

## General Description

The SN74HC4052 is a dual single-pole quad-throw analog switch (2×SP4T) suitable for use in analog or digital 4:1 multiplexer/demultiplexer applications. Each switch features four independent inputs/outputs (nY0, nY1, nY2 and nY3) and a common input/output (nZ). A digital enable input ( $\bar{E}$ ) and two digital select inputs (S0 and S1) are common to both switches. When  $\bar{E}$  is HIGH, the switches are turned off. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

## Features

- Wide analog input voltage range from -5 V to +5 V
- Low ON resistance:
  - 80  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 4.5$  V
  - 70  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 6.0$  V
  - 60  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 9.0$  V
- Logic level translation: to enable 5 V logic to communicate with  $\pm 5$  V
- Typical “break before make” built-in
- Input levels:
  - For 74HC4052: CMOS level
- Specified from -40°C to +105°C
- Packaging information: DIP16/SOP16/TSSOP16

## Applications:

- Analog multiplexing and demultiplexing
- Digital multiplexing and demultiplexing
- Signal gating

## Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74HC4052N	DIP-16	74HC4052N	Tube	1000Pcs/Box
XBLW SN74HC4052DTR	SOP-16	74HC4052	Tape	2500Pcs/Reel
XBLW SN74HC4052TDTR	TSSOP-16	74HC4052	Tape	5000Pcs/Reel

Block Diagram And Pin Description

Block Diagram

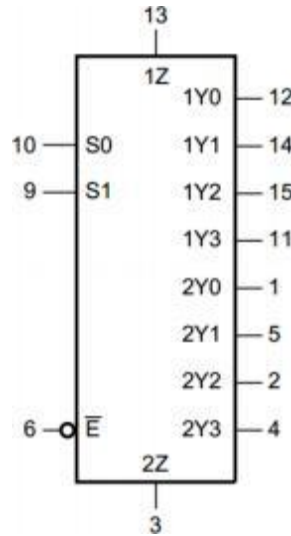


Figure 1. Logic symbol

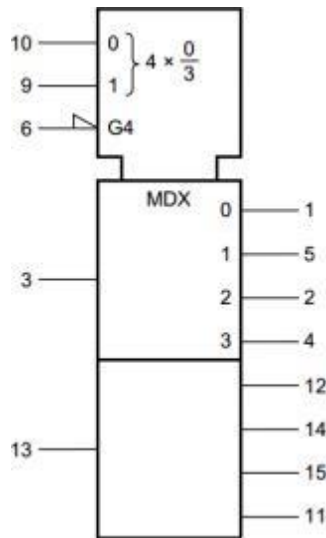


Figure 2. IEC logic symbol

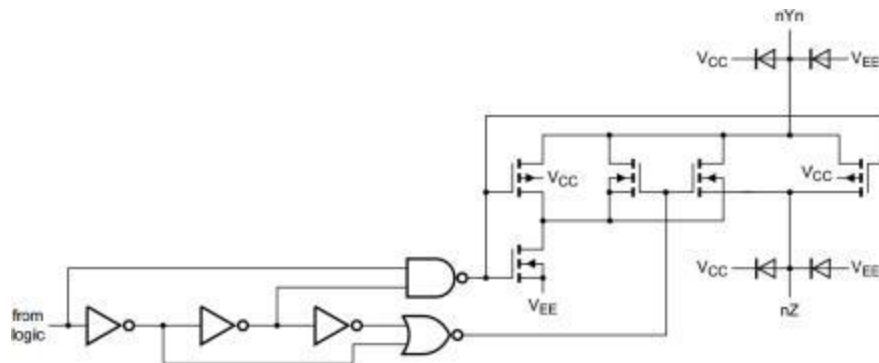


Figure 3. Schematic diagram (one switch)

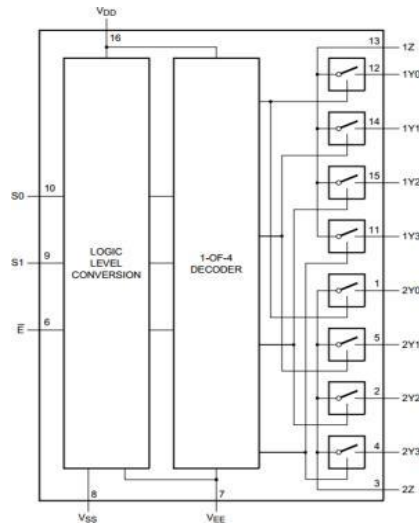
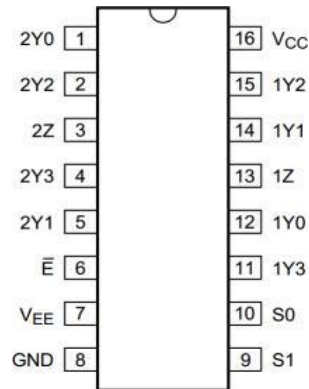


Figure 4. Functional diagram

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	2Y0	independent input or output
2	2Y2	independent input or output
3	2Z	common input or output
4	2Y3	independent input or output
5	2Y1	independent input or output
6	$\bar{E}$	enable input (active LOW)
7	$V_{EE}$	negative supply voltage
8	GND	ground supply voltage
9	S1	select logic input
10	S0	select logic input
11	1Y3	independent input or output
12	1Y0	independent input or output
13	1Z	common input or output
14	1Y1	independent input or output
15	1Y2	independent input or output
16	$V_{CC}$	positive supply voltage

**Function Table**

Input			Channel ON
$\bar{E}$	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

Note: H=HIGH voltage level; L=LOW voltage level; X=don'tcare.

**Electrical Parameter**
**Absolute Maximum Ratings**

 (Voltages are referenced to  $V_{EE} = \text{GND}$  (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	$V_{CC}$	- <sup>[1]</sup>	-0.5	+11	V
input clamping current	$I_{IK}$	$V_I < -0.5 \text{ V}$ or $V_I > V_{CC} + 0.5 \text{ V}$	-	$\pm 20$	mA
switch clamping current	$I_{SK}$	$V_{SW} < -0.5 \text{ V}$ or $V_{SW} > V_{CC} + 0.5 \text{ V}$	-	$\pm 20$	mA
switch current	$I_{SW}$	$-0.5 \text{ V} < V_{SW} < V_{CC} + 0.5 \text{ V}$	-	$\pm 25$	mA
supply current	$I_{EE}$	-	-	$\pm 20$	mA
supply current	$I_{CC}$	-	-	50	mA
ground current	$I_{GND}$	-	-	-50	mA
storage temperature	$T_{stg}$	-	-65	+150	$^{\circ}\text{C}$
total power dissipation	$P_{tot}$	- <sup>[2]</sup>	-	500	mW
power dissipation	P	per switch	-	100	mW
Soldering temperature	$T_L$	10s	DIP	245	$^{\circ}\text{C}$
			SOP	250	$^{\circ}\text{C}$

Note:

[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] For DIP16 packages: above  $70^{\circ}\text{C}$  the value of  $P_{tot}$  derates linearly with 12mW/K.

