74LVC2G17-Q100

Dual non-inverting Schmitt trigger with 5 V tolerant input
Rev. 6 — 21 August 2023
Product data sheet

1. General description

The 74LVC2G17-Q100 is a dual buffer with Schmitt-trigger inputs. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

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

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 1.65 V to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- ±24 mA output drive (V_{CC} = 3.0 V)
- CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD-8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V

3. Applications

· Wave and pulse shapers for highly noisy environments

4. Ordering information

Table 1. Ordering information

Type number	Package					
	Temperature range	Name	Description	Version		
74LVC2G17GW-Q100	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	SOT363-2		
74LVC2G17GV-Q100	-40 °C to +125 °C	SC-74; TSOP6	plastic surface-mounted package; 6 leads	SOT457		



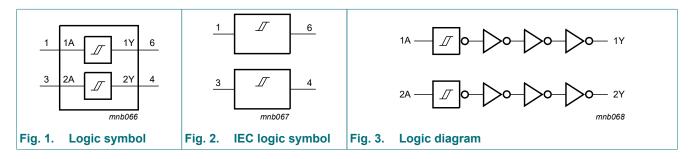
5. Marking

Table 2. Marking codes

Type number	Marking code [1]
74LVC2G17GW-Q100	VV
74LVC2G17GV-Q100	VV

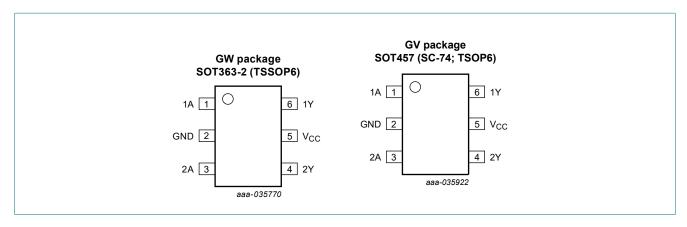
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



7. Pinning information

7.1. Pinning



7.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1A	1	data input
GND	2	ground (0 V)
2A	3	data input
2Y	4	data output
V _{CC}	5	supply voltage
1Y	6	data output

8. Functional description

Table 4. Function table

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level.$

Input	Output
nA	nY
L	L
Н	Н

9. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+6.5	V
I _{IK}	input clamping current	V _I < 0 V	-	-50	mA
VI	input voltage	[1]	-0.5	+6.5	V
I _{OK}	output clamping current	V _O < 0 V	-	-50	mA
Vo	output voltage	Active mode [1]	-0.5	V _{CC} + 0.5	V
		Power-down mode; V _{CC} = 0 V [1]	-0.5	+6.5	V
Io	output current	V _O = 0 V to V _{CC}	-	±50	mA
I _{CC}	supply current		-	100	mA
I _{GND}	ground current		-	-100	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	T_{amb} = -40 °C to +125 °C [2]	-	250	mW

^[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

10. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		1.65	-	5.5	V
VI	input voltage		0	-	5.5	V
V _O	output voltage		0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	-	+125	°C

^[2] For SOT363-2 (TSSOP6) package: P_{tot} derates linearly with 3.7 mW/K above 83 °C. For SOT457 (SC-74; TSOP6) package: P_{tot} derates linearly with 4.1 mW/K above 89 °C.

11. Static characteristics

Table 7. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T _{amb} = -	40 °C to +85 °C					
V _{OL}	LOW-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		I_{O} = 100 μ A; V_{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.3	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	V
V _{OH}	HIGH-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		I _O = -100 μA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	V
		I_{O} = -8 mA; V_{CC} = 2.3 V	1.9	-	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	-	-	V
		I_{O} = -32 mA; V_{CC} = 4.5 V	3.8	-	0.45 0.3 0.4 0.55 0.55	V
l _l	input leakage current	$V_{I} = 5.5 \text{ V or GND}; V_{CC} = 5.5 \text{ V}$	-	±0.1	±1	μΑ
I _{OFF}	power-off leakage current	V _I or V _O = 5.5 V; V _{CC} = 0 V	-	±0.1	±2	μΑ
I _{CC}	supply current	$V_{I} = V_{CC}$ or GND; $I_{O} = 0$ A; $V_{CC} = 5.5$ V	-	0.1	4	μΑ
ΔI _{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}$	-	5	500	μΑ
Cı	input capacitance		-	3.5	-	pF

