74LVC1G57-Q100

Low-power configurable multiple function gate Rev. 1 — 15 April 2014 P

Product data sheet

General description 1.

The 74LVC1G57-Q100 provides configurable multiple functions. Eight patterns of 3-bit input, determine the output state. The user can choose the logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer. All inputs can be connected to V_{CC} or GND.

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.

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.

All inputs (A, B and C) are Schmitt trigger inputs that can transform slowly changing input signals into sharply defined, jitter-free output signals.

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

Features and benefits 2.

- 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)
 - JESD8B/JESD36 (2.7 V to 3.6 V).
- 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)
- \pm 24 mA output drive (V_{CC} = 3.0 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



3. Ordering information

Table 1. Ordering information

Type number	Package							
	Temperature range	Name	Description	Version				
74LVC1G57GW-Q100	–40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363				
74LVC1G57GV-Q100	–40 °C to +125 °C	SC-74	plastic surface-mounted package; 6 leads	SOT457				

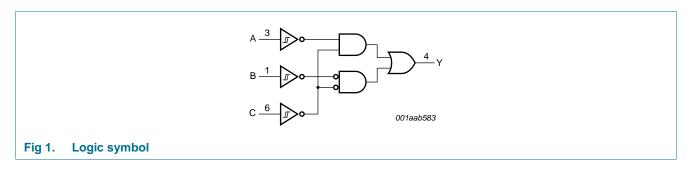
4. Marking

Table 2. Marking

Type number	Marking code ^[1]
74LVC1G57GW-Q100	YC
74LVC1G57GV-Q100	V57

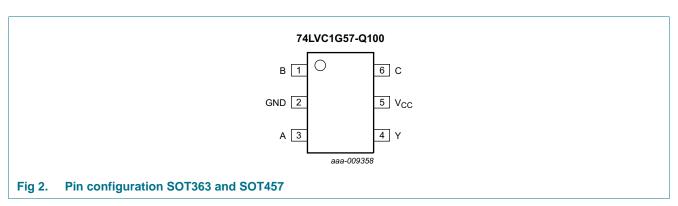
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

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

7. Functional description

Table 4. Function table[1]

Input			Output
С	В	A	Υ
L	L	L	Н
L	L	Н	L
L	Н	L	Н
L	Н	Н	L
Н	L	L	L
Н	L	Н	L
Н	Н	L	Н
Н	Н	Н	Н

^[1] H = HIGH voltage level; L = LOW voltage level.

7.1 Logic configurations

Table 5. Function selection table

Logic function	Figure
2-input AND	see Figure 3
2-input AND with both inputs inverted	see Figure 6
2-input NAND with inverted input	see Figure 4 and Figure 5
2-input OR with inverted input	see Figure 4 and Figure 5
2-input NOR	see Figure 6
2-input NOR with both inputs inverted	see Figure 3
2-input XNOR	see Figure 7
Inverter	see Figure 8
Buffer	see Figure 9

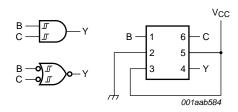


Fig 3. 2-input AND gate or 2-input NOR gate with both inputs inverted

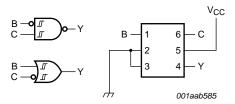


Fig 4. 2-input NAND gate with input B inverted or 2-input OR gate with inverted C input

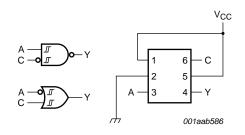


Fig 5. 2-input NAND gate with input C inverted or 2-input OR gate with inverted A input

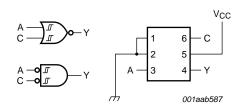


Fig 6. 2-input NOR gate or 2-input AND gate with both inputs inverted

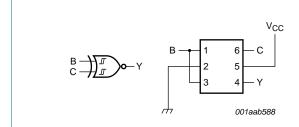


Fig 7. 2-input XNOR gate

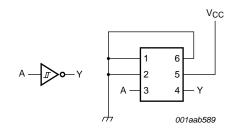
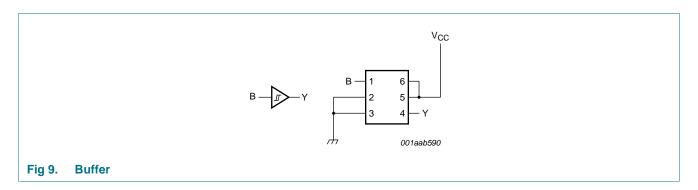