For SOP16 packages: above  $70^{\circ}\text{C}$  the value of  $P_{tot}$  derates linearly with 8mW/K.

For (T)SSOP16 packages: above  $60^{\circ}\text{C}$  the value of  $P_{tot}$  derates linearly with 5.5mW/K.

**Recommended Operating Conditions**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	$V_{CC}$	$V_{CC} - \text{GND}$	3.0	5.0	9.0	V
		$V_{CC} - V_{EE}$	3.0	5.0	9.0	V
input voltage	$V_I$	-	0	-	$V_{CC}$	V
switch voltage	$V_{SW}$	-	$V_{EE}$	-	$V_{CC}$	V
ambient temperature	$T_{amb}$	in free air	-40	-	+105	$^{\circ}\text{C}$
input transition rise and fall rate	$\Delta t/\Delta V$	$V_{CC} = 4.5 \text{ V}$	-	1.67	139	ns/V
		$V_{CC} = 6.0 \text{ V}$	-	-	83	ns/V
		$V_{CC} = 9.0 \text{ V}$	-	-	31	ns/V

**Electrical Characteristics**
**DC Characteristics 1**

( $T_{amb} = -40^{\circ}\text{C} \sim 85^{\circ}\text{C}$ , voltages are reference to GND (ground=0V), unless otherwise specified, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ. <sup>[1]</sup>	Max.	Unit
ON resistance (peak)	$R_{ON(peak)}$	$V_{is} = V_{CC} \text{ to } V_{EE};$ $I_{SW} = 1000 \mu\text{A}$	$V_{CC} = 4.5 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	100	225	$\Omega$
			$V_{CC} = 6.0 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	90	200	$\Omega$
			$V_{CC} = 4.5 \text{ V};$ $V_{EE} = -4.5 \text{ V}$	-	70	165	$\Omega$
ON resistance (rail)	$R_{ON(rail)}$	$V_{is} = V_{EE};$ $I_{SW} = 1000 \mu\text{A}$	$V_{CC} = 4.5 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	80	175	$\Omega$
			$V_{CC} = 6.0 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	70	150	$\Omega$
			$V_{CC} = 4.5 \text{ V};$ $V_{EE} = -4.5 \text{ V}$	-	60	130	$\Omega$
		$V_{is} = V_{CC};$ $I_{SW} = 1000 \mu\text{A}$	$V_{CC} = 4.5 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	90	200	$\Omega$
			$V_{CC} = 6.0 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	80	175	$\Omega$
			$V_{CC} = 4.5 \text{ V};$ $V_{EE} = -4.5 \text{ V}$	-	65	150	$\Omega$
ON resistance mismatch between channels	$\Delta R_{ON}$	$V_{is} = V_{CC} \text{ to } V_{EE}$	$V_{CC} = 4.5 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	9	-	$\Omega$
			$V_{CC} = 6.0 \text{ V};$ $V_{EE} = 0 \text{ V}$	-	8	-	$\Omega$
			$V_{CC} = 4.5 \text{ V};$ $V_{EE} = -4.5 \text{ V}$	-	6	-	$\Omega$
HIGH-level input voltage	$V_{IH}$	$V_{CC} = 4.5 \text{ V}$	3.15	2.4	-	V	
		$V_{CC} = 6.0 \text{ V}$	4.2	3.2	-	V	
		$V_{CC} = 9.0 \text{ V}$	6.3	4.7	-	V	
LOW-level input voltage	$V_{IL}$	$V_{CC} = 4.5 \text{ V}$	-	2.1	1.35	V	
		$V_{CC} = 6.0 \text{ V}$	-	2.8	1.8	V	
		$V_{CC} = 9.0 \text{ V}$	-	4.3	2.7	V	
input leakage current	$I_i$	$V_{EE} = 0 \text{ V};$ $V_i = V_{CC} \text{ or } \text{GND}$	$V_{CC} = 6.0 \text{ V}$	-	-	$\pm 1.0$	$\mu\text{A}$
			$V_{CC} = 9.0 \text{ V}$	-	-	$\pm 2.0$	$\mu\text{A}$
OFF-state leakage	$I_{S(OFF)}$	$V_{CC} = 9.0 \text{ V};$	per channel	-	-	$\pm 1.0$	$\mu\text{A}$

current		$V_{EE} = 0\text{ V};$ $V_I = V_{IH}\text{ or }V_{IL};$ $ V_{SW}  = V_{CC} - V_{EE};$ see Figure 7	all channels	-	-	$\pm 2.0$	$\mu\text{A}$
ON-state leakage current	$I_{S(ON)}$	$V_I = V_{IH}\text{ or }V_{IL};  V_{SW}  = V_{CC} - V_{EE};$ $V_{CC} = 9.0\text{ V}; V_{EE} = 0\text{ V};$ see Figure 8		-	-	$\pm 2.0$	$\mu\text{A}$
supply current	$I_{CC}$	$V_{EE} = 0\text{ V};$ $V_I = V_{CC}\text{ or GND};$ $V_{is} = V_{EE}\text{ or }V_{CC};$ $V_{os} = V_{CC}\text{ or }V_{EE}$	$V_{CC} = 6.0\text{ V}$	-	-	80.0	$\mu\text{A}$
			$V_{CC} = 9.0\text{ V}$	-	-	160.0	$\mu\text{A}$
input capacitance	$C_i$	-	-	3.5	-	$\text{pF}$	
switch capacitance	$C_{SW}$	independent pins nYn	-	5	-	$\text{pF}$	
		common pins nZ	-	12	-	$\text{pF}$	

Note:

[1] All typical values are measured at  $T_{amb} = 25^\circ\text{C}$ .

[2]  $V_I = V_{IH}$  or  $V_{IL}$ ; for test circuit see Figure 5.

[3]  $V_{is}$  is the input voltage at an Y nor nZ terminal, whichever is assigned as an input.

[4]  $V_{os}$  is the output voltage at a nY nor nZ terminal, whichever is assigned as an output.