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
T _{amb} =	40 °C to +125 °C					
V_{OL}	LOW-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		I_{O} = 100 μ A; V_{CC} = 1.65 V to 5.5 V	-	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.70	V
		I_{O} = 8 mA; V_{CC} = 2.3 V	-	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.80	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.80	V
V _{OH}	HIGH-level output voltage	$V_I = V_{T+}$ or V_{T-}				
		I_{O} = -100 μ A; V_{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	0.95	-	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.7	-	-	V
		I_{O} = -12 mA; V_{CC} = 2.7 V	1.9	-	-	V
		I_{O} = -24 mA; V_{CC} = 3.0 V	2.0	-	-	V
		I_{O} = -32 mA; V_{CC} = 4.5 V	3.4	-	0.70 0.45 0.60 0.80 - -	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 5.5 V	-	±0.1	±1	μA
I _{OFF}	power-off leakage current	V _I or V _O = 5.5 V; V _{CC} = 0 V	-	-	±2	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	4	μA
Δl _{CC}	additional supply current	$V_1 = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V} \text{ to } 5.5 \text{ V}$	-	-	500	μA

^[1] All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

12. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 5.

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit	
			Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation delay	nA to nY; see Fig. 4 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.5	5.6	10.5	1.5	13.1	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	3.7	6.5	1.0	8.5	ns
		V _{CC} = 2.7 V	1.0	3.8	6.5	1.0	8.5	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	3.6	5.7	1.0	7.1	ns
		V _{CC} = 4.5 V to 5.5 V	1.0	2.7	4.3	1.0	5.4	ns
C_{PD}	power dissipation capacitance	per buffer; $V_{CC} = 3.3 \text{ V}$; [3] $V_I = \text{GND to } V_{CC}$	-	16.3	-	-	-	pF

Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.8 V, 2.5 V, 2.7 V, 3.3 V and 5.0 V respectively.

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

 f_i = input frequency in MHz;

fo = output frequency in MHz;

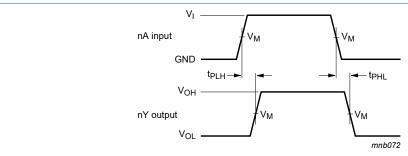
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching; $\sum (C_L \times V_{CC}^2 \times f_0)$ = sum of outputs.

 t_{pd} is the same as t_{PLH} and t_{PHL} . C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

12.1. Waveforms and test circuit



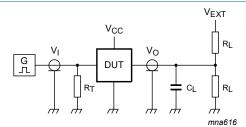
Measurement points are given in Table 9.

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

Fig. 4. The input (nA) to output (nY) propagation delays and the output transition times

Table 9. Measurement points

Supply voltage	Input	Output
V _{CC}	V _M	V _M
1.65 V to 1.95 V	0.5 × V _{CC}	0.5 × V _{CC}
2.3 V to 2.7 V	0.5 × V _{CC}	0.5 × V _{CC}
2.7 V	1.5 V	1.5 V
3.0 V to 3.6 V	1.5 V	1.5 V
4.5 V to 5.5 V	0.5 × V _{CC}	0.5 × V _{CC}



Measurement points are given in <u>Table 10</u>.

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 output impedance Z_{o} of the pulse generator.

