

Description

The 74LVC1G02 is a single 2-input positive NOR gate with a standard totem pole output. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down.

The gate performs the positive Boolean function:

$$Y = \overline{A + B} \text{ or } Y = \overline{A} \cdot \overline{B}$$

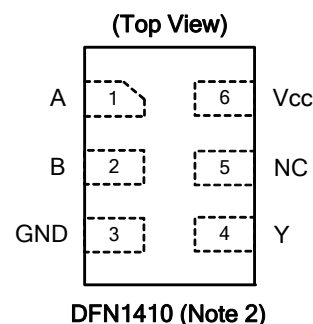
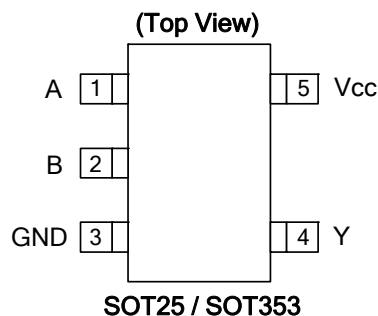
Features

- Wide Supply Voltage Range from 1.65 to 5.5V
- $\pm 24\text{mA}$ Output Drive at 3.3V
- CMOS low power consumption
- I_{OFF} Supports Partial-Power-Down Mode Operation
- Inputs accept up to 5.5V
- ESD Protection Tested per JESD 22
 - Exceeds 200-V Machine Model (A115-A)
 - Exceeds 2000-V Human Body Model (A114-A)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- Range of Package Options
- Direct Interface with TTL Levels
- SOT25, SOT353, and DFN1410: Assembled with "Green" Molding Compound (no Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 1)

Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at http://www.diodes.com/products/lead_free.html.

2. Pin 2 and pin 5 of the DFN1410 package are internally connected.

Pin Assignments



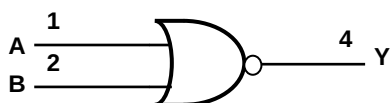
Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as.
 - o PCs, networking, notebooks, netbooks, PDAs
 - o Computer peripherals, hard drives, CD/DVD ROM
 - o TV, DVD, DVR, set top box
 - o Cell Phones, Personal Navigation / GPS
 - o MP3 players ,Cameras, Video Recorders

Pin Descriptions

Pin Name	Description
A	Data Input
B	Data Input
GND	Ground
Y	Data Output
Vcc	Supply Voltage
NC	No Connection

Logic Diagram



Function Table

Inputs		Output
A	B	Y
H	X	L
X	H	L
L	L	H

Absolute Maximum Ratings (Note 3)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	KV
ESD MM	Machine Model ESD Protection	200	V
V_{CC}	Supply Voltage Range	-0.5 to 6.5	V
V_I	Input Voltage Range	-0.5 to 6.5	V
V_O	Voltage applied to output in high impedance or I_{OFF} state	-0.5 to 6.5	V
V_O	Voltage applied to output in high or low state.	-0.3 to $V_{CC} + 0.5$	V
I_{IK}	Input Clamp Current $V_I < 0$	-50	mA
I_{OK}	Output Clamp Current	-50	mA
I_O	Continuous output current	± 50	mA
	Continuous current through Vdd or GND	± 100	mA
T_J	Operating Junction Temperature	-40 to 150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature	-65 to 150	$^{\circ}\text{C}$

Notes: 3. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

Recommended Operating Conditions (Note 4)

Symbol	Parameter		Min	Max	Unit
V _{CC}	Operating Voltage	Operating	1.65	5.5	V
		Data retention only	1.5		V
V _{IH}	High-level Input Voltage	V _{CC} = 1.65V to 1.95V	0.65 X V _{CC}		V
		V _{CC} = 2.3V to 2.7V	1.7		
		V _{CC} = 3V to 3.6V	2		
		V _{CC} = 4.5V to 5.5V	0.7 X V _{CC}		
V _{IL}	Low-level input voltage	V _{CC} = 1.65V to 1.95V		0.35 X V _{CC}	V
		V _{CC} = 2.3V to 2.7V		0.7	
		V _{CC} = 3V to 3.6 V		0.8	
		V _{CC} = 4.5V to 5.5V		0.3 X V _{CC}	
V _I	Input Voltage		0	5.5	V
V _O	Output Voltage		0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 1.65V		-4	mA
		V _{CC} = 2.3V		-8	
		V _{CC} = 3V		-16	
		V _{CC} = 4.5V		-24	
I _{OL}	Low-level output current	V _{CC} = 1.65V		4	mA
		V _{CC} = 2.3V		8	
		V _{CC} = 3V		16	
		V _{CC} = 4.5V		24	
Δt/ΔV	Input transition rise or fall rate	V _{CC} = 1.8V ± 0.15V, 2.5V ± 0.2V		20	ns/V
		V _{CC} = 3.3V ± 0.3V		10	
		V _{CC} = 5V ± 0.5V		5	
T _A	Operating free-air temperature		-40	85	°C

