

74LVC1G97-Q100

Low-power configurable multiple function gate

Rev. 1 — 22 March 2019

Product data sheet

1. General description

The 74LVC1G97-Q100 is a configurable multiple function gate with Schmitt-trigger inputs. The device can be configured as any of the following logic functions MUX, AND, OR, NAND, NOR, inverter and buffer; using the 3-bit input. 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 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 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)
 - JESD8B/JESD36 (2.7 V to 3.6 V).
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- ESD protection:
 - MIL-STD-883, method 3015 exceeds 2000 V
 - HBM ANSI/ESDA/Jedec JS-001 exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V (C = 200 pf, R = 0 Ω)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V

3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74LVC1G97GW-Q100	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 2. Marking

Type number	Marking code [1]
74LVC1G97GW-Q100	YV

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

5. Functional diagram

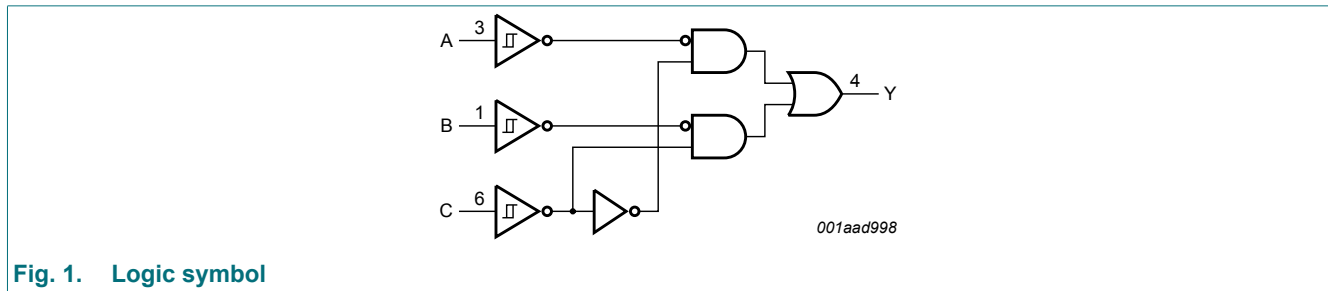


Fig. 1. Logic symbol

6. Pinning information

6.1. Pinning

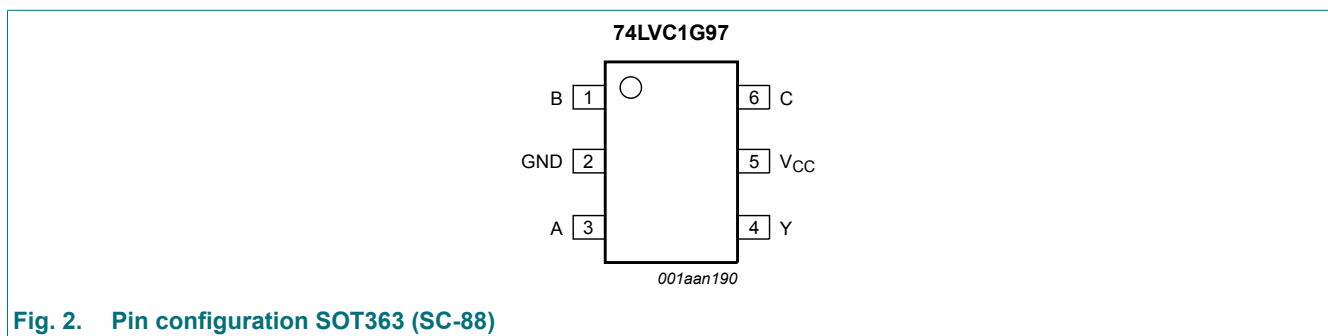


Fig. 2. Pin configuration SOT363 (SC-88)

6.2. Pin description

Table 3. Pin description

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

7. Functional description

Table 4. Function table

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

Input			Output
C	B	A	Y
L	L	L	L
L	L	H	L
L	H	L	H
L	H	H	H
H	L	L	L
H	L	H	H
H	H	L	L
H	H	H	H

7.1. Logic configurations

Table 5. Function selection table

Logic function	Figure
2-input MUX	see Fig. 3
2-input AND	see Fig. 4
2-input OR with one input inverted	see Fig. 5
2-input NAND with one input inverted	see Fig. 5
2-input AND with one input inverted	see Fig. 6
2-input NOR with one input inverted	see Fig. 6
2-input OR	see Fig. 7
Inverter	see Fig. 8
Buffer	see Fig. 9

