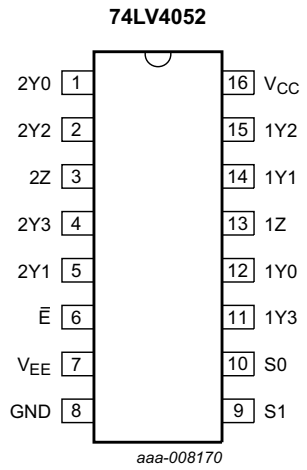


Fig 5. Pin configuration for DIP16 andSO16

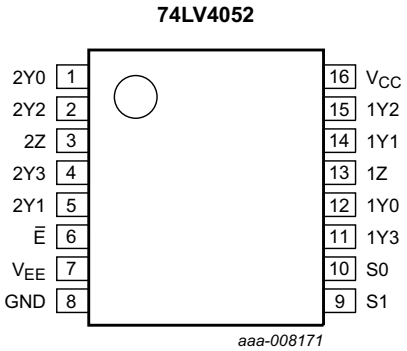


Fig 6. Pin configuration for (T)SSOP16

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
2Y0	1	independent input or output
2Y2	2	independent input or output
2Z	3	common input or output
2Y3	4	independent input or output
2Y1	5	independent input or output
$\overline{E}$	6	enable input (active LOW)
V_{EE}	7	negative supply voltage
GND	8	ground (0 V)
S1	9	select logic input
S0	10	select logic input
1Y3	11	independent input or output
1Y0	12	independent input or output
1Z	13	common input or output
1Y1	14	independent input or output
1Y2	15	independent input or output
V_{CC}	16	positive supply voltage

6. Functional description

Table 3. Function table[1]

Input			Channel on
$\overline{E}$	S1	S0	
L	L	L	nY0 and nZ
L	L	H	nY1 and nZ
L	H	L	nY2 and nZ
L	H	H	nY3 and nZ
H	X	X	none

[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
		SSOP16 and TSSOP16 package		-	400	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 flows out of terminals nYn. 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 package: above 70 °C the value of P_{tot} derates linearly with 12 mW/K.
For SO16 package: 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.

8. Recommended operating conditions

Table 5. Recommended operating conditions[1]

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage	see Figure 7	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 V to 2.0 V	-	-	500	ns/V
		V_{CC} = 2.0 V to 2.7 V	-	-	200	ns/V
		V_{CC} = 2.7 V to 6.0 V	-	-	100	ns/V

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

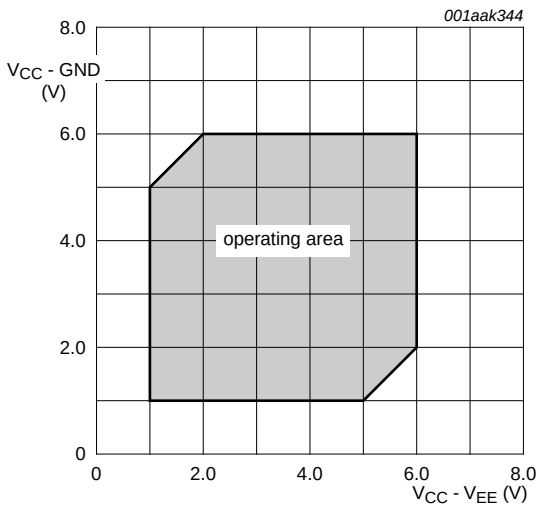


Fig 7. Guaranteed operating area as a function of the supply voltages

9. Static characteristics

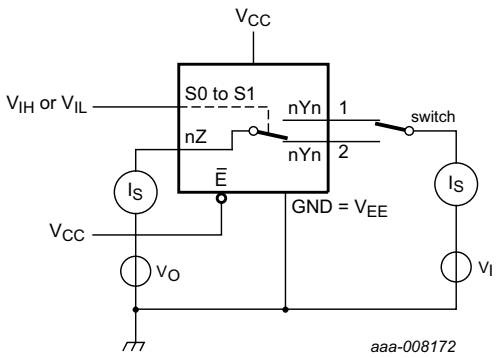
Table 6. Static characteristics

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[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 8						
		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 9						
		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 nYn	-	5	-	-	-	pF
		common pins nZ	-	12	-	-	-	pF

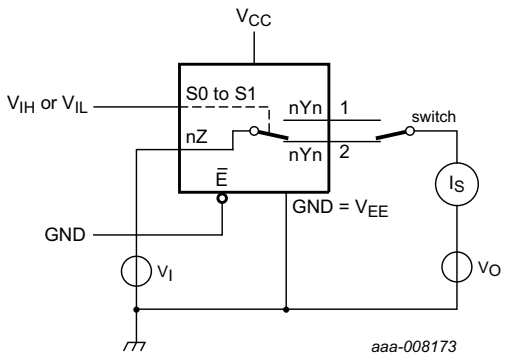
[1] Typical values are measured at T_{amb} = 25 °C.