## DC Characteristics 2

( $T_{amb} = -40^\circ\text{C} \sim 105^\circ\text{C}$ , voltages are reference to GND (ground=0V), unless otherwise specified, unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ. <sup>[1]</sup>	Max.	Unit	
ON resistance (peak)	$R_{ON(peak)}$	$V_{is} = V_{CC}\text{ to }V_{EE};$ $I_{SW} = 1000\text{ }\mu\text{A}$	$V_{CC} = 4.5\text{ V};$ $V_{EE} = 0\text{ V}$	-	-	270	$\Omega$
			$V_{CC} = 6.0\text{ V};$ $V_{EE} = 0\text{ V}$	-	-	240	$\Omega$
			$V_{CC} = 4.5\text{ V};$ $V_{EE} = -4.5\text{ V}$	-	-	195	$\Omega$
ON resistance (rail)	$R_{ON(rail)}$	$V_{is} = V_{EE};$ $I_{SW} = 1000\text{ }\mu\text{A}$	$V_{CC} = 4.5\text{ V};$ $V_{EE} = 0\text{ V}$	-	-	210	$\Omega$
			$V_{CC} = 6.0\text{ V};$ $V_{EE} = 0\text{ V}$	-	-	180	$\Omega$
			$V_{CC} = 4.5\text{ V};$ $V_{EE} = -4.5\text{ V}$	-	-	160	$\Omega$
		$V_{is} = V_{CC};$ $I_{SW} = 1000\text{ }\mu\text{A}$	$V_{CC} = 4.5\text{ V};$ $V_{EE} = 0\text{ V}$	-	-	240	$\Omega$
			$V_{CC} = 6.0\text{ V};$ $V_{EE} = 0\text{ V}$	-	-	210	$\Omega$
			$V_{CC} = 4.5\text{ V};$ $V_{EE} = -4.5\text{ V}$	-	-	180	$\Omega$
HIGH-level input voltage	$V_{IH}$	$V_{CC} = 4.5\text{ V}$	3.15	-	-	V	
		$V_{CC} = 6.0\text{ V}$	4.2	-	-	V	
		$V_{CC} = 9.0\text{ V}$	6.3	-	-	V	

LOW-level input voltage	$V_{IL}$	$V_{CC} = 4.5\text{ V}$		-	-	1.35	V	
		$V_{CC} = 6.0\text{ V}$		-	-	1.8	V	
		$V_{CC} = 9.0\text{ V}$		-	-	2.7	V	
input leakage current	$I_I$	$V_{EE} = 0\text{ V};$ $V_I = V_{CC}\text{ or GND}$	$V_{CC} = 6.0\text{ V}$	-	-	$\pm 1.0$	$\mu\text{A}$	
			$V_{CC} = 9.0\text{ V}$	-	-	$\pm 2.0$	$\mu\text{A}$	
OFF-state leakage current	$I_{S(OFF)}$	$V_{CC} = 9.0\text{ V};$ $V_{EE} = 0\text{ V};$ $V_I = V_{IH}\text{ or }V_{IL};$ $ V_{SW}  = V_{CC} - V_{EE};$ see Figure 7	per channel	-	-	$\pm 1.0$	$\mu\text{A}$	
			all channels	-	-	$\pm 2.0$	$\mu\text{A}$	
ON-state leakage current	$I_{S(ON)}$	$V_I = V_{IH}\text{ or }V_{IL};  V_{SW}  = V_{CC} - V_{EE};$ $V_{CC} = 9.0\text{ V}; V_{EE} = 0\text{ V};$ see Figure 8		-	-	$\pm 2.0$	$\mu\text{A}$	
			$V_{EE} = 0\text{ V};$	$V_{CC} = 6.0\text{ V}$	-	-	160.0	$\mu\text{A}$
				$V_{CC} = 9.0\text{ V}$	-	-	320.0	$\mu\text{A}$

Note:

- [1] All typical values are measured at  $T_{amb} = 25^\circ\text{C}$ .
- [2]  $V_I = V_{IH}$  or  $V_{IL}$ ; for test circuit see Figure 5.
- [3]  $V_{is}$  is the input voltage at an  $Y$  nor  $nZ$  terminal, whichever is assigned as an input.
- [4]  $V_{os}$  is the output voltage at a  $nY$  nor  $nZ$  terminal, whichever is assigned as an output.

AC Characteristics 1

( $T_{amb} = -40^{\circ}\text{C} \sim +85^{\circ}\text{C}$ ;  $GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ. <sup>[1]</sup>	Max.	Unit	
propagation delay	$t_{pd}$	$V_{is}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Figure 9 <sup>[2]</sup>	$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	5	15	ns
			$V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	4	13	ns
			$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$	-	4	10	ns
turn-on time	$t_{on}$	$\bar{E}$ , Sn to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Figure 10 <sup>[3]</sup>	$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	38	81	ns
			$V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$	-	28	-	ns
			$V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	30	69	ns
			$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$	-	26	58	ns
turn-off time	$t_{off}$	$\bar{E}$ , Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Figure 10 <sup>[4]</sup>	$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	27	63	ns
			$V_{CC} = 5.0\text{ V}$ ; $V_{EE} = 0\text{ V}$ ; $C_L = 15\text{ pF}$	-	21	-	ns
			$V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	22	54	ns
			$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$	-	22	48	ns
power dissipation capacitance	$C_{PD}$	per switch; $V_i = GND$ to $V_{CC}$ <sup>[5]</sup>	-	57	-	pF	

Note:

[1] All typical values are measured at  $T_{amb} = 25^{\circ}\text{C}$ .

[2]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .

[3]  $t_{on}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .

[4]  $t_{off}$  is the same as  $t_{PHZ}$  and  $t_{PLZ}$ .

[5]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$N$  = number of inputs switching;

$\sum \{(C_L + C_{SW}) \times V_{CC}^2 \times f_o\}$  = sum of outputs;

$C_L$  = output load capacitance in pF;

$C_{SW}$  = switch capacitance in pF;

$V_{CC}$  = supply voltage in V.

[6] For test circuit see Figure 11.

[7]  $V_{is}$  is the input voltage at an  $Y_n$  or  $nZ$  terminal, whichever is assigned as an input.

[8]  $V_{os}$  is the output voltage at a  $nY$  or  $nZ$  terminal, whichever is assigned as an output.



AC Characteristics 2

( $T_{amb} = -40^{\circ}\text{C} \sim +105^{\circ}\text{C}$ ;  $GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ. <sup>[1]</sup>	Max.	Unit	
propagation delay	$t_{pd}$	$V_{is}$ to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Figure 9 <sup>[2]</sup>	$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	-	18	ns
			$V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	-	15	ns
			$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$	-	-	12	ns
turn-on time	$t_{on}$	$\bar{E}$ , Sn to $V_{os}$ ; $R_L = \infty\ \Omega$ ; see Figure 10 <sup>[3]</sup>	$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	-	98	ns
			$V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	-	83	ns
			$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$	-	-	69	ns
turn-off time	$t_{off}$	$\bar{E}$ , Sn to $V_{os}$ ; $R_L = 1\text{ k}\Omega$ ; see Figure 10 <sup>[4]</sup>	$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	-	75	ns
			$V_{CC} = 6.0\text{ V}$ ; $V_{EE} = 0\text{ V}$	-	-	64	ns
			$V_{CC} = 4.5\text{ V}$ ; $V_{EE} = -4.5\text{ V}$	-	-	57	ns

Note:

[1] All typical values are measured at  $T_{amb} = 25^{\circ}\text{C}$ .

[2]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .

[3]  $t_{on}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .

[4]  $t_{off}$  is the same as  $t_{PHZ}$  and  $t_{PLZ}$ .

[5] For test circuit see Figure 11.

[6]  $V_{is}$  is the input voltage at an Ynor nZ terminal, whichever is assigned as an input.