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

Fig. 5. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load	Load		
V _{CC}	V _I	t _r , t _f	C _L	R _L	t _{PLH} , t _{PHL}	
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	open	
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	open	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	open	

13. Transfer characteristics

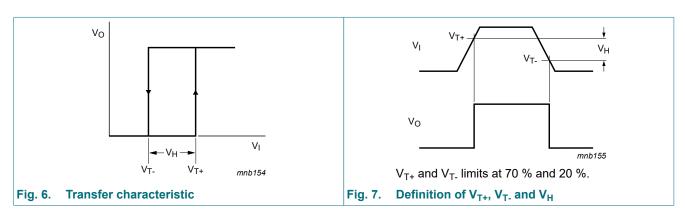
Table 11. Transfer characteristics

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40	-40 °C to +85 °C			-40 °C to +125 °C	
			Min	Typ[1]	Max	Min	Max	
V _{T+}	positive-going	see Fig. 6 and Fig. 7						
	threshold voltage	V _{CC} = 1.8 V	0.70	1.10	1.50	0.70	1.70	V
		V _{CC} = 2.3 V	1.00	1.40	1.80	1.00	2.00	V
		V _{CC} = 3.0 V	1.30	1.76	2.20	1.30	2.40	V
		V _{CC} = 4.5 V	1.90	2.47	3.10	1.90	3.30	V
		V _{CC} = 5.5 V	2.20	2.91	3.60	2.20	3.80	V
V _{T-}	negative-going threshold voltage	see Fig. 6 and Fig. 7						
		V _{CC} = 1.8 V	0.25	0.61	0.90	0.25	1.10	V
		V _{CC} = 2.3 V	0.40	0.80	1.15	0.40	1.35	V
		V _{CC} = 3.0 V	0.60	1.04	1.50	0.60	1.70	V
		V _{CC} = 4.5 V	1.00	1.55	2.00	1.00	2.20	V
		V _{CC} = 5.5 V	1.20	1.86	2.30	1.20	2.50	V
V _H	hysteresis voltage	$(V_{T+} - V_{T-})$; see <u>Fig. 6</u> , <u>Fig. 7</u> and <u>Fig. 8</u>						
		V _{CC} = 1.8 V	0.15	0.49	1.00	0.15	1.20	V
		V _{CC} = 2.3 V	0.25	0.60	1.10	0.25	1.30	V
		V _{CC} = 3.0 V	0.40	0.73	1.20	0.40	1.40	V
		V _{CC} = 4.5 V	0.60	0.92	1.50	0.60	1.70	V
		V _{CC} = 5.5 V	0.70	1.02	1.70	0.70	1.90	V

^[1] All typical values are measured at T_{amb} = 25 °C.

13.1. Waveforms transfer characteristics



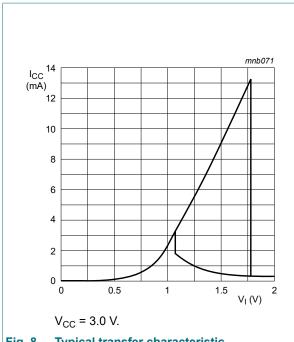
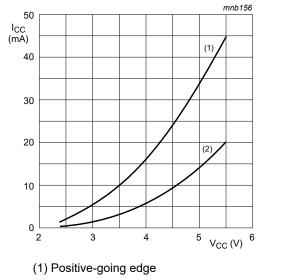


Fig. 8. Typical transfer characteristic



(2) Negative-going edge

Linear change of V_I between 0.8 V to 2.0 V. All values given are typical unless otherwise specified.

