Triple Schmitt-Trigger Buffer

General Description

This triple schmitt-trigger buffer ET74LVC3G17 is designed for 1.65 V to 5.5 V V_{CC} operation.

The ET74LVC3G17 device contains three buffers and performs the Boolean function Y = A. The device functions as three independent buffers but, because of Schmitt action, it may have different input threshold levels for High Level Input Voltage (V_{OH}) and Low Level Input Voltage (V_{OL}) signals.

This device is fully specified for partial-power-down applications using I_{OFF}. The I_{OFF} circuitry disables the outputs, preventing damaging current back flow through the device when it is powered down.

ET74LVC3G17 are available in the SOP8 and TSSOP8 packages.

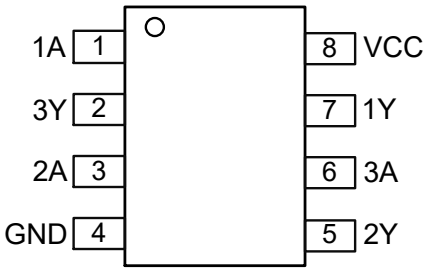
Features

- Wide Supply Voltage Range from 1.65V to 5.5V
- 5V Tolerant Input/Output for Interfacing with 5V Logic
- ± 24mA Output Drive at 3.0V
- CMOS Low Power Consumption
- Direct Interface with TIL Levels
- Specified from -40°C to +125°C
- Latch-Up Performance 100mA Per JESD 78
- ESD Protection Exceeds JESD 22
  -- 2000V Human-Body Model (A114) Pass
  -- 1000V Charged-Device Model (C101) Pass

Device Information

Part No.	Package	MSL
ET74LVC3G17M	SOP8	3
ET74LVC3G17V	TSSOP8	3

Pin Configuration



SOP8/TSSOP8

Figure1. Top View

Pin Function

SOP8 / TSSOP8

Pin No.	Function	Function
1	1A	Data Input
7	1Y	Data Output
3	2A	Data Input
5	2Y	Data Output
6	3A	Data Input
2	3Y	Data Output
4	GND	Ground
8	VCC	Supply Voltage

Block Diagram

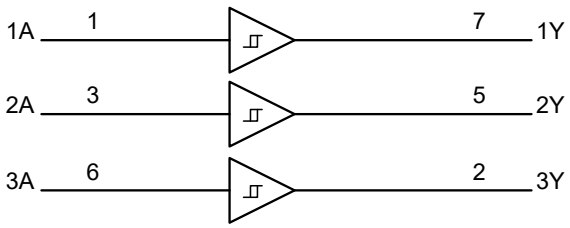


Figure2. Logic Symbol

Functional Description

Function Table

Input A	Output Y
L	L
H	H

Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)[1]

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply Voltage Range		-0.5	+6.5	V
V_I	Input Voltage [2]		-0.5	+6.5	V
V_O	Output Voltage [2][3]		-0.5	V_{CC}+0.5	V
I_{IK}	Input Clamp Current, V_I < 0V		-50		mA
I_{OK}	Output Clamp Current, V_O >V_{CC} or V_O < 0V			-50	mA
I_O	V_O=0V to V_{CC}			±50	mA
I_{CC}	Supply Current			100	mA
I_{GND}	Ground Current		-100		mA
T_J	Max Junction Temperature		-40	+150	°C
T_{STG}	Storage Temperature Range		-65	+150	°C
P_D	Total Power Dissipation	SOP8/TSSOP8		250	mW
V_{ESD}	Human Body Model (EIA/JESD22−A114)		±2000		V
	Charged Device Model (JESD22−C101)		±1000		
I_{LU}	Max Latch-up Current (EIA/JESD78)		±100		mA

Note1: Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Note2: The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

Note3: 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) [4]

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	1.65	5.5	V
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage	0	V_{CC}	V
T_A	Operating Ambient Temperature	-40	125	°C

Note4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

Electrical Characteristics

Over recommended operating free-air temperature range (unless otherwise noted)

