HD74LV1GT125A

Bus Buffer Gate with 3–state Output /
CMOS Logic Level Shifter

Description

The HD74LV1GT125A has a bus buffer gate with 3–state output in a 5 pin package. Output is disabled when the associated output enable ($\overline{OE}$) input is high. To ensure the high impedance state during power up or power down, $\overline{OE}$ should be connected to V_{CC} through a pull-down resistor; the minimum value of the resistor is determined by the current sourcing capability of the driver. The input protection circuitry on this device allows over voltage tolerance on the input, allowing the device to be used as a logic–level translator from 3.0 V CMOS Logic to 5.0 V CMOS Logic or from 1.8 V CMOS logic to 3.0 V CMOS Logic while operating at the high-voltage power supply. Low voltage and high-speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

Features

- The basic gate function is lined up as Renesas uni logic series.
- Supplied on emboss taping for high-speed automatic mounting.
- TTL compatible input level.
  Supply voltage range : 3.0 to 5.5 V
  Operating temperature range : –40 to +85°C
- Logic-level translate function
  3.0 V CMOS logic $\rightarrow$ 5.0 V CMOS logic (@V_{CC} = 5.0 V)
  1.8 V or 2.5 V CMOS logic $\rightarrow$ 3.3 V CMOS logic (@V_{CC} = 3.3 V)
- All inputs V_{IH} (Max.) = 5.5 V (@V_{CC} = 0 V to 5.5 V)
  All outputs V_O (Max.) = 5.5 V (@V_{CC} = 0 V, Output : Z)
- Output current ±6 mA (@V_{CC} = 3.0 V to 3.6 V), ±12 mA (@V_{CC} = 4.5 V to 5.5 V)
- All the logical input has hysteresis voltage for the slow transition.
- Ordering Information

| Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LV1GT125ACME	CMPAK–5 pin	PTSP0005ZC-A (CMPAK-5V)	CM	E (3000 pcs/reel)
HD74LV1GT125AVSE	VSON–5 pin	PUSN0005KA-A (TNP-5DV)	VS	E (3000 pcs/reel)

Note: Please consult the sales office for the above package availability.
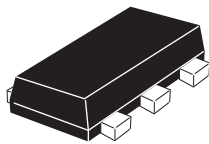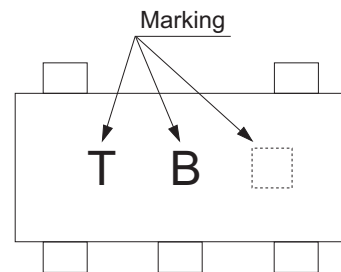
Outline and Article Indication

• HD74LV1GT125A

Index band   Marking

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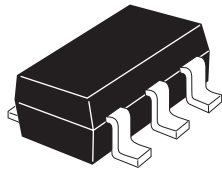
CMPAK–5
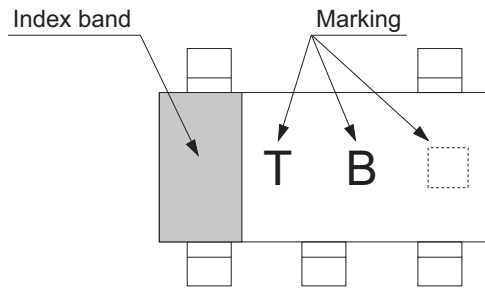
☐ = Control code

• HD74LV1GT125A

Marking

T   B

VSON–5

☐ = Control code

Function Table

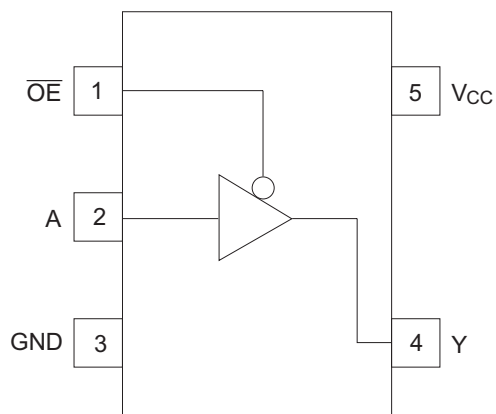| Inputs		Output Y
$\overline{\text{OE}}$	A	
L	H	H
L	L	L
H	X	Z

H : High level

L : Low level

X : Immaterial

Z : High impedance

Pin Arrangement

(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	V_{CC}	−0.5 to 7.0	V	
Input voltage range [*1]	V_I	−0.5 to 7.0	V	
Output voltage range [*1, 2]	V_O	−0.5 to V_{CC} + 0.5	V	Output : H or L
		−0.5 to 7.0		V_{CC} : OFF or Output : Z
Input clamp current	I_{IK}	−20	mA	$V_I < 0$
Output clamp current	I_{OK}	±50	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	I_O	±25	mA	V_O = 0 to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	±50	mA	
Maximum power dissipation at Ta = 25°C (in still air) [*3]	P_T	200	mW	
Storage temperature	Tstg	−65 to 150	°C	

Notes: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore no two of which may be realized at the same time.

