74LVC2G07-Q100

Buffers with open-drain outputs Rev. 1 — 15 November 2013

Product data sheet

General description 1.

The 74LVC2G07-Q100 provides two non-inverting buffers.

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 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

Schmitt trigger action at all inputs makes the circuit tolerant for slower input rise and fall time.

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.

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
- 5 V tolerant input/output for interfacing with 5 V logic
- High noise immunity
- Complies with JEDEC standard:
 - ◆ JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8-B/JESD36 (2.7 V to 3.6 V)
- -24 mA output drive ($V_{CC} = 3.0 \text{ V}$)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Multiple package options
- ESD protection:
 - MIL-STD-883, method 3015 exceeds 2000 V
 - ♦ HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V (C = 200 pf, R = 0 Ω)



3. Ordering information

Table 1. Ordering information

Type number	Package	ackage				
	Temperature range	Name	Description	Version		
74LVC2G07GW-Q100	−40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363		
74LVC2G07GV-Q100	–40 °C to +125 °C	TSOP6	plastic surface-mounted package (TSOP6); 6 leads	SOT457		

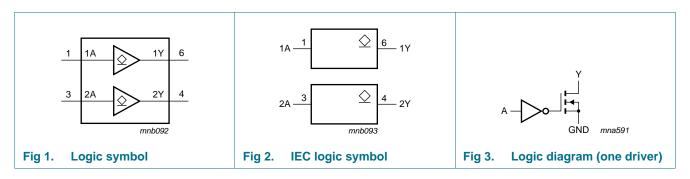
4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74LVC2G07GW-Q100	V7
74LVC2G07GV-Q100	V07

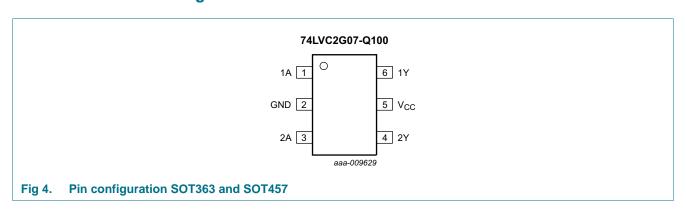
^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1 Pinning



74LVC2G07_Q100

6.2 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

7. Functional description

Table 4. Function table[1]

Input nA	Output nY
L	L
Н	Z

^[1] H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

8. 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		<u>[1]</u> –0.5	+6.5	V
l _{OK}	output clamping current	V _O < 0 V	-50	-	mA
Vo	output voltage	Active mode	<u>[1]</u> –0.5	+6.5	V
		Power-down mode	<u>[1][2]</u> –0.5	+6.5	V
lo	output current	$V_0 = 0 \ V \text{ to } 6.5 \ V$	-	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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	<u>[3]</u> -	250	mW

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

^[2] When $V_{CC} = 0 \text{ V}$ (Power-down mode), the output voltage can be 5.5 V in normal operation.

^[3] For SC-88 and TSOP6 packages: above 87.5 $^{\circ}$ C the value of P $_{tot}$ derates linearly with 4.0 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		1.65	-	5.5	V
V _I	input voltage		0	-	5.5	V
Vo	output voltage	Active mode	0	-	5.5	V
		Power-down mode; V _{CC} = 0 V	0	-	5.5	V
T _{amb}	ambient temperature		-40	-	+125	°C
Δt/ΔV input transition rise and		V _{CC} = 1.65 V to 2.7 V	-	-	20	ns/V
	fall rate	V _{CC} = 2.7 V to 5.5 V	-	-	10	ns/V

