



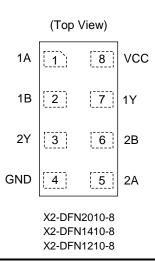
DUAL 2-INPUT AND GATE

Description

The 74LVC2G08 is a dual, two input AND gate. Both gates have push-pull outputs designed for operation over a power supply range of 1.65V to 5.5V. 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. Each gate performs the positive Boolean function:

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

Pin Assignments



Features

- Wide Supply Voltage Range from 1.65 to 5.5V
- ± 24mA Output Drive at 3.3V
- CMOS low power consumption
- IOFF Supports Partial-Power-Down Mode Operation
- Inputs accept up to 5.5V
- Schmitt Trigger Action at all inputs makes the circuit tolerant for slower input rise and fall times. The hysteresis is typically 100mV at V_{CC} = 3.0V.
- ESD Protection Exceeds JESD 22
 - 2000-V Human Body Model (A114)
 - Exceeds 1000-V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, Class I
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide Array of Products Such as:
 - PCs, Networking, Notebooks, Netbooks, PDAs
 - Tablet Computers, E-readers
 - Computer Peripherals, Hard Drives, CD/DVD ROMs
 - TVs, DVDs, DVRs, Set Top Boxes
 - Cell Phones, Personal Navigation / GPS
 - MP3 Players, Cameras, Video Recorders

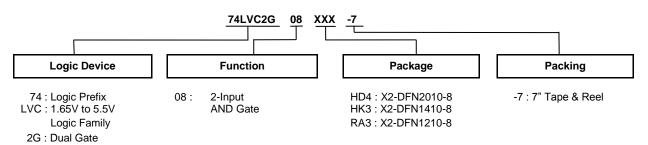
Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.

2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.

3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.



Ordering Information (Note 4)



	Package	Package	Package	7" Tape and Re	el (Note 6)
Device	Code	(Note 5)	Size	Quantity	Part Number Suffix
74LVC2G08HD4-7	HD4	X2-DFN2010-8	1.95mm x 1.0mm x 0.4mm 0.5 mm lead pitch	5,000/Tape & Reel	-7
74LVC2G08HK3-7	НК3	X2-DFN1410-8	1.35mm x 1.0mm x 0.35mm 0.4 mm lead pitch	5,000/Tape & Reel	-7
74LVC2G08RA3-7	RA3	X2-DFN1210-8	1.2mm x 1.0mm x 0.35mm 0.3 mm lead pitch	5,000/Tape & Reel	-7

Notes: 4. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

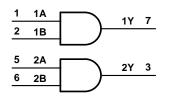
5. Pad layout as shown in Diodes Incorporated's package outline PDFs, which can be found on our website at http://www.diodes.com/packageoutlines.html.

6. The taping orientation is located on our website at http://www.diodes.com/datasheets/ap02007.pdf.

Pin Descriptions

Pin Name	Pin No.	Description	
1A	1	Data Input	
1B	2	Data Input	
2Y	3	Data Output	
GND	4	Ground	
2A	5	Data Input	
2B	6	Data Input	
1Y	7	Data Output	
Vcc	8	Supply Voltage	

Logic Diagram



Function Table

In	Inputs			
А	В	Y		
L	L	L		
L	н	L		
Н	L	L		
Н	н	Н		



Absolute Maximum Ratings (Notes 7 & 8)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
Vcc	Supply Voltage	-0.5 to +6.5	V
VI	Input Voltage	-0.5 to +6.5	V
Vo	Output Voltage -Active Mode	-0.5 to V _{CC} +0.5	V
Vo	Output Voltage Power Down Mode	-0.5 to +6.5	V
I _{IK}	Input Clamp Current VI<0	-50	mA
I _{OK}	Output Clamp Current (Vo < 0 OR Vo > Vcc)	±50	mA
lo	Continuous Output Current (Vo = 0 to V _{CC})	±50	mA
Icc	Continuous Current Through V _{CC}	100	mA
I _{GND}	Continuous Current Through GND	-100	mA
TJ	Operating Junction Temperature	-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C

Notes: 7. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device

Stesses beyond the absolute maximum may result in minediate failure of reduced reliability. These are stress values and device operation should be within recommend values.
Forcing the maximum allowed voltage could cause a condition exceeding the maximum current or conversely forcing the maximum current could cause a condition exceeding the maximum voltage. The ratings of both current and voltage must be maintained within the controlled range.

