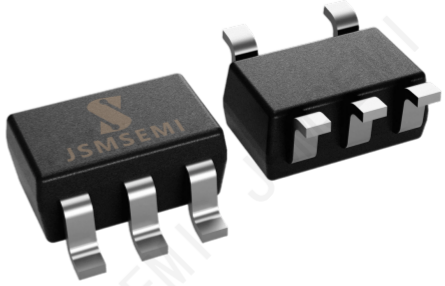
Description

This single Schmitt-trigger buffer is designed for 1.65V to 5.5V VCC operation.

The 74LVC1G17 device contains one buffer and performs the Boolean function Y = A.

The CMOS device has high output drive while maintaining low static power dissipation over a broad VCC operating range.

The 74LVC1G17 is available in Green SOT23-5 and SOT-353 packages. It operates over an ambient temperature range of -40°C to +125°C.



Functional Block Diagram

Features

- Packages: SOT23-5, SOT-353(SC70-5)
- Supports 5V V_{CC} operation
- Inputs accept voltages to 5.5V
- Maximum t_{pd} of 4.6ns at 3.3V
- Low power consumption, 1μA maximum I_{CC}
- ±24mA output drive at 3V
- I_{off} supports live insertion, partial-power-down mode, and back-drive protection
- Latch-up performance exceeds 100mA
- ESD protection exceeds JESD 22
  - 2000V human-body model
  - 200V machine model
  - 1000V charged-device model
- Operating Temperature Range: -40°C to +125°C
- RoSH compatible

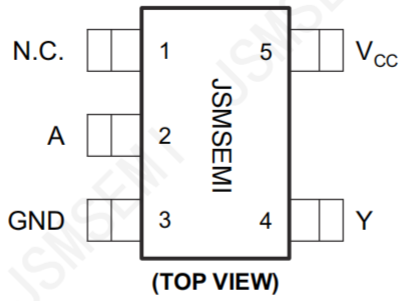
Applications

- AV receiver
- Audio dock: portable
- Blu-ray player and home theater
- MP3 player/recorder
- Personal Digital Assistant (PDA)
- Power: telecom/server AC/DC supply: single controller: analog and digital
- Solid State Drive (SSD): client and enterprise
- TV: LCD/Digital and High-Definition (HDTV)
- Tablet: enterprise
- Video analytics: server
- Wireless headset, keyboard, and mouse

Ordering Information

Order number	Package	Marking	Operation Temperature Range	MSL Grade	Ship,Quantity	Green
74LVC1G17GV,125-JSM	SOT-23-5L	C17J	-40 to 125°C	3	TR&3000	Rohs
74LVC1G17GW,125-JSM	SOT-353	C75	-40 to 125°C	3	TR&3000	Rohs

Pin Configuration and Functions



(TOP VIEW)

Pin Functions

PIN		DESCRIPTION
SOT23-5 SOT-353	NAME	
1	NC	Not connected
2	A	Input
3	GND	Ground
4	Y	Output
5	V_{CC}	Power terminal

Specifications

Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage range		–0.5	6.5	V
V_I	Input voltage range(2)		–0.5	6.5	V
V_O	Voltage range applied to any output in the high-impedance or power-off state(2)		–0.5	6.5	V
V_O	Voltage range applied to any output in the high or low state(2) (3)		–0.5	V_{CC} + 0.5	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_{stg}	Storage temperature range		–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	V
		Charged device model (CDM)	±1000	V

Recommended Operating Conditions

See (1)

			MIN	MAX	UNIT
V_{CC}	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 1.65V		–4	mA
		V_{CC} = 2.3V		–8	
		V_{CC} = 3V		–16	
				–24	
		V_{CC} = 4.5V		–32	
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	
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 ensure proper device operation.

Thermal Information

THERMAL METRIC		74LVC1G17		UNIT
		DBV	DCK	
		5 PINS	5 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	357.1	371.0	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	263.7	297.5	
$R_{\theta JB}$	Junction-to-board thermal resistance	264.4	258.6	
ψ_{JT}	Junction-to-top characterization parameter	195.6	195.6	
ψ_{JB}	Junction-to-board characterization parameter	262.2	256.2	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	–	–	

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	Vcc	TEMP	MIN(2)	TYP(3)	MAX(2)	UNIT
V_{T+}	Positive going input threshold voltage		1.65V	Full	0.75		1.05	V
			2.3V		1.25		1.55	
			3V		1.5		2.1	
			4.5V		2.3		3.0	
			5.5V		2.8		3.4	
V_{T-}	Negative going input threshol d voltage		1.65V	Full	0.3		0.6	V
			2.3V		0.6		0.9	
			3V		0.9		1.2	
			4.5V		1.35		1.75	
			5.5V		1.65		2.0	
ΔV_T	Hysteresis (V_{T+}-V_{T-})		1.65V	Full	0.3		0.7	V
			2.3V		0.35		0.75	
			3V		0.5		1.0	
			4.5V		0.8		1.3	
			5.5V		1.0		1.6	
V_{OH}		I_{OH} = -100μA	1.65V to 5.5V	Full	Vcc-0.1			V
		I_{OH} = -4mA	1.65V		1.2			
		I_{OH} = -8mA	2.3V		1.9			
		I_{OH} = -16mA	3V		2.4			
		I_{OH} = -24mA			2.3			
		I_{OH} = -32mA	4.5V		3.8			
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

