

Description

This single inverter buffer and driver is designed for 1.65V to 5.5V VCC operation.

The output of the 74LVC1G06 device is open-drain and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions. The maximum sink current is 32mA. This device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs when the device is powered down.

This inhibits current backflow into the device which prevents damage to the device.

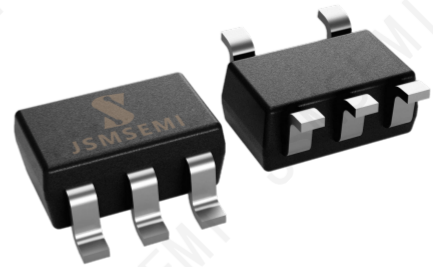
The 74LVC1G06 is available in Green SOT23-5 and SOT-353 packages. It operates over an ambient temperature range of -40°C to +125°C.

Features

- ESD protection exceeds JESD 22
 - 2000V human body model
 - 200V machine model
 - 1000V charged-device model
- Packages: SOT23-5, SOT-353(SC70-5)
- Supports 5V V_{CC} operation
- Input and open-drain output accept voltages up to 5.5V
- Low power consumption, 1μA maximum I_{CC}
- ±24mA output drive at 3V for open-drain devices
- I_{off} supports partial-power-down mode and back-drive protection
- Latch-up performance exceeds 100mA
- Can be used for up or down translation
- Schmitt trigger action on all ports
- Operating Temperature Range: -40°C to +125°C
- RoSH compatible

Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship,Quantity	Green
74LVC1G06GV,125-JSM	SOT-23-5L	C06J	-40 to 125°C	3	TR&3000	Rohs
74LVC1G06GW,125-JSM	SOT-353	CT5	-40 to 125°C	3	TR&3000	Rohs

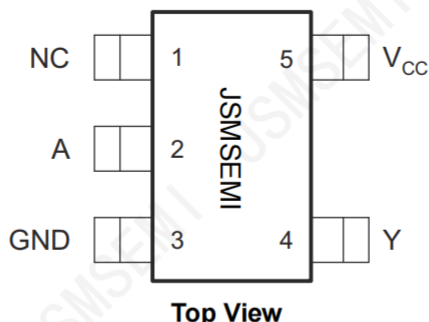


Logic Diagram (Positive Logic)

Applications

- AV receivers
- Blu-ray players and home theaters
- DVD recorders and players
- Desktop or notebook PCs
- Digital radio or internet radio players
- Digital video cameras (DVC)
- Embedded PCs
- GPS: personal navigation devices
- Mobile internet devices
- Network projector front-ends
- Portable media players
- Pro audio mixers
- Smoke detectors
- Solid state drive (SSD): enterprise
- High-definition (HDTV)
- Tablets: enterprise
- Audio docks: portable
- DLP front projection systems
- DVR and DVS
- Digital picture frame (DPF)
- Digital still cameras

Pin Configuration and Functions



Top View

Pin Functions

PIN		I/O	DESCRIPTION
SO23-5 SOT-353	NAME		
1	NC	—	Not connected
2	A	I	Input
3	GND	—	Ground
4	Y	O	Output
5	V _{CC}	—	Power pin

Specifications

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage	−0.5	6.5	V
V _I	Input voltage ⁽²⁾	−0.5	6.5	V
V _O	Voltage applied to any output in the high-impedance or power-off state ⁽²⁾	−0.5	6.5	V
V _O	Voltage applied to any output in the high or low state ^{(2) (3)}	−0.5	6.5	V
I _{IK}	Input clamp current		−50	mA
I _{OK}	Output clamp current		−50	mA
I _O	Continuous output current		±50	mA
	Continuous current through V _{CC} or GND		±100	mA
T _j	Junction temperature	−65	150	°C
T _{stg}	Storage temperature	−65	150	°C

- (1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V_{CC} is provided in the Recommended Operating Conditions table.

ESD Ratings

		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM)	2000
		Charged-device model (CDM)	1000
		Machine Model (MM)	200

Specifications

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage		−0.5	6.5	V
V _I	Input voltage ⁽²⁾		−0.5	6.5	V
V _O	Voltage applied to any output in the high-impedance or power-off state ⁽²⁾		−0.5	6.5	V
V _O	Voltage applied to any output in the high or low state ⁽²⁾ (3)		−0.5	6.5	V
I _{IK}	Input clamp current	V _I < 0		−50	mA
I _{OK}	Output clamp current	V _O < 0		−50	mA
I _O	Continuous output current			±50	mA
	Continuous current through V _{CC} or GND			±100	mA
T _j	Junction temperature		−65	150	°C
T _{stg}	Storage temperature		−65	150	°C

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- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of V_{CC} is provided in the Recommended Operating Conditions table.

