74LV1T34-Q100

Single supply translating buffer

Rev. 4 — 6 December 2023

Product data sheet

1. General description

The 74LV1T34-Q100 is a single, level translating buffer. The low threshold inputs support 1.8 V input logic at V_{CC} = 3.3 V and can be used in 1.8 V to 3.3 V level up translation. In addition, the 5 V tolerant input pins enable level down translation (3.3 V to 2.5 V output at V_{CC} = 2.5 V). The output level is referenced to the supply voltage and supports 1.8 V, 2.5 V, 3.3 V and 5.0 V CMOS levels. The wide V_{CC} range permits the generation of output levels to connect to controllers or processors.

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
- Single supply voltage translator at 1.8 V, 2.5 V, 3.3 V and 5.0 V
- Up translation
 - 1.2 V to 1.8 V at V_{CC} = 1.8 V
 - 1.5 V to 2.5 V at V_{CC} = 2.5 V
 - 1.8 V to 3.3 V at V_{CC} = 3.3 V
 - 3.3 V to 5.0 V at V_{CC} = 5.0 V
- Down translation
 - 3.3 V to 1.8 V at V_{CC} = 1.8 V
 - 3.3 V to 2.5 V at V_{CC} = 2.5 V
 - 5.0 V to 3.3 V at V_{CC} = 3.3 V
- 5 V tolerant inputs
- Latch-up performance exceeds 250 mA per JESD 78 Class II
- 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

- Portable applications
- PC and notebooks
- · Industrial controller
- Telecom

4. Ordering information

Table 1. Ordering information

Type number	Package	ackage						
	Temperature range	Name	Description	Version				
74LV1T34GW-Q100	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1				
74LV1T34GV-Q100	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	<u>SOT753</u>				



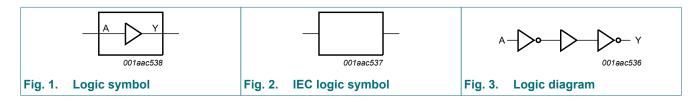
5. Marking

Table 2. Marking

Type number	Marking code[1]
74LV1T34GW-Q100	SQ
74LV1T34GV-Q100	SQ

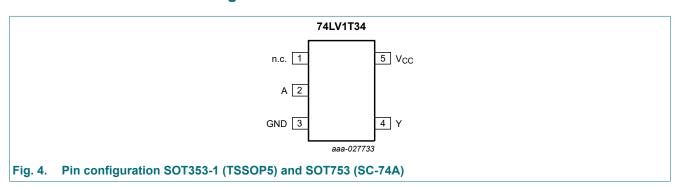
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



7. Pinning information

7.1. Pinning



7.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
n.c.	1	not connected
A	2	data input
GND	3	ground (0 V)
Υ	4	data output
V _{CC}	5	supply voltage

8. Functional description

Table 4. Function table

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

Input	Output
A	Υ
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	+7.0	V
VI	input voltage		[1]	-0.5	+7.0	V
Vo	output voltage	output HIGH or LOW state	[2] [3]	-0.5	V _{CC} + 0.5	V
		output in power-off state	[2]	-0.5	4.6	V
I _{IK}	input clamping current	V _I < 0 V		-20	-	mA
I _{OK}	output clamping current	$V_O < 0 \text{ V or } V_O > V_{CC}$		-	±20	mA
Io	output current	$V_O = 0 V \text{ to } V_{CC}$		-	±25	mA
I _{CC}	supply current			-	50	mA
I _{GND}	ground current			-50	-	mA
T _{stg}	storage temperature			-65	+150	°C
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C	[4]	-	250	mW

^[1] If the input current ratings are observed, the minimum input voltage ratings may be exceeded.

10. Recommended operating conditions

Table 6. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		1.6	5.0	5.5	V
VI	input voltage		0	-	5.5	V
Vo	output voltage	output HIGH or LOW state	0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 1.8 V to 5.0 V	-	-	20	ns/V

^[2] If the output current ratings are observed, the output voltage ratings may be exceeded.

^[3] This value is limited to 7 V maximum.

^[4] 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.