Notes: 4. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (All typical values are at $V_{CC} = 3.3V$, $T_A = 25^\circ C$)

Over recommended free-air temperature range (unless otherwise noted)

Symbol	Parameter	Test Conditions	Vcc	Min	Typ.	Max	Unit
V_{OH}	High Level Output Voltage	$I_{OH} = -100\mu A$	1.65V to 5.5V	$V_{CC} - 0.1$			V
		$I_{OH} = -4mA$	1.65V	1.2			
		$I_{OH} = -8mA$	2.3V	1.9			
		$I_{OH} = -16mA$	3V	2.4			
		$I_{OH} = -24mA$		2.3			
		$I_{OH} = -32mA$	4.5V	3.8			
V_{OL}	High-level Input Voltage	$I_{OL} = 100\mu A$	1.65V to 5.5V			0.1	V
		$I_{OL} = 4mA$	1.65V			0.45	
		$I_{OL} = 8mA$	2.3V			0.3	
		$I_{OL} = 16mA$	3V			0.4	
		$I_{OL} = 24mA$				0.55	
		$I_{OL} = 32mA$	4.5V			0.55	
I_I	Input Current	$V_I = 5.5V$ or GND	0 to 5.5V			± 5	μA
I_{OFF}	Power Down Leakage Current	V_I or $V_O = 5.5V$	0			± 10	μA
I_{CC}	Supply Current	$V_I = 5.5V$ or GND $I_O = 0$	1.65V to 5.5V			10	μA
ΔI_{CC}	Additional Supply Current	One input at $V_{CC} - 0.6V$ Other inputs at V_{CC} or GND	3V to 5.5V			500	μA
C_i	Input Capacitance	$V_I = V_{CC}$ – or GND	3.3		4		pF
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT25	(Note 5)		204		$^\circ C/W$
		SOT353	(Note 5)		371		$^\circ C/W$
		DFN1410	(Note 5)		430		$^\circ C/W$
θ_{JC}	Thermal Resistance Junction-to-Case	SOT25	(Note 5)		52		$^\circ C/W$
		SOT353	(Note 5)		143		$^\circ C/W$
		DFN1410	(Note 5)		190		$^\circ C/W$

Notes: 5. Test condition for SOT25, SOT353, and DFN1410: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Switching Characteristics

Over recommended free-air temperature range, CL = 15pF (see Figure 1)

Parameter	From (Input)	TO (OUTPUT)	Vcc = 1.8 V ± 0.15V		Vcc = 2.5 V ± 0.2V		Vcc = 3.3 V ± 0.3V		Vcc = 5 V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t _{pd}	A or B	Y	1.9	7.2	0.8	4.4	0.8	3.6	0.8	3.4	ns

Over recommended free-air temperature range, CL = 30 or 50pF (see Figure 2)

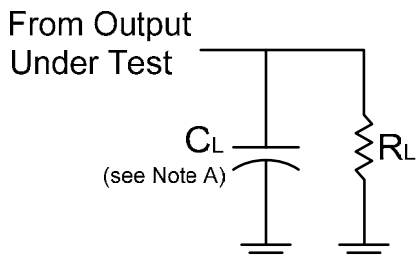
Parameter	From (Input)	TO (OUTPUT)	Vcc = 1.8 V ± 0.15V		Vcc = 2.5 V ± 0.2V		Vcc = 3.3 V ± 0.3V		Vcc = 5 V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t _{pd}	A or B	Y	2.8	8.0	1.2	5.5	1.0	4.5	1.0	4.0	ns

Operating Characteristics

T_A = 25 °C

Parameter		Test Conditions	Vcc = 1.8 V	Vcc = 2.5 V	Vcc = 3.3 V	Vcc = 5 V	Unit
			TYP	TYP	TYP	TYP	
C _{pd}	Power dissipation capacitance	f = 10 MHz	23	23	23	25	pF