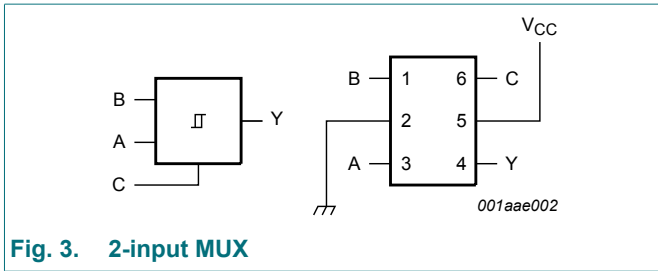


Fig. 3. 2-input MUX

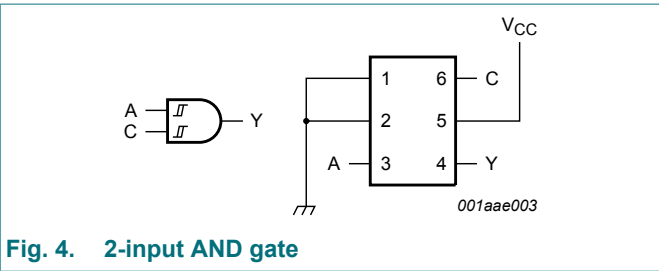


Fig. 4. 2-input AND gate

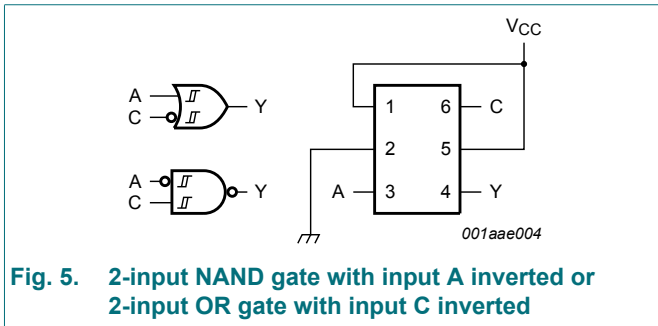


Fig. 5. 2-input NAND gate with input A inverted or 2-input OR gate with input C inverted

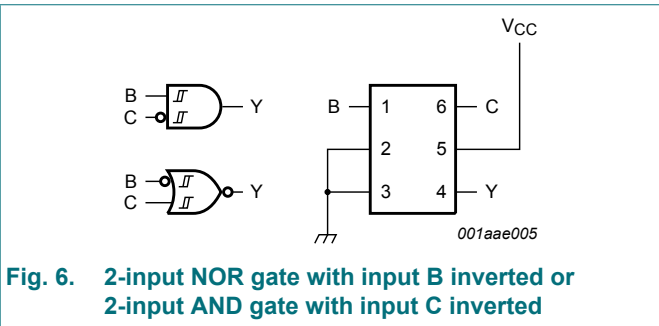


Fig. 6. 2-input NOR gate with input B inverted or 2-input AND gate with input C inverted