Fig. 9. Average I_{CC} as a function of V_{CC}

14. Package outline

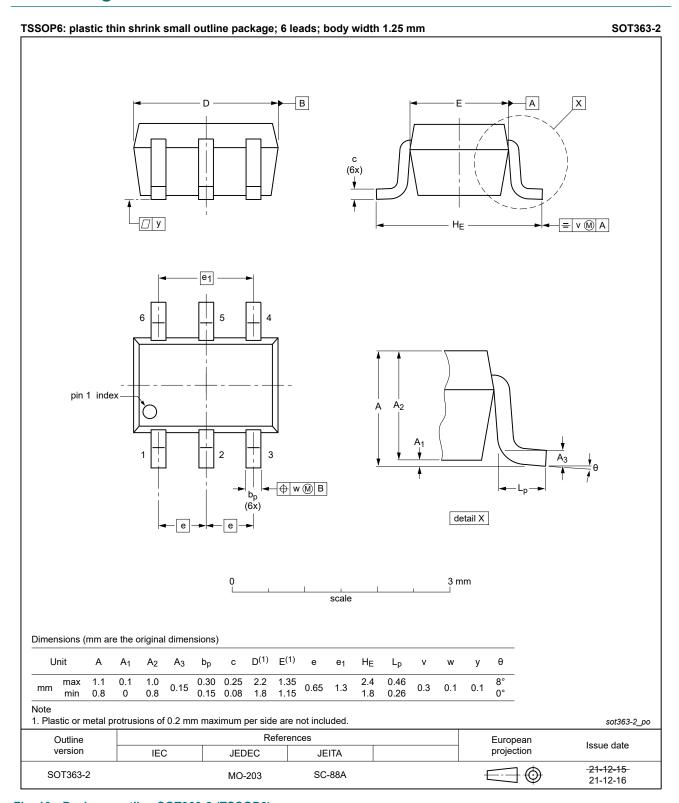


Fig. 10. Package outline SOT363-2 (TSSOP6)

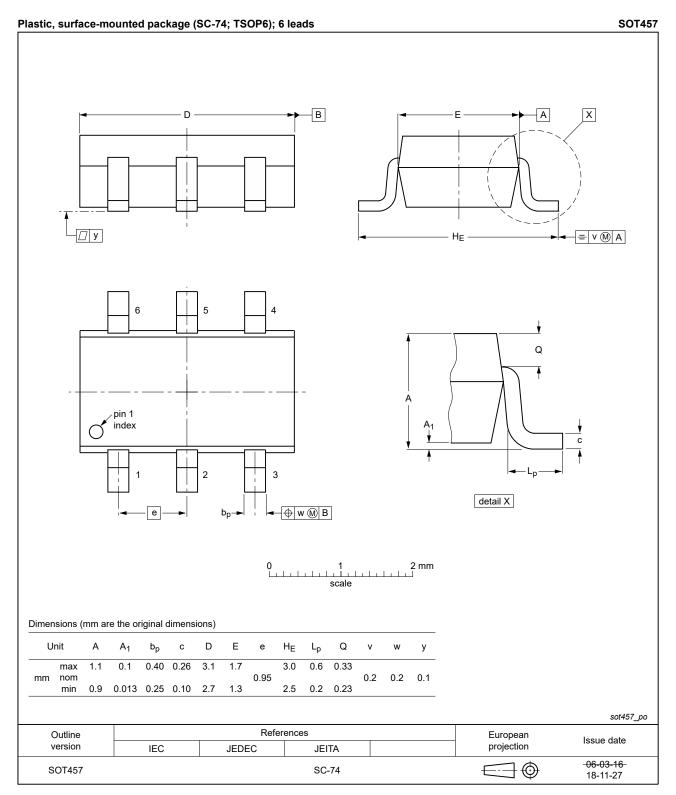


Fig. 11. Package outline SOT457 (SC-74; TSOP6)

15. Abbreviations

Table 12. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
TTL	Transistor-Transistor Logic

16. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes			
74LVC2G17_Q100 v.6	20230821	Product data sheet	-	74LVC2G17_Q100 v.5			
Modifications:	Section 2: E	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.					
74LVC2G17_Q100 v.5	20220124	Product data sheet	-	74LVC2G17_Q100 v.4			
Modifications:	Package S0	Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6).					
74LVC2G17_Q100 v.4	20210621	Product data sheet	-	74LVC2G17_Q100 v.3			
Modifications:	guidelines c Legal texts Section 1 ar Section 9: E	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Section 1 and Section 2 updated. Section 9: Derating values for P_{tot} total power dissipation updated. Fig. 11: Package outline drawing SOT457 (SC-74; TSOP6) updated. 					
74LVC2G17_Q100 v.3	20161214	Product data sheet	-	74LVC2G17_Q100 v.2			
Modifications:	<u>Table 7</u> : The maximum limits for leakage current and supply current have changed.						
74LVC2G17_Q100 v.2	20130502	Product data sheet	-	74LVC2G17_Q100 v.1			
Modifications:	<u>Table 3</u> : the description of pin 6 changed from data input to data output.						
74LVC2G17_Q100 v.1	20120807	Product data sheet	-	-			

17. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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74LVC2G17_Q100

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