[7]  $V_{os}$  is the output voltage at a nYnor nZ terminal, whichever is assigned as an output.

**AC Characteristics 3**

 (T<sub>amb</sub> = 25°C; GND = 0V; C<sub>L</sub> = 50pF; recommended conditions and typical values.)

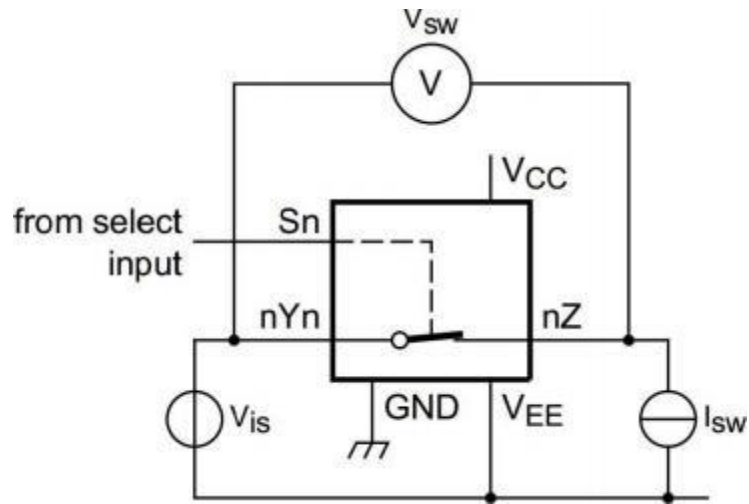
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
sine-wave distortion	d <sub>sin</sub>	f <sub>i</sub> = 1 kHz; R <sub>L</sub> = 10 kΩ; see Figure 12	V <sub>is</sub> = 4.0 V (p-p); V <sub>CC</sub> = 2.25 V; V <sub>EE</sub> = -2.25 V	-	0.04	-	%
			V <sub>is</sub> = 8.0 V (p-p); V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V	-	0.02	-	%
		f <sub>i</sub> = 10 kHz; R <sub>L</sub> = 10 kΩ; see Figure 12	V <sub>is</sub> = 4.0 V (p-p); V <sub>CC</sub> = 2.25 V; V <sub>EE</sub> = -2.25 V	-	0.12	-	%
			V <sub>is</sub> = 8.0 V (p-p); V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V	-	0.06	-	%
isolation (OFF-state)	U <sub>iso</sub>	R <sub>L</sub> = 600 Ω; f <sub>i</sub> = 1 MHz; see Figure 13	V <sub>CC</sub> = 2.25 V; <sup>[1]</sup> V <sub>EE</sub> = -2.25 V	-	-50	-	dB
			V <sub>CC</sub> = 4.5 V; <sup>[1]</sup> V <sub>EE</sub> = -4.5 V	-	-50	-	dB
crosstalk	Xtalk	between two switches/multiplexers; R <sub>L</sub> = 600 Ω; f <sub>i</sub> = 1 MHz; see Figure 14	V <sub>CC</sub> = 2.25 V; <sup>[1]</sup> V <sub>EE</sub> = -2.25 V	-	-60	-	dB
			V <sub>CC</sub> = 4.5 V; <sup>[1]</sup> V <sub>EE</sub> = -4.5 V	-	-60	-	dB
crosstalk voltage	V <sub>ct</sub>	peak-to-peak value; between control and any switch; R <sub>L</sub> = 600 Ω; f <sub>i</sub> = 1 MHz; E or Sn square wave between V <sub>CC</sub> and GND; t <sub>r</sub> = t <sub>f</sub> = 6 ns; see Figure 15	V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = 0 V	-	110	-	mV
			V <sub>CC</sub> = 4.5 V; V <sub>EE</sub> = -4.5 V	-	220	-	mV
-3dB frequency response	f <sub>(-3dB)</sub>	R <sub>L</sub> = 50 Ω; see Figure 16	V <sub>CC</sub> = 2.25 V; <sup>[2]</sup> V <sub>EE</sub> = -2.25 V	-	170	-	MHz
			V <sub>CC</sub> = 4.5 V; <sup>[2]</sup> V <sub>EE</sub> = -4.5 V	-	180	-	MHz

Note:

- [1] Adjust input voltage V<sub>is</sub> to 0 dBm level (0 dBm = 1 mW into 600 Ω).
- [2] Adjust input voltage V<sub>is</sub> to 0 dBm level at V<sub>os</sub> for 1 MHz (0 dBm = 1 mW into 50 Ω).
- [3] V<sub>is</sub> is the input voltage at an Y<sub>nor</sub> nZ terminal, whichever is assigned as an input.
- [4] V<sub>os</sub> is the output voltage at a nY<sub>nor</sub> nZ terminal, whichever is assigned as an output.

