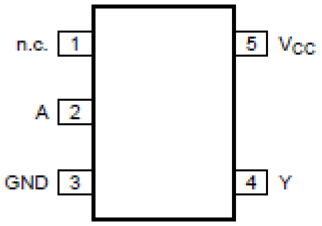
SINGLE BUFFER/DRIVER WITH OPEN-DRAIN OUTPUT

1、General Description

The 74LVC1G07 provides the non-inverting buffer.
The output of this device is an open drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions.
Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device in a mixed 3.3V and 5V environment.
This device is fully specified for partial power-down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.



Features:

- Wide supply voltage range from 1.65V to 5.5V
- 5V tolerant inputs for interfacing with 5V logic -
- 24mA output drive (V_{CC}=3.0V)
- CMOS low power consumption
- Latch-up performance exceeds 250mA
- Direct interface with TTL levels
- Input accepts voltages up to 5V
- Specified from -40℃ to +105℃
- Packaging information: DBVR SOT-23-5/ DCKR SOT-353

2、Block Diagram And Pin Description

2.1、Block Diagram

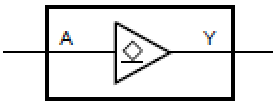


Figure 1. Logic symbol

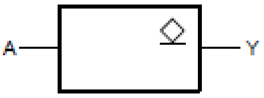


Figure 2. IEC logic symbol

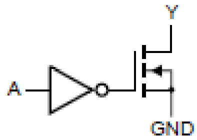
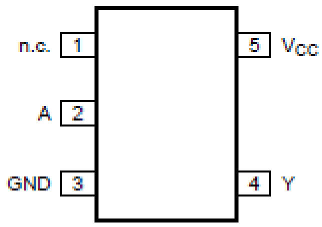


Figure 3. Logic diagram

2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	n.c.	not connected
2	A	data input
3	GND	ground (0V)
4	Y	data output
5	V_{CC}	supply voltage

2.4、Function Table

Input	Output
A	**Y**
L	L
H	Z

Note: H=HIGH voltage level; L=LOW voltage level; Z=high-impedance OFF-state.

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{CC}	-	-0.5	+6.5	V
input clamping current	I_{IK}	$V_I < 0V$	-50	-	mA
input voltage	V_I	-	-0.5	+6.5	V
output clamping current	I_{OK}	$V_O < 0V$	-50	-	mA
output voltage	V_O	Active mode	-0.5	+6.5	V
		Power-down mode; V_{CC}=0V	-0.5	+6.5	V
output current	I_O	V_O=0V to V_{CC}	-	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	250		℃

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}	-	1.65	-	5.5	V
input voltage	V_I	-	0	-	5.5	V
output voltage	V_O	Active mode	0	-	5.5	V
		Power-down mode; V_{CC}=0V	0	-	5.5	V
ambient temperature	T_{amb}	-	-40	-	+105	℃
input transition rise and fall rate	Δt/ΔV	V_{CC}=1.65V to 2.7V	-	-	20	ns/V
		V_{CC}=2.7V to 5.5V	-	-	10	ns/V