Recommended Operating Conditions (Note 9)

Symbol	Р	arameter	Min	Мах	Unit	
		Operating	1.65	5.5		
Vcc	V _{CC} Operating Voltage	Data Retention Only	1.5	_	V	
VI	Input Voltage		0	5.5	V	
N/	Output Voltage Active Mode		0	V _{CC}	V	
Vo	Output Voltage Power-Down Mode		0	5.5	V	
		$V_{CC} = 1.65V$	—	-4		
		V _{CC} =	$V_{CC} = 2.3V$	—	-8	1
I _{OH}	High-Level Output Current	$V_{CC} = 2.7 V$	—		mA	
ЧОН		V _{CC} = 3.0V	—	-16	IIIA	
		VCC = 3.0V		-24		
		$V_{CC} = 4.5V$	—	-32		
		V _{CC} = 1.65V	—	4		
		$V_{CC} = 2.3V$	—	8		
IOL	Low-Level Output Current	$V_{CC} = 2.7 V$	—	12	mA	
IOL		V _{CC} = 3.0V	—	16		
		v _{CC} = 3.0v		24		
		$V_{CC} = 4.5V$		32		
Δt/ΔV	Input Transition Rise or Fall Rate	$V_{CC} = 1.65V$ to 2.7V	_	20	ns/V	
		$V_{CC} = 2.7V$ to 5.5V	—	10	115/ V	
TA	Operating F	ree-Air Temperature	-40	+125	°C	

Note: 9. Unused inputs should be held at V_{CC} or Ground.



Electrical Characteristics (All typical values are at T_A = +25°C)

0	Demonst	To al O an allilla		-40	°C to +8	5°C	-40°C to	+125°C	11
Symbol	Parameter	Test Conditions	Vcc	Min	Тур.	Max	Min	Max	Unit
			$V_{CC} = 1.65V$ to 1.95V	0.65 x V _{CC}		_	0.65 x V _{CC}	_	
	High-Level		V _{CC} = 2.3V to 2.7V	1.7		_	1.7	_	.,
VIH	Input Voltage	_	$V_{CC} = 2.7 V \text{ to } 3.6 V$	2.0	_	_	2.0	_	V
			V _{CC} = 4.5V to 5.5V	0.7 x V _{CC}	_	_	0.7 x V _{CC}	_	
			$V_{CC} = 1.65V$ to 1.95V	_	_	0.35 x V _{CC}		0.35 x V _{CC}	
	Low-Level		$V_{CC} = 2.3V$ to 2.7V	_	_	0.7		0.7	
VIL	Input Voltage	_	$V_{CC} = 2.7 V \text{ to } 3.6 V$	—		0.8		0.8	V
			$V_{CC} = 4.5V$ to 5.5V	—		0.3 x V _{CC}		0.3 x V _{CC}	
		I _{OH} = -100μA	1.65V to 5.5V	$V_{CC} - 0.1$	Vcc	_	V _{CC} – 0.1	_	
		I _{OH} = -4mA	1.65V	1.2	1.53	_	0.95	_	
	High-Level	I _{OH} = -8mA	2.3V	1.9	2.13	_	1.7	_	
Vон	Output	I _{OH} = -12mA	2.7	2.2	2.5	_	1.9	_	V
V	Voltage	I _{OH} = -16mA	2)/	2.4	2.7	_	2.2	_	
		I _{OH} = -24mA	3V	2.3	2.6	_	2.0	_	
		I _{OH} = -32mA	4.5V	3.8	4.1	_	3.4	_	
		I _{OL} = 100μA	1.65V to 5.5V	_	0	0.1		0.1	
		$I_{OL} = 4mA$	1.65V	_	0.08	0.45	_	0.7	
	Low-Level	$I_{OL} = 8mA$	2.3V	_	0.14	0.3	_	0.45	
Vol	Output	$I_{OL} = 12mA$	2.7V	_	0.19	0.4	_	0.6	V
	Voltage	$I_{OL} = 16 \text{mA}$	3V	_	0.25	0.4	_	0.6	
		$I_{OL} = 24mA$	3V	—	0.37	0.55	_	0.8	
		$I_{OL} = 32mA$	4.5V	—	0.43	0.55		0.8	
I _I	Input Current	$V_1 = 5.5V \text{ or GND}$	0V to 5.5V	_	± 0.1	±5	_	± 20	μA
I _{OFF}	Power Down Leakage Current	V_1 or $V_0 = 5.5V$	0V	_	± 0.1	±10	_	±20	μA
I _{CC}	Supply Current	$V_1 = 5.5V$ or GND $I_0=0A$	1.65V to 5.5V	_	0.1	10	_	40	μA
ΔI _{CC}	Additional Supply Current	One input at $V_{CC} - 0.6V$ Other inputs at V_{CC} or GND	2.3V to 5.5V	_	5	500	_	5,000	μΑ
Cı	Input Capacitance	$V_{I} = V_{CC} \text{ or } GND$	3.3V	_	2.5	_	_	_	pF



