74LVC1G32-Q100

Single 2-input OR gate Rev. 6 — 18 January 2022

Product data sheet

1. General description

The 74LVC1G32-Q100 is a single 2-input OR gate. 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. Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times. 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
- · CMOS low power dissipation
- I_{OFF} circuitry provides partial Power-down mode operation
- ±24 mA output drive (V_{CC} = 3.0 V)
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- 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)
- 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)
- Multiple package options

3. Ordering information

Table 1. Ordering information

Type number	Package							
Temperature range Name Description				Version				
74LVC1G32GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1				
74LVC1G32GV-Q100	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753				
74LVC1G32GM-Q100	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886				



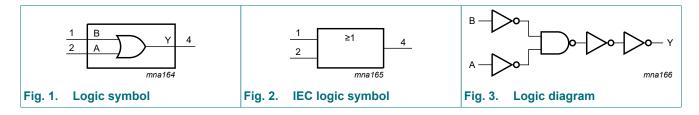
4. Marking

Table 2. Marking

Type number	Marking code [1]
74LVC1G32GW-Q100	VG
74LVC1G32GV-Q100	V32
74LVC1G32GM-Q100	VG

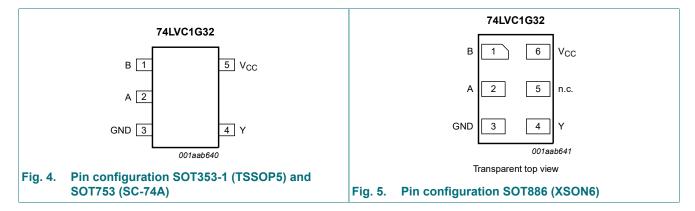
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description	
	TSSOP5 and SC-74A	XSON6	
В	1	1	data input
Α	2	2	data input
GND	3	3	ground (0 V)
Υ	4	4	data output
n.c.	-	5	not connected
V _{CC}	5	6	supply voltage

7. Functional description

Table 4. Function table

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

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

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	[1]	-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]	-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
P _{tot}	total power dissipation	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$ [2]	-	250	mW
T _{stg}	storage temperature		-65	+150	°C

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

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
VI	input voltage		0	-	5.5	V
Vo	output voltage	Active mode	0	-	V _{CC}	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 fall rate	V _{CC} = 1.65 V to 2.7 V	-	-	20	ns/V
		V _{CC} = 2.7 V to 5.5 V	-	-	10	ns/V

^[2] For SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C. For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C. For SOT886 (XSON6) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
V _{IH}	HIGH-level	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	0.65 × V _{CC}	-	V
	input voltage	V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}	-	-	0.7 × V _{CC}	-	V
V _{IL}		V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	-	0.35 × V _{CC}	V
	voltage	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	8.0	V
		V _{CC} = 4.5 V to 5.5 V	-	-	0.3 × V _{CC}	-	0.3 × V _{CC}	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL}						
	output voltage	I _O = -100 μA; V _{CC} = 1.65 V to 5.5 V	V _{CC} - 0.1	-	-	V _{CC} - 0.1	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	0.95	-	V
		$I_O = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.9	-	-	1.7	-	٧
		$I_O = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	1.9	-	V
		$I_O = -24$ mA; $V_{CC} = 3.0$ V	2.3	-	-	2.0	-	٧
	$I_O = -32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.8	-	-	3.4	-	V	
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V	-	-	0.10	-	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	-	0.70	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.30	-	0.45	V
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.40	-	0.60	٧
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.80	V
		$I_O = 32 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.55	-	0.80	V
I _I	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	±1	-	±1	μΑ
I _{OFF}	power-off leakage current	$V_{CC} = 0 \text{ V}; V_{I} \text{ or } V_{O} = 5.5 \text{ V}$	-	±0.1	±2	-	±2	μΑ
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	4	-	4	μΑ
ΔI _{CC}	additional supply current	per pin; V _{CC} = 2.3 V to 5.5 V; V _I = V _{CC} - 0.6 V; I _O = 0 A	-	5	500	-	500	μΑ
C _I	input capacitance	V_{CC} = 3.3 V; V_I = GND to V_{CC}	-	5	-	-	-	pF

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to	Unit	
			Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation delay	A, B to Y; see <u>Fig. 6</u> [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	3.1	8.0	1.0	10.5	ns
		V _{CC} = 2.3 V to 2.7 V	0.5	2.1	5.5	0.5	7.0	ns
		V _{CC} = 2.7 V	0.5	2.5	5.5	0.5	7.0	ns
		V _{CC} = 3.0 V to 3.6 V	0.5	2.1	4.5	0.5	6.0	ns
		V _{CC} = 4.5 V to 5.5 V	0.5	1.7	4.0	0.5	5.5	ns
C _{PD}	power dissipation capacitance	$V_1 = GND \text{ to } V_{CC}; V_{CC} = 3.3 \text{ V}$ [3]	-	16	-	-	-	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.
- 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).