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

			MIN	MAX	UNIT
V_{CC}	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
V_{IH}	High-level input voltage	$V_{CC} = 1.65V$ to $1.95V$	$0.65 \times V_{CC}$		V
		$V_{CC} = 2.3V$ to $2.7V$	1.7		
		$V_{CC} = 3V$ to $3.6V$	2		
		$V_{CC} = 4.5V$ to $5.5V$	$0.7 \times V_{CC}$		
V_{IL}	Low-level input voltage	$V_{CC} = 1.65V$ to $1.95V$		$0.15 \times V_{CC}$	V
		$V_{CC} = 2.3V$ to $2.7V$		0.3	
		$V_{CC} = 3V$ to $3.6V$		0.4	
		$V_{CC} = 4.5V$ to $5.5V$		$0.15 \times V_{CC}$	
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	5.5	V
I_{OL}	Low-level output current	$V_{CC} = 1.65V$		4	mA
		$V_{CC} = 2.3V$		8	
		$V_{CC} = 3V$		16	
				24	
		$V_{CC} = 4.5V$		32	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 1.8V \pm 0.15V, 2.5V \pm 0.2V$		20	ns/V
		$V_{CC} = 3.3V \pm 0.3V$		10	
		$V_{CC} = 5V \pm 0.5V$		5	
T_A	Operating free-air temperature		-40	125	°C

- (1) All unused inputs of the device must be held at V_{CC} or GND to establish proper device operation.



Electrical Characteristics—DC Limit Changes

over recommended operating free-air temperature range (Full=-40°C to +125°C, typical values are at T_A = +25°C, unless otherwise noted.) ⁽¹⁾

PARAMETER		TEST CONDITIONS	V _{CC}	TEMP	MIN	TYP	MAX	UNIT
V _{OL}		I _{OL} = 100μA	1.65V to 5.5V	Full			0.1	V
		I _{OL} = 4mA	1.65V				0.45	
		I _{OL} = 8mA	2.3V				0.3	
		I _{OL} = 16mA	3V				0.4	
		I _{OL} = 24mA					0.55	
		I _{OL} = 32mA	4.5V				0.55	
I _I	A input	V _I =5.5V or GND	0V to 5.5V	+25°C		±0.1	±1	μA
				Full			±5	
I _{off}		V _I or V _O =5.5V	0	+25°C		±0.1	±1	μA
				Full			±10	
I _{CC}		V _I =5.5V or GND, I _O =0	1.65V to 5.5V	+25°C		0.1	1	μA
				Full			10	
ΔI _{CC}		One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND	3V to 5.5V	Full			500	μA

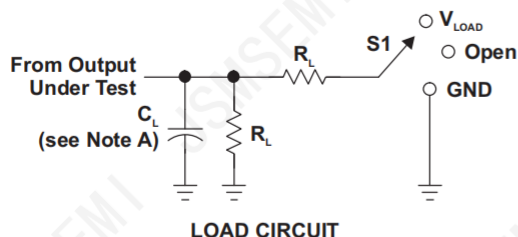
Electrical Characteristics—AC Limit Changes

PARAMETER	SYMBOL	TEST CONDITIONS		TEMP	MIN	TYP	MAX	UNIT
Propagation Delay	t _{pd}	V _{CC} =1.8V±0.15V	C _L =30pF, R _L =1kΩ	Full		6.4		ns
		V _{CC} =2.5V±0.2V	C _L =30pF, R _L =500Ω	Full		4.5		
		V _{CC} =3.3V±0.3V	C _L =50pF, R _L =500Ω	Full		4.2		
		V _{CC} =5V±0.5V	C _L =50pF, R _L =500Ω	Full		3.7		
Input Capacitance	C _i	V _{CC} =3.3V	V _I =V _{CC} or GND	+25°C		4		pF
Power dissipation capacitance	C _{pd}	V _{CC} =1.8V	f=10MHz	+25°C		3		pF
		V _{CC} =2.5V				3		
		V _{CC} =3.3V				4		
		V _{CC} =5V				6		

