General Deseription

The HSN74LVC1G3157DBVR provides one analog multiplexer/demultiplexer with one digital select input (S), two independent inputs/outputs (Y0, Y1) and a common input/output (Z).

Schmitt trigger action at the select input makes the circuit tolerant of slower input rise and fall times across the entire V_{CC} range from 1.65V to 5.5V.

Features

Wide supply voltage range from 1.65V to 5.5V

Very low ON resistance:

- 7.5Ω (typical) at V_{CC}=2.7V
- 6.5Ω (typical) at V_{CC}=3.3V
- 6Ω (typical) at V_{CC}=5V

Switch current capability of 32mA

Break-before-make switching

CMOS low power consumption

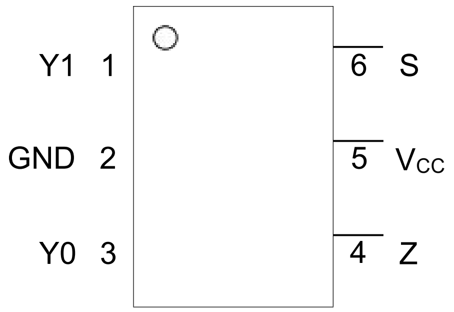
TTL interface compatibility at 3.3V

Control input accepts voltages up to 5.5V

Specified from -40℃ to +105℃

Packaging information: SOT-23-6L/SOT-363

Pin Configurations



SOT-23-6L/SOT-363

Pin Deseription

Pin No.	Pin Name	Description
1	Y1	independent input or output
2	GND	ground (0 V)
3	Y0	independent input or output
4	Z	common output or input
5	V_{CC}	supply voltage
6	S	select input

Block Diagram

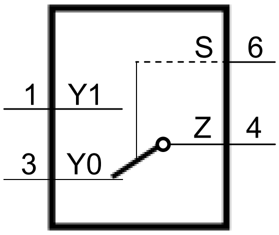


Figure 1. Logic symbol

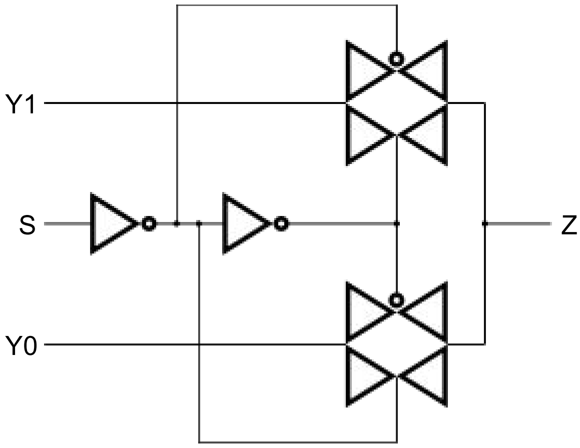


Figure 2. Logic diagram

Function Table

Input S	Channel on
L	Y0
H	Y1

Note: H=HIGH voltage level; L=LOW voltage level.

Absolute Maximum Ratings

(T_{amb}=25℃, All voltage referenced to GND, unless otherwise specified)

Characteristic	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{CC}	-	-0.5	+6.5	V
input voltage	V_I	-[1]	-0.5	+6.5	V
input clamping current	I_{IK}	V_I<-0.5V or V_I>V_{CC}+0.5V	-50	-	mA
switch clamping current	I_{SK}	V_I<-0.5V or V_I>V_{CC}+0.5V	-	±50	mA
switch voltage	V_{SW}	enable and disable mode[2]	-0.5	V_{CC}+0.5	V
switch current	I_{SW}	V_{SW}>-0.5V or V_{SW}<V_{CC}+0.5V	-	±50	mA
supply current	I_{CC}	-	-	100	mA
ground current	I_{GND}	-	-100	-	mA
storage temperature	T_{stg}	-	-65	+150	℃
total power dissipation	P_{tot}	-	-	250	mW
soldering temperature	T_L	10s	260		℃

Note:

[1] The minimum input voltage rating maybe exceeded if the input current rating is observed.

[2] The minimum and maximum switch voltage ratings may be exceeded if the switch clamping current rating is observed.

Recommended Operating Conditions

Characteristic	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	1.65	-	5.5	V
input voltage	V_I	-	0	-	5.5	V
switch voltage	V_{SW}	enable and disable mode[1]	0	-	V_{CC}	V
ambient temperature	T_{amb}	-	-40	-	+105	℃
input transition rise and fall rate	$\Delta t/\Delta V$	V_{CC}=1.65V to 2.7V[2]	-	-	20	ns/V
		V_{CC}=2.7V to 5.5V[2]	-	-	10	ns/V

Note:

[1] To avoid sinking GND current from terminal Z when switch current flows in terminal Yn, the voltage drop across the bidirectional switch must not exceed 0.4V. If the switch current flows into terminal Z, no GND current will flow from terminal Yn. In this case, there is no limit for the voltage drop across the switch.

[2] Applies to control signal levels.

Electrical Characteristies

DC Characteristies

(T_{amb}=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.[1]	Max.	Unit
HIGH-level input voltage	V_{IH}	V_{CC}=1.65V to 1.95V	0.65V_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V	1.7	-	-	V
		V_{CC}=3V to 3.6V	2.0	-	-	V
		V_{CC}=4.5V to 5.5V	0.7V_{CC}	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=1.65V to 1.95V	-	-	0.35V_{CC}	V
		V_{CC}=2.3V to 2.7V	-	-	0.7	V
		V_{CC}=3V to 3.6V	-	-	0.8	V
		V_{CC}=4.5V to 5.5V	-	-	0.3V_{CC}	V
input leakage current	I_I	pin S; VI = 5.5 V or GND; VCC = 0 V to 5.5 V[2]	-	±0.1	±1	uA
OFF-state	$I_{S(OFF)}$	V_{CC}=5.5V; see Figure 3[2]	-	±0.1	±0.2	uA
ON-state	$I_{S(ON)}$	V_{CC}=5.5V; see Figure 4[2]	-	±0.1	±1	uA
supply current	I_{CC}	V_I=5.5V or GND; V_{SW}=GND or V_{CC}; V_{CC}=1.65V to 5.5V[2]	-	0.1	4	uA
additional supply current	ΔI_{CC}	pin S; V_I=V_{CC}-0.6V; V_{CC}=5.5V; V_{SW}=GND or V_{CC}[2]	-	5	500	uA
input capacitance	C_I	-	-	2.5	-	pF
OFF-state capacitance	$C_{S(OFF)}$)	-	-	6.0	-	pF
ON-state capacitance	$C_{S(ON)}$	-	-	18	-	pF

Note:

[1] Typical values are measuredat T_{amb}=25℃.