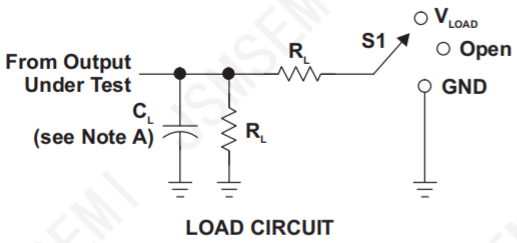
(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.
(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

Electrical Characteristics—AC Limit Changes

PARAMETER	SYMBOL	TEST CONDITIONS		TEMP	MIN(2)	TYP(3)	MAX(2)	UNIT
Propagation Delay	t_{pd}	V_{CC}=1.8V±0.15V	C_L=30pF, R_L=500Ω	Full		21		ns
		V_{CC}=2.5V±0.2V	C_L=30pF, R_L=500Ω	Full		7.8		
		V_{CC}=3.3V±0.3V	C_L=50pF, R_L=500Ω	Full		5.7		
		V_{CC}=5V±0.5V	C_L=50pF, R_L=500Ω	Full		4.2		
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		21		pF
		V_{CC}=2.5V				22		
		V_{CC}=3.3V				22		
		V_{CC}=5V				25		

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.
(2) This parameter is ensured by design and/or characterization and is not tested in production.
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

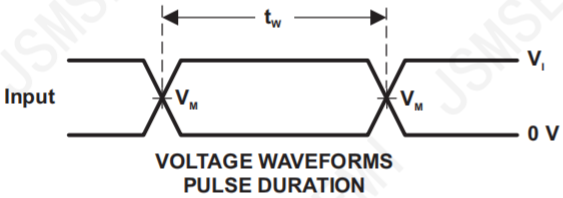
Parameter Measurement Information



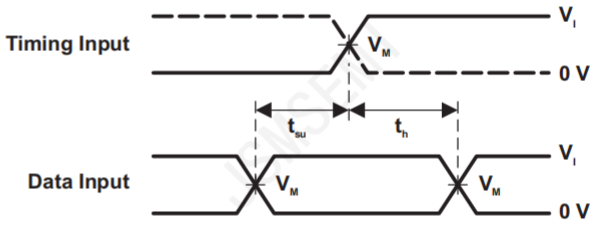
LOAD CIRCUIT

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

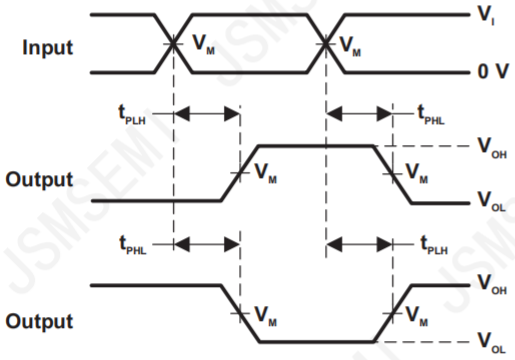
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L		R_L		V_Δ
	V_I	t_r/t_f							
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	15pF	30pF	1MΩ	1kΩ	0.15V
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	15pF	30pF	1MΩ	500Ω	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	15pF	50pF	1MΩ	500Ω	0.3V
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	2 x V_{CC}	15pF	50pF	1MΩ	500Ω	0.3V



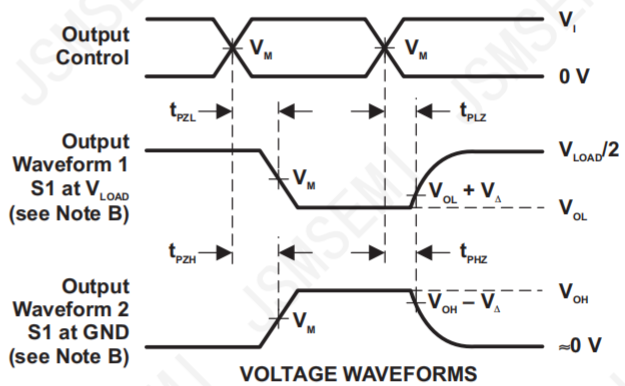
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

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 ≤ 10 MHz, Z_O = 50 Ω.
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_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
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 74LVC1G17 device contains one Schmitt trigger buffer and performs the Boolean function Y = A. The device functions as an independent buffer, but because of the Schmitt action, the device has different input threshold levels for positive-going (VT+) and negative-going signals.