Testing Circuit

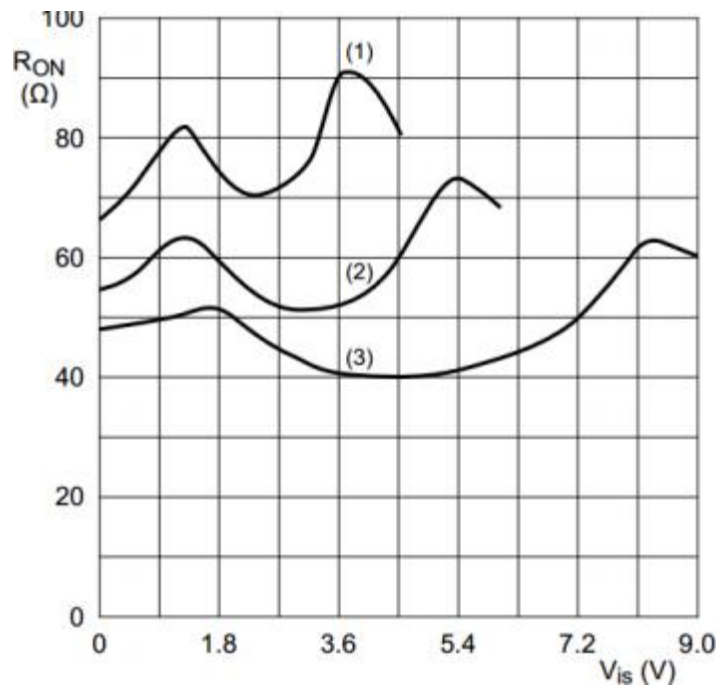
DC Testing Circuit 1



$$V_{is} = 0V \text{ to } (V_{CC} - V_{EE})$$

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

Figure 5. Test circuit for measuring  $R_{ON}$



$$V_{is} = 0V \text{ to } (V_{CC} - V_{EE})$$

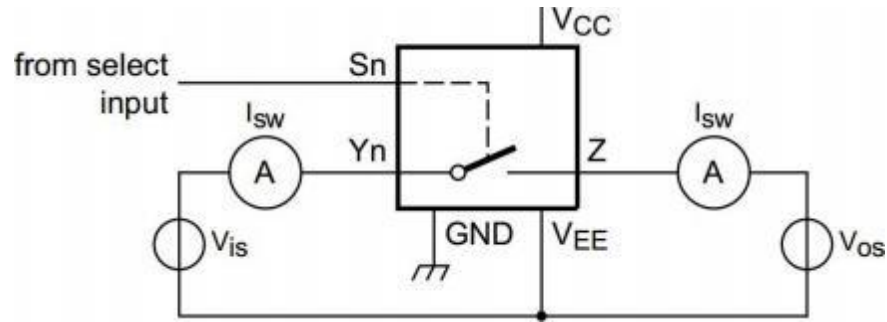
(1)  $V_{CC} = 4.5V$

(2)  $V_{CC} = 6V$

(3)  $V_{CC} = 9V$

Figure 6. Typical  $R_{ON}$  as a function of input voltage  $V_{is}$

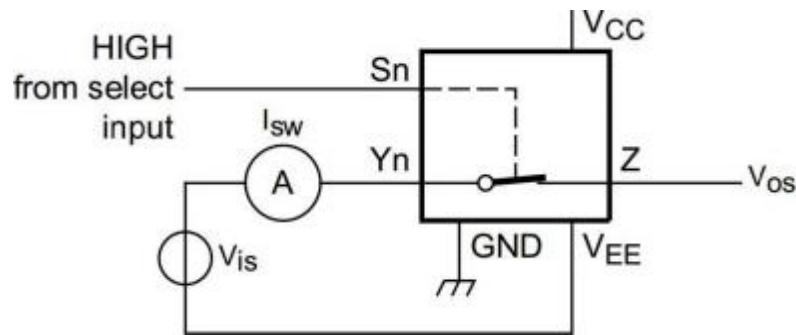
DC Testing Circuit 2



$V_{is} = V_{CC}$  and  $V_{os} = V_{EE}$ .

$V_{is} = V_{EE}$  and  $V_{os} = V_{CC}$ .

Figure 7. Test circuit for measuring OFF-state current



$V_{is} = V_{CC}$  and  $V_{os} = \text{open-circuit}$ .

$V_{is} = V_{EE}$  and  $V_{os} = \text{open-circuit}$ .

Figure 8. Test circuit for measuring ON-state current

AC Testing Waveforms

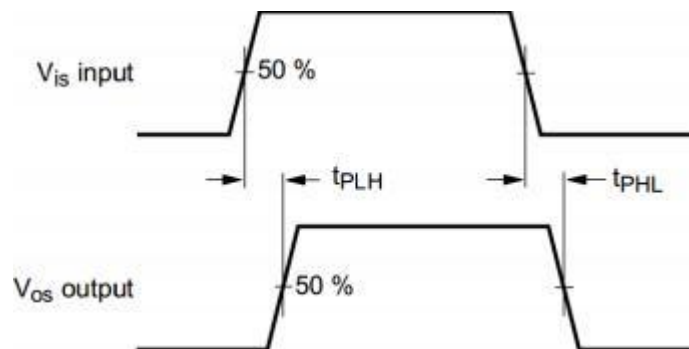


Figure 9. Input ( $V_{is}$ ) to output ( $V_{os}$ ) propagation delays

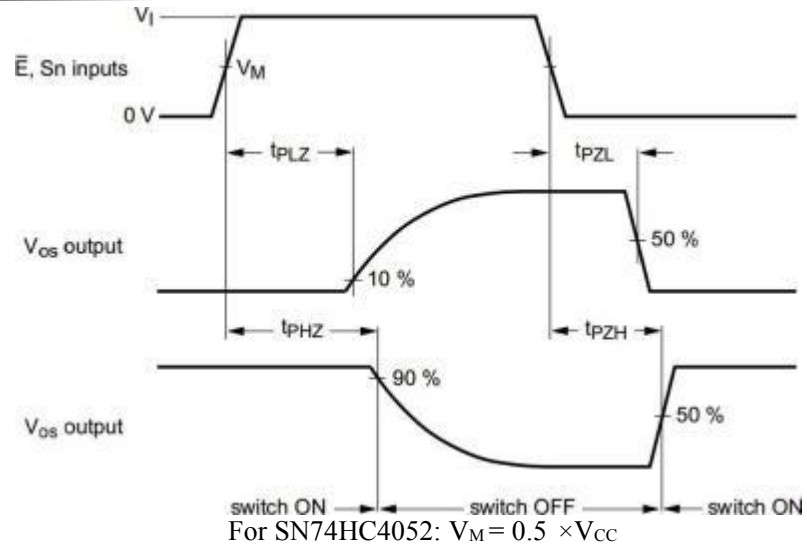


Figure 10. Turn-on and turn-off times

### AC Testing Circuit 1

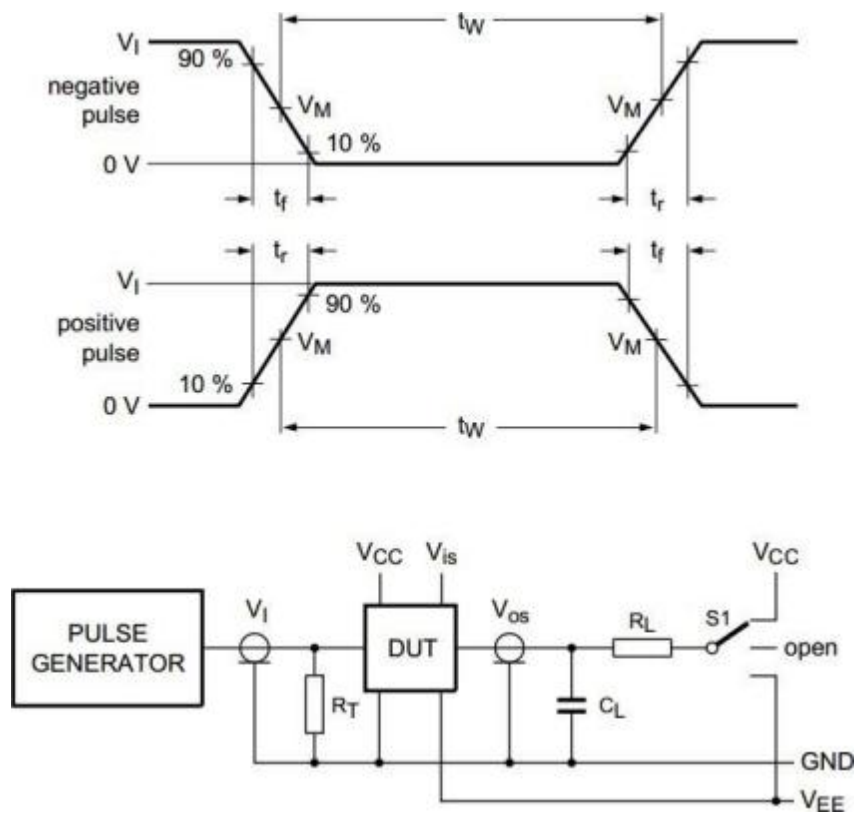


Figure 11. Test circuit for measuring switching times

Definitions for test circuit:

$R_T$  = termination resistance should be equal to the output impedance  $Z_O$  of the pulse generator.  $C_L$  = load capacitance including jig and probe capacitance.