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

V_{CC} = supply voltage in V;

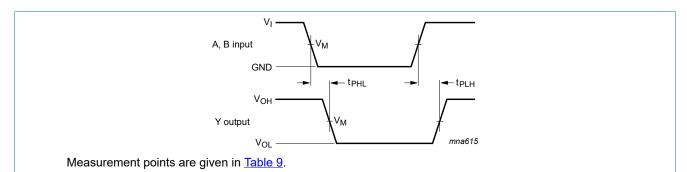
f_i = input frequency in MHz;

N = number of inputs switching;

C_L = output load capacitance in pF;

 f_o = output frequency in MHz.

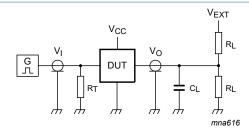
11.1. Waveforms and test circuit



V_{OL} and V_{OH} are typical output voltage levels that occur with the output load. The input A, B to output Y propagation delays Fig. 6.

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}



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. 7. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input	Input Load V _{EXT}		V _{EXT}	
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

12. Package outline

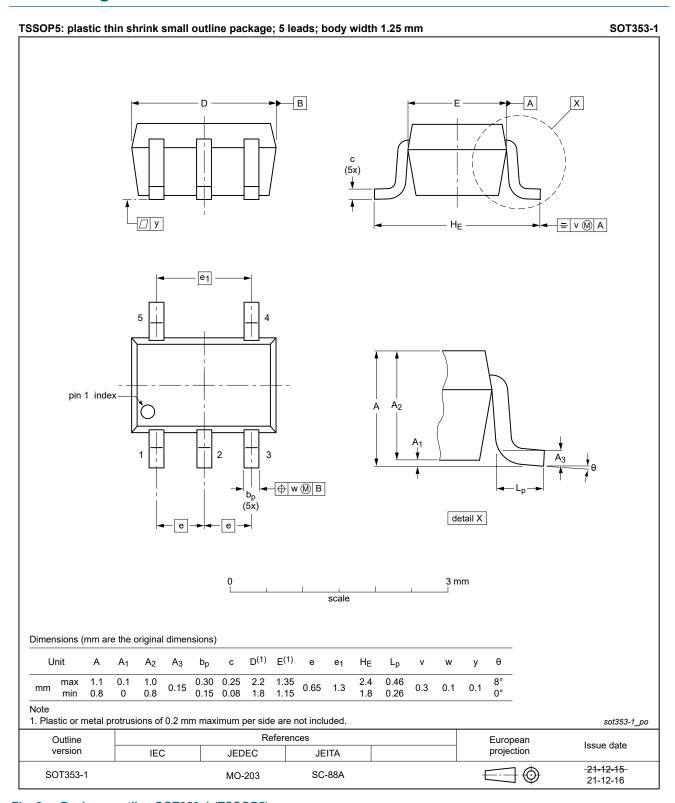


Fig. 8. Package outline SOT353-1 (TSSOP5)

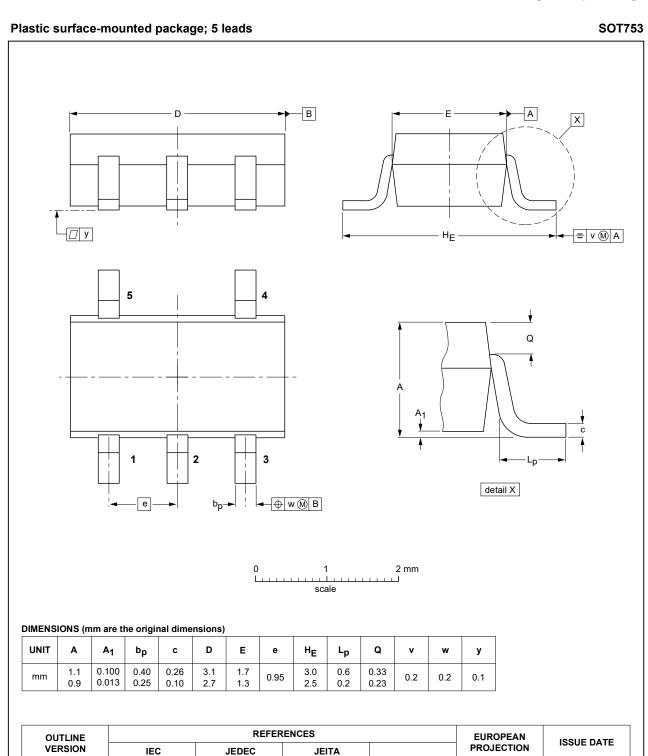


Fig. 9. Package outline SOT753 (SC-74A)