Fig 8. Inverter



8. Limiting values

Table 6. 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
I _{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V		-	±50	mA
Vo	output voltage	Active mode	[1][2]	-0.5	+6.5	V
		Power-down mode	[1][2]	-0.5	+6.5	V
Io	output current	$V_O = 0 \text{ V to } V_{CC}$		-	±50	mA
Icc	supply current			-	+100	mA
I _{GND}	ground current			-100	-	mA
T _{stg}	storage temperature			-65	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[3]	-	250	mW

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

9. Recommended operating conditions

Table 7. 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
Vo	output voltage	Active mode	0	-	V _{CC}	V
		V _{CC} = 0 V; Power-down mode	0	-	5.5	V
T _{amb}	ambient temperature		-40	-	+125	°C

^[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 SC-74 packages: above 87.5 °C the value of Ptot derates linearly with 4.0 mW/K.

10. Static characteristics

Table 8. Static 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_{OL}	LOW-level	$V_I = V_{T+}$ or V_{T-}							
	output voltage	$I_O = 100 \mu A;$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	-	-	0.1	-	0.1	V	
		$I_O = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.45	-	0.7	V	
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.3	-	0.45	V	
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.4	-	0.6	V	
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	-	0.8	V	
		$I_O = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	-	0.8	V	
V _{OH}	HIGH-level	$V_I = V_{T+}$ or V_{T-}							
	output voltage	$I_O = -100 \mu A;$ $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	V _{CC} - 0.1	-	-	V _{CC} - 0.1	-	V	
		$I_O = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	1.2	-	-	0.95	-	V	
		$I_{O} = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.9	-	-	1.7	-	V	
		$I_O = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	1.9	-	V	
		$I_{O} = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.3	-	-	2.0	-	V	
		$I_{O} = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.8	-	-	3.4	-	V	
l _l	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±5	-	±100	μА	
I _{OFF}	power-off leakage current	$V_1 \text{ or } V_0 = 5.5 \text{ V}; V_{CC} = 0 \text{ V}$	-	±0.1	±10	-	±200	μА	
I _{CC}	supply current	V _I = 5.5 V or GND; I _O = 0 A; V _{CC} = 1.65 V to 5.5 V	-	0.1	10	-	200	μА	
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	-	5000	μА	
Cı	input capacitance		-	2.5	-	-	-	pF	

^[1] Typical values are measured at maximum V_{CC} and T_{amb} = 25 °C.

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit, see Figure 11.

Symbol	Parameter	Conditions	-40 °C to +85 °C		40 °C to +85 °C		-40 °C to +125 °C		
			Min	Typ[1]	Max	Min	Max		
t _{pd}	propagation delay	A, B, C to Y; see Figure 10							
		V _{CC} = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18	ns	
		V _{CC} = 2.3 V to 2.7 V	0.5	3.5	8.3	0.5	10.4	ns	
		V _{CC} = 2.7 V	0.5	4.2	8.5	0.5	10.6	ns	
		V _{CC} = 3.0 V to 3.6 V	0.5	3.8	6.3	0.5	7.9	ns	
		V _{CC} = 4.5 V to 5.5 V	0.5	3.0	5.1	0.5	6.4	ns	
C _{PD}	power dissipation capacitance	$V_{CC} = 3.3 \text{ V}; V_I = \text{GND to } V_{CC}$ [3]	-	22	-	-	-	pF	

- [1] Typical values are measured at nominal V_{CC} and at T_{amb} = 25 °C.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL}
- [3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

 f_i = input frequency in MHz;

fo = output frequency in MHz;