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

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

<table>
<tr><th>Parameter</th><th>Symbol</th><th colspan="2">Conditions</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Unit</th></tr>
<tr><td rowspan="4">HIGH-level input voltage</td><td rowspan="4">V_{IH}</td><td colspan="2">V_{CC}=1.65V to 1.95V</td><td>0.65× V_{CC}</td><td>-</td><td>-</td><td>V</td></tr>
<tr><td colspan="2">V_{CC}=2.3V to 2.7V</td><td>1.7</td><td>-</td><td>-</td><td>V</td></tr>
<tr><td colspan="2">V_{CC}=2.7V to 3.6V</td><td>2.0</td><td>-</td><td>-</td><td>V</td></tr>
<tr><td colspan="2">V_{CC}=4.5V to 5.5V</td><td>0.7× V_{CC}</td><td>-</td><td>-</td><td>V</td></tr>
<tr><td rowspan="4">LOW-level input voltage</td><td rowspan="4">V_{IL}</td><td colspan="2">V_{CC}=1.65V to 1.95V</td><td>-</td><td>-</td><td>0.35× V_{CC}</td><td>V</td></tr>
<tr><td colspan="2">V_{CC}=2.3V to 2.7V</td><td>-</td><td>-</td><td>0.7</td><td>V</td></tr>
<tr><td colspan="2">V_{CC}=2.7V to 3.6V</td><td>-</td><td>-</td><td>0.8</td><td>V</td></tr>
<tr><td colspan="2">V_{CC}=4.5V to 5.5V</td><td>-</td><td>-</td><td>0.3× V_{CC}</td><td>V</td></tr>
<tr><td rowspan="6">LOW-level output voltage</td><td rowspan="6">V_{OL}</td><td rowspan="6">V_I = V_{IH} or V_{IL}</td><td>I_O=100uA; V_{CC}=1.65V to 5.5V</td><td>-</td><td>-</td><td>0.1</td><td>V</td></tr>
<tr><td>I_O=4mA; V_{CC}=1.65V</td><td>-</td><td>-</td><td>0.45</td><td>V</td></tr>
<tr><td>I_O=8mA; V_{CC}=2.3V</td><td>-</td><td>-</td><td>0.3</td><td>V</td></tr>
<tr><td>I_O=12mA; V_{CC}=2.7V</td><td>-</td><td>-</td><td>0.4</td><td>V</td></tr>
<tr><td>I_O=24mA; V_{CC}=3.0V</td><td>-</td><td>-</td><td>0.55</td><td>V</td></tr>
<tr><td>I_O=32mA; V_{CC}=4.5V</td><td>-</td><td>-</td><td>0.55</td><td>V</td></tr>
<tr><td>input leakage current</td><td>I_I</td><td colspan="2">V_I=5.5V or GND; V_{CC}=0V to 5.5V</td><td>-</td><td>±0.1</td><td>±1</td><td>uA</td></tr>
<tr><td>OFF-state output current</td><td>I_{OZ}</td><td colspan="2">V_I=V_{IH} or V_{IL}; V_O=V_{CC} or GND; V_{CC}=5.5V</td><td>-</td><td>±0.1</td><td>±2</td><td>uA</td></tr>
<tr><td>power-off leakage current</td><td>I_{OFF}</td><td colspan="2">V_I or V_O=5.5V; V_{CC}=0V</td><td>-</td><td>±0.1</td><td>±2</td><td>uA</td></tr>
<tr><td>supply current</td><td>I_{CC}</td><td colspan="2">V_I=5.5V or GND; I_O=0A; V_{CC}=1.65V to 5.5V</td><td>-</td><td>0.1</td><td>4</td><td>uA</td></tr>
<tr><td>additional supply current</td><td>ΔI_{CC}</td><td colspan="2">per pin; V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=2.3V to 5.5V</td><td>-</td><td>5</td><td>500</td><td>uA</td></tr>
<tr><td>input capacitance</td><td>C_I</td><td colspan="2">V_{CC}=3.3V; V_I=GND to V_{CC}</td><td>-</td><td>5</td><td>-</td><td>pF</td></tr>
</table>

Note: All typical values are measured at V_{CC}=3.3V and T_{amb}=25℃.

3.3.2、DC Characteristics 2

(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		0.65×V_{CC}	-	-	V
		V_{CC}=2.3V to 2.7V		1.7	-	-	V
		V_{CC}=2.7V to 3.6V		2.0	-	-	V
		V_{CC}=4.5V to 5.5V		0.7×V_{CC}	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=1.65V to 1.95V		-	-	0.35×V_{CC}	V
		V_{CC}=2.3V to 2.7V		-	-	0.7	V
		V_{CC}=2.7V to 3.6V		-	-	0.8	V
		V_{CC}=4.5V to 5.5V		-	-	0.3×V_{CC}	V
LOW-level output voltage	V_{OL}	V_I = V_{IH} or V_{IL}	I_O=100uA; V_{CC}=1.65V to 5.5V	-	-	0.1	V
			I_O=4mA; V_{CC}=1.65V	-	-	0.7	V
			I_O=8mA; V_{CC}=2.3V	-	-	0.45	V
			I_O=12mA; V_{CC}=2.7V	-	-	0.6	V
			I_O=24mA; V_{CC}=3.0V	-	-	0.8	V
			I_O=32mA; V_{CC}=4.5V	-	-	0.8	V
input leakage current	I_I	V_I=5.5V or GND; V_{CC}=0V to 5.5V		-	-	±1	uA
OFF-state output current	I_{OZ}	V_I=V_{IH} or V_{IL}; V_O=V_{CC} or GND; V_{CC}=5.5V		-	-	±2	uA
power-off leakage current	I_{OFF}	V_I or V_O=5.5V; V_{CC}=0V		-	-	±2	uA
supply current	I_{CC}	V_I=5.5V or GND; I_O=0A; V_{CC}=1.65V to 5.5V		-	-	4	uA
additional supply current	ΔI_{CC}	per pin; V_I=V_{CC}-0.6V; I_O=0A; V_{CC}=2.3V to 5.5V		-	-	500	uA

Note: All typical values are measured at V_{CC}=3.3V and T_{amb}=25℃.