SOT753

SC-74A

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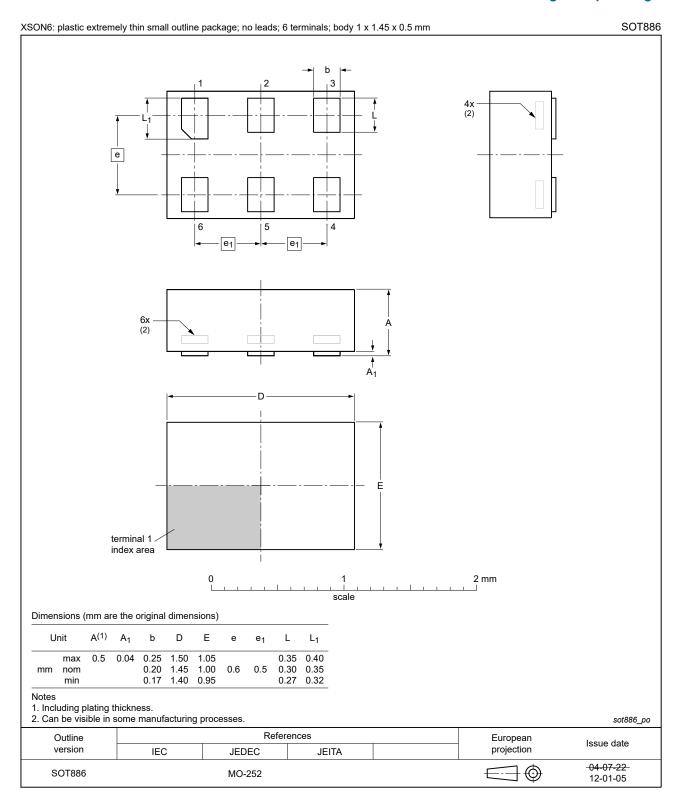


Fig. 10. Package outline SOT886 (XSON6)

13. Abbreviations

Table 11. Abbreviations

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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		

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74LVC1G32_Q100 v.6	20220118	Product data sheet	-	74LVC1G32_Q100 v.5	
Modifications:	• Fig. 8: Pack	age outline drawing SOT3	53-1 (TSSOP5) ha	as changed.	
74LVC1G32_Q100 v.5	20210518	Product data sheet	-	74LVC1G32_Q100 v.4	
Modifications:	 <u>Section 1</u> and <u>Section 2</u> updated. <u>Table 5</u>: Derating values for P_{tot} total power dissipation updated. 				
74LVC1G32_Q100 v.4	20190125	Product data sheet	-	74LVC1G32_Q100 v.3	
Modifications:	 Added type 	number 74LVC1G32GM-C	100 (SOT886)		
74LVC1G32_Q100 v.3	20180817	Product data sheet	-	74LVC1G32_Q100 v.2	
Modifications:	 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. 				
74LVC1G32_Q100 v.2	20161209	Product data sheet	-	74LVC1G32_Q100 v.1	
Modifications:	<u>Table 7</u> : The maximum limits for leakage current and supply current have changed.				
74LVC1G32_Q100 v.1	20120807	Product data sheet	-	-	

15. 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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Product data sheet

Contents

1. Gene	ral description	1
2. Featu	res and benefits	1
3. Order	ring information	1
4. Marki	ing	2
5. Funct	tional diagram	2
6. Pinnii	ng information	2
6.1. Pinr	ning	2
6.2. Pin	description	2
7. Funct	tional description	3
8. Limiti	ing values	3
9. Recor	mmended operating conditions	3
10. Stati	ic characteristics	4
11. Dyna	amic characteristics	5
11.1. Wa	eveforms and test circuit	5
12. Pack	kage outline	7
13. Abb	reviations1	0
14. Revi	ision history1	0
15. Lega	al information1	1
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