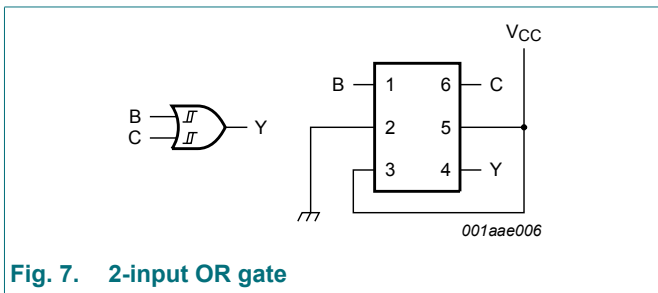


Fig. 7. 2-input OR gate

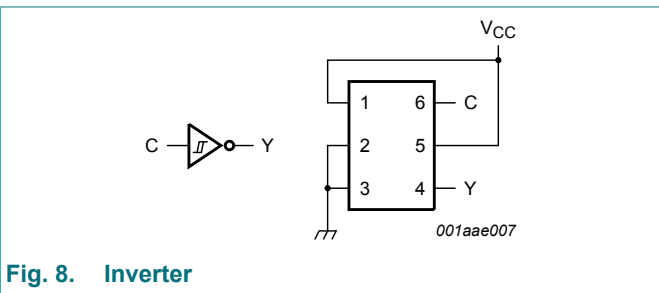


Fig. 8. Inverter

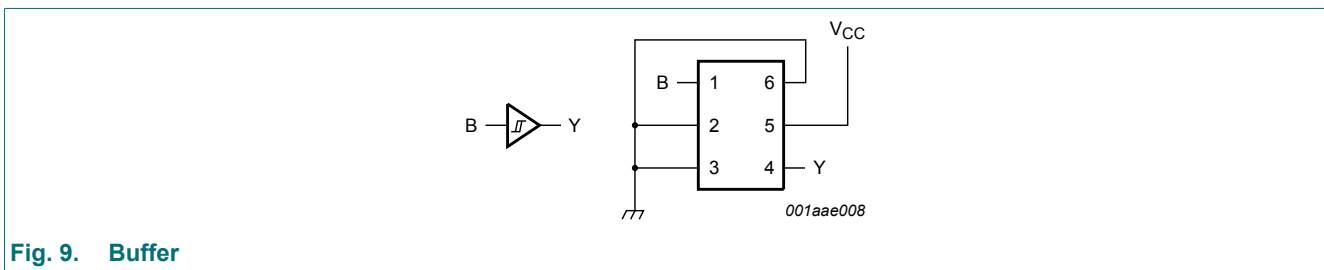


Fig. 9. Buffer

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
V_I	input voltage		[1] -0.5	+6.5	V
I_{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	±50	mA
V_O	output voltage	Active mode	[1] -0.5	+6.5	V
		$V_{CC} = 0$ V; Power-down mode	[1] -0.5	+6.5	V
I_O	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.

[2] For SC-88 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.

9. Recommended operating conditions

Table 7. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		1.65	-	5.5	V
V_I	input voltage		0	-	5.5	V
V_O	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

10. Static characteristics

Table 8. 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 _{OL}	LOW-level output voltage	V _I = V _{CC} or GND						
		I _O = 100 µA; V _{CC} = 1.65 V to 5.5 V	-	-	0.1	-	0.1	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	-	0.7	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.3	-	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	-	0.6	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.8	V
		I _O = 32 mA; V _{CC} = 4.5 V	-	-	0.55	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{CC} or GND						
		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 mA; V _{CC} = 2.3 V	1.9	-	-	1.7	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	1.9	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.3	-	-	2.0	-	V
		I _O = -32 mA; V _{CC} = 4.5 V	3.8	-	-	3.4	-	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	µA
I _{OFF}	power-off leakage current	V _I or V _O = 5.5 V; V _{CC} = 0 V	-	±0.1	±2	-	±2	µA
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	µA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V	-	5	500	-	500	µA
C _I	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 Fig. 11.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation delay	A, B, C to Y; see Fig. 10 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	6.0	14.4	1.0	18.0	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 V; V _I = 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).

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

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;

∑(C_L × V_{CC}² × f_o) = sum of outputs.