9.1 Test circuits



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

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



$V_I = V_{CC}$ 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[1]	Max	Min	Max	
$R_{ON(peak)}$	ON resistance (peak)	V_I = 0 V to $V_{CC} - V_{EE}$						
		V_{CC} = 1.2 V; I_{SW} = 100 μA [2]	-	-	-	-	-	Ω
		V_{CC} = 2.0 V; I_{SW} = 1000 μA	-	145	325	-	375	Ω
		V_{CC} = 2.7 V; I_{SW} = 1000 μA	-	90	200	-	235	Ω
		V_{CC} = 3.0 V to 3.6 V; I_{SW} = 1000 μA	-	80	180	-	210	Ω
		V_{CC} = 4.5 V; I_{SW} = 1000 μA	-	60	135	-	160	Ω
		V_{CC} = 6.0 V; I_{SW} = 1000 μA	-	55	125	-	145	Ω
ΔR_{ON}	ON resistance mismatch between channels	V_I = 0 V to $V_{CC} - V_{EE}$						
		V_{CC} = 1.2 V; I_{SW} = 100 μA [2]	-	-	-	-	-	Ω
		V_{CC} = 2.0 V; I_{SW} = 1000 μA	-	5	-	-	-	Ω
		V_{CC} = 2.7 V; I_{SW} = 1000 μA	-	4	-	-	-	Ω
		V_{CC} = 3.0 V to 3.6 V; I_{SW} = 1000 μA	-	4	-	-	-	Ω
		V_{CC} = 4.5 V; I_{SW} = 1000 μA	-	3	-	-	-	Ω
		V_{CC} = 6.0 V; I_{SW} = 1000 μA	-	2	-	-	-	Ω

Table 7. ON resistance *...continued*

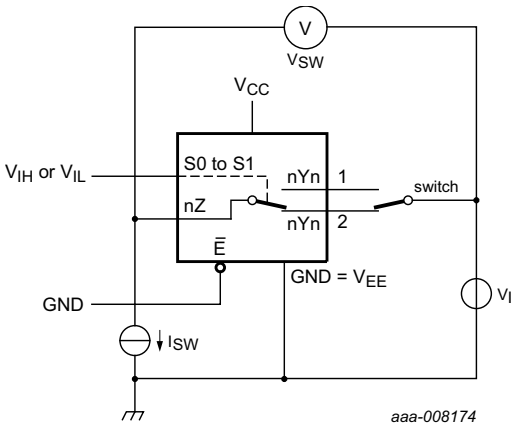
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see Figure 10 and Figure 11.

Symbol	Parameter	Conditions	−40 °C to +85 °C			−40 °C to +125 °C		Unit
			Min	Typ[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.

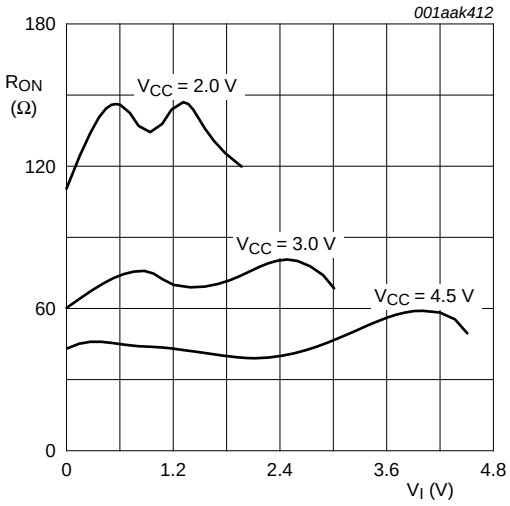
[2] When supply voltages ($V_{CC} - V_{EE}$) near 1.2 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 1.2 V, only use these devices for transmitting digital signals.