3.3.3、AC Characteristics 1

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
A to Y propagation delay	t_{pd}	see Figure 5	V_{CC}=1.65V to 1.95V	1.0	2.6	6.7	ns
			V_{CC}=2.3V to 2.7V	0.5	1.7	5.5	ns
			V_{CC}=2.7V	0.5	2.3	4.7	ns
			V_{CC}=3.0V to 3.6V	0.5	2.2	4.2	ns
			V_{CC}=4.5V to 5.5V	0.5	1.6	3.5	ns
Power dissipation capacitance	C_{PD}	V_{CC}=3.3V; V_I=GND to V_{CC}		-	7.0	-	pF

Note:

[1] Typical values are measured at T_{amb}=25℃ and V_{CC}=1.8V, 2.5V, 2.7V, 3.3V and 5.0V respectively.

[2] t_{pd} is the same as t_{PLZ} and t_{PZL}.

[3] C_{PD} is used to determine the dynamic power dissipation (P_D in uW).

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

f_i=input frequency in MHz;

f_o=output frequency in MHz;

C_L=output load capacitance in pF;

V_{CC}=supply voltage in V;

N=number of inputs switching;

$\sum(C_L\times V_{CC}^2\times f_o)$=sum of outputs.

3.3.4、AC Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
A to Y propagation delay	t_{pd}	see Figure 5	V_{CC}=1.65V to 1.95V	1.0	-	8.4	ns
			V_{CC}=2.3V to 2.7V	0.5	-	7.0	ns
			V_{CC}=2.7V	0.5	-	6.0	ns
			V_{CC}=3.0V to 3.6V	0.5	-	5.5	ns
			V_{CC}=4.5V to 5.5V	0.5	-	4.5	ns

Note:

[1] Typical values are measured at T_{amb}=25℃ and V_{CC}=1.8V, 2.5V, 2.7V, 3.3V and 5.0V respectively.

[2] t_{pd} is the same as t_{PLZ} and t_{PZL}.

4、Testing Circuit

4.1、AC Testing Circuit

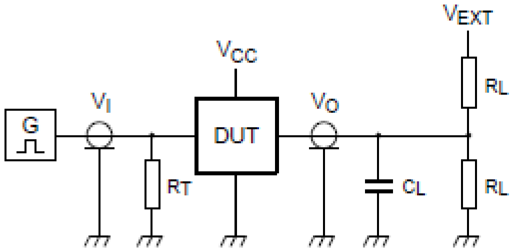


Figure 4. Test circuit for measuring switching times

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 the output impedance Z_o of the pulse generator.

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

4.2、AC Testing Waveforms

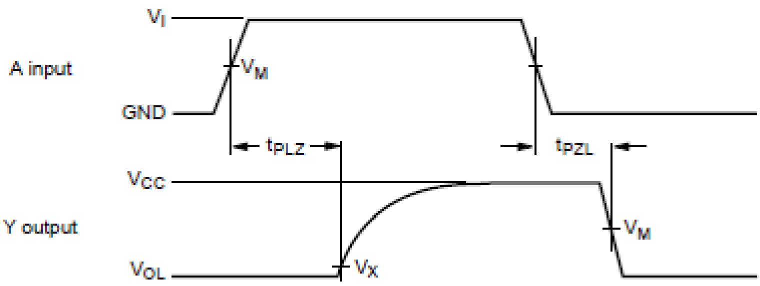


Figure 5. The input A to output Y propagation delays

4.3、Measurement Points

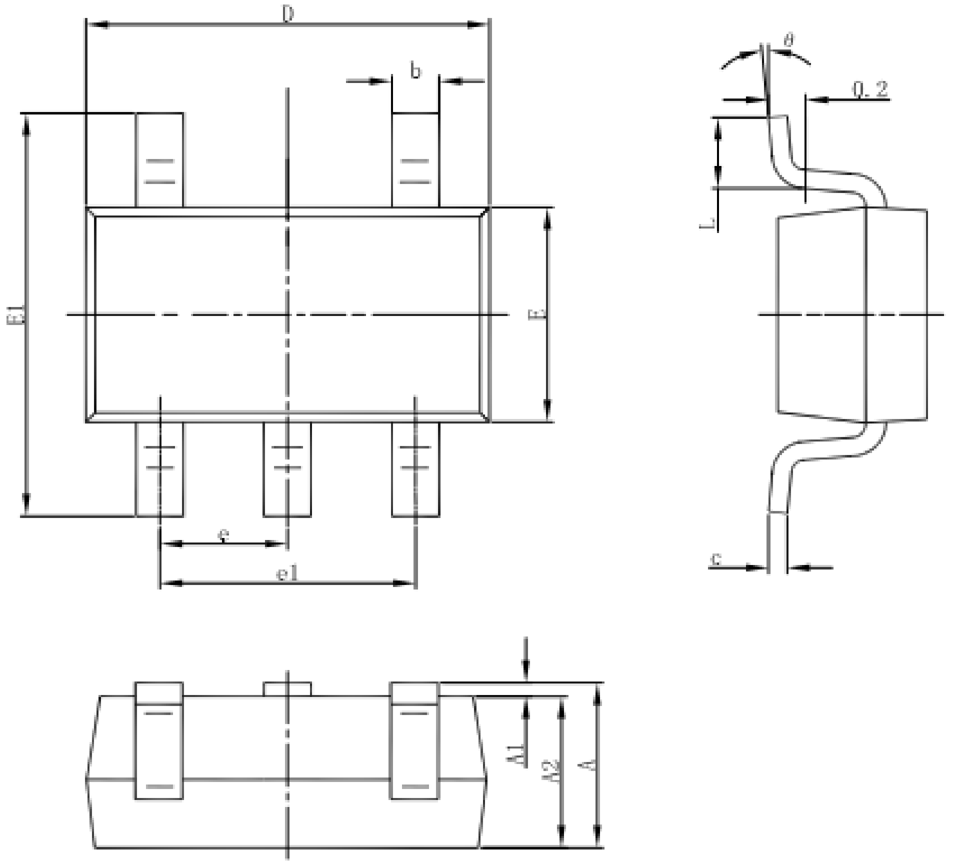
Supply voltage	Input	Output	
V_{CC}	V_M	V_M	V_X
1.65V to 1.95V	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V
2.3V to 2.7V	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.15V
2.7V	1.5V	1.5V	V_{OL}+0.3V
3.0V to 3.6V	1.5V	1.5V	V_{OL}+0.3V
4.5V to 5.5V	0.5×V_{CC}	0.5×V_{CC}	V_{OL}+0.3V