1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V_{CC}	3.0	5.5	V	
Input voltage range	V_I	0	5.5	V	
Output voltage range	V_O	0	V_{CC}	V	
		0	5.5		Output : Z
Output current	I_{OH}	—	6	mA	V_{CC} = 3.0 to 3.6 V
		—	12		V_{CC} = 4.5 to 5.5 V
	I_{OL}	—	−6	mA	V_{CC} = 3.0 to 3.6 V
		—	−12		V_{CC} = 4.5 to 5.5 V
Input transition rise or fall rate	Δt / Δv	0	100	ns / V	V_{CC} = 3.0 to 3.6 V
		0	20		V_{CC} = 4.5 to 5.5 V
Operating free-air temperature	T_a	−40	85	°C	

Note: Unused or floating inputs must be held high or low.

Electrical Characteristic

- Ta = –40 to 85°C

Item	Symbol	V$_{CC}$ (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	V$_{IH}$	3.0 to 3.6	1.5	—	—	V	
		4.5 to 5.5	2.0	—	—		
	V$_{IL}$	3.0 to 3.6	—	—	0.6		
		4.5 to 5.5	—	—	0.8		
Hysteresis voltage	V$_H$	3.3	—	0.10	—	V	V$_T^+$ – V$_T^-$
		5.0	—	0.15	—		
Output voltage	V$_{OH}$	Min to Max	V$_{CC}$–0.1	—	—	V	I$_{OH}$ = –50 μA
		3.0	2.48	—	—		I$_{OH}$ = –6 mA
		4.5	3.8	—	—		I$_{OH}$ = –12 mA
	V$_{OL}$	Min to Max	—	—	0.1		I$_{OL}$ = 50 μA
		3.0	—	—	0.44		I$_{OL}$ = 6 mA
		4.5	—	—	0.55		I$_{OL}$ = 12 mA
Input current	I$_{IN}$	0 to 5.5	—	—	±1	μA	V$_{IN}$ = 5.5 V or GND
Off state output current	I$_{OZ}$	Min to Max	—	—	±5	μA	V$_O$ = 5.5 V or GND
Quiescent supply current	I$_{CC}$	5.5	—	—	10	μA	V$_{IN}$ = V$_{CC}$ or GND, I$_O$ = 0
	ΔI$_{CC}$	5.5	—	—	1.5	mA	One input V$_{IN}$ = 3.4 V, other input V$_{CC}$ or GND
Output leakage current	I$_{OFF}$	0	—	—	5	μA	V$_{IN}$ or V$_O$ = 0 to 5.5 V
Input capacitance	C$_{IN}$	5.0	—	3.0	—	pF	V$_{IN}$ = V$_{CC}$ or GND

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

Switching Characteristics

- V$_{CC}$ = 3.3 ± 0.3 V

Item	Symbol	Ta = 25°C			Ta = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t$_{PLH}$	—	4.5	9.0	1.0	10.5	ns	C$_L$ = 15 pF	A	Y
	t$_{PHL}$	—	6.0	11.5	1.0	13.0		C$_L$ = 50 pF		
Enable time	t$_{ZH}$	—	4.5	9.0	1.0	10.5	ns	C$_L$ = 15 pF	$\overline{OE}$	Y
	t$_{ZL}$	—	6.0	11.5	1.0	13.0		C$_L$ = 50 pF		
Disable time	t$_{HZ}$	—	4.0	10.0	1.0	11.5	ns	C$_L$ = 15 pF	$\overline{OE}$	Y
	t$_{LZ}$	—	5.5	13.5	1.0	15.0		C$_L$ = 50 pF		