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 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[1]	Max	Min	Max	
t_{pd}	propagation delay	nYn to nZ, nZ to nYn; see Figure 12	[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	7	-	8	ns
t_{en}	enable time	$\overline{E}$, Sn to nYn, nZ; see Figure 13	[2]						
		V_{CC} = 1.2 V		-	190	-	-	-	ns
		V_{CC} = 2.0 V		-	65	121	-	146	ns
		V_{CC} = 2.7 V		-	48	89	-	108	ns
		V_{CC} = 3.0 V to 3.6 V; C_L = 15 pF	[3]	-	30	-	-	-	ns
		V_{CC} = 3.0 V to 3.6 V	[3]	-	36	71	-	86	ns
		V_{CC} = 4.5 V		-	32	60	-	73	ns
		V_{CC} = 6.0 V		-	25	46	-	56	ns
t_{dis}	disable time	$\overline{E}$, Sn to nYn, nZ; see Figure 13	[2]						
		V_{CC} = 1.2 V		-	125	-	-	-	ns
		V_{CC} = 2.0 V		-	43	80	-	95	ns
		V_{CC} = 2.7 V		-	33	59	-	71	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]	-	26	48	-	57	ns
		V_{CC} = 4.5 V		-	23	41	-	49	ns
		V_{CC} = 6.0 V		-	18	32	-	38	ns
C_{PD}	power dissipation capacitance	C_L = 50 pF; f_i = 1 MHz; V_I = GND to V_{CC}	[4]	-	57	-	-	-	pF

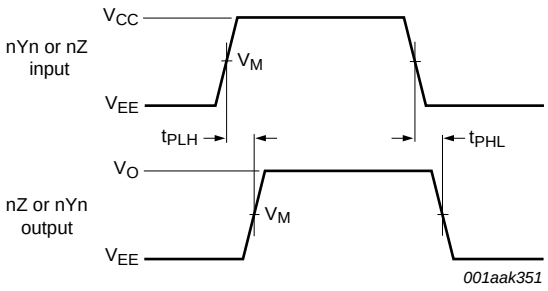
[1] All typical values are measured at T_{amb} = 25 °C.

[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).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma((C_L + C_{sw}) \times V_{CC}^2 \times f_o)$ where:
f_i = input frequency in MHz, f_o = output frequency in MHz
C_L = output load capacitance in pF
C_{sw} = maximum switch capacitance in pF;
V_{CC} = supply voltage in Volts
N = number of inputs switching
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

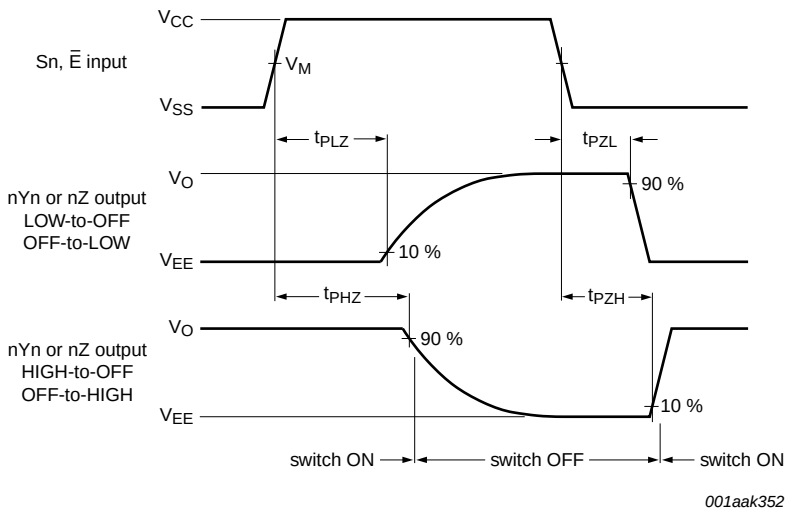
10.1 Waveforms



Measurement points are given in Table 9.

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

Fig 12. nYn, nZ to nZ, nYn propagation delays



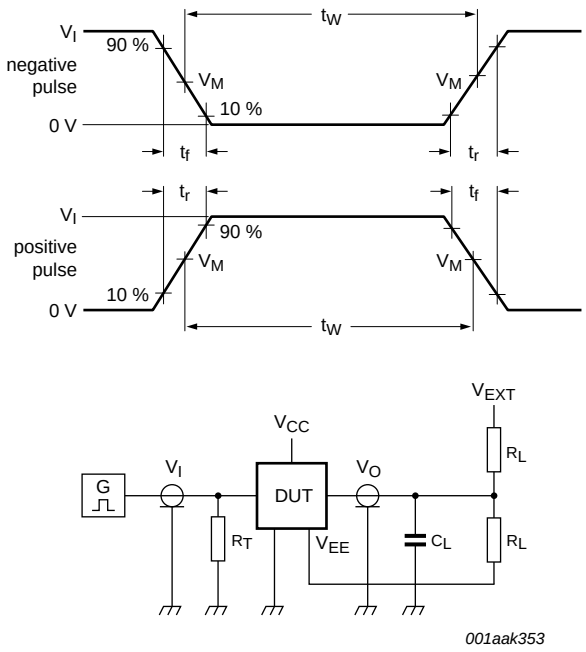
Measurement points are given in Table 9.