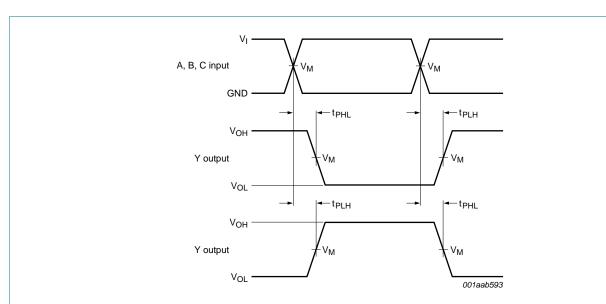
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms



Measurement points are given in Table 10.

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

Fig 10. Input A, B and C to output Y propagation delay times

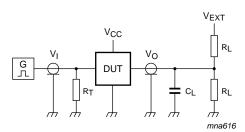
74LVC1G57-Q100

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Table 10. Measurement points

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



Measurement points are given in Table 11.

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_0 of the pulse generator.

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

Fig 11. Test circuit for measuring switching times

Table 11. Measurement points

Supply voltage	Input		Load	Load	
V _{CC}	V _I	$t_r = t_f$	CL	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

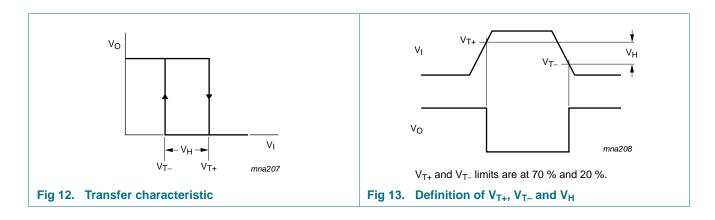
Table 12. Transfer characteristics

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

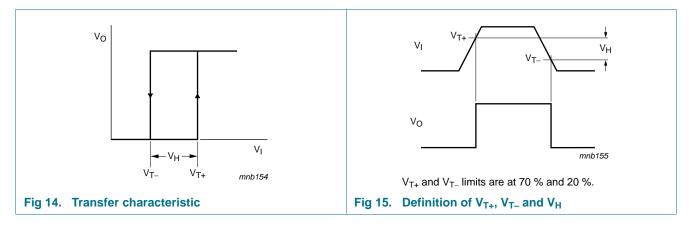
Symbol	Parameter	Conditions	-4	0 °C to +8	5 °C	-40 °C 1	Unit	
			Min	Typ[1]	Max	Min	Max	
V _{T+}	positive-going threshold voltage	see Figure 12, Figure 13, Figure 14 and Figure 15						
		V _{CC} = 1.8 V	0.70	1.02	1.20	0.67	1.20	V
		V _{CC} = 2.3 V	1.11	1.42	1.60	1.08	1.60	V
		V _{CC} = 3.0 V	1.50	1.79	2.00	1.47	2.00	V
		V _{CC} = 4.5 V	2.16	2.52	2.74	2.13	2.74	V
		V _{CC} = 5.5 V	2.61	2.99	3.33	2.58	3.33	V
V_{T-}	negative-going threshold voltage	see <u>Figure 12</u> , <u>Figure 13</u> , <u>Figure 14</u> and <u>Figure 15</u>						
		V _{CC} = 1.8 V	0.30	0.53	0.72	0.30	0.75	V
		V _{CC} = 2.3 V	0.58	0.77	1.00	0.58	1.03	V
		V _{CC} = 3.0 V	0.80	1.04	1.30	0.80	1.33	V
		V _{CC} = 4.5 V	1.21	1.55	1.90	1.21	1.93	V
		V _{CC} = 5.5 V	1.45	1.86	2.29	1.45	2.32	V
V _H	hysteresis voltage	(V _{T+} – V _{T-}); see <u>Figure 12</u> , <u>Figure 13</u> , <u>Figure 14</u> and <u>Figure 15</u>						
		V _{CC} = 1.8 V	0.30	0.48	0.62	0.23	0.62	V
		V _{CC} = 2.3 V	0.40	0.64	0.80	0.34	0.80	V
		V _{CC} = 3.0 V	0.50	0.75	1.00	0.44	1.00	V
		V _{CC} = 4.5 V	0.71	0.97	1.20	0.65	1.20	V
		V _{CC} = 5.5 V	0.71	1.13	1.40	0.65	1.40	V