[2] These typical values are measured at V_{CC}=3.3V

DC Characteristies

(T_{amb}=-40℃ to +105℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	V_{CC}=1.65V to 1.95V	0.65V_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V	1.7	-	-	V
		V_{CC}=3V to 3.6V	2.0	-	-	V
		V_{CC}=4.5V to 5.5V	0.7V_{CC}	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=1.65V to 1.95V	-	-	0.35V_{CC}	V
		V_{CC}=2.3V to 2.7V	-	-	0.7	V
		V_{CC}=3V to 3.6V	-	-	0.8	V
		V_{CC}=4.5V to 5.5V	-	-	0.3V_{CC}	V
input leakage current	I_I	pin S; VI = 5.5 V or GND; VCC = 0 V to 5.5 V[1]	-	-	±1	uA
OFF-state	$I_{S(OFF)}$	V_{CC}=5.5V; see Figure 3[1]	-	-	±0.5	uA
ON-state	$I_{S(ON)}$	V_{CC}=5.5V; see Figure 4[1]	-	-	±2	uA
supply current	I_{CC}	V_I=5.5V or GND; V_{SW}=GND or V_{CC}; V_{CC}=1.65V to 5.5V[1]	-	-	4	uA
additional supply current	ΔI_{CC}	pin S; V_I=V_{CC}-0.6V; V_{CC}=5.5V; V_{SW}=GND or V_{CC}[1]	-	-	500	uA

ON Resistance

(T_{amb}=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.[1]	Max.	Unit
ON resistance (peak)	$R_{ON(peak)}$	V_I=GND to V_{CC}; see Figure 5	I_{SW} = 4 mA; V_{CC}=1.65V to 1.95V	-	34.0	130	Ω
			I_{SW}=8mA; V_{CC}=2.3V to 2.7V	-	12.0	30	Ω
			I_{SW}=12mA; V_{CC}=2.7V	-	10.4	25	Ω
			I_{SW}=24mA; V_{CC}=3V to 3.6V	-	7.8	20	Ω
			I_{SW}=32mA; V_{CC}=4.5V to 5.5V	-	6.2	15	Ω
ON resistance (rail)	$R_{ON(rail)}$	V_I=GND; see Figure 5	I_{SW} = 4 mA; V_{CC}=1.65V to 1.95V	-	8.2	18	Ω
			I_{SW}=8mA; V_{CC}=2.3V to 2.7V	-	7.1	16	Ω
			I_{SW}=12mA; V_{CC}=2.7V	-	6.9	14	Ω
			I_{SW}=24mA; V_{CC}=3V to 3.6V	-	6.5	12	Ω
			I_{SW}=32mA; V_{CC}=4.5V to 5.5V	-	5.8	10	Ω
		V_I=V_{CC}; see Figure 5	I_{SW} = 4 mA; V_{CC}=1.65V to 1.95V	-	10.4	30	Ω
			I_{SW}=8mA; V_{CC}=2.3V to 2.7V	-	7.6	20	Ω
			I_{SW}=12mA; V_{CC}=2.7V	-	7.0	18	Ω
			I_{SW}=24mA; V_{CC}=3V to 3.6V	-	6.1	15	Ω
			I_{SW}=32mA; V_{CC}=4.5V to 5.5V	-	4.9	10	Ω
ON resistance (flatness)	$R_{ON(flat)}$	V_I=GND to V_{CC}[2]	I_{SW} = 4 mA; V_{CC}=1.65V to 1.95V	-	26.0	-	Ω
			I_{SW}=8mA; V_{CC}=2.3V to 2.7V	-	5.0	-	Ω
			I_{SW}=12mA; V_{CC}=2.7V	-	3.5	-	Ω
			I_{SW}=24mA; V_{CC}=3V to 3.6V	-	2.0	-	Ω
			I_{SW}=32mA; V_{CC}=4.5V to 5.5V	-	1.5	-	Ω

Note:

[1] Typical values are measuredat T_{amb}=25℃ and nominal V_{CC}.

[2] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V_{CC} and temperature.

ON Resistance

(T_{amb}=-40℃ to +105℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
ON resistance (peak)	$R_{ON(peak)}$	V_I=GND to V_{CC}; see Figure 5	I_{SW} = 4 mA; V_{CC}=1.65V to 1.95V	-	-	195	Ω
			I_{SW}=8mA; V_{CC}=2.3V to 2.7V	-	-	45	Ω
			I_{SW}=12mA; V_{CC}=2.7V	-	-	38	Ω
			I_{SW}=24mA; V_{CC}=3V to 3.6V	-	-	30	Ω
			I_{SW}=32mA; V_{CC}=4.5V to 5.5V	-	-	23	Ω
ON resistance (rail)	$R_{ON(rail)}$	V_I=GND; see Figure 5	I_{SW} = 4 mA; V_{CC}=1.65V to 1.95V	-	-	27	Ω
			I_{SW}=8mA; V_{CC}=2.3V to 2.7V	-	-	24	Ω
			I_{SW}=12mA; V_{CC}=2.7V	-	-	21	Ω
			I_{SW}=24mA; V_{CC}=3V to 3.6V	-	-	18	Ω
			I_{SW}=32mA; V_{CC}=4.5V to 5.5V	-	-	15	Ω
		V_I=V_{CC}; see Figure 5	I_{SW} = 4 mA; V_{CC}=1.65V to 1.95V	-	-	45	Ω
			I_{SW}=8mA; V_{CC}=2.3V to 2.7V	-	-	30	Ω
			I_{SW}=12mA; V_{CC}=2.7V	-	-	27	Ω
			I_{SW}=24mA; V_{CC}=3V to 3.6V	-	-	23	Ω
			I_{SW}=32mA; V_{CC}=4.5V to 5.5V	-	-	15	Ω