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

Fig 13. Enable and disable times

Table 9. Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
< 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$
2.7 V to 3.6 V	1.5 V	1.5 V
> 3.6 V	$0.5V_{CC}$	$0.5V_{CC}$



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}	≤ 6 ns	50 pF	1 kΩ	open	V_{EE}	$2V_{CC}$
2.7 V to 3.6 V	2.7 V	≤ 6 ns	15 pF, 50 pF	1 kΩ	open	V_{EE}	$2V_{CC}$
> 3.6 V	V_{CC}	≤ 6 ns	50 pF	1 kΩ	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; $T_{amb} = 25$ °C.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
THD	total harmonic distortion	f_i = 1 kHz; C_L = 50 pF; R_L = 10 kΩ; see Figure 19					
		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 kΩ; see Figure 19					
		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 Ω; see Figure 15	[1]				
		V_{CC} = 3.0 V		-	180	-	MHz
		V_{CC} = 6.0 V		-	200	-	MHz
α_{iso}	isolation (OFF-state)	f_i = 1 MHz; C_L = 50 pF; R_L = 600 Ω; see Figure 17	[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 Ω; see Figure 20					
		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 Ω; see Figure 21	[2]				
		V_{CC} = 3.0 V		-	−60	-	dB
		V_{CC} = 6.0 V		-	−60	-	dB

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

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

10.2.1 Test circuits

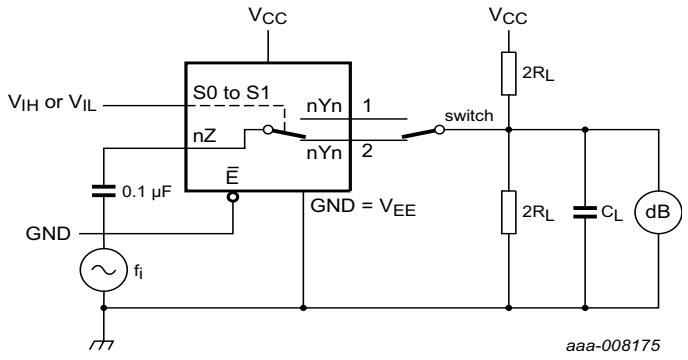
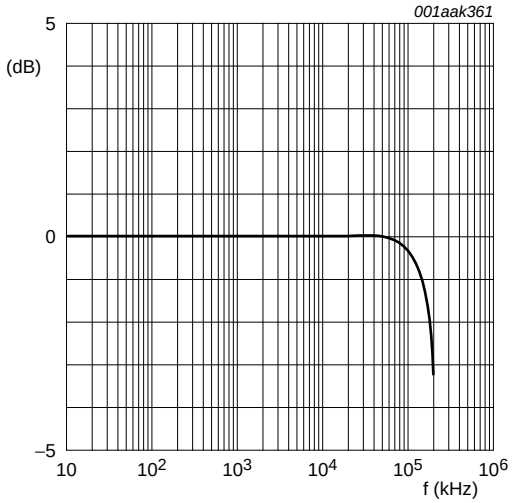


Fig 15. Test circuit for measuring frequency response



V_{CC} = 3.0 V; GND = 0 V; V_{EE} = - 3.0 V; R_L = 50 Ω; R_{SOURCE} = 1 kΩ.

Fig 16. Typical frequency response

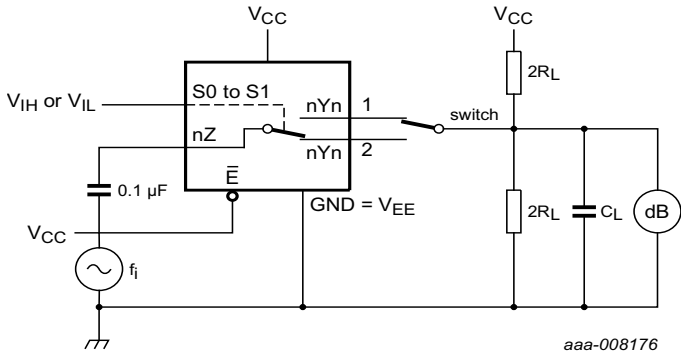
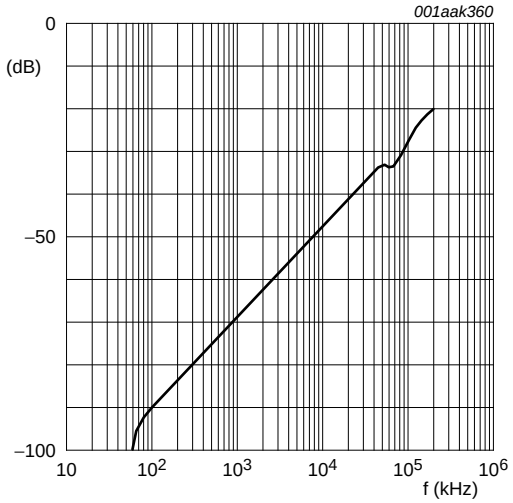