Symbol	Parameter	Condition	V_{CC}	−40°C to 85°C			−40°C to 125°C			Unit
				Min	Typ[5]	Max	Min	Typ[5]	Max	
V_{IH}	High Level Input Voltage		1.65 to 1.95V	0.65× V_{CC}			0.65× V_{CC}			V
			2.3 to 2.7V	1.7			1.7			
			2.7 to 3.6V	2.0			2.0			
			4.5 to 5.5V	0.70× V_{CC}			0.70× V_{CC}			
V_{IL}	Low Level Input Voltage		1.65 to 1.95V			0.30 ×V_{CC}			0.30 ×V_{CC}	V
			2.3 to 2.7V			0.7			0.7	
			2.7 to 3.6V			0.8			0.8	
			4.5 to 5.5V			0.30 ×V_{CC}			0.30 ×V_{CC}	
V_{OH}	High−Level Output Voltage	I_{OH} = −100uA	1.65 to 5.5V	V_{CC} -0.1			V_{CC} -0.1			V
		I_{OH} = −4mA	1.65V	1.2			0.95			
		I_{OH} = −8mA	2.3V	1.9			1.7			
		I_{OH} = −12mA	2.7V	2.2			1.9			
		I_{OH} = −24mA	3.0V	2.3			2.0			
		I_{OH} = −32mA	4.5V	3.8			3.4			
V_{OL}	Low−Level Output Voltage	I_{OH} = 100uA	1.65 to 5.5V			0.10			0.10	V
		I_{OH} = 4mA	1.65V			0.45			0.70	
		I_{OH} = 8mA	2.3V			0.30			0.45	
		I_{OH} = 12mA	2.7V			0.40			0.60	
		I_{OH} = 24mA	3.0V			0.55			0.80	
		I_{OH} = 32mA	4.5V			0.55			0.80	
I_I	Input Leakage Current	V_I = 5.5 V or GND	0V to 5.5V		±0.1	±1			±1	μA
I_{OFF}	Power-off Leakage Current	V_O or V_I = 5.5V	0 V		±0.1	±2			±2	μA
I_{CC}	Quiescent Supply Current	V_I = 5.5 V or GND,I_O = 0A	1.65 to 5.5V		0.1	4			4	μA
ΔI_{CC}	Additional Supply Current	V_I=V_{CC} -0.6V, I_O=0A	2.3V to 5.5V		5	500			500	μA

Notes5: All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

AC Electrical Characteristics

Over recommended operating free-air temperature range, C_L = 30 pF or 50 pF (unless otherwise noted)

Symbol	Parameters	Conditions	V_{CC}(V)	-40°C≤T_A≤85°C			-40°C≤T_A≤125°C		Unit
				Min	Typ(6)	Max	Min	Max	
t_{PD}(7)	Propagation Delay	See Fig.4	1.65V to 5.5V	1.0	5.7	11.0	1.0	12.0	ns
			2.3V to 2.7V	0.5	4.2	8.0	0.5	9.0	ns
			2.7V	0.5	4.5	8.5	0.5	9.5	ns
			3.0V to 3.6V	0.5	4.2	8.0	0.5	9.0	ns
			4.5V to 5.5V	0.5	3.5	7.5	0.5	8.0	ns

Note6: Typical values are measure at V_{CC} = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively, T_A = 25°C.

Note7: t_{PD} is the same as t_{PLH} and t_{PHL}.

Capacitance Characteristics

Symbol	Parameters	Conditions	V_{CC}(V)	-40°C≤T_A≤85°C			Unit
				Min	Typ	Max	
C_{PD} (8)	Power Dissipation Capacitance	V_I = GND to V_{CC}	3.3V		23		pF
C_I	Input Capacitance	V_I = GND to V_{CC}	3.3V		2.5		pF

Note8: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

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

AC Testing Circuit

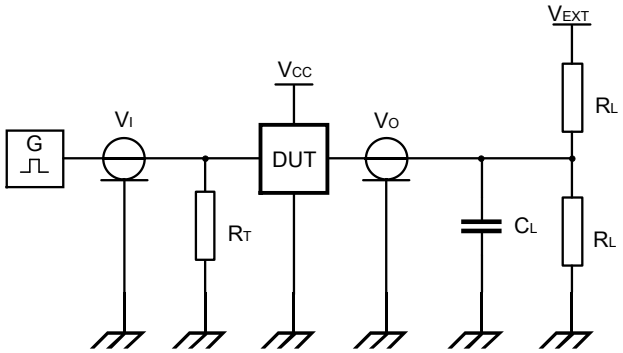


Figure 3. Test circuit for measuring switching times

Definitions test circuit:

R_L = Load resistance;

C_L = Load capacitance including jig and probe capacitance;

R_T = Termination resistance should be equal to output impedance Z_O of the pulse generator;

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

V_{CC}	Input			Output	Load		V_{EXT}
	V_I	t_r/t_f	V_M	V_M	C_L	R_L	t_{PLH} t_{PHL}
1.65 V to 5.5V	V_{CC}	≤ 6 ns	0.5 × V_{CC}	0.5 × V_{CC}	30 pF	1 kΩ	open
2.3V to 2.7V	V_{CC}	≤ 6 ns	0.5 × V_{CC}	0.5 × V_{CC}	30 pF	500 Ω	open
2.7V	2.7V	≤ 6 ns	1.5V	1.5V	50 pF	500 Ω	open
3.0V to 3.6V	3.0V	≤ 6 ns	1.5V	1.5V	50 pF	500 Ω	open
4.5V to 5.5V	V_{CC}	≤ 6 ns	0.5 × V_{CC}	0.5 × V_{CC}	50 pF	500 Ω	open

Table 1. Measurement Points and Test Data

AC Testing Waveform

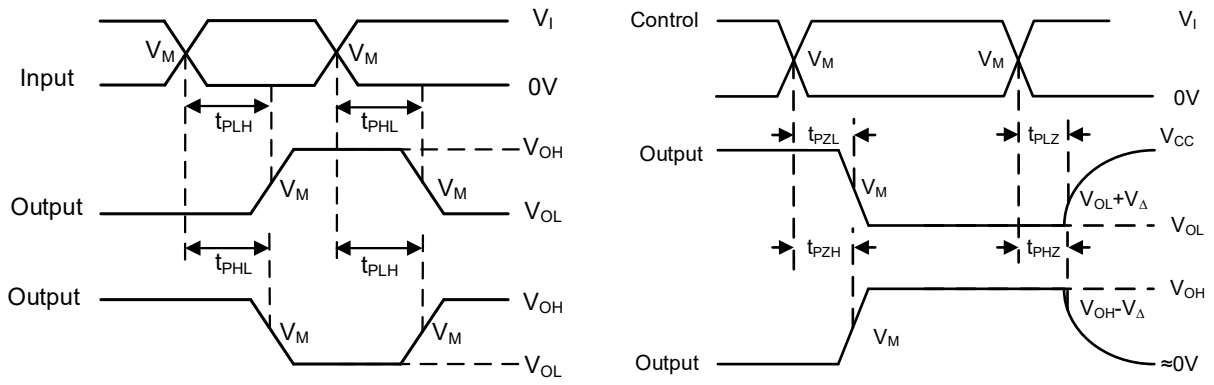
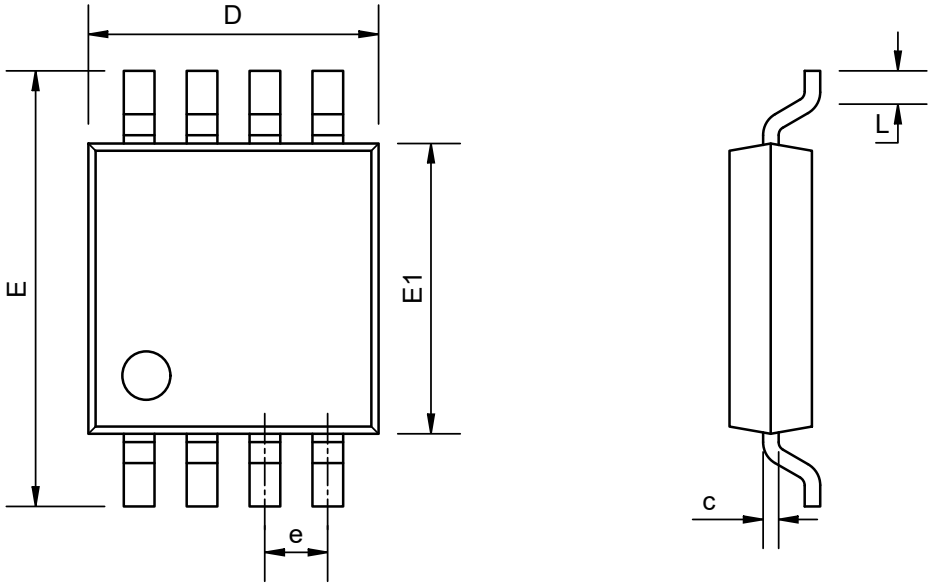
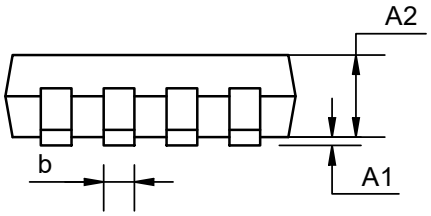