11. Static characteristics

Table 7. Static characteristics

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25	25 °C		+85 °C	-40 °C to +125 °C		Unit	
			Min	Max	Min	Max	Min	Max		
V _{IH}	HIGH-level	V _{CC} = 1.65 V to 1.8 V	0.94	-	1.0	-	1.0	-	٧	
	input voltage	V _{CC} = 2.0 V	0.99	-	1.03	-	1.03	-	V	
		V _{CC} = 2.25 V to 2.5 V	1.135	-	1.18	-	1.18	-	V	
		V _{CC} = 2.75 V	1.21	-	1.23	-	1.23	-	V	
		V _{CC} = 3.0 V to 3.3 V	1.35	-	1.37	-	1.37	-	V	
		V _{CC} = 3.6 V	1.47	-	1.48	-	1.48	-	V	
		V _{CC} = 4.5 V to 5.0 V	2.02	-	2.03	-	2.03	-	V	
		V _{CC} = 5.5 V	2.10	-	2.11	-	2.11	-	V	
V _{IL}	LOW-level	V _{CC} = 1.65 V to 2.0 V	-	0.58	-	0.55	-	0.55	V	
	input voltage	V _{CC} = 2.25 V to 2.75 V	-	0.75	-	0.71	-	0.71	V	
		V _{CC} = 3.0 V to 3.6 V	-	0.80	-	0.65	-	0.65	V	
		V _{CC} = 4.5 V to 5.5 V	-	0.80	-	0.80	-	0.80	V	
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ;								
	output voltage	V _{CC} = 1.65 V to 5.5 V; I _O = -20 μA	V _{CC} - 0.1	-	V _{CC} - 0.1	-	V _{CC} - 0.1	-	V	
		V _{CC} = 1.65 V; I _O = -2 mA	1.28	-	1.21	-	1.21	_	V	
		V _{CC} = 1.8 V; I _O = -2 mA	1.5	-	1.45	-	1.45	-	V	
		V _{CC} = 2.3 V; I _O = -2.3 mA	2.0	-	2.0	-	2.0	-	V	
		$V_{CC} = 2.3 \text{ V}; I_{O} = -3 \text{ mA}$	2.0	-	1.93	-	1.93	_	V	
		$V_{CC} = 2.5 \text{ V}; I_{O} = -3 \text{ mA}$	2.25	-	2.15	-	2.15	-	V	
		$V_{CC} = 3.0 \text{ V}; I_{O} = -3 \text{ mA}$	2.78	-	2.7	-	2.7	-	V	
		V _{CC} = 3.0 V; I _O = -5.5 mA	2.6	-	2.49	-	2.49	-	V	
		$V_{CC} = 3.3 \text{ V}; I_{O} = -5.5 \text{ mA}$	2.9	-	2.8	-	2.8	-	V	
		V _{CC} = 4.5 V; I _O = -4 mA	4.2	-	4.1	-	4.1	-	V	
		V _{CC} = 4.5 V; I _O = -8 mA	4.1	-	3.95	-	3.95	-	V	
		$V_{CC} = 5.0 \text{ V}; I_{O} = -8 \text{ mA}$	4.6	-	4.5	-	4.5	-	V	
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	V _{CC} = 1.65 V to 5.5 V; I _O = 20 μA	-	0.1	-	0.1	-	0.1	V	
		V _{CC} = 1.65 V; I _O = 2 mA	-	0.2	-	0.25	-	0.25	V	
		V _{CC} = 2.3 V; I _O = 2.3 mA	-	0.1	-	0.15	-	0.15	V	
		V _{CC} = 2.3 V; I _O = 3 mA	-	0.15	-	0.2	-	0.2	V	
		V _{CC} = 3.0 V; I _O = 3 mA	-	0.1	-	0.15	-	0.15	V	
		$V_{CC} = 3.0 \text{ V}; I_{O} = 5.5 \text{ mA}$	-	0.2	-	0.252	-	0.252	٧	
		V _{CC} = 4.5 V; I _O = 4 mA	-	0.15	-	0.2	-	0.2	٧	
		V _{CC} = 4.5 V; I _O = 8 mA	-	0.3	-	0.35	-	0.35	٧	
I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 0 V to 5.5 V	-	±0.1	-	±1	-	±1	μΑ	
СС	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 1.8 V, 2.5 V, 3.3 V, 5.0 V	-	1	-	10	-	10	μA	