AC Characteristies

(T_{amb}=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.[1]	Max.	Unit
propagation delay	t_{pd}	Z to Yn or Yn to Z; see Figure 12[2][3]	V_{CC}=1.65V to 1.95V	-	-	2	ns
			V_{CC}=2.3V to 2.7V	-	-	1.2	ns
			V_{CC}=2.7V	-	-	1.0	ns
			V_{CC}=3V to 3.6V	-	-	0.8	ns
			V_{CC}=4.5V to 5.5V	-	-	0.6	ns
enable time	t_{en}	S to Yn; see Figure 13[4]	V_{CC}=1.65V to 1.95V	3.1	8.7	20.8	ns
			V_{CC}=2.3V to 2.7V	2.2	5.3	11.5	ns
			V_{CC}=2.7V	2.1	4.9	9.3	ns
			V_{CC}=3V to 3.6V	1.8	4.0	7.6	ns
			V_{CC}=4.5V to 5.5V	1.5	3.0	5.7	ns
disable time	t_{dis}	S to Yn; see Figure 13[5]	V_{CC}=1.65V to 1.95V	3.0	6.0	11.4	ns
			V_{CC}=2.3V to 2.7V	2.1	4.4	7.3	ns
			V_{CC}=2.7V	2.1	4.2	6.3	ns
			V_{CC}=3V to 3.6V	1.7	3.6	5.3	ns
			V_{CC}=4.5V to 5.5V	1.3	2.9	3.8	ns
break-befor emake time	t_{b-m}	see Figure 14[6]	V_{CC}=1.65V to 1.95V	0.5	-	-	ns
			V_{CC}=2.3V to 2.7V	0.5	-	-	ns
			V_{CC}=2.7V	0.5	-	-	ns
			V_{CC}=3V to 3.6V	0.5	-	-	ns
			V_{CC}=4.5V to 5.5V	0.5	-	-	ns

Note:

[1] Typical values are measuredat T_{amb}=25℃ and nominal V_{CC}.

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

[3] Propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified capacitance when driven by an ideal voltage source (zero output impedance).

[4] t_{en} is the same as t_{PZH} and t_{PZL}.

[5] t_{dis} is the sameast_{PLZ} and t_{PHZ}.

[6] Break-before-make specified by design.

AC Characteristies

(T_{amb}=-40℃ to +105℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.[1]	Max.	Unit
propagation delay	t_{pd}	Z to Yn or Yn to Z; see Figure 12[2][3]	V_{CC}=1.65V to 1.95V	-	-	3.0	ns
			V_{CC}=2.3V to 2.7V	-	-	2.0	ns
			V_{CC}=2.7V	-	-	1.5	ns
			V_{CC}=3V to 3.6V	-	-	1.5	ns
			V_{CC}=4.5V to 5.5V	-	-	1.0	ns
enable time	t_{en}	S to Yn; see Figure 13[4]	V_{CC}=1.65V to 1.95V	3.1	-	22.0	ns
			V_{CC}=2.3V to 2.7V	2.2	-	12.5	ns
			V_{CC}=2.7V	2.1	-	10.5	ns
			V_{CC}=3V to 3.6V	1.8	-	9.0	ns
			V_{CC}=4.5V to 5.5V	1.5	-	6.1	ns
disable time	t_{dis}	S to Yn; see Figure 13[5]	V_{CC}=1.65V to 1.95V	3.0	-	11.7	ns
			V_{CC}=2.3V to 2.7V	2.1	-	7.6	ns
			V_{CC}=2.7V	2.1	-	6.6	ns
			V_{CC}=3V to 3.6V	1.7	-	5.9	ns
			V_{CC}=4.5V to 5.5V	1.3	-	4.3	ns
break-befor emake time	t_{b-m}	see Figure 14[6]	V_{CC}=1.65V to 1.95V	0.5	-	-	ns
			V_{CC}=2.3V to 2.7V	0.5	-	-	ns
			V_{CC}=2.7V	0.5	-	-	ns
			V_{CC}=3V to 3.6V	0.5	-	-	ns
			V_{CC}=4.5V to 5.5V	0.5	-	-	ns

Note:

[1] Typical values are measuredat T_{amb}=25℃ and nominal V_{CC}.

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

[3] Propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified capacitance when driven by an ideal voltage source (zero output impedance).

[4] t_{en} is the same as t_{PZH} and t_{PZL}.

[5] t_{dis} is the sameast$_{PLZ}$ and t_{PHZ}.

[6] Break-before-make specified by design.