Fig 17. Test circuit for measuring isolation (OFF-state)



V_{CC} = 3.0 V; GND = 0 V; V_{EE} = - 3.0 V; R_L = 50 Ω; R_{SOURCE} = 1 kΩ.

Fig 18. Typical isolation (OFF-state) as function of frequency

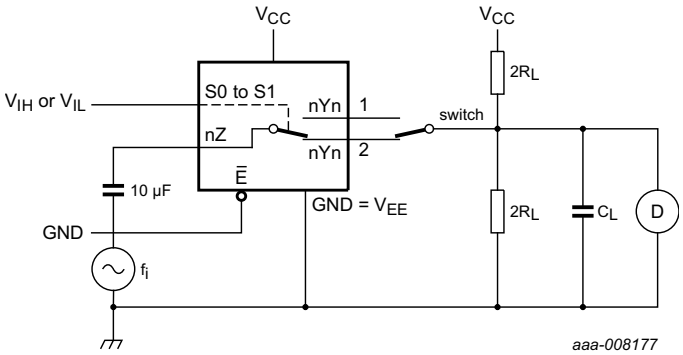
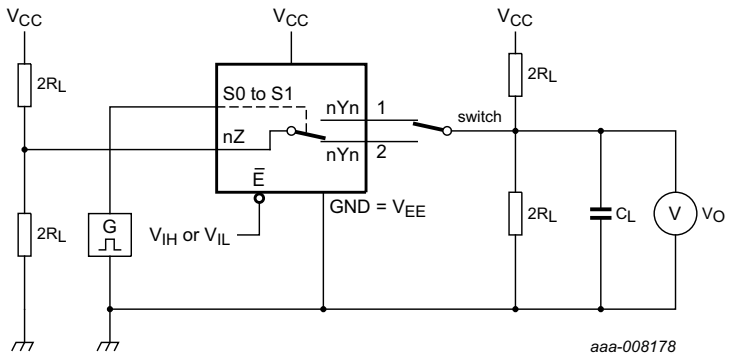
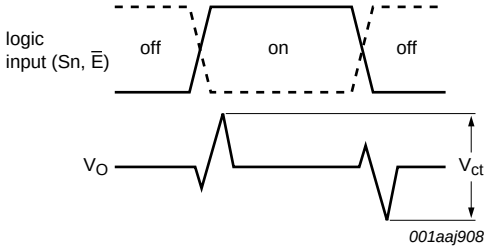


Fig 19. Test circuit for measuring total harmonic distortion



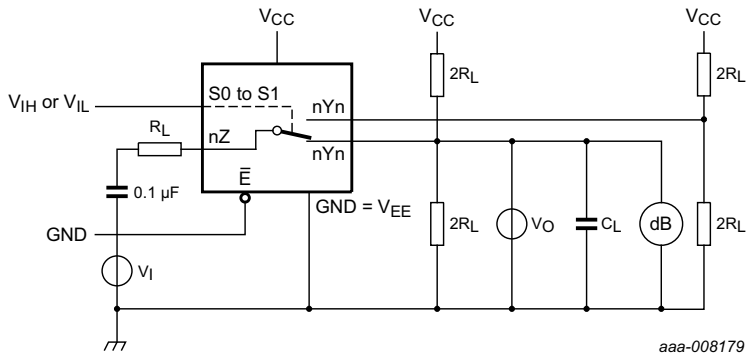
a. Test circuit



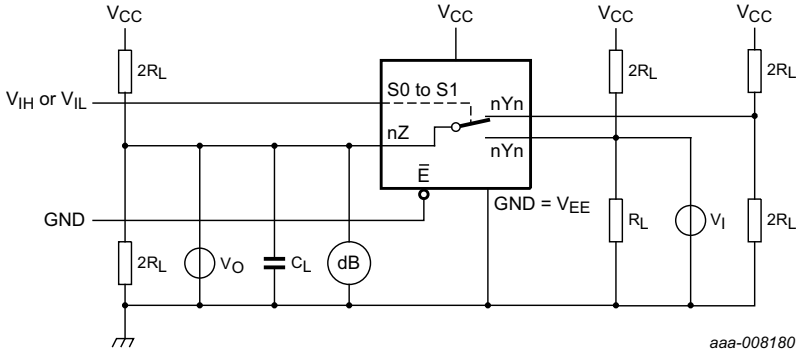
b. Input and output pulse definitions

V_I may be connected to Sn or $\overline{E}$.