Parameter Measurement Information



V _{CC}	Inputs		V _M	C _L	R _L
	V _I	t _r /t _f			
1.8V±0.15V	V _{CC}	≤2ns	V _{CC} /2	15pF	1MΩ
2.5V±0.2V	V _{CC}	≤2ns	V _{CC} /2	15pF	1MΩ
3.3V±0.3V	3V	≤2.5ns	1.5V	15pF	1MΩ
5V±0.5V	V _{CC}	≤2.5ns	V _{CC} /2	15pF	1MΩ

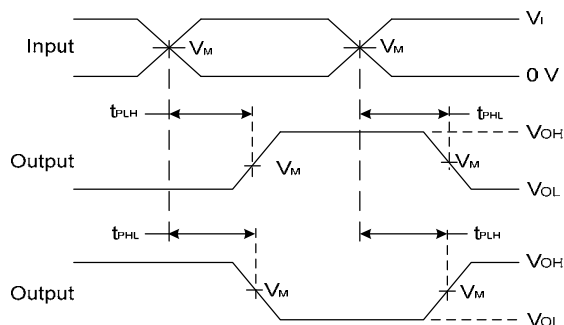
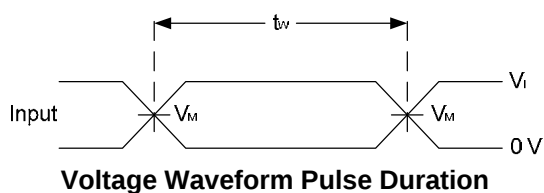
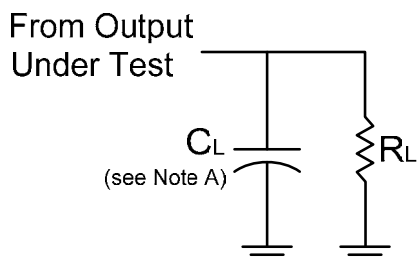


Figure 1. Load Circuit and Voltage Waveforms

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
 - C. Inputs are measured separately one transition per measurement.
 - D. t_{PLH} and t_{PHL} are the same as t_{PD}.

Parameter Measurement Information (Continued)



V _{CC}	Inputs		V _M	C _L	R _L
	V _I	t _r /t _f			
1.8V±0.15V	V _{CC}	≤2ns	V _{CC} /2	30pF	1KΩ
2.5V±0.2V	V _{CC}	≤2ns	V _{CC} /2	30pF	500Ω
3.3V±0.3V	3V	≤2.5ns	1.5V	50pF	500Ω
5V±0.5V	V _{CC}	≤2.5ns	V _{CC} /2	50pF	500Ω

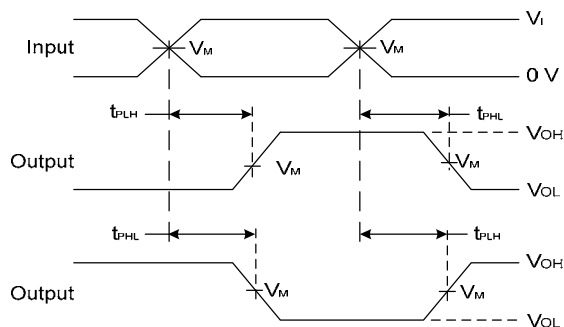
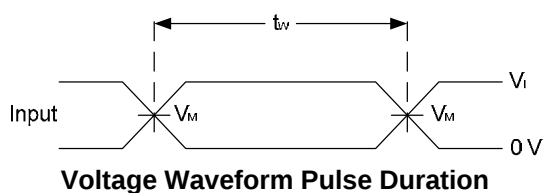
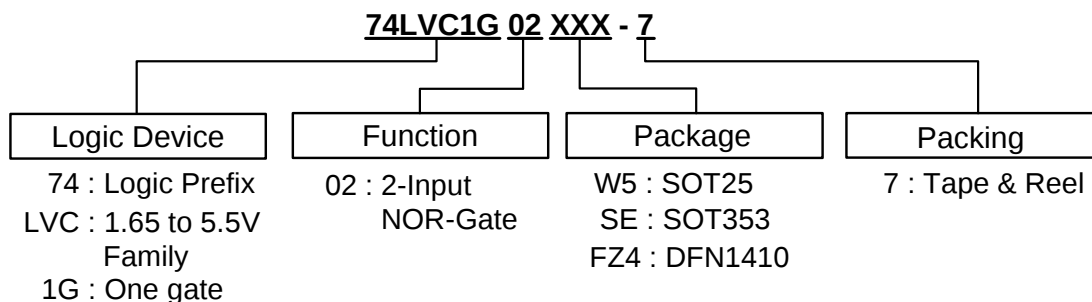


Figure 2. Load Circuit and Voltage Waveforms

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
 - C. Inputs are measured separately one transition per measurement.
 - D. t_{PLH} and t_{PHL} are the same as t_{PD}.