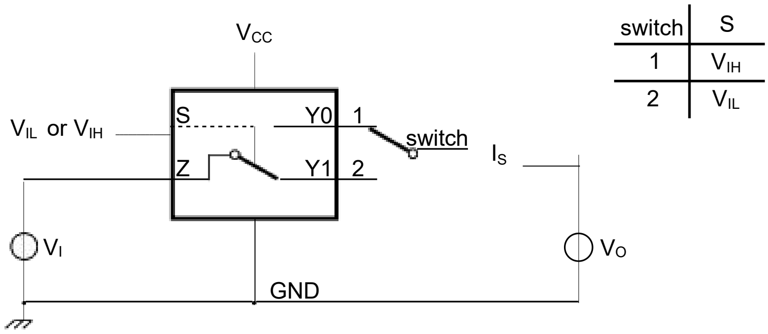
Additional AC Characteristics

(T_{amb}=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
total harmonic distortion	THD	f_i=600Hz to 20kHz; R_L=600Ω; C_L=50pF; V_I=0.5V(p-p); see Figure 16	V_{CC}=1.65V	-	0.260	-	%
			V_{CC}=2.3V	-	0.078	-	%
			V_{CC}=3.0V	-	0.078	-	%
			V_{CC}=4.5V	-	0.078	-	%
−3 dB frequency response	$f_{(-3dB)}$	R_L=50Ω; see Figure 17	V_{CC}=1.65V	-	200	-	MHz
			V_{CC}=2.3V	-	300	-	MHz
			V_{CC}=3.0V	-	300	-	MHz
			V_{CC}=4.5V	-	300	-	MHz
isolation (OFF-state)	α_{iso}	R_L=50Ω; C_L=5pF; f_i=10MHz; see Figure 18	V_{CC}=1.65V	-	-42	-	dB
			V_{CC}=2.3V	-	-42	-	dB
			V_{CC}=3.0V	-	-40	-	dB
			V_{CC}=4.5V	-	-40	-	dB
charge injection	Q_{inj}	C_L=0.1nF; V_{gen}=0V; R_{gen}=0Ω; f_i=1MHz; R_L=1MΩ; see Figure 19	V_{CC}=1.8V	-	3.3	-	pC
			V_{CC}=2.5V	-	4.1	-	pC
			V_{CC}=3.3V	-	5.0	-	pC
			V_{CC}=4.5V	-	6.4	-	pC
			V_{CC}=5.5V	-	7.5	-	pC

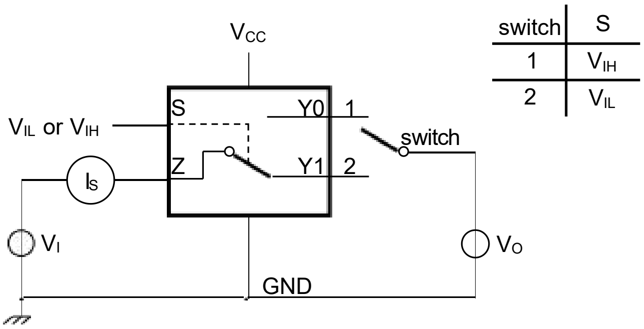
Testing Circuit

DC Testing Circuit



V_I=V_{CC} or GND and V_O=GND or V_{CC}.

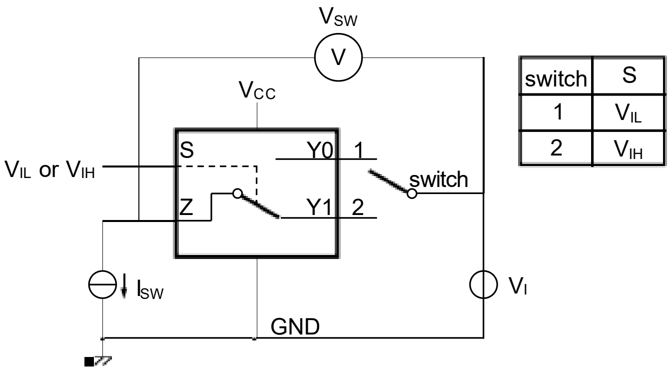
Figure 3. Test circuit for measuring OFF-state leakage current



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

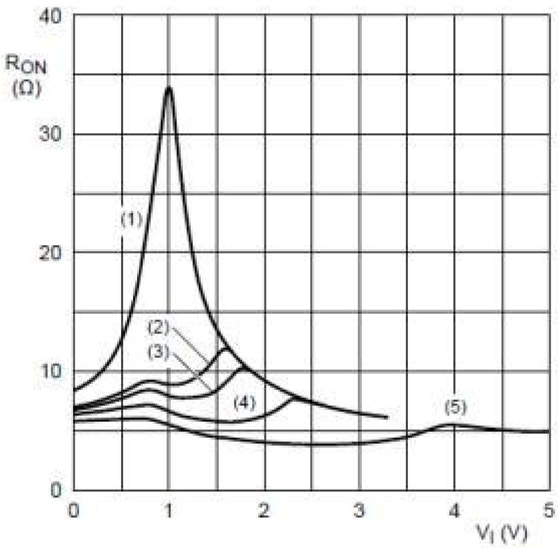
Figure 4. Test circuit for measuring ON-state leakage current

ON Resistance Test Circuit And Graphs



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

Figure 5. Test circuit for measuring ON resistance



(1) V_{CC}=1.8V.

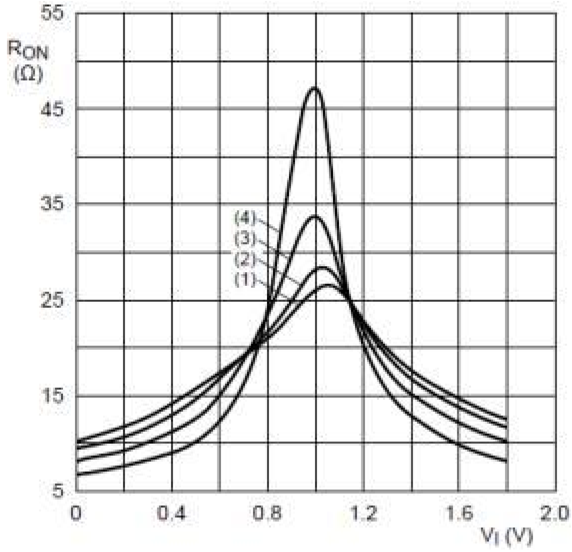
(2) V_{CC}=2.5V.

(3) V_{CC}=2.7V.

(4) V_{CC}=3.3V.