11.1. Waveforms and test circuit

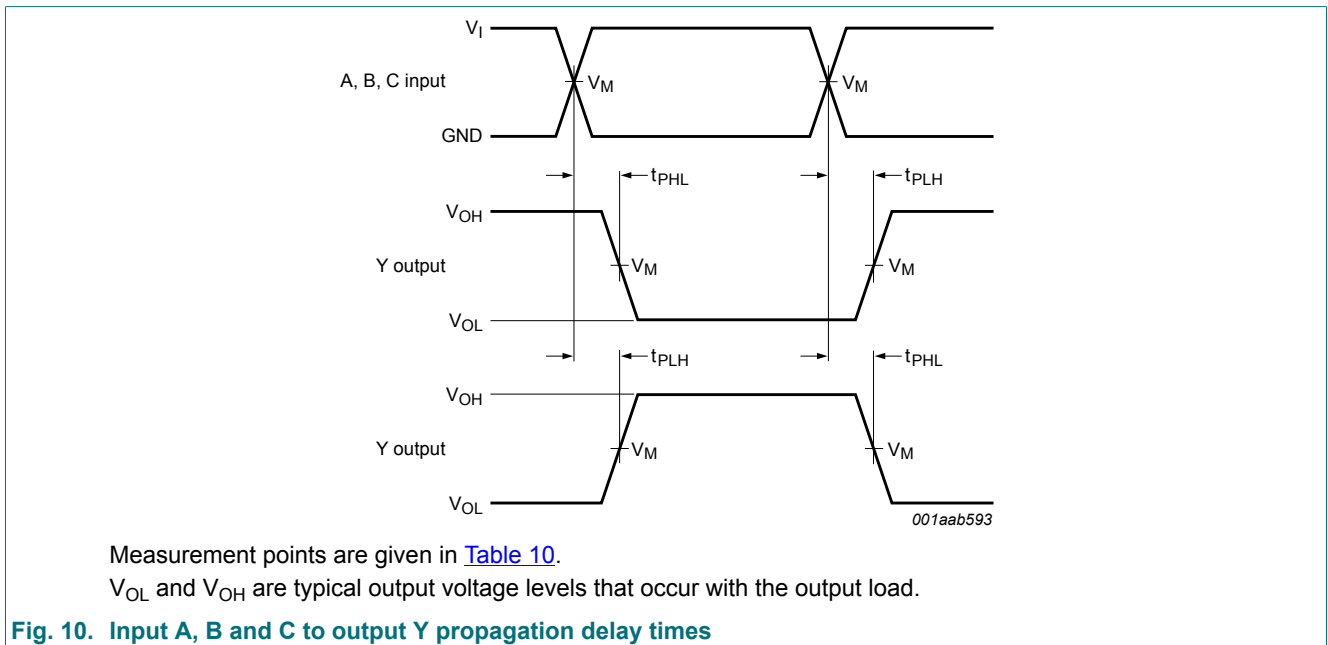
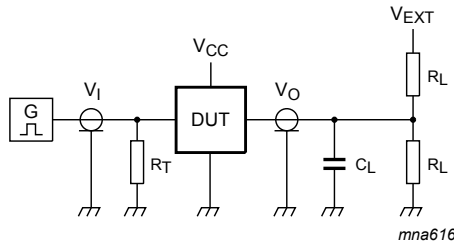


Table 10. Measurement points

Supply voltage	Input		Output
V_{CC}	V_M	V_I	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_o 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		V_{EXT}
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 k Ω	open
2.3 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. Transfer characteristics