Ordering Information



Device	Package Code	Packaging (Note 6)	7" Tape and Reel	
			Quantity	Part Number Suffix
74LVC1G02W5-7	W5	SOT25	3000/Tape & Reel	-7
74LVC1G02SE-7	SE	SOT353	3000/Tape & Reel	-7
74LVC1G02 FZ4-7	FZ4	DFN1410	5000/Tape & Reel	-7

Notes: 6. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

Marking Information

(1) SOT25 and SOT353

(Top View)



XX : Identification code

Y : Year 0~9

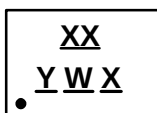
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week

X : A~Z : Internal code

Part Number	Package	Identification Code
74LVC1G02W5	SOT25	UT
74LVC1G02SE	SOT353	UT

(2) DFN1410

(Top View)



XX : Identification Code

Y : Year : 0~9

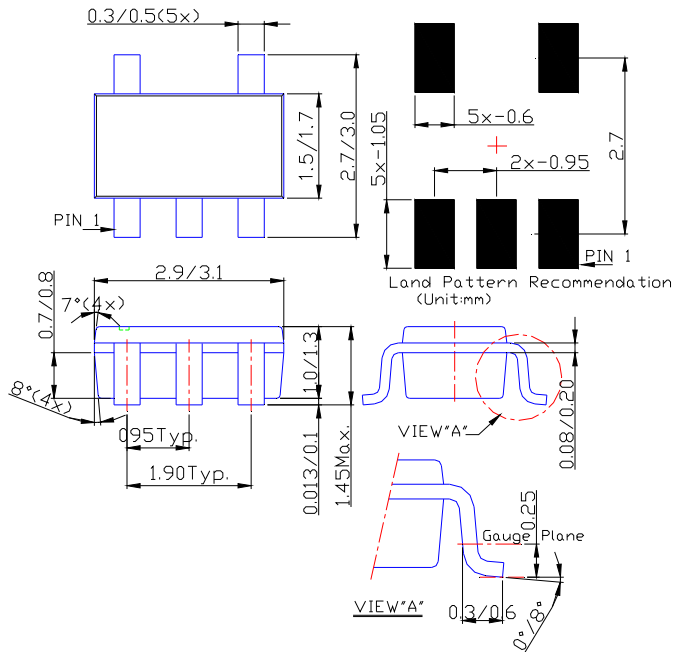
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week

X : A~Z : Internal code

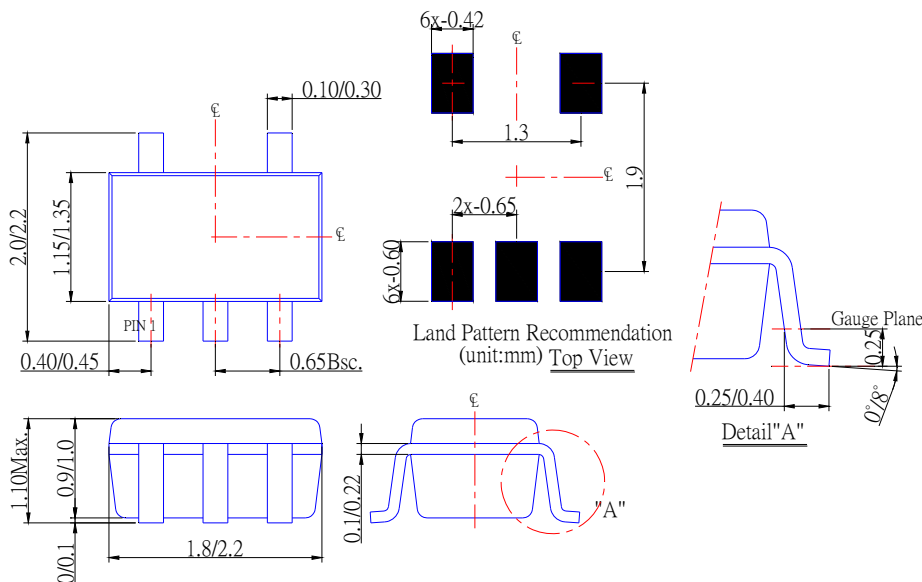
Part Number	Package	Identification Code
74LVC1G02FZ4	DFN1410	UT

Package Outline Dimensions (All Dimensions in mm)