$R_L$  = load resistance.

S1 = Test selection switch.

Test Data

Test	Input				Load		S1 position
	V <sub>I</sub>	V <sub>is</sub>	t <sub>r</sub> , t <sub>f</sub>		C <sub>L</sub>	R <sub>L</sub>	
			atf <sub>max</sub>	other <sup>[1]</sup>			
t <sub>PHL</sub> , t <sub>PLH</sub>	[2]	pulse	< 2ns	6ns	50pF	1kΩ	open
t <sub>PZH</sub> , t <sub>PHZ</sub>	[2]	V <sub>CC</sub>	< 2ns	6ns	50pF	1kΩ	V <sub>EE</sub>
t <sub>PZL</sub> , t <sub>PLZ</sub>	[2]	V <sub>EE</sub>	< 2ns	6ns	50pF	1kΩ	V <sub>CC</sub>

Note:

[1] t<sub>r</sub> = t<sub>f</sub> = 6 ns; when measuring f<sub>max</sub>, there is no constraint to t<sub>r</sub> and t<sub>f</sub> with 50 % duty factor.

[2] V<sub>I</sub> values:

For SN74HC4052: V<sub>I</sub> = V<sub>CC</sub>.

AC Testing Circuit 2

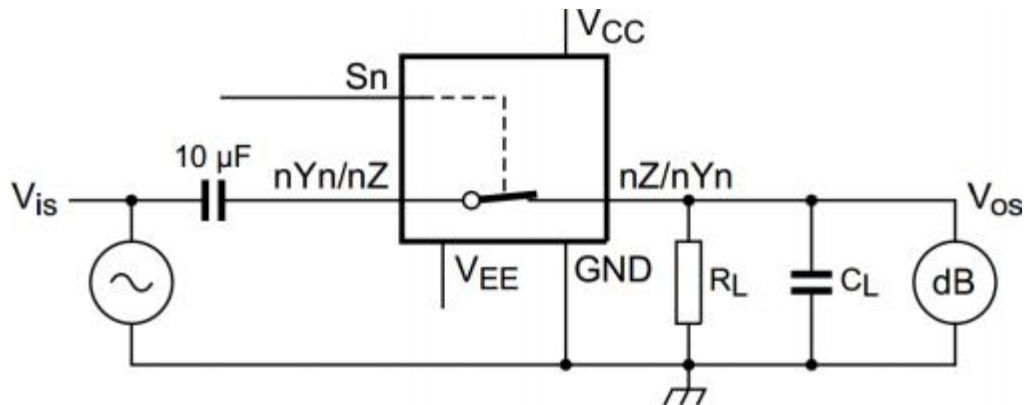
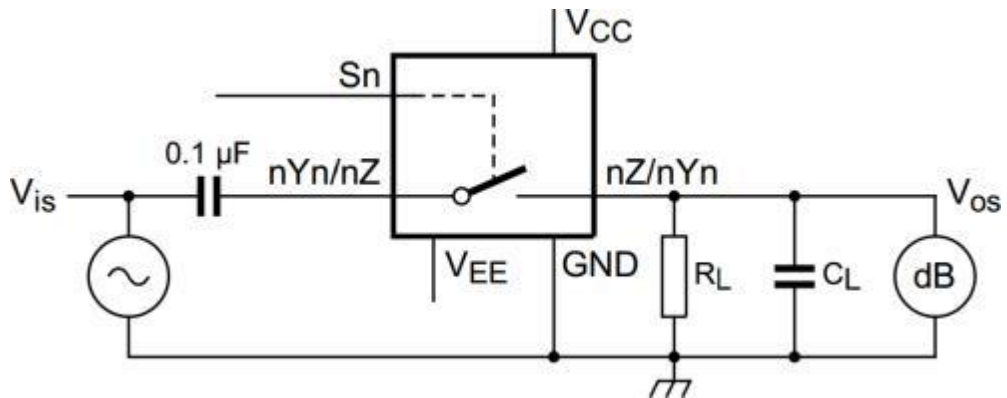
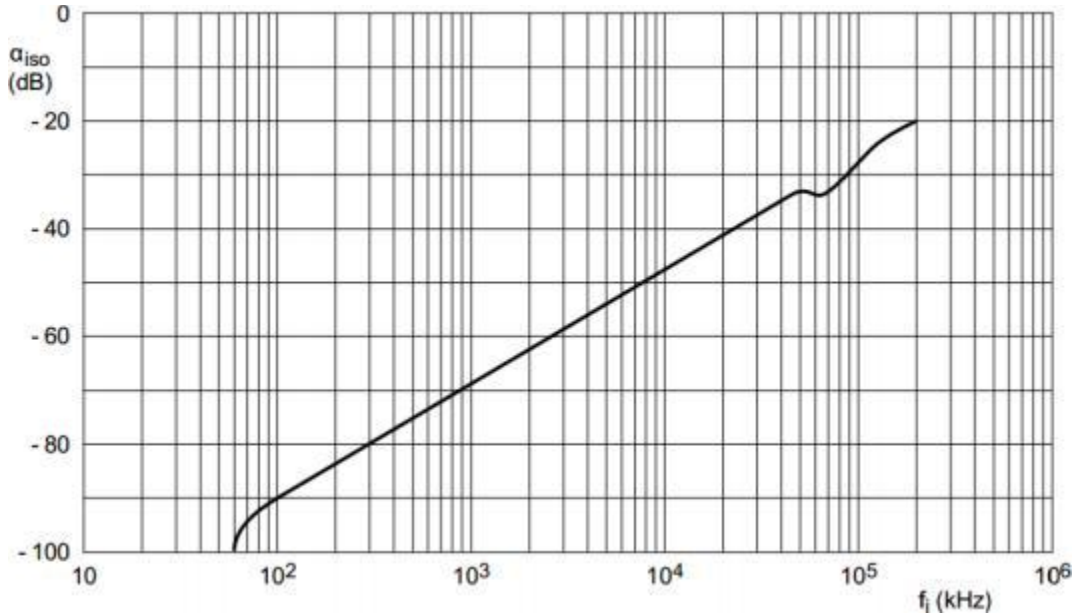


Figure 12. Test circuit for measuring sine-wave distortion



V<sub>CC</sub> = 4.5 V; GND = 0 V; V<sub>EE</sub> = -4.5 V; R<sub>L</sub> = 600 Ω; R<sub>s</sub> = 1 kΩ.

a. Test circuit



b. Isolation (OFF-state) as a function of frequency  
Figure 13. Test circuit for measuring isolation (OFF-state)