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

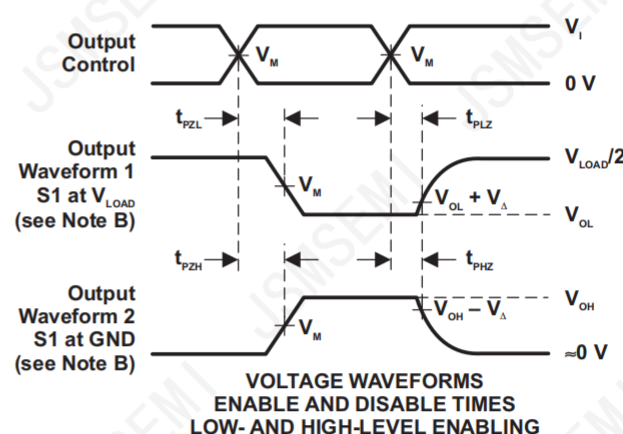
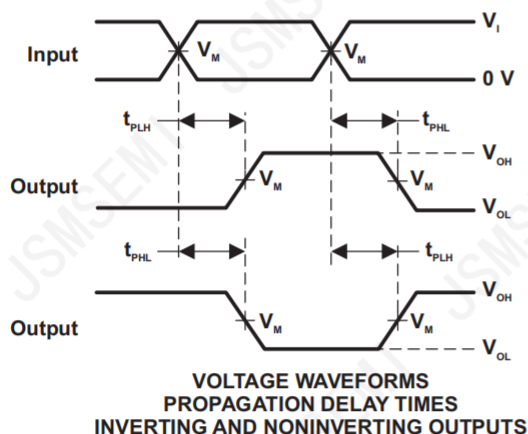
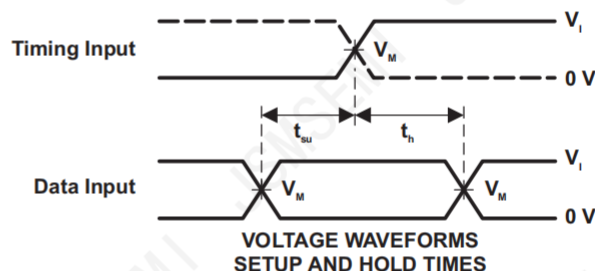
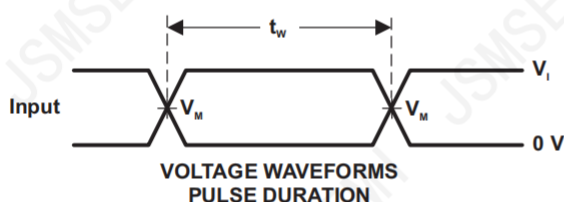


Parameter Measurement Information



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L		R_L		V_{Δ}
	V_I	t_r/t_f							
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	30pF	1M Ω	1k Ω	0.15V
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	30pF	1M Ω	500 Ω	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	15pF	50pF	1M Ω	500 Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	50pF	1M Ω	500 Ω	0.3V



- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_o = 50 \Omega$.
 - D. The outputs are measured one at a time, with one transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{PLH} .
 - F. t_{PZL} and t_{PZH} are the same as t_{PHL} .
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

Detailed Description

Overview

The 74LVC1G06 device contains one open-drain inverter with a maximum sink current of 32mA. This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs when the device is powered down. This inhibits current backflow into the device which prevents damage to the device.

Functional Block Diagram



Logic Diagram (Positive Logic)

Feature Description

Partial Power Down (I_{off})

Each input and output enter a high impedance state when the supply voltage is 0V. The maximum leakage into or out of any input or output pin on the device is specified by I_{off} in the Electrical Characteristics.

Over-voltage Tolerant Inputs

Input signals to this device can be driven above the supply voltage as long as the input signals remain below the maximum input voltage value specified in the Recommended Operating Conditions.

Device Functional Modes

Table 1 lists the functional modes of the 74LVC1G06.

Table 1. Function Table

INPUT A	OUTPUT Y
L	Hi-Z
H	L

Application Information

The 74LVC1G06 is a high-drive CMOS device that can be used to implement a high output drive buffer, such as an LED application. It can sink 32mA of current at 4.5V making it appropriate for high-drive applications. It is good for high-speed applications up to 100MHz. The inputs are 5.5V tolerant allowing it to translate up or down to V_{CC} . Below shows a simple LED driver application for a single channel of the device.