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = -40	°C to +85 °C[1]					
V _{IH}	HIGH-level input	V _{CC} = 1.65 V to 1.95 V	0.65 × \	/ _{CC} -	-	V
	voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
		V _{CC} = 4.5 V to 5.5 V	$0.7 \times V_0$	cc -	-	V
V _{IL}	LOW-level input	V _{CC} = 1.65 V to 1.95 V	-	-	$0.35 \times V_{CC}$	V
	voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	$0.3 \times V_{CC}$	V
V _{OL} LOW-level output		$V_I = V_{IH}$ or V_{IL}				
`	voltage	$I_O = 100 \ \mu A; \ V_{CC} = 1.65 \ V \ to \ 5.5 \ V$	-	-	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	V
		$I_{O} = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.30	V
		$I_{O} = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.40	V
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	V
		$I_{O} = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	V
l _l	input leakage current	$V_1 = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	[2] _	±0.1	±5	μΑ
l _{oz}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	±0.1	±10	μΑ
OFF	power-off leakage current	V_I or $V_O = 5.5$ V; $V_{CC} = 0$ V	-	±0.1	±10	μΑ
I _{cc}	supply current	$V_I = 5.5 \text{ V or GND}; I_O = 0 \text{ A};$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	-	0.1	10	μΑ
Δl _{CC}	additional supply current	per pin; $V_I = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	[2] _	5	500	μΑ
Cı	input capacitance		-	2.5	-	pF

 Table 7.
 Static characteristics ...continued

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
T _{amb} = -40	°C to +125 °C					
V _{IH}	HIGH-level input	V _{CC} = 1.65 V to 1.95 V	$0.65 \times V_{CC}$	-	-	V
	voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	V
		V _{CC} = 4.5 V to 5.5 V	$0.7 \times V_{CC}$	-	-	V
V _{IL}	LOW-level input	V _{CC} = 1.65 V to 1.95 V	-	-	$0.35 \times V_{CC}$	V
	voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	V
		V _{CC} = 4.5 V to 5.5 V	-	-	$0.3 \times V_{CC}$	V
V _{OL}	LOW-level output	$V_I = V_{IH}$ or V_{IL}				
	voltage	I_{O} = 100 μ A; V_{CC} = 1.65 V to 5.5 V	-	-	0.10	V
		$I_{O} = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.70	V
		$I_{O} = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.45	V
		$I_{O} = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.60	V
		$I_{O} = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.80	V
		$I_{O} = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.80	V
l _l	input leakage current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	±20	μА
l _{oz}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±10	μΑ
OFF	power-off leakage current	V_I or $V_O = 5.5$ V; $V_{CC} = 0$ V	-	-	±20	μΑ
I _{cc}	supply current	$V_I = 5.5 \text{ V or GND; } I_O = 0 \text{ A;}$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	-	-	40	μΑ
Δl _{CC}	additional supply current	per pin; $V_1 = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$; $V_{CC} = 2.3 \text{ V}$ to 5.5 V	-	-	5000	μΑ

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

^[2] These typical values are measured at $V_{CC} = 3.3 \text{ V}$.

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit, see Figure 6.

Symbol	Parameter	Conditions		-40	°C to +85	S °C	-40 °C to	+125 °C	Unit
				Min	Typ[1]	Max	Min	Max	
t_{pd}	propagation delay	nA to nY; see Figure 5	[2]						
	$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$		1.0	3.5	6.7	1.0	8.4	ns	
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.5	2.4	4.3	0.5	5.5	ns
		$V_{CC} = 2.7 \text{ V}$		1.0	2.3	4.2	1.0	5.3	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		0.5	2.6	3.7	0.5	4.7	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$		0.5	1.5	2.9	0.5	3.7	ns
C_{PD}	power dissipation capacitance	$V_I = GND \text{ to } V_{CC}; V_{CC} = 3.3 \text{ V}$	[3]	-	6.5	-	-	-	pF

- [1] 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.
- [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 μW).

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

 f_i = input frequency in MHz;

f_o = output frequency in MHz;

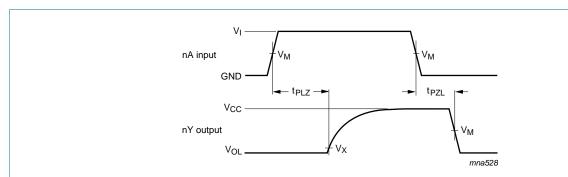
C_L = output load capacitance in pF;

 V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms



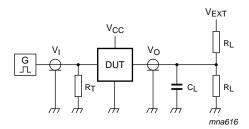
Measurement points are given in Table 9.