(1) Package Type: SOT25

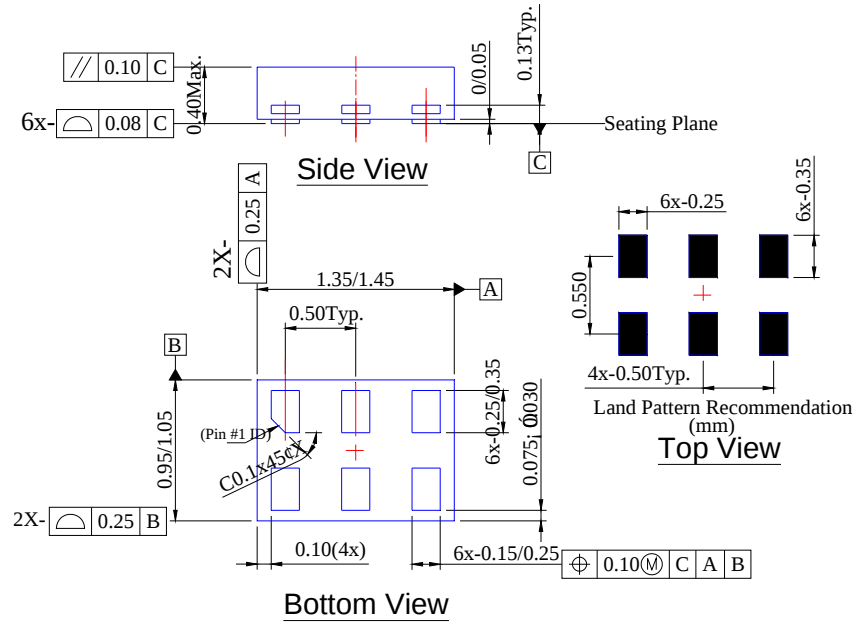


(2) Package Type: SOT353



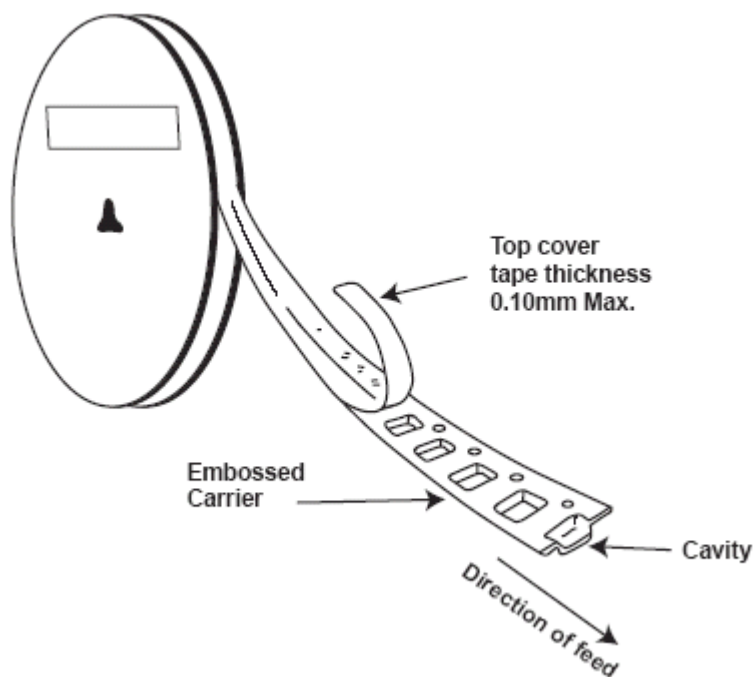
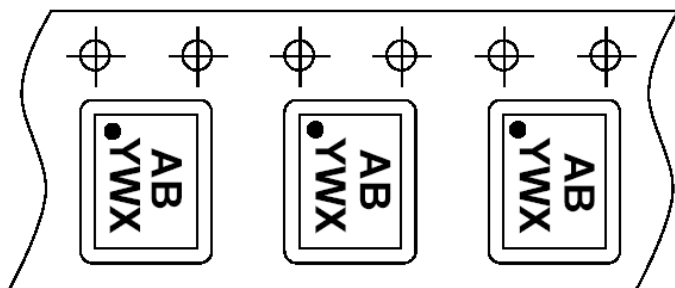
Package Outline Dimensions (Continued)

(3) Package Type: DFN1410



Taping Orientation (Note 7)

For DFN1410



Notes: 7. The taping orientation of the other package type can be found on our website at <http://www.diodes.com/datasheets/ap02007.pdf>

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