Typical Application

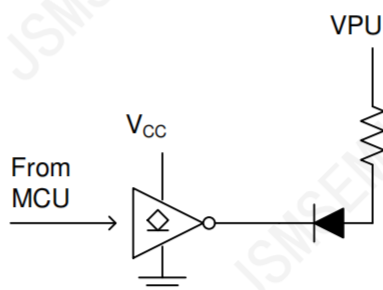


Figure 2. Typical Application Diagram

Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the Recommended Operating Conditions table.

The V_{CC} pin must have a good bypass capacitor to prevent power disturbance. A 0.1 μ F capacitor is recommended, and it is acceptable to parallel multiple bypass caps to reject different frequencies of noise. 0.1 μ F and 1 μ F capacitors are commonly used in parallel. For the best results, install the bypass capacitor as close to the power pin as possible.

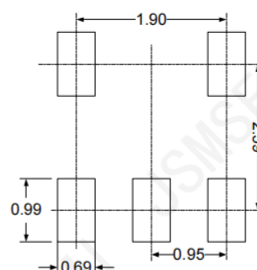
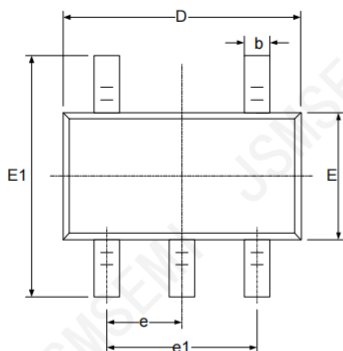
Layout

Layout Guidelines

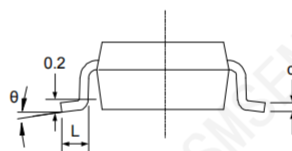
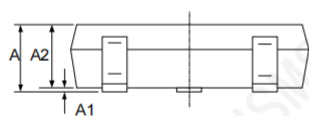
Even low data rate digital signals can contain high-frequency signal components due to fast edge rates. When a printed-circuit board (PCB) trace turns a corner at a 90° angle, a reflection can occur. A reflection occurs primarily because of the change of width of the trace. At the apex of the turn, the trace width increases to 1.414 times the width. This increase upsets the transmission-line characteristics, especially the distributed capacitance and self-inductance of the trace which results in the reflection. Not all PCB traces can be straight and therefore some traces must turn corners.

Package Information

SOT-23-5L



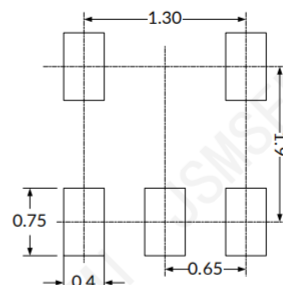
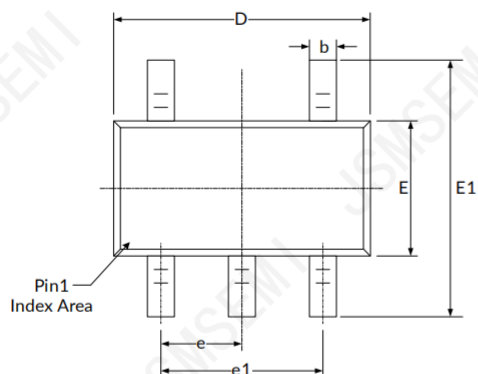
RECOMMENDED LAND PATTERN (Unit: mm)



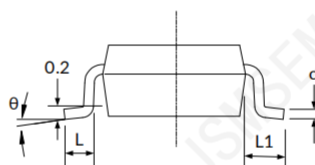
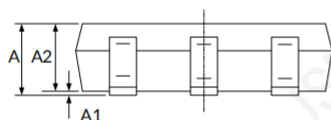
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

Package Information

SOT-353(SC70-5)



RECOMMENDED LAND PATTERN (Unit: mm)



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 ⁽¹⁾	2.000	2.200	0.079	0.087
E ⁽¹⁾	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
e1	1.300(BSC)		0.051(BSC)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

Revision History

Rev.	Change	Date
V1.0	Initial version	6/27/2021

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