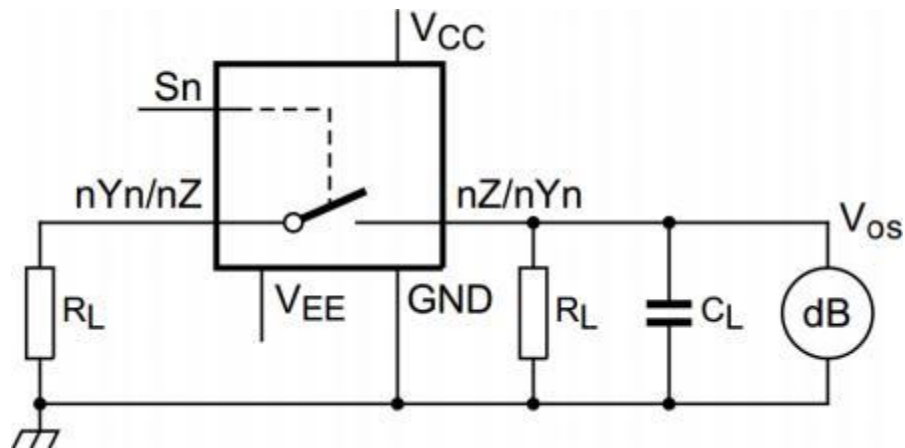
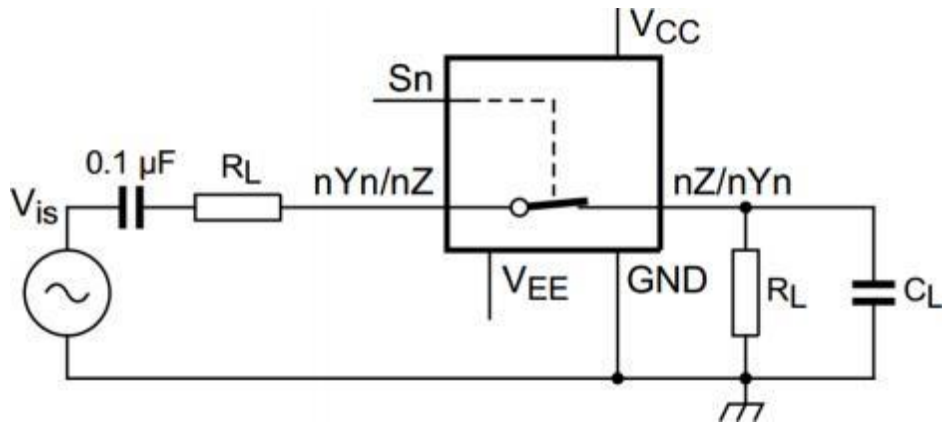


Figure 14. Test circuits for measuring crosstalk between any two switches/multiplexers

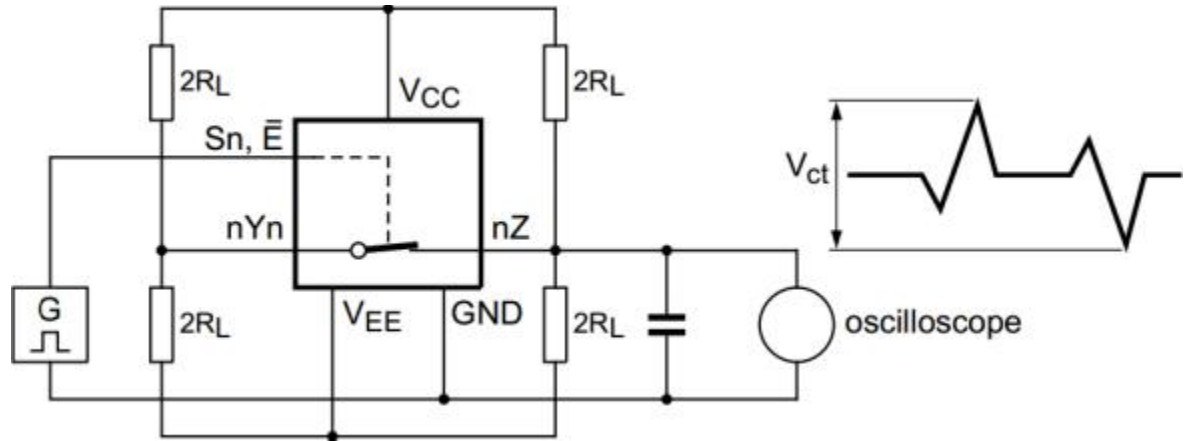
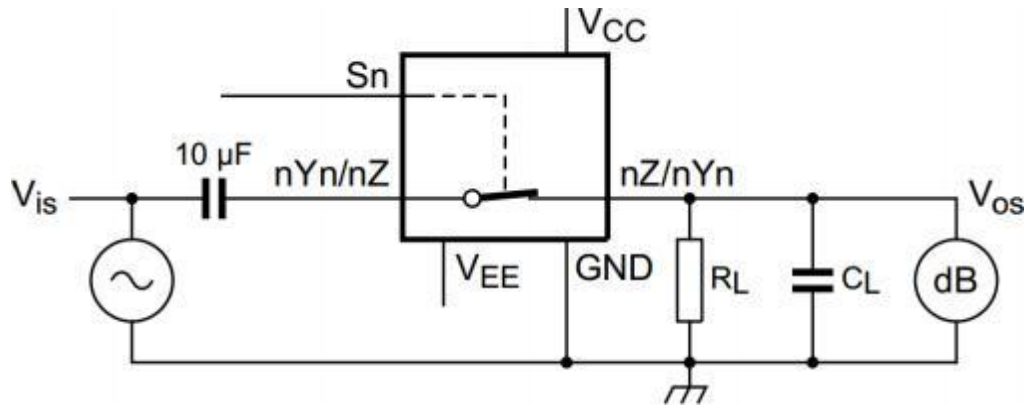
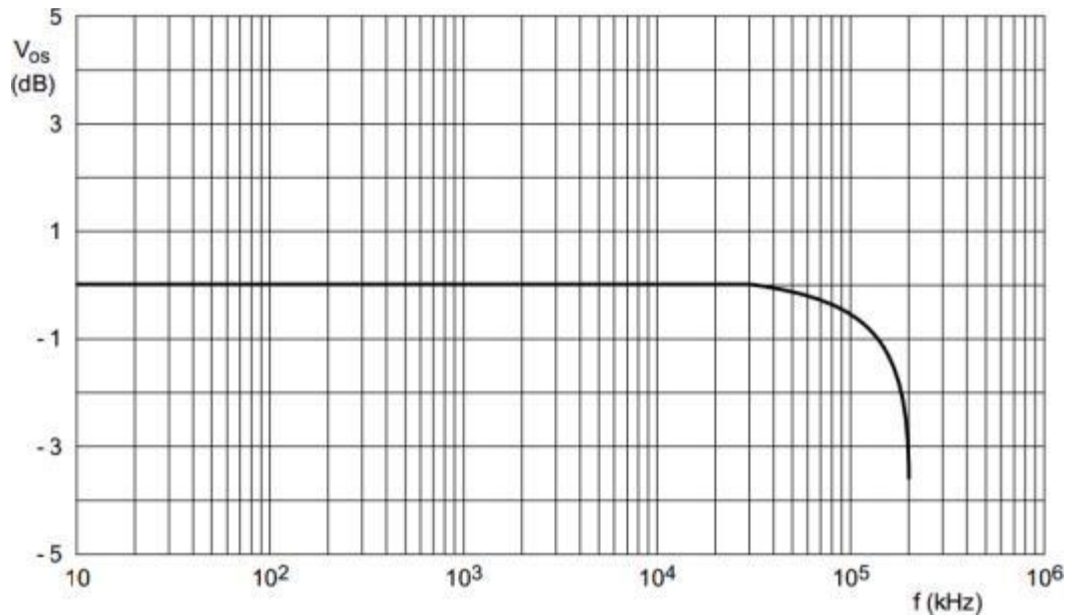