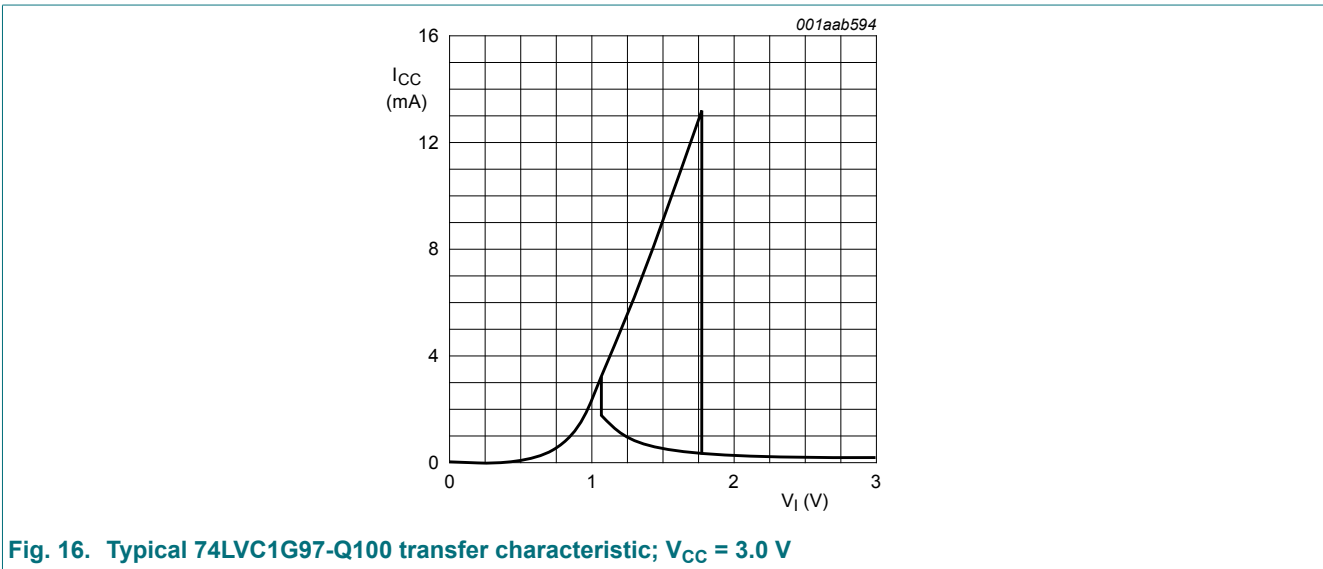
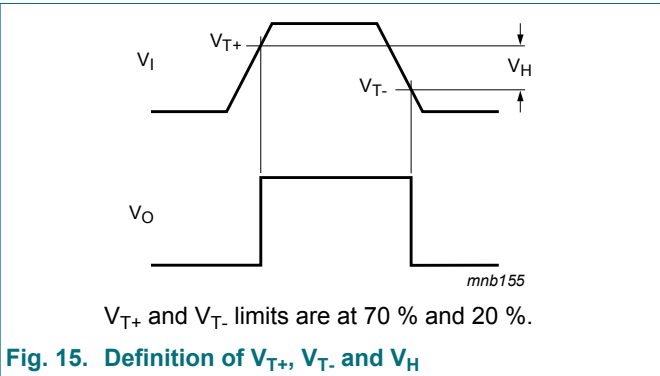
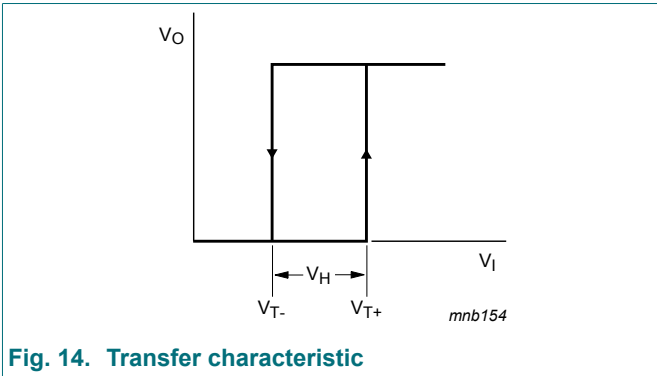
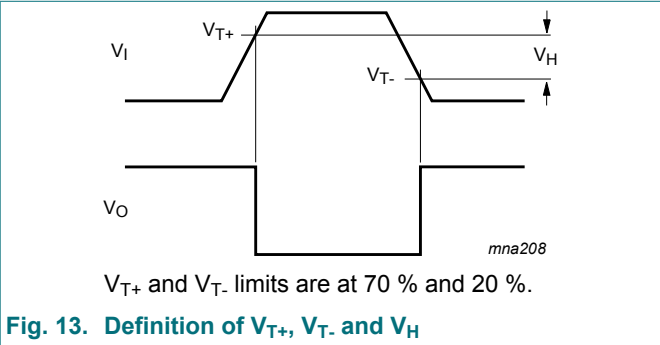
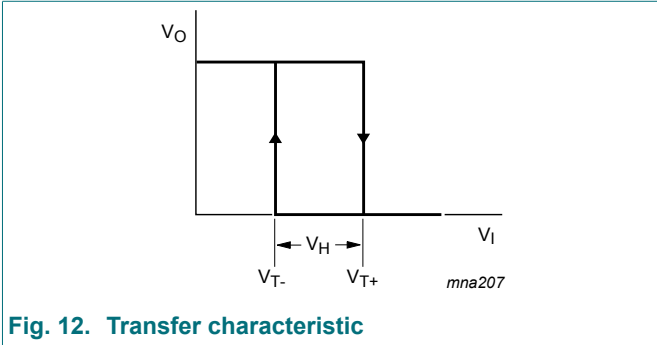
Table 12. Transfer characteristics

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 _{T+}	positive-going threshold voltage	See Fig. 12 , Fig. 13 , Fig. 14 and Fig. 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, see Fig. 16	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 Fig. 12 , Fig. 13 , Fig. 14 and Fig. 15						
		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, see Fig. 16	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 Fig. 12 , Fig. 13 , Fig. 14 and Fig. 15						
		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, see Fig. 16	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.