Figure4. Load Circuit and Voltage Waveforms

Package Dimension

SOP8

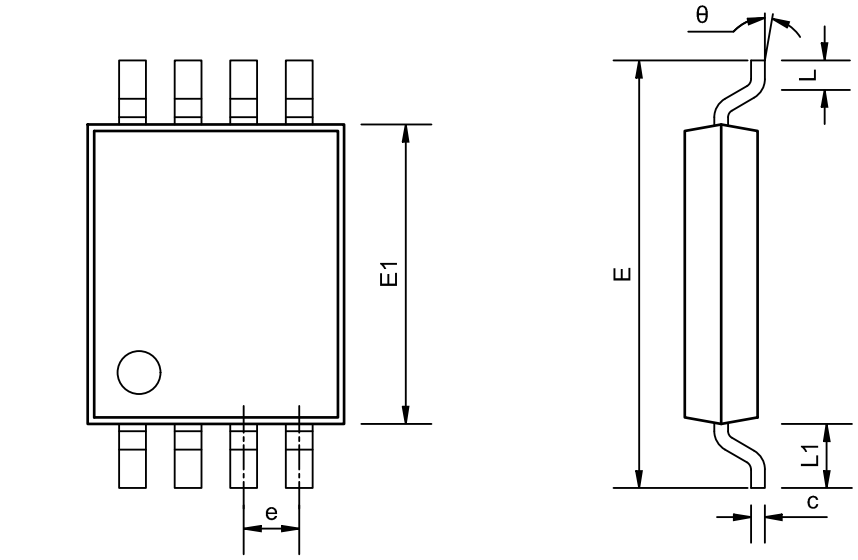


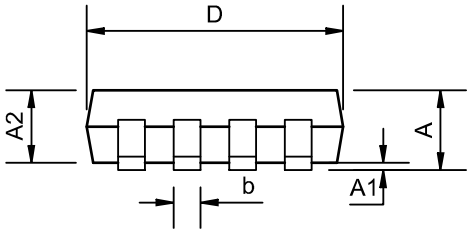


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A1	0.00	-	0.15
A2	1.35	1.40	1.50
b	0.38	-	0.47
c	0.17	-	0.25
D	4.80	4.90	5.00
E	5.80	6.00	6.20
D2	3.02	3.17	3.32
E1	3.80	3.90	4.00
E2	2.13	2.28	2.43
e	1.17	1.27	1.37
L	0.45	0.60	0.80

TSSOP8





COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	1.0	1.05	1.1
A1	0.00	0.07	0.15
A2	0.75	0.85	0.95
b	0.22	0.30	0.38
c	0.08	0.10	0.18
D	2.9	3.0	3.1
E	3.9	4.0	4.1
E1	2.9	3.0	3.1
e	0.65BSC		
L	0.33	0.40	0.47
L1	0.5REF		
θ	0°	4°	8°

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2023.11.10	Preliminary Version	Maruijie	Luhao	Liujiaying
1.0	2024.1.25	Offered Version	Shibo	Luhao	Liujiaying