4.4、Test Data

Supply voltage	Input		Load		V_{EXT}
V_{CC}	V_I	t_r, t_f	C_L	R_L	t_{PLZ}, t_{PZL}
1.65V to 1.95V	V_{CC}	≤2.0ns	30pF	1kΩ	2×V_{CC}
2.3V to 2.7V	V_{CC}	≤2.0ns	30pF	500Ω	2×V_{CC}
2.7V	2.7V	≤2.5ns	50pF	500Ω	6V
3.0V to 3.6V	2.7V	≤2.5ns	50pF	500Ω	6V
4.5V to 5.5V	V_{CC}	≤2.5ns	50pF	500Ω	2×V_{CC}

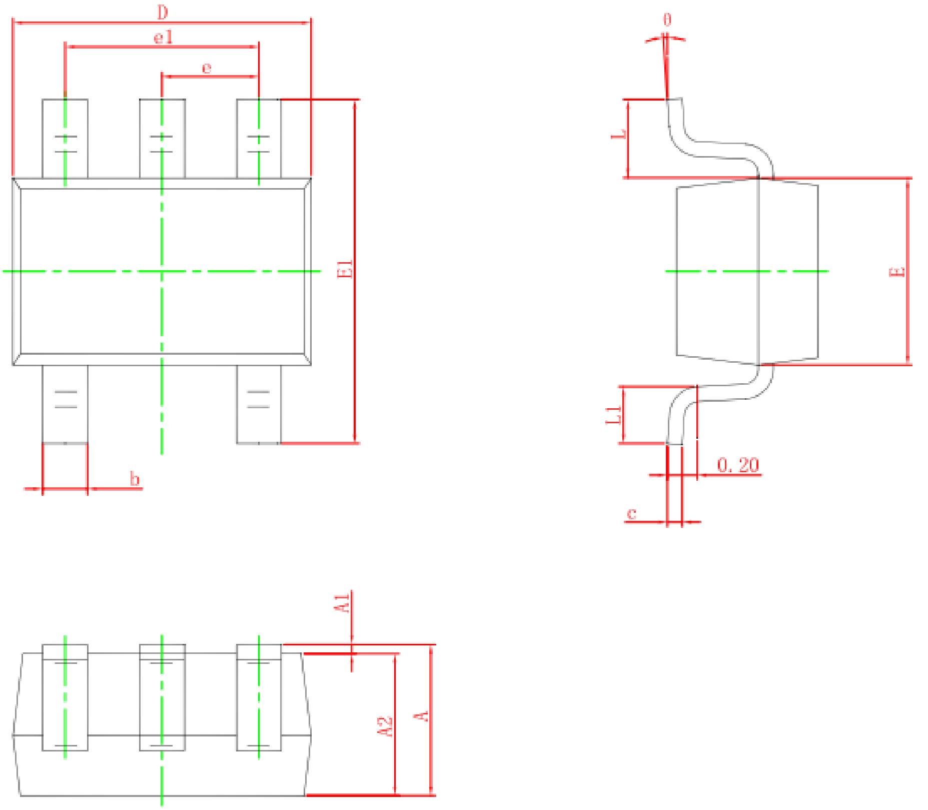
5、Package Information

5.1、SOT-23-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

5.2、SOT-353



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP.		0.026 TYP.	
e1	1.200	1.400	0.047	0.055
L	0.525 REF.		0.021 REF.	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°