The 74LVC1G17 is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when the device is powered down.

Functional Block Diagram

Feature Description

- Wide operating voltage range
  - Operates from 1.65V to 5.5V
- Allows down voltage translation
- Inputs accept voltages to 5.5V
- I_{off} feature allows voltages on the inputs and outputs when V_{CC} is 0V

Device Functional Modes

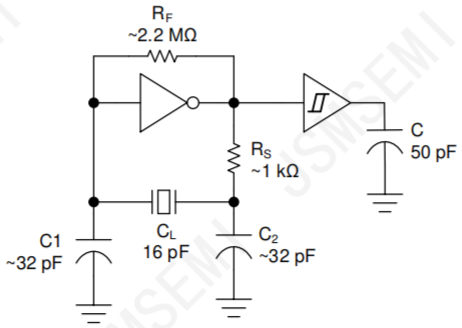
Table 1. Function Table

INPUT A	OUTPUT Y
H	H
L	L

Application Information

The 74LVC1G17 is a high drive CMOS device that can be used for a multitude of buffer type functions where the input is slow or noisy. 74LVC1G17 can produce 24mA of drive current at 3.3V; engineers can use it for driving multiple outputs and good for high speed applications up to 100MHz. The inputs are 5.5V tolerant allowing 74LVC1G17 to translate down to V_{CC}.

Typical Application



Power Supply Recommendations

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

Each Vcc pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1μF capacitor is recommended. If there are multiple Vcc pins, then a 0.01μF or 0.022μF capacitor is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. 0.1μF and 1μF capacitors are commonly used in parallel. For best results, install the bypass capacitor as close to the power pin as possible.

Layout

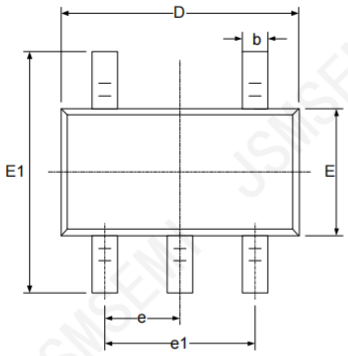
Layout Guidelines

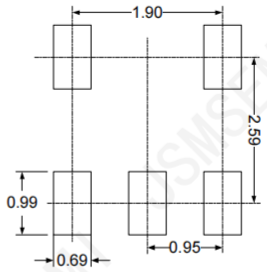
When using multiple bit logic devices, verify that inputs do not ever float. In many cases, functions or parts of functions of digital logic devices are unused, for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Do no leave such input terminals unconnected because the undefined voltages at the outside connections result in undefined operational states. In all circumstances, observe the rules specified below. Connect all unused inputs of digital logic devices to a high or low bias to prevent them from floating. The logic level that applies to any particular unused input depends on the function of the device. Generally the logic level is tied to the Gnd or Vcc, whichever is the better choice.

Layout Example

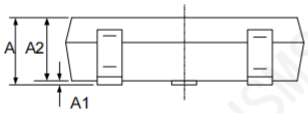
Package Information

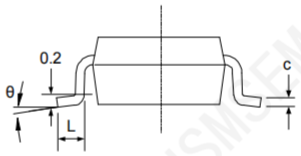
SOT-23-5L





RECOMMENDED LAND PATTERN (Unit: mm)

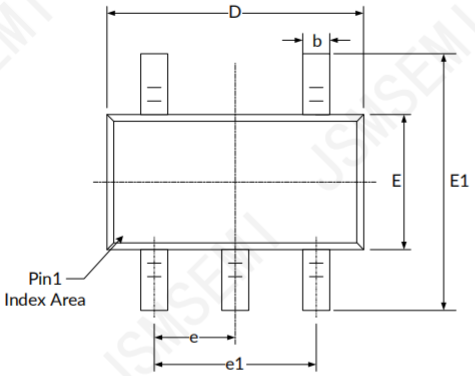


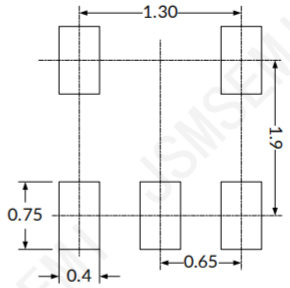


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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





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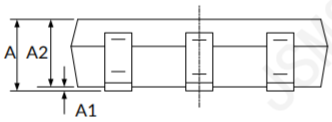

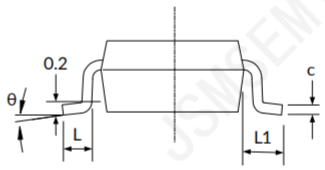

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D (1)	2.000	2.200	0.079	0.087
E (1)	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		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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