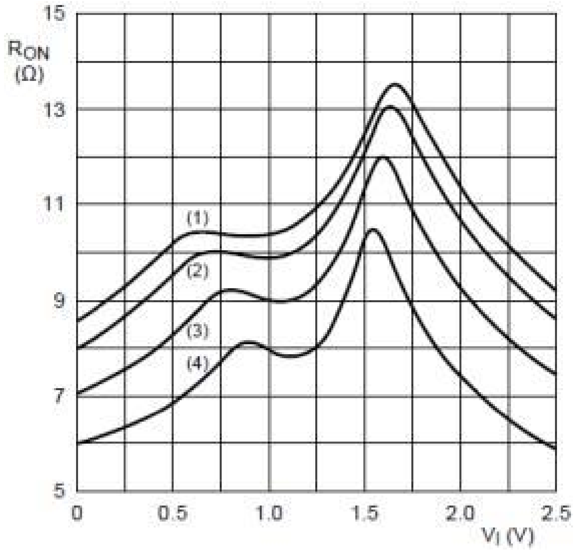
(5) V_{CC}=5.0V.

Figure 6. Typical ON resistance as a function of input voltage; T_{amb}=25℃



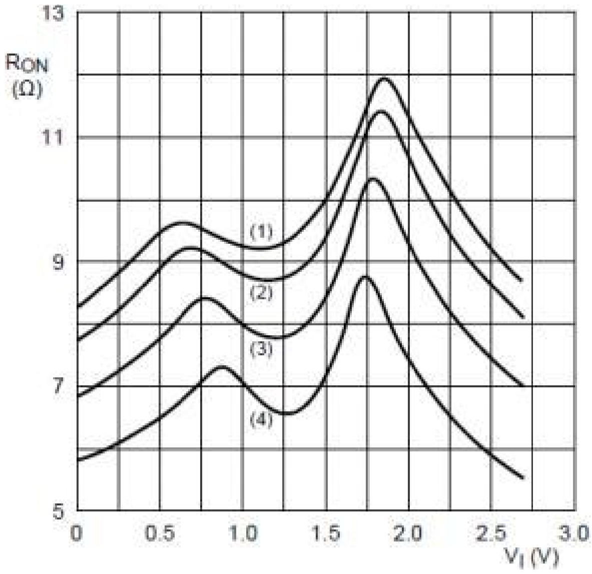
(1) T_{amb}=105℃.
(2) T_{amb}=85℃.
(3) T_{amb}=25℃.
(4) T_{amb}=-40℃.

Figure 7. ON resistance as a function of input voltage; V_{CC}=1.8V



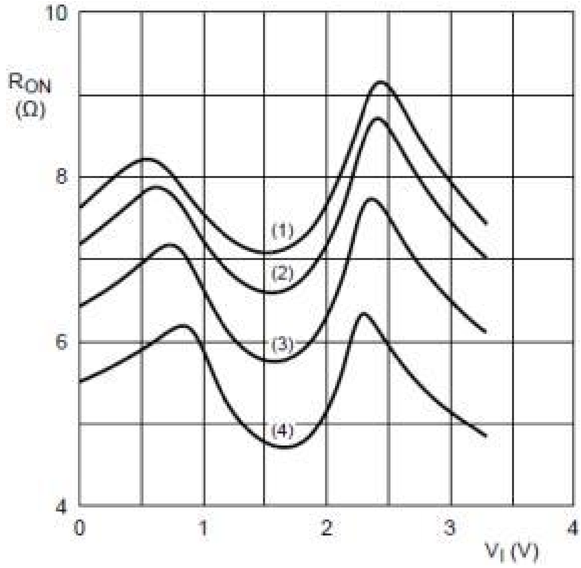
(1) T_{amb}=105℃.
(2) T_{amb}=85℃.
(3) T_{amb}=25℃.
(4) T_{amb}=-40℃.

Figure 8. ON resistance as a function of input voltage; V_{CC}=2.5V



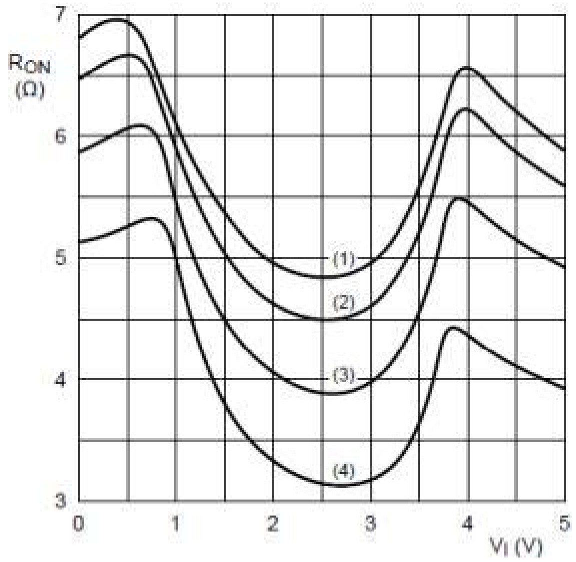
(1) T_{amb}=105℃.
(2) T_{amb}=85℃.
(3) T_{amb}=25℃.
(4) T_{amb}=-40℃.

Figure 9. ON resistance as a function of input voltage; V_{CC}=2.7V



(1) T_{amb}=105℃.
(2) T_{amb}=85℃.
(3) T_{amb}=25℃.
(4) T_{amb}=-40℃.

Figure 10. ON resistance as a function of input voltage; V_{CC}=3.3V



(1) T_{amb}=105℃.

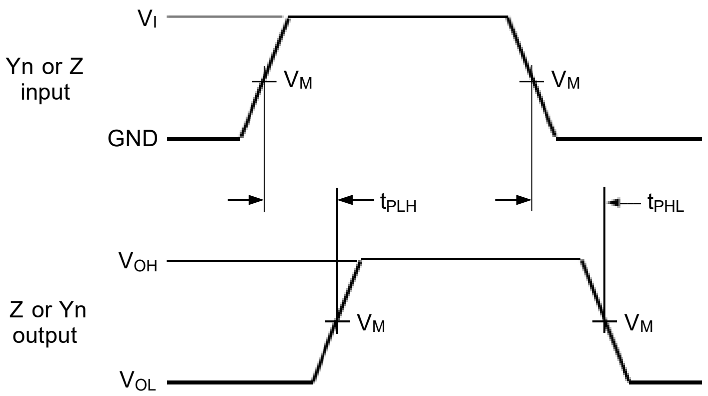
(2) T_{amb}=85℃.