- V$_{CC}$ = 5.0 ± 0.5 V

Item	Symbol	Ta = 25°C			Ta = –40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t$_{PLH}$	—	3.4	5.5	1.0	6.5	ns	C$_L$ = 15 pF	A	Y
	t$_{PHL}$	—	4.3	7.5	1.0	8.5		C$_L$ = 50 pF		
Enable time	t$_{ZH}$	—	3.4	5.1	1.0	6.0	ns	C$_L$ = 15 pF	$\overline{OE}$	Y
	t$_{ZL}$	—	4.4	7.1	1.0	8.0		C$_L$ = 50 pF		
Disable time	t$_{HZ}$	—	3.2	6.8	1.0	8.0	ns	C$_L$ = 15 pF	$\overline{OE}$	Y
	t$_{LZ}$	—	4.0	8.8	1.0	10.0		C$_L$ = 50 pF		

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Operating Characteristics

- $C_L = 50$ pF

Item	Symbol	V_{CC} (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C_{PD}	5.0	—	11.5	—	pF	f = 10 MHz

Test Circuit

TEST	S1
t_{PLH}/ t_{PHL}	OPEN
t_{ZH}/ t_{HZ}	GND
t_{ZL} / t_{LZ}	V_{CC}

Note: 1. C_L includes probe and jig capacitance.
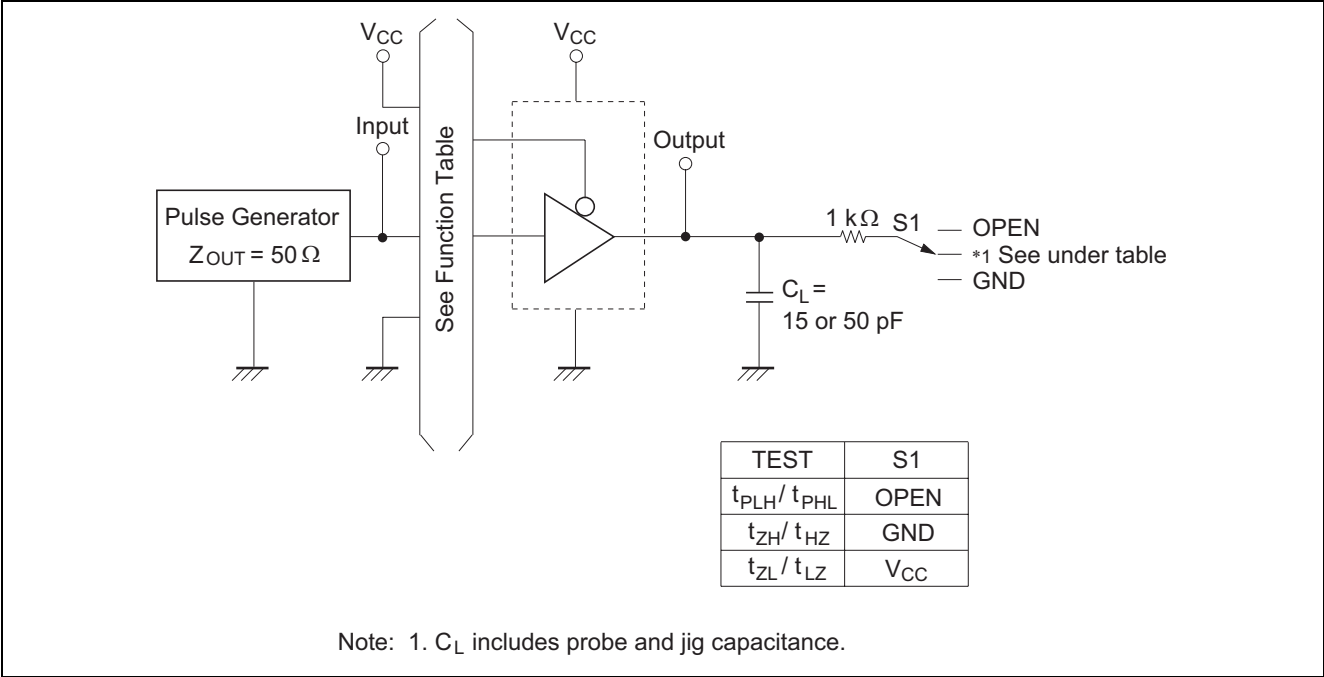
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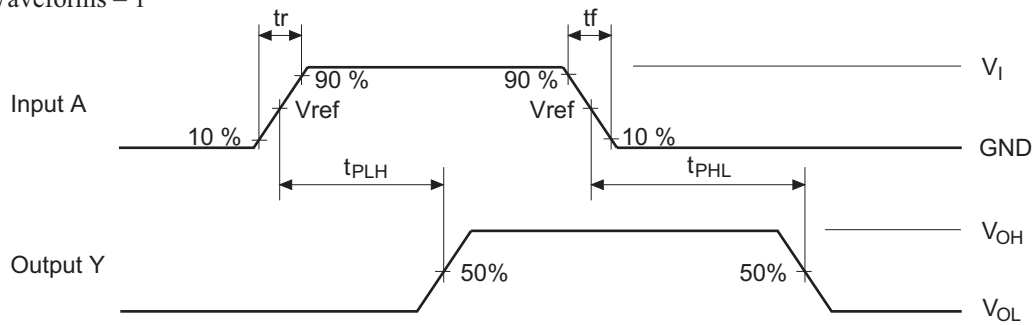
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• Waveforms – 2
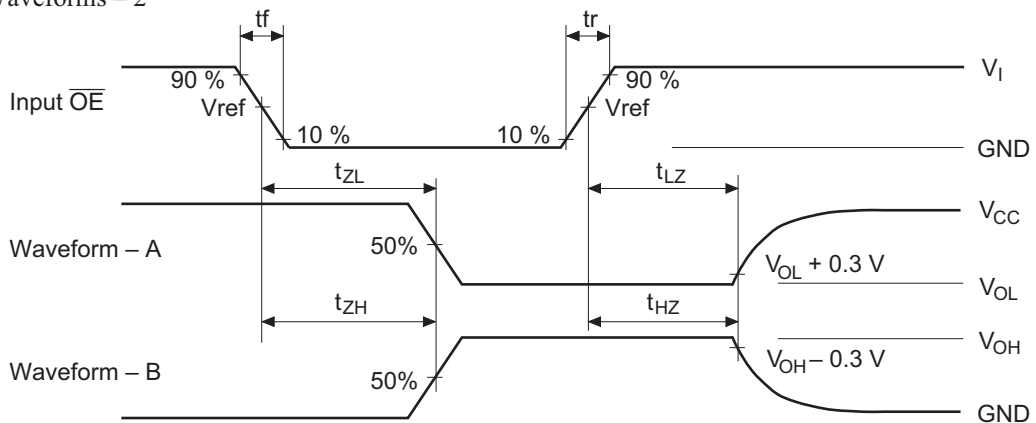
V_{CC} (V)	INPUTS		Vref
	V_I	t_r / t_f	
3.3±0.3	2.5 V	≤ 3.0 ns	50%
5.0±0.5	3 V	≤ 3.0 ns	1.5 V