Symbol	Parameter	Conditions	25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	Min	Max	
ΔI _{CC}	additional supply current	per input pin; V_{CC} = 1.8 V; V_I = 0.3 V or 1.1 V; I_O = 0 A; other pins at V_{CC} or GND	-	10	-	10	-	10	μΑ
		per input pin; V_{CC} = 5.5 V; V_I = 0.3 V or 3.4 V; I_O = 0 A; other pins at V_{CC} or GND	-	1.35	-	1.5	-	1.5	mA

12. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V. For test circuit, see Fig. 6.

Symbol	Parameter	Conditions	25 °C		-40 °C to	+85 °C	-40 °C to +125 °C		Unit	
			Min	Тур	Max	Min	Max	Min	Max	
t _{pd}	propagation	A, B to Y; see <u>Fig. 5</u> [1]								
	delay	$V_{CC} = 1.8 \text{ V}; C_L = 15 \text{ pF}$	-	6.3	9.4	-	10.6	-	11.4	ns
		$V_{CC} = 1.8 \text{ V}; C_L = 30 \text{ pF}$	-	7.4	10.5	-	12.0	-	12.8	ns
		V _{CC} = 2.5 V; C _L = 15 pF	-	4.5	6.4	-	7.2	-	7.8	ns
		V _{CC} = 2.5 V; C _L = 30 pF	-	5.3	7.2	-	8.2	-	8.9	ns
		V _{CC} = 3.3 V; C _L = 15 pF	-	3.7	5.2	-	5.9	-	6.3	ns
		$V_{CC} = 3.3 \text{ V}; C_L = 30 \text{ pF}$	-	4.3	5.9	-	6.8	-	7.1	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	3.1	3.9	-	4.3	-	4.5	ns
		V _{CC} = 5.0 V; C _L = 30 pF	-	3.6	4.5	-	4.9	-	5.2	ns
Cı	input capacitance	$V_I = V_{CC}$ or GND; $V_{CC} = 3.3 \text{ V}$	-	1.5	10	-	10	-	10	pF
Co	output capacitance	$V_O = V_{CC}$ or GND; $V_{CC} = 3.3 \text{ V}$	-	2.5	-	-	-	-	-	pF
C _{PD}	power dissipation	per buffer; V_I = GND to V_{CC} ; [2] C_L = 30 pF; f = 10 MHz								
	capacitance	V _{CC} = 1.8 V	-	4.2	-	-	-	-	-	pF
		V _{CC} = 2.5 V	-	5.5	-	-	-	-	-	pF
		V _{CC} = 3.3 V	-	7.4	-	-	-	-	-	pF
		V _{CC} = 5.0 V	-	11.5	-	-	-	-	-	pF

 f_i = input frequency in MHz;

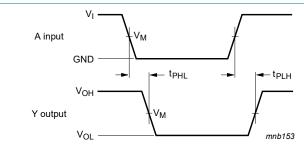
f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

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

12.1. Waveforms and test circuit



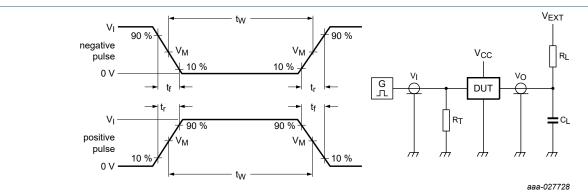
Measurement points are given in Table 9.

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

Fig. 5. The input A to output Y propagation delays

Table 9. Measurement points

Input	Output
V_{M}	V _M
0.5 × V _I	0.5 × V _{CC}



Test data is given in Table 10.

