74LVCE1G08

SINGLE 2 INPUT POSITIVE AND GATE

Description

The 74LVCE1G08 is a single 2-input positive AND gate with a standard totem pole output. The device is designed for operation with a power supply range of 1.4V 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:

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

Pin Assignments

(Top View)

A 1 — 5 Vcc
B 2 —
GND 3 — 4 Y

SOT25 / SOT353

Features

- Extended Supply Voltage Range from 1.4 to 5.5V
- Switching speed characterized for operation at 1.5V
- Offers 30% speed improvement over LVC at 1.8V.
- ± 24mA Output Drive at 3.3V
- CMOS low power consumption
- IOFF Supports Partial-Power-Down Mode Operation
- Inputs accept up to 5.5V
- ESD Protection Exceeds JESD 22
- 200-V Machine Model (A115-A)
- 2000-V Human Body Model (A114-A)
- Range of Package Options
- Direct Interface with TTL Levels
- SOT25 and SOT353: Available in "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.
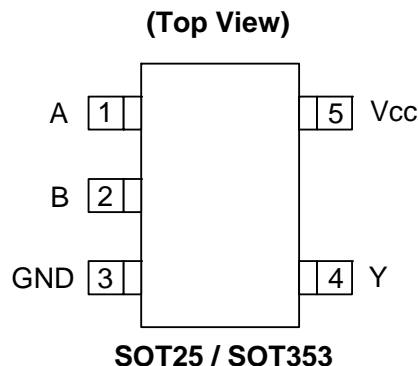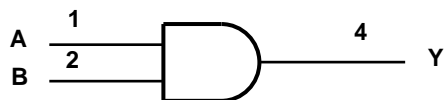
Applications

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

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Pin Descriptions

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

Logic Diagram

Function Table

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

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Absolute Maximum Ratings (Note 2)

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	°C
T_{STG}	Storage Temperature	-65 to 150	°C

Notes: 2. 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.

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Recommended Operating Conditions (Note 3)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Operating Voltage	Operating	1.4	5.5	V
		Data retention only	1.2		V
V_{IH}	High-level Input Voltage	V_{CC} = 1.4 V to 1.95 V	0.65 X V_{CC}		V
		V_{CC} = 2.3 V to 2.7 V	1.7		
		V_{CC} = 3 V to 3.6 V	2		
		V_{CC} = 4.5 V to 5.5 V	0.7 X V_{CC}		
V_{IL}	Low-level input voltage	V_{CC} = 1.4 V to 1.95 V		0.35 X V_{CC}	V
		V_{CC} = 2.3 V to 2.7 V		0.7	
		V_{CC} = 3 V to 3.6 V		0.8	
		V_{CC} = 4.5 V to 5.5 V		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	Vcc=1.4 V		-3	mA
		V_{CC} = 1.65 V		-4	
		V_{CC} = 2.3 V		-8	
		V_{CC} = 3 V		-16	
				-24	
		V_{CC} = 4.5 V		-32	
I_{OL}	Low-level output current	Vcc=1.4 V		3	mA
		V_{CC} = 1.65 V		4	
		V_{CC} = 2.3 V		8	
		V_{CC} = 3 V		16	
				24	
		V_{CC} = 4.5 V		32	
Δt/ΔV	Input transition rise or fall rate	V_{CC} = 1.4 to 3V		20	ns/V
		V_{CC} = 3.3 V ± 0.3 V		10	
		V_{CC} = 5 V ± 0.5 V		5	
T_A	Operating free-air temperature		-40	85	ºC

Notes: 3. Unused inputs should be held at Vcc or Ground.