Figure 15. Test circuit for measuring crosstalk between control input and any switch



$V_{CC} = 4.5\text{ V}$ ;  $GND = 0\text{ V}$ ;  $V_{EE} = -4.5\text{ V}$ ;  $R_L = 50\ \Omega$ ;  $R_S = 1\text{ k}\Omega$

a. Test circuit



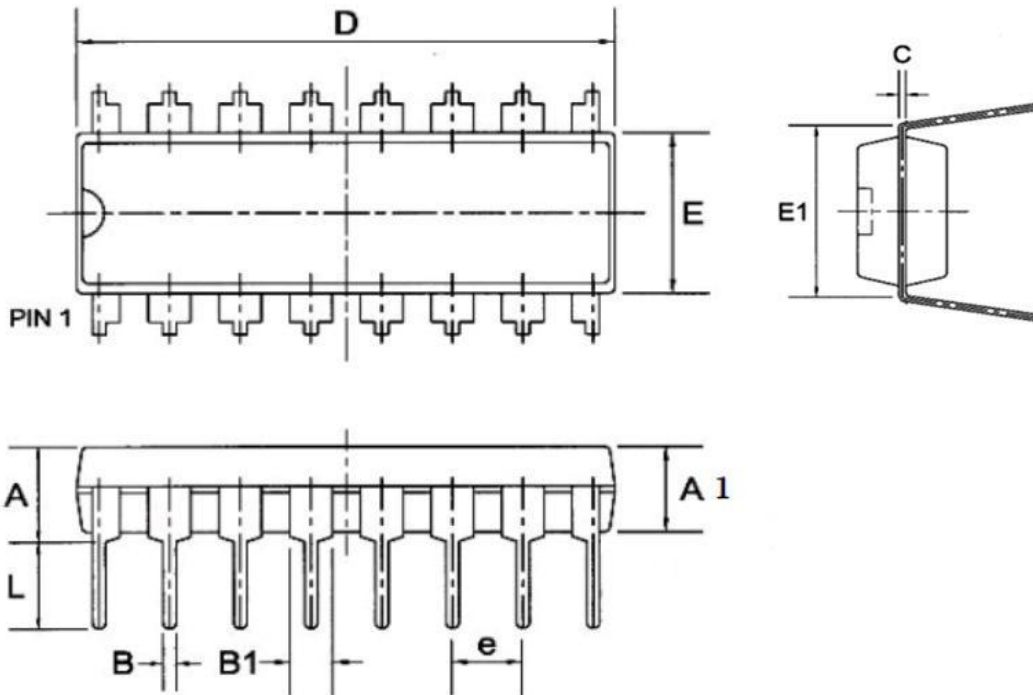
b. Typical frequency response

Figure 16. Test circuit for frequency response



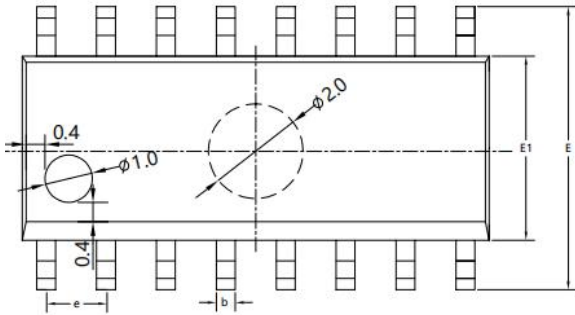
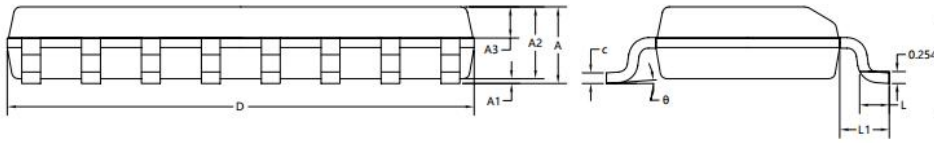
Package Information

DIP16



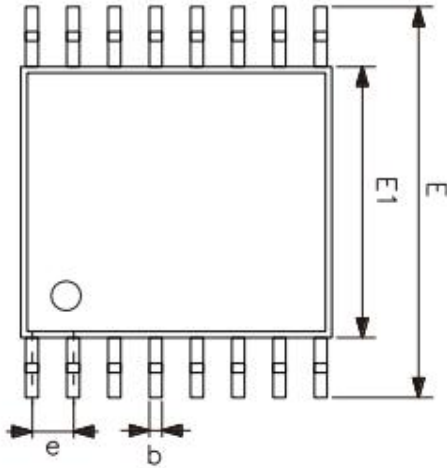
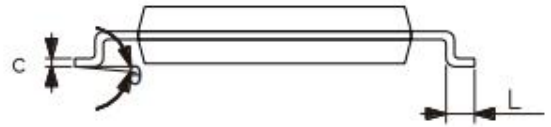
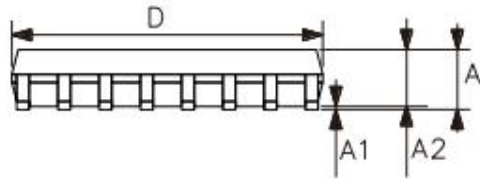
Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A	--	--	4.31
A1	3.15	3.30	3.65
B	--	0.50	--
B1	--	1.6	--
C	--	0.27	--
D	19.00	19.20	19.60
E	6.20	6.50	6.60
E1	--	8.0	--
e	--	2.3	--
L	3.00	3.20	3.60

SOP16



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.50	1.60	1.70
A1	0.10	0.15	0.25
A2	1.40	1.45	1.50
A3	0.60	0.65	0.70
b	0.30	0.40	0.50
c	0.15	0.20	0.25
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.85	3.90	3.95
e	1.27BSC		
L	0.50	0.60	0.70
L1	1.05BSC		
θ	0°	4°	8°

TSSOP16



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	4.90	5.10
E1	4.30	4.50
E	6.20	6.60
e	0.65	
L	0.45	0.75
$\theta$	0°	8°



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