Definitions test circuit:

 R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator;

C_L = Load capacitance including jig and probe capacitance;

R_L = Load resistance;

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	Δt/ΔV [1]	f _{max}	CL	R _L	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
1.8 V	V _{CC}	≤ 1.0 ns/V	15 MHz	15 pF, 30 pF	1ΜΩ	GND	GND	V _{CC}
2.5 V	V _{CC}	≤ 1.0 ns/V	25 MHz	15 pF, 30 pF	1ΜΩ	GND	GND	V _{CC}
3.3 V	3 V	≤ 1.0 ns/V	50 MHz	15 pF, 30 pF	1ΜΩ	GND	GND	V _{CC}
5.0 V	3 V	≤ 1.0 ns/V	50 MHz	15 pF, 30 pF	1ΜΩ	GND	GND	V _{CC}

[1] $dV/dt \ge 1.0 V/ns$

13. Package outline

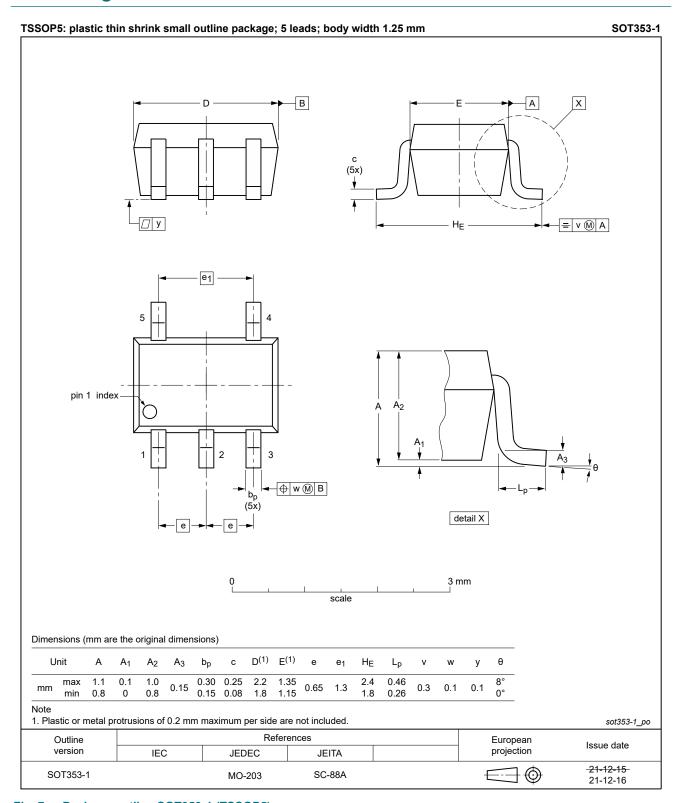


Fig. 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads **SOT753** Α = v M A H_{E} 5 Q 2 3 detail X —<u></u> w M B 2 mm scale **DIMENSIONS** (mm are the original dimensions) $^{\rm H_{\rm E}}$ UNIT Q Α1 bp С Ε е L_{p} w У 1.1 0.100 0.40 0.26 3.1 1.7 3.0 0.6 0.33 mm 0.95 0.2 0.2 0.1 0.9 0.013 0.10 2.7 1.3 2.5 0.23 0.2 REFERENCES OUTLINE VERSION **EUROPEAN ISSUE DATE** PROJECTION

Package outline SOT753 (SC-74A)

SOT753

IEC

JEDEC

JEITA

SC-74A

02-04-16

06-03-16

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14. Abbreviations

Table 11. Abbreviations

Acronym	Description				
CDM	Charge Device Model				
CMOS	omplementary Metal Oxide Semiconductor				
DUT	Device Under Test				
ESD	ElectroStatic Discharge				
НВМ	Human Body Model				

15. Revision history

Table 12. Revision history

iable 12. Revision history						
Document ID	Release date	Data sheet status	Change notice	Supersedes		
74LV1T34_Q100 v.4	20231206	Product data sheet	-	74LV1T34_Q100 v.3		
Modifications:	Section 2:	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74LV1T34_Q100 v.3	20220210	Product data sheet	-	74LV1T34_Q100 v.2		
Modifications:	• <u>Fig. 7</u> : Pad	Fig. 7: Package outline drawing for SOT353-1 (TSSOP5) has changed.				
74LV1T34_Q100 v.2	20220105	Product data sheet	-	74LV1T34_Q100 v.1		
Modifications:	Type numl	Type number 74LV1T34GW-Q100 (SOT353-1/TSSOP5) added.				
74LV1T34_Q100 v.1	20200504	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.

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74LV1T34_Q100

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