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



a. Switch on channel.

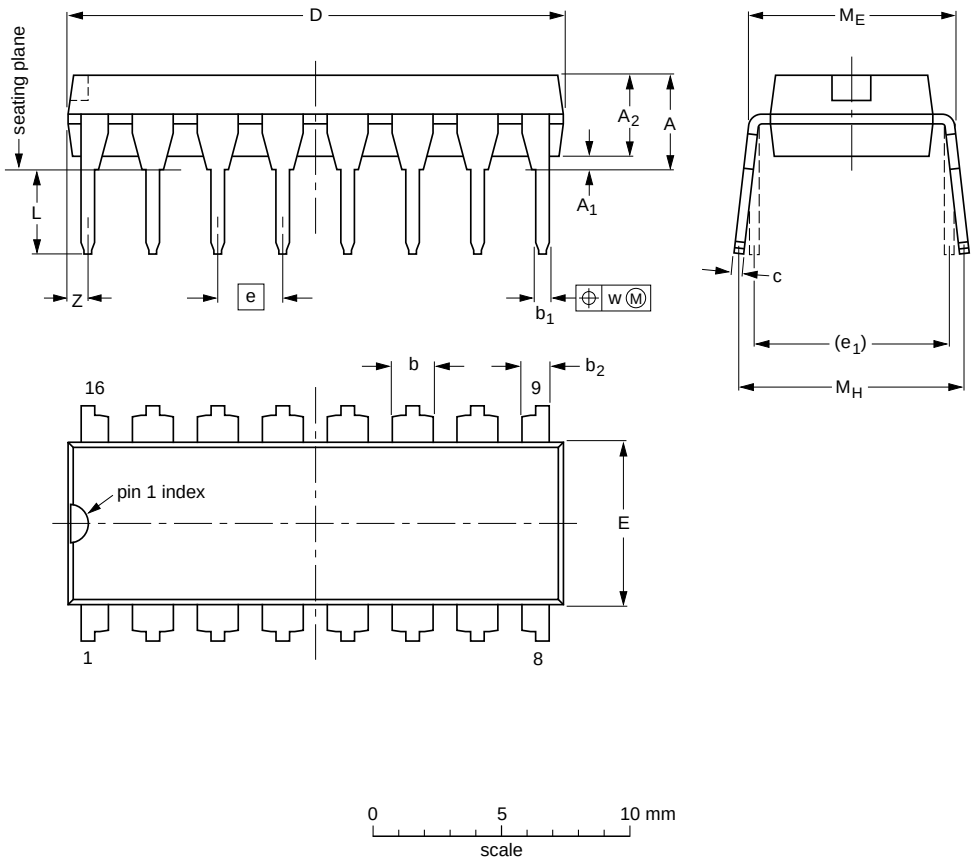


b. Switch off channel.

Fig 21. Test circuit for measuring crosstalk between switches

11. Package outline

DIP16: plastic dual in-line package; 16 leads (300 mil) **SOT38-4**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1 min.	A_2 max.	b	b_1	b_2	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.02	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.1	0.3	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.03