12.1. Waveforms transfer characteristics



13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

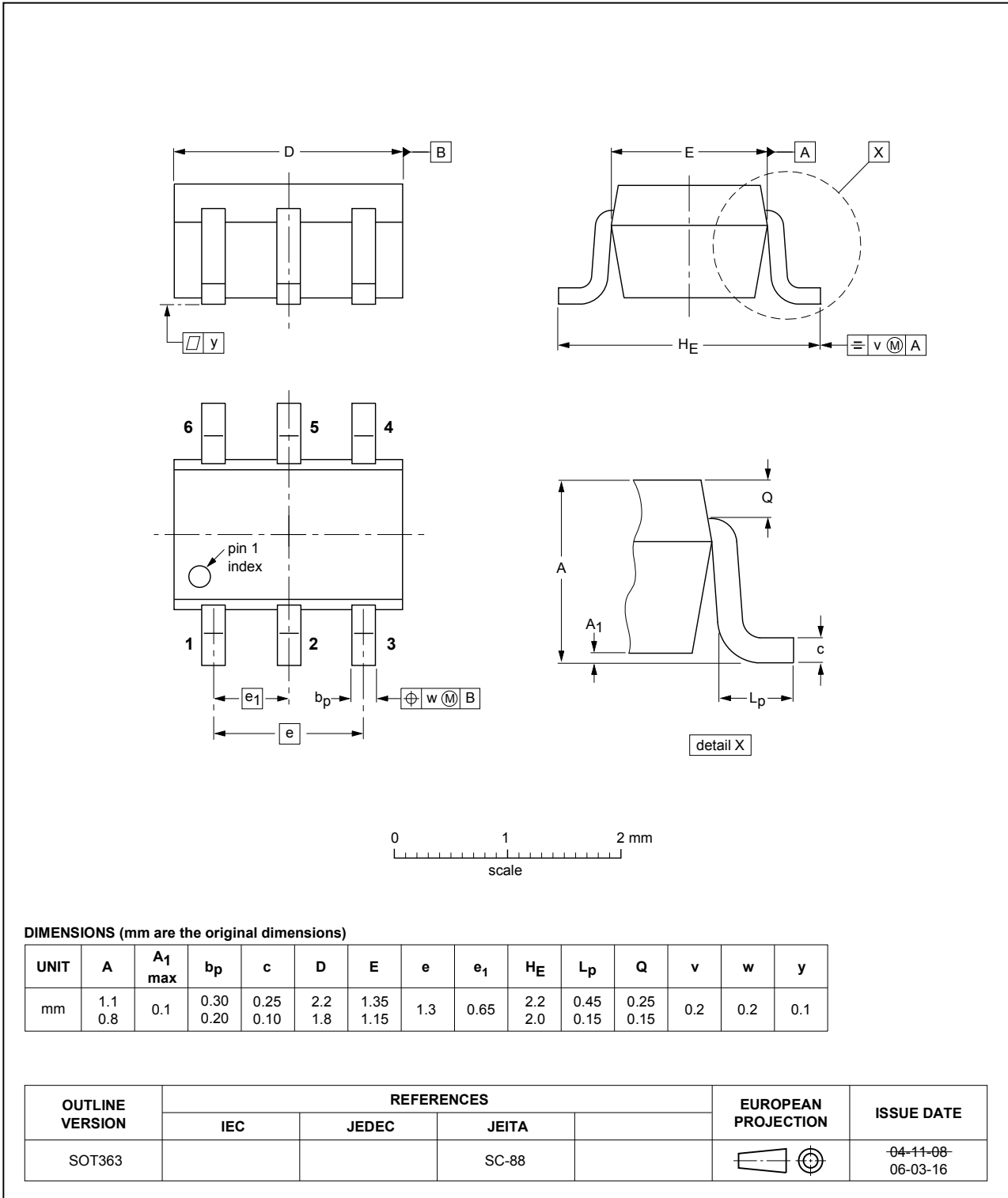


Fig. 17. Package outline SOT363 (SC-88)

14. Abbreviations

Table 13. Abbreviations

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

15. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC1G97_Q100 v.1	20190322	Product data sheet	-	-

16. 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.

- [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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia.

Right to make changes — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use in automotive applications — This Nexperia product has been qualified for use in automotive applications. Unless otherwise agreed in writing, the product is not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or

equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Contents

1. General description	1
2. Features and benefits	1
3. Ordering information	2
4. Marking	2
5. Functional diagram	2
6. Pinning information	2
6.1. Pinning.....	2
6.2. Pin description.....	3
7. Functional description	3
7.1. Logic configurations.....	3
8. Limiting values	5
9. Recommended operating conditions	5
10. Static characteristics	6
11. Dynamic characteristics	7
11.1. Waveforms and test circuit.....	7
12. Transfer characteristics	9
12.1. Waveforms transfer characteristics.....	10
13. Package outline	11
14. Abbreviations	12
15. Revision history	12
16. Legal information	13

© Nexperia B.V. 2019. All rights reserved

For more information, please visit: <http://www.nexperia.com>
For sales office addresses, please send an email to: salesaddresses@nexperia.com
Date of release: 22 March 2019

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Nexperia:](#)

[74LVC1G97GW-Q100H](#)