Operating Characteristics

	Parameter	Test Conditions	V _{CC} = 1.8V Typ.	V _{CC} = 2.5V Typ.	V _{CC} = 3.3V Typ.	V _{CC} = 5V Typ.	Unit
C _{pd}	Power Dissipation Capacitance	f = 10MHz	17	17	17	20	pF

Package Characteristics

Symbol	Parameter	Package	Test Conditions	Min	Тур.	Max	Unit
		X2-DFN2010-8		_	313		
θ_{JA}	Thermal Resistance Junction- to-Ambient	X2-DFN1410-8	(Note 10)	_	321	_	°C/W
	to-Ambient	X2-DFN1210-8		_	395		
		X2-DFN2010-8		_	145	_	
θ_{JC}	Thermal Resistance Junction-	X2-DFN1410-8	(Note 10)	_	166		°C/W
	to-Case	X2-DFN1210-8		_	236	_	

Note: 10. Test condition for each package type: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

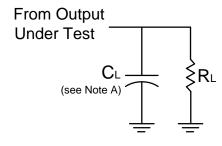
Switching Characteristics

Т	ypical Values	at $T_A = +25$	5°C and nom	inal voltages 1.8V,	2.5V, 2.7V, 3.3	V, and 5.0V.	See Figure 1.	
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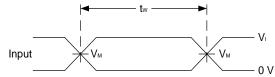
Demonster	From	То	V	T _A	= -40°C to +85	5°C	T _A = -40°C	to +125°C	11
Parameter	Input	Output	Vcc	Min	Тур	Max	Min	Мах	Unit
			1.8V ± 0.15V	1.0	3.2	9.0	1.0	11.3	
			2.5V ± 0.2V	0.5	2.2	5.1	0.5	6.4	
t _{pd}	A or B	Y	2.7V	1.0	2.5	5.3	1.0	6.7	ns
			3.3V ± 0.3V	0.5	2.1	4.7	0.5	5.9	
			5.0V ± 0.5V	0.5	1.7	3.8	0.5	4.8	



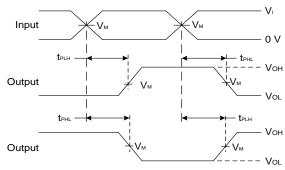
Parameter Measurement Information



V _{cc}	In	puts	V _M	CL	R∟
V CC	Vı	t _r /t _f	۷M	OL	κ <u>ι</u>
1.8V ± 0.15V	V _{cc}	≤2ns	V _{CC} /2	30pF	1kΩ
2.5V ± 0.2V	V _{cc}	≤2ns	V _{CC} /2	30pF	500Ω
2.7V	2.7V	≤2.5ns	1.5V	50pF	500Ω
3.3V ± 0.3V	2.7V	≤2.5ns	1.5V	50pF	500Ω
5.0V ± 0.5V	V _{cc}	≤2.5ns	V _{CC} /2	50pF	500Ω



Voltage Waveform Pulse Duration



Voltage Waveform Propagation Delay Times Inverting and Non Inverting Outputs

Figure 1. Load Circuit and Voltage Waveforms

A. Includes test lead and test apparatus capacitance. B. All pulses are supplied at pulse repetition rate \leq 10MHz. Notes:

- C. Inputs are measured separately one transition per measurement.
- D. t_{PLH} and t_{PHL} are the same as $t_{\text{pd}}.$



Marking Information

(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 : Internal Code

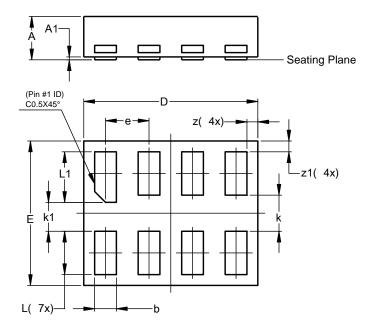
Part Number	Package	Identification Code
74LVC2G08HD4-7	X2-DFN2010-8	9E
74LVC2G08HK3-7	X2-DFN1410-8	9F
74LVC2G08RA3-7	X2-DFN1210-8	9G



X2-DFN1210-8 Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

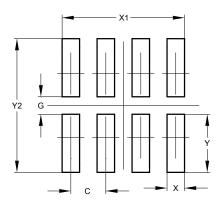
X2-DFN1210-8



X2-DFN1210-8				
Dim	Min	Max	Тур	
Α	-	0.35	0.30	
A1	0	0.03	0.02	
b	0.10	0.20	0.15	
D	1.15	1.25	1.20	
E	0.95	1.05	1.00	
е	-	-	0.30	
k	-	-	0.25	
k1	-	-	0.20	
L	0.25	0.35	0.30	
L1	0.30	0.40	0.35	
z	0.050	0.100	0.075	
z1	0.050	0.100	0.075	
All Dimensions in mm				

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.



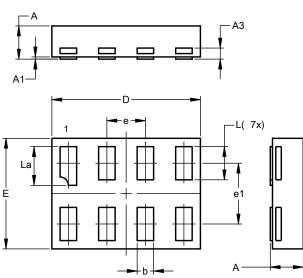
X2-DFN1210-8

Dimensions	Value (in mm)	
С	0.300	
G	0.150	
Х	0.150	
X1	1.050	
Y	0.500	
Y1	1.150	



X2-DFN1410-8 Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

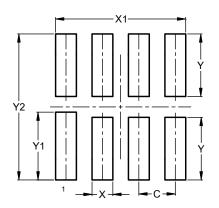


X2-DFN1410-8				
Dim	Min	Max	Тур	
Α	0.30	0.35	0.33	
A1	0.00	0.03	0.02	
A3			0.10	
b	0.12	0.20	0.15	
D	1.30	1.40	1.35	
E	0.95	1.05	1.00	
е			0.35	
e1			0.55	
L	0.27	0.35	0.30	
L1	0.32	0.40	0.35	
All Dimensions in mm				

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.





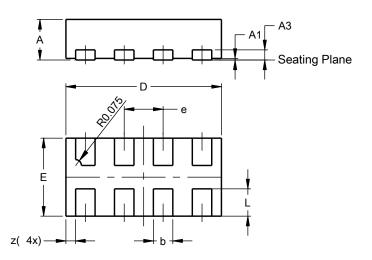
Dimensions	Value	
Dimensions	(in mm)	
С	0.350	
Х	0.200	
X1	1.250	
Y	0.600	
Y1	0.650	
Y2	1.400	

X2-DFN1410-8



X2-DFN2010-8 Package Outline Dimensions

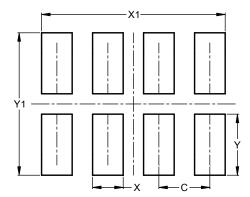
Please see http://www.diodes.com/package-outlines.html for the latest version.



X2-DFN2010-8				
Dim	Min	Max	Тур	
Α		0.40		
A1	0.00	0.05	0.02	
A3			0.13	
b	0.20	0.30	0.25	
D	1.950	2.05	2.00	
E	0.95	1.05	1.00	
е			0.50	
L	0.30	0.40	0.35	
z			0.125	
All Dimensions in mm				

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.



X2-DFN2010-8

Dimensions	Value (in mm)	
С	0.500	
Х	0.300	
X1	1.800	
Y	0.600	
Y1	1.400	

X2-DFN2010-8



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