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Electrical Characteristics (All typical values are at Vcc = 3.3V, T_A = 25°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} = -100µA	1.4 V to 5.5V	V_{CC} – 0.1			V
		I_{OH} = -3mA	1.4 V	1.05			
		I_{OH} = -4mA	1.65 V	1.2			
		I_{OH} = -8mA	2.3V	1.9			
		I_{OH} = -16mA	3 V	2.4			
		I_{OH} = -24mA		2.3			
		I_{OH} = -32mA	4.5 V	3.8			
V_{OL}	High-level Input Voltage	I_{OL} = 100µA	1.4 V to 5.5V			0.1	V
		I_{OL} = 3mA	1.4V			.4	
		I_{OL} = 4mA	1.65 V			0.45	
		I_{OL} = 8mA	2.3V			0.3	
		I_{OL} = 16mA	3 V			0.4	
		I_{OL} = 24mA				0.55	
		I_{OL} = 32mA	4.5			0.55	
I_I	Input Current	V_I = 5.5 V or GND	0 to 5.5 V			± 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 of GND I_O=0	1.4 V to 5.5V			10	µA
ΔI_{CC}	Additional Supply Current	One input at V_{CC} – 0.6 V Other inputs at V_{CC} or GND	3 V to 5.5V			500	µA
C_i	Input Capacitance	V_i = V_{CC} – or GND	3.3		3.5		pF
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT25	(Note 4)		204		°C/W
		SOT353	(Note 4)		371		°C/W
θ_{JC}	Thermal Resistance Junction-to-Case	SOT25	(Note 4)		52		°C/W
		SOT353	(Note 4)		143		°C/W

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

Switching Characteristics

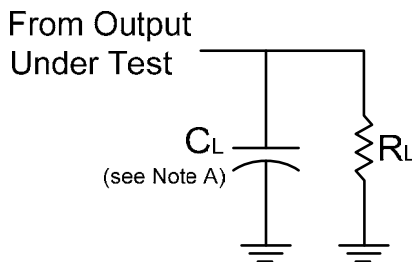Over recommended free-air temperature range, CL = 15pF (see Figure 1)

Parameter	From (Input)	TO (OUTPUT)	Vcc = 1.5 V ± 0.1V		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	Min	Max	
t_{pd}	A or B	Y	1.5	7.2	1.0	5	0.5	3.5	0.6	2.9	0.7	2.9	ns

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

Parameter	From (Input)	TO (OUTPUT)	Vcc = 1.5 V ± 0.1V		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	Min	Max	
t_{pd}	A or B	Y	2.4	8	1.6	5.6	0.8	4.4	0.8	3.6	0.9	3.6	ns

Operating Characteristics

T_A = 25 ºC

Parameter		Test Conditions	Vcc = 1.5 V	Vcc = 1.8 V	Vcc = 2.5 V	Vcc = 3.3 V	Vcc = 5 V	Unit
			TYP	TYP	TYP	TYP	TYP	
C_{pd}	Power dissipation capacitance	f = 10 MHz	21	21	24	26	31	pF

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Parameter Measurement Information

From Output
Under Test

C_L
(see Note A)

R_L

Vcc	Inputs		V_M	C_L	R_L
	V_I	t_r/t_f			
1.5V±0.1V	V_{CC}	≤2ns	$V_{CC}/2$	15pF	1MΩ
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
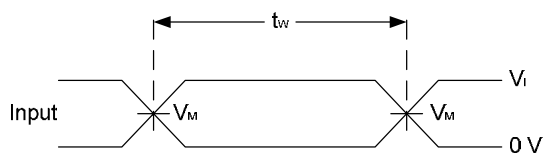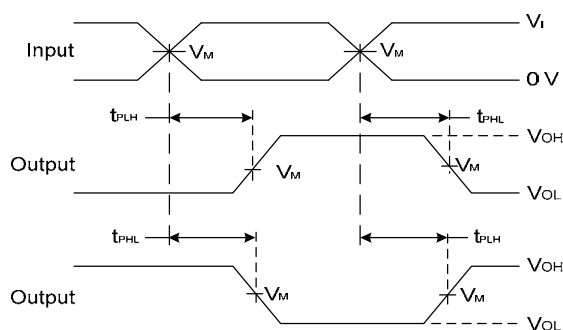
t_W

Input V_M V_M V_I
0 V

**Voltage Waveform
Pulse Duration**

Input V_M V_M V_I
0 V

t_{PLH} t_{PHL} V_{OH}

Output V_M V_M V_{OL}

t_{PHL} t_{PLH} V_{OH}

Output V_M V_M V_{OL}

**Voltage Waveform
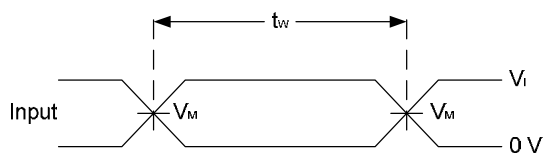Propagation Delay Times
Inverting and Non Inverting Outputs**

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}.