(3) T_{amb}=25℃.

(4) T_{amb}=-40℃.

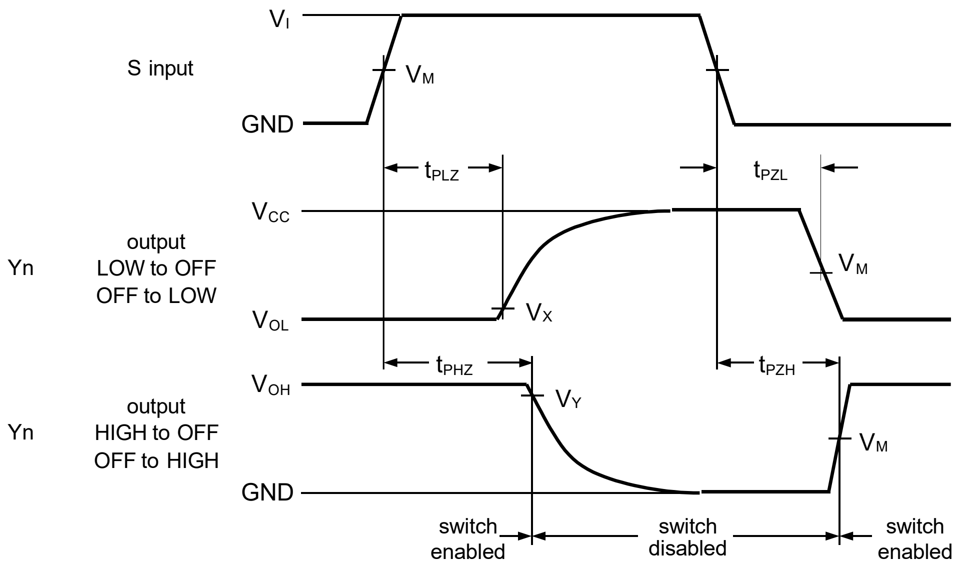
Figure 11. ON resistance as a function of input voltage; V_{CC}=5.0V

AC Testing Waveforms



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

Figure 12. Input (Yn or Z) to output (Z or Yn) propagation delays

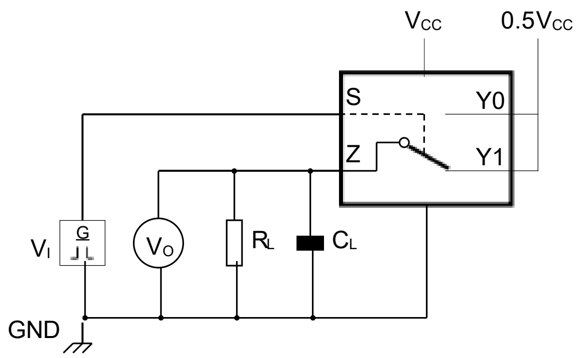


Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.
Figure 13. Enable and disable times

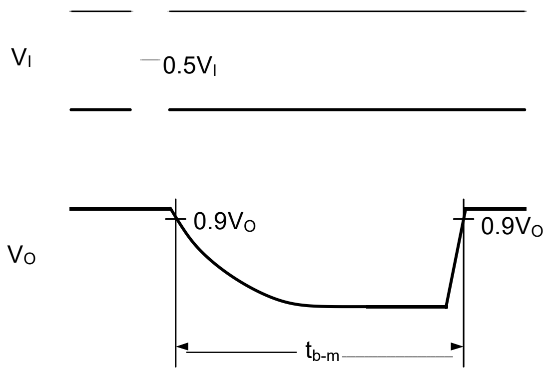
Measurement Points

Supply voltage	Input	Output		
V_{CC}	V_M	V_M	V_X	V_Y
1.65V to 5.5V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V_{OL}+0.3V	V_{OH}-0.3V

AC Testing Cireuit

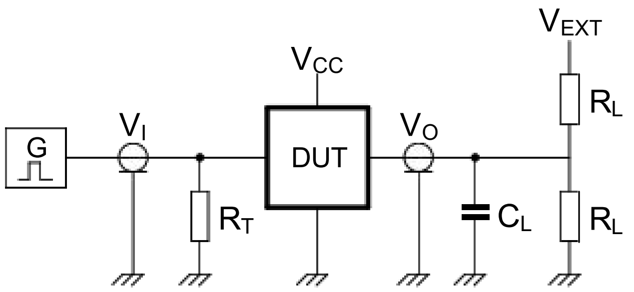


a. Test circuit



b. Input and output measurement points

Figure 14. Test circuit for measuring break-before-make timing



Definitions test circuit:

R_T=Termination resistance should be equal to output impedance Z_o of the pulse generator.
C_L=Load capacitance including jig and probe capacitance.

R_L=Load resistance.

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

Figure 15. Test circuit for measuring switching times

Test Data

Supply voltage	Input		Load		V_{EXT}		
V_{CC}	V_I	t_r,t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.65V to 1.95V	V_{CC}	≤2.0ns	50pF	500Ω	open	GND	2×V_{CC}
2.3V to 2.7V	V_{CC}	≤2.0ns	50pF	500Ω	open	GND	2×V_{CC}
2.7V	V_{CC}	≤2.5ns	50pF	500Ω	open	GND	2×V_{CC}
3V to 3.6V	V_{CC}	≤2.5ns	50pF	500Ω	open	GND	2×V_{CC}
4.5V to 5.5V	V_{CC}	≤2.5ns	50pF	500Ω	open	GND	2×V_{CC}