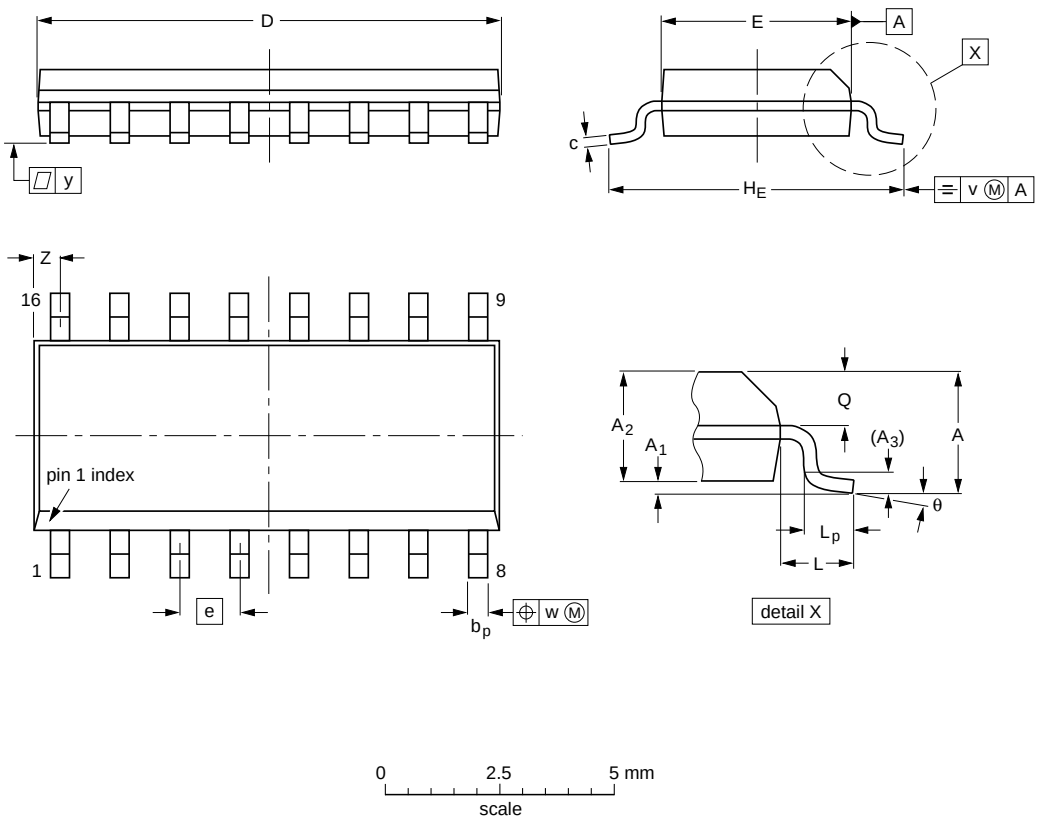
Note

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT38-4						~~95-01-14~~ 03-02-13

Fig 22. Package outline SOT38-4 (DIP16)

SO16: plastic small outline package; 16 leads; body width 3.9 mm **SOT109-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

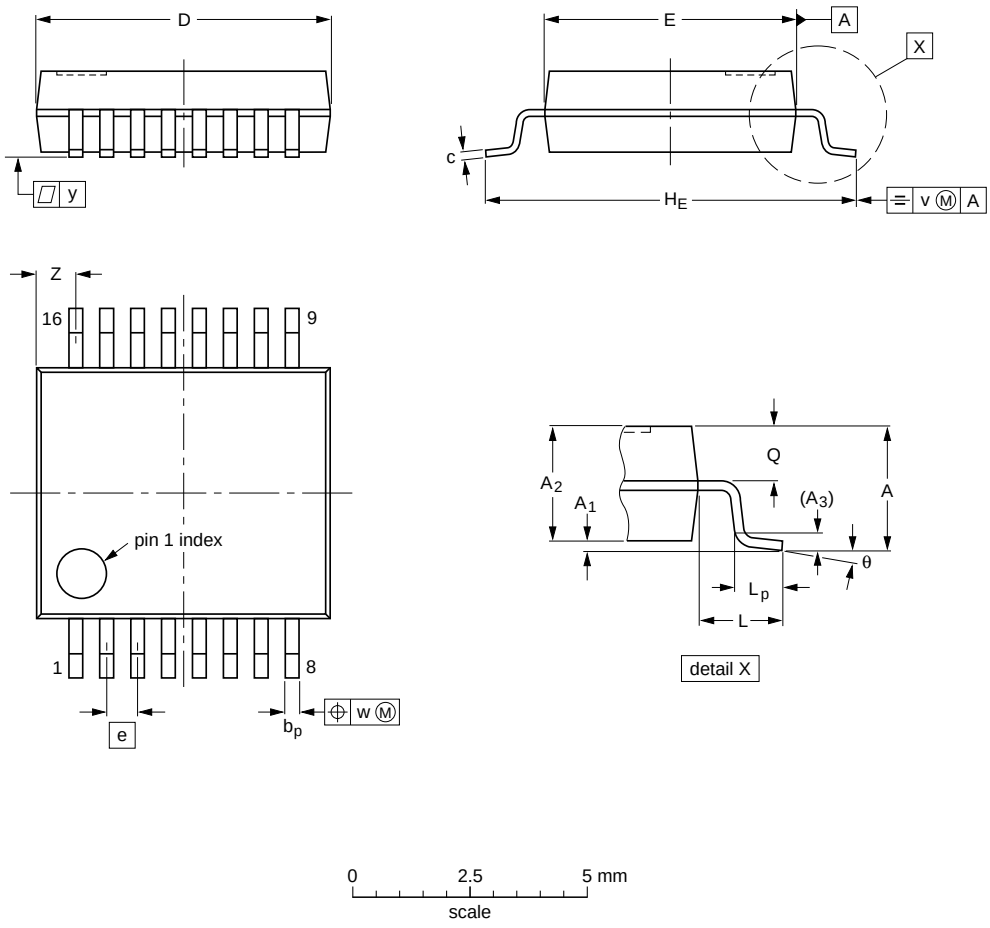
Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				~~99-12-27~~ 03-02-19