V_{OL} is the typical output voltage level that occurs with the output load.

Fig 5. The input (nA) to output (nY) propagation delays

Table 9. Measurement points

Supply voltage	Input	Output	Output			
V _{CC}	V _M	V _M	V _X			
1.65 V to 1.95 V	$0.5 \times V_{\text{CC}}$	$0.5 \times V_{CC}$	V _{OL} + 0.15 V			
2.3 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.15 V			
2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V			
3.0 V to 3.6 V	1.5 V	1.5 V	V _{OL} + 0.3 V			
4.5 V to 5.5 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.3 V			



Test data is given in Table 10.

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_0 of the pulse generator.

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

Fig 6. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load		V _{EXT}
V _{CC}	V _I	t _r , t _f	CL	R _L	t _{PZL} , t _{PLZ}
1.65 V to 1.95 V	V _{CC}	≤ 2.0 ns	30 pF	1 kΩ	$2\times V_{CC}$
2.3 V to 2.7 V	V _{CC}	≤ 2.0 ns	30 pF	500 Ω	$2 \times V_{CC}$
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	6 V
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	6 V
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	$2\times V_{CC}$

13. Package outline

Plastic surface-mounted package; 6 leads **SOT363** Α X = v M A Q ⊕ w M B е detail X **DIMENSIONS** (mm are the original dimensions) Α1 UNIT D Ε Α С Q v е HΕ Lp w у max 0.30 0.25 0.45 0.25 1.1 2.2 1.35 2.2 0.65 1.3 0.1 1.8 0.20 0.10 8.0 1.15 0.15 0.15 **REFERENCES EUROPEAN** OUTLINE ISSUE DATE

Fig 7. Package outline SOT363 (SC-88)

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PROJECTION

VERSION

SOT363

JEITA

SC-88

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

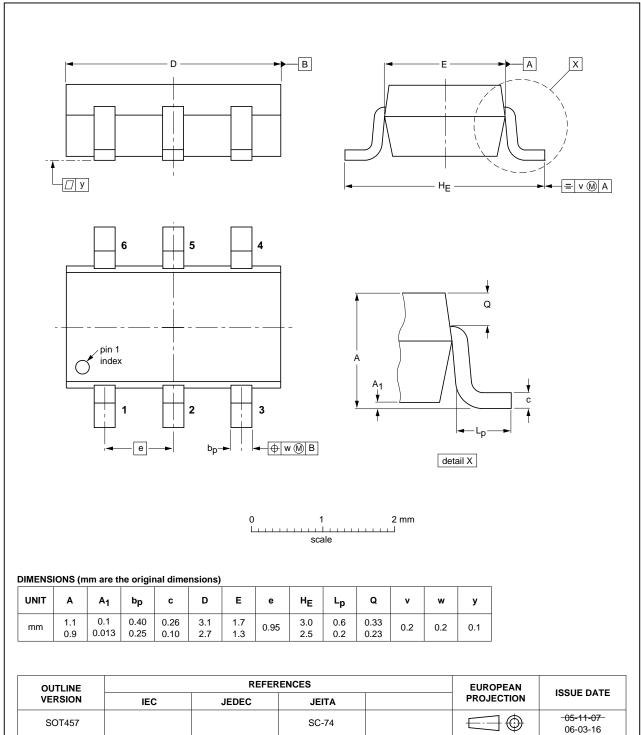


Fig 8. Package outline SOT457 (TSOP6)

14. Abbreviations

Table 11. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MIL	Military
MM	Machine Model
TTL	Transistor-Transistor Logic

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC2G07_Q100 v.1	20131115	Product data sheet	-	-

16. Legal information

16.1 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.
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