Additional AC Testing Circuit

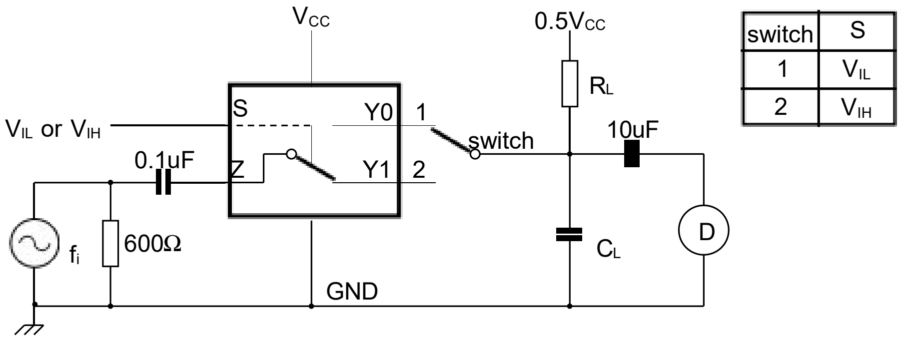
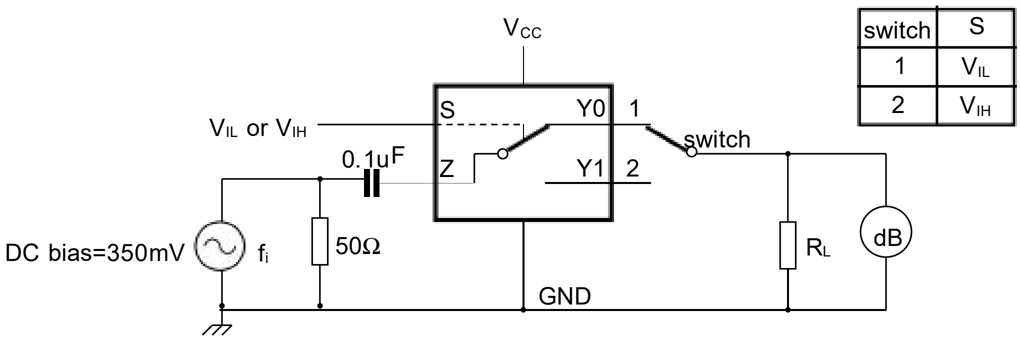
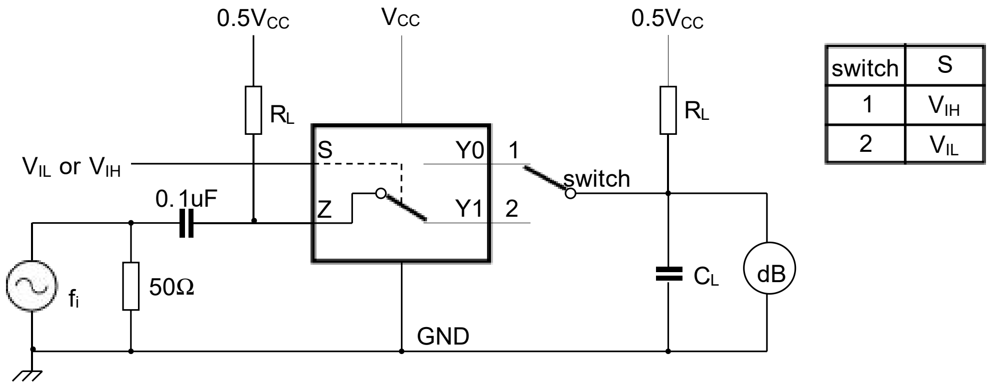


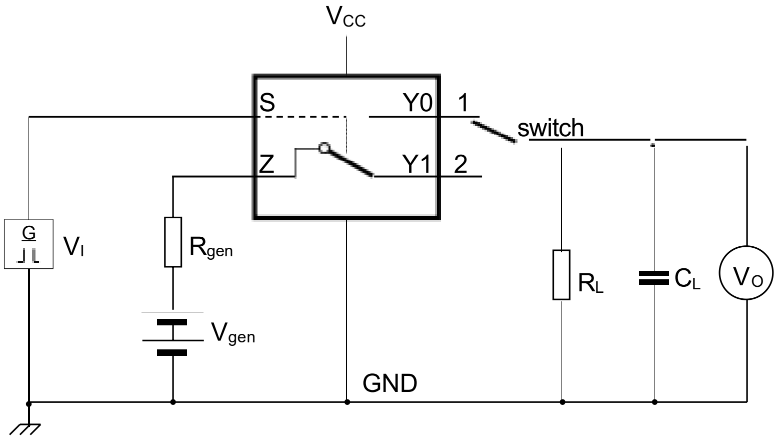
Figure 16. Test circuit for measuring total harmonic distortion



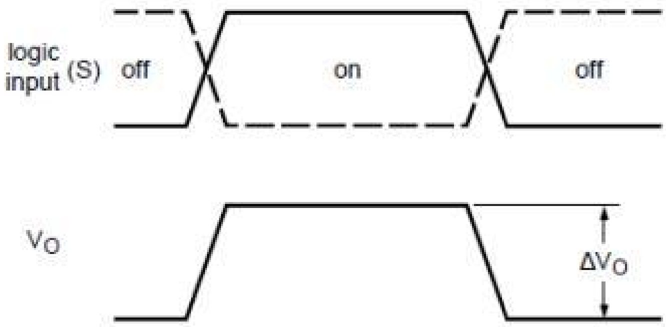
Adjust f_i voltage to obtain 0dBm level at output. Increase f_i frequency until dB meter reads -3dB.
Figure 17. Test circuit for measuring the frequency response when switch is in ON-state



Adjust f_i voltage to obtain 0dBm level at input.
Figure 18. Test circuit for measuring isolation (OFF-state)



a. Test circuit



b. Input and output pulse definitions

$Q_{inj}=\Delta V_O \times C_L$.

ΔV_O=output voltage variation.