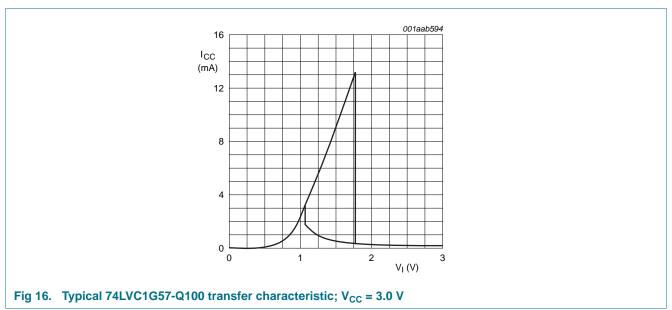
^[1] Typical values are measured at T_{amb} = 25 °C.

14. Waveforms transfer characteristics



74LVC1G57-Q100





15. Package outline

Plastic surface-mounted package; 6 leads

SOT363

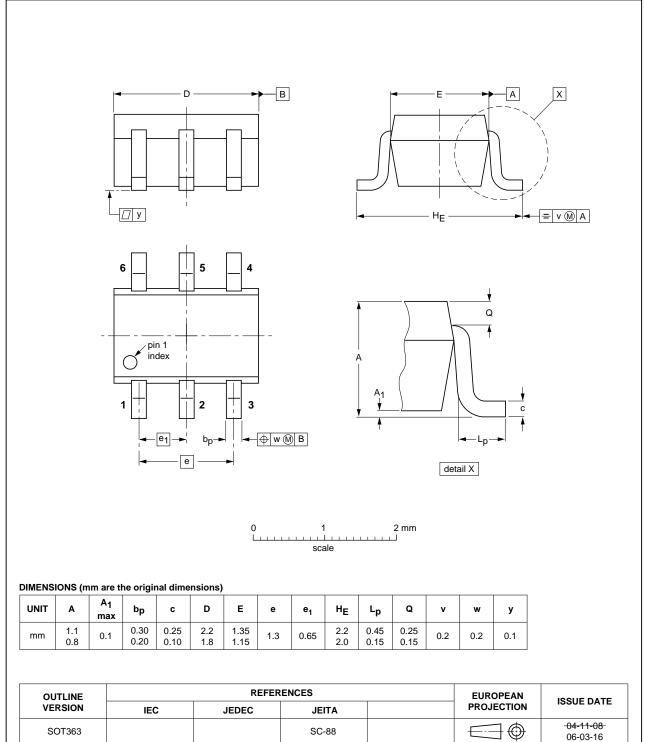


Fig 17. Package outline SOT363 (SC-88)

74LVC1G57-Q100

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Plastic surface-mounted package (TSOP6); 6 leads **SOT457** В = v M A 6 pin 1 index 3 ⊕ w M B detail X **DIMENSIONS** (mm are the original dimensions) UNIT Е Q ΗE Lp 0.40 1.1 0.1 0.26 3.1 1.7 3.0 0.6 0.33 0.95 0.2 0.2 0.1 mm 0.013 0.25 0.9 0.10 1.3 2.5 0.23 REFERENCES EUROPEAN PROJECTION OUTLINE ISSUE DATE VERSION IEC **JEDEC** JEITA -05-11-07

Fig 18. Package outline SOT457 (SC-74)

SC-74

06-03-16

SOT457

16. Abbreviations

Table 13. Abbreviations

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

17. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G57_Q100 v.1	20140415	Product data sheet	-	-

18. Legal information

18.1 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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions"
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74LVC1G57-Q100

74LVC1G57-Q100

Low-power configurable multiple function gate

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