Notes: 1. Input waveform : PRR ≤ 1 MHz, Zo = 50 Ω.
2. Waveform – A is for an output with internal conditions such that the output is low except when disabled by the output control.
3. Waveform – B is for an output with internal conditions such that the output is high except when disabled by the output control.
4. The output are measured one at a time with one transition per measurement.

Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
SC-88A	PTSP0005ZC-A	CMPAK-5 / CMPAK-5V	0.006g

A-A Section

Pattern of terminal position areas

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	0.8	—	1.1
A_1	0	—	0.1
A_2	0.8	0.9	1.0
A_3	—	0.25	—
b	0.15	0.22	0.3
b_1	—	0.2	—
c	0.1	0.13	0.15
c_1	—	0.11	—
D	1.8	2.0	2.2
E	1.15	1.25	1.35
e	—	0.65	—
H_E	1.8	2.1	2.4
L	0.3	—	0.7
L_1	0.1	—	0.5
L_P	0.2	—	0.6
x	—	—	0.05
y	—	—	0.05
b_2	—	—	0.35
e_1	—	1.5	—
l_1	—	—	0.9
Q	—	0.25	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-USON5-1.2x1.6-0.50	PUSN0005KA-A	TNP-5D/TNP-5DV	0.002g

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	1.55	1.6	1.65
E	1.1	1.2	1.3
A	—	—	0.6
A_1	—	—	—
A_2	—	—	—
b	0.15	0.2	0.3
b_1	—	—	—
e	—	0.5	—
L_P	—	—	—
x	—	—	—
y	—	—	—
Z_D	—	—	—
c	0.07	0.12	0.22
c_1	—	—	—
H_E	1.55	1.6	1.65
L_1	—	0.2	—

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RENESAS SALES OFFICES

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