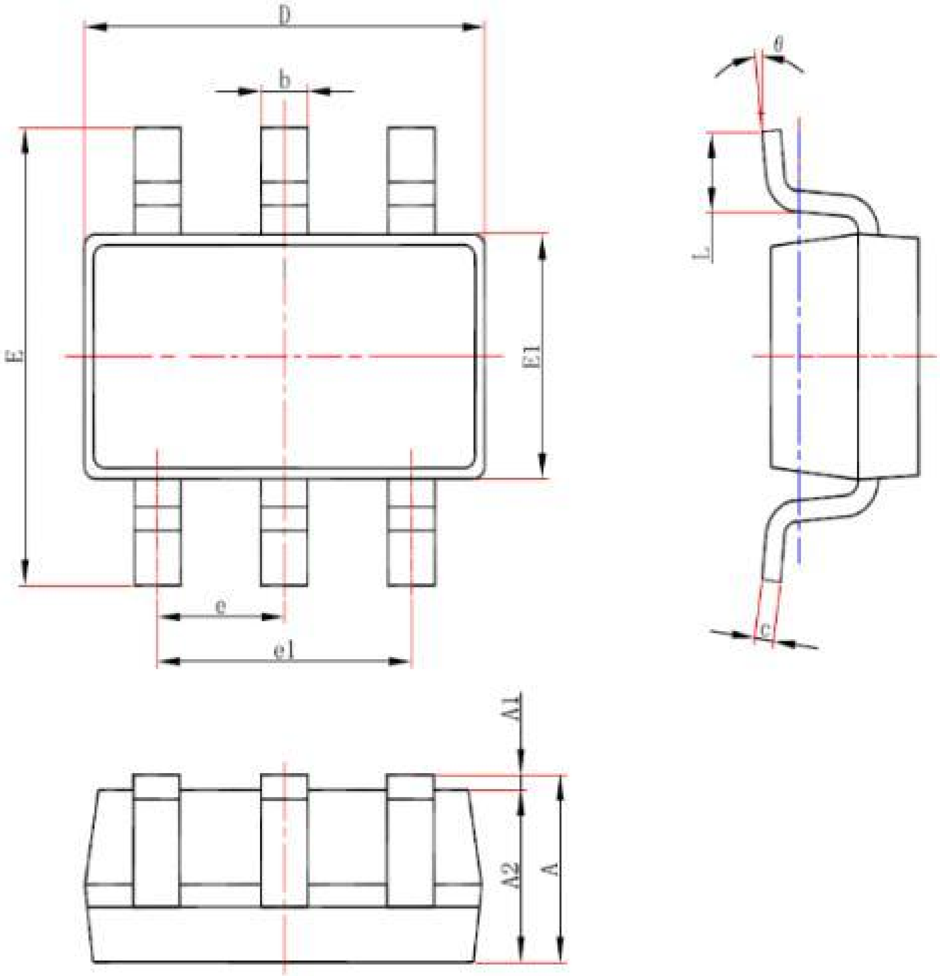
R_{gen}=generator resistance.

V_{gen}=generator voltage.

Figure 19. Test circuit for measuring charge injection

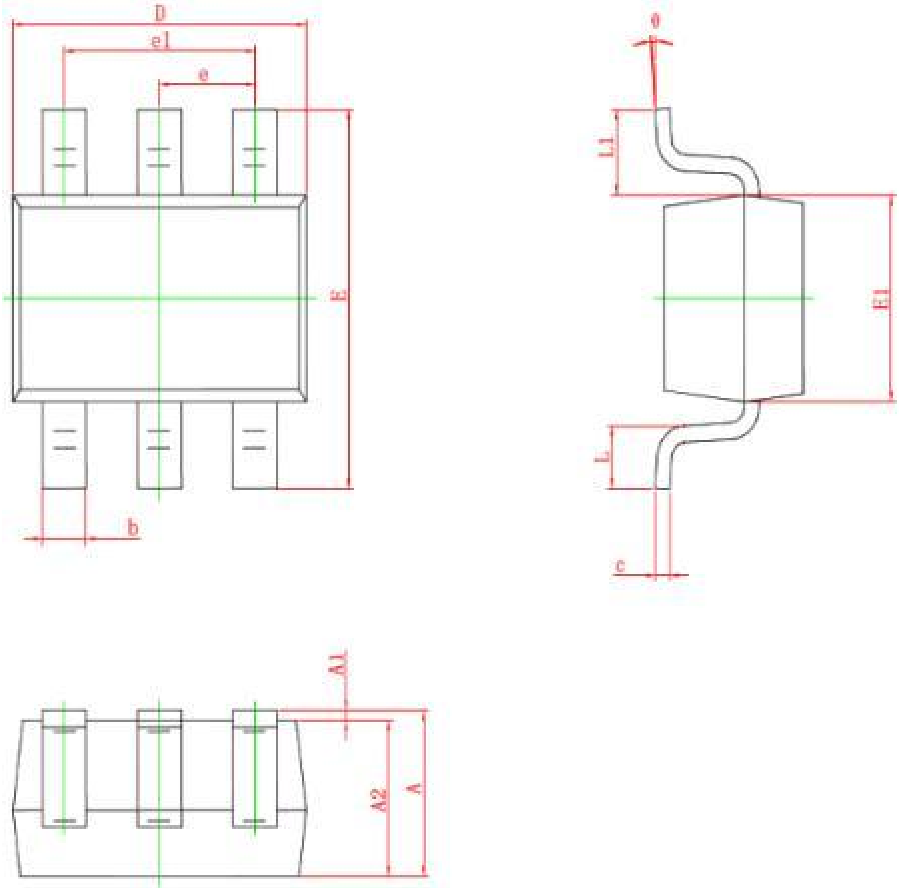
Package Information

SOT-23-6L



Symbol	Dimensions (mm)	
	Min.	Max.
A	-	1.25
A1	0.00	0.12
A2	1.00	1.20
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	2.60	3.00
E1	1.50	1.70
e	0.95	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°

SOT-363



Symbol	Dimensions (mm)	
	Min.	Max.
A	0.90	1.10
A1	0.00	0.10
A2	0.90	1.00
b	0.15	0.35
c	0.11	0.175
D	2.00	2.20
E	2.15	2.45
E1	1.15	1.35
e	0.65	
e1	1.20	1.40
L	0.26	0.46
L1	0.525	
θ	0。	8。

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