Fig 23. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm **SOT338-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.00 0.55	8^o 0^o

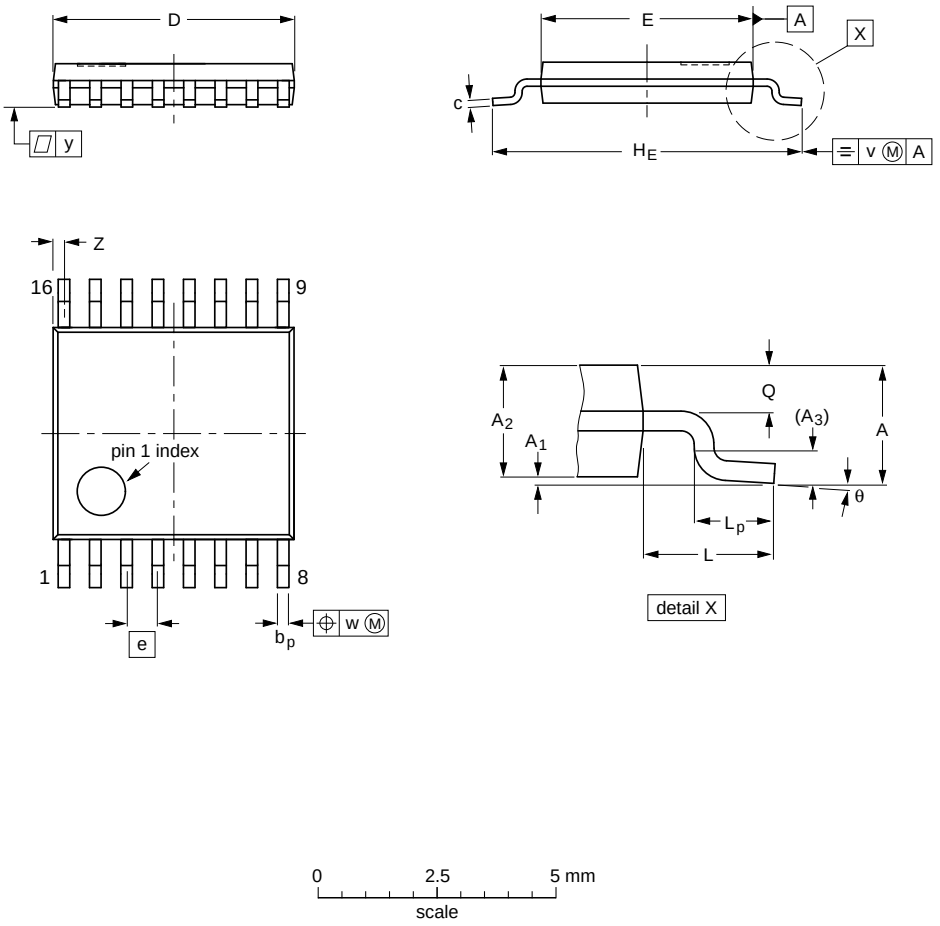
Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT338-1		MO-150				~~99-12-27~~ 03-02-19

Fig 24. Package outline SOT338-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm **SOT403-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8^o 0^o

Notes

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT403-1		MO-153				~~99-12-27~~ 03-02-18

Fig 25. Package outline SOT403-1 (TSSOP16)

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
74LV4052 v.4	20130701	Product data sheet	-	74LV4052 v.3
Modifications:	• 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.			
74LV4052 v.3	19980623	Product specification	-	74LV4052 v.2
74LV4052 v.2	19970715	Product specification	-	-

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.

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. NXP Semiconductors 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 NXP Semiconductors 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 NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors 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, NXP Semiconductors 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. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors 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, NXP Semiconductors' 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 NXP Semiconductors.

Right to make changes — NXP Semiconductors 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 — NXP Semiconductors 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 an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors 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. NXP Semiconductors 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 NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors 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.

NXP Semiconductors 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 NXP Semiconductors 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). NXP 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 — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nxp.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. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors 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 NXP Semiconductors 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. NXP Semiconductors 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 NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' 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.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

16. Contents

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

For more information, please visit: http://www.nxp.com
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 1 July 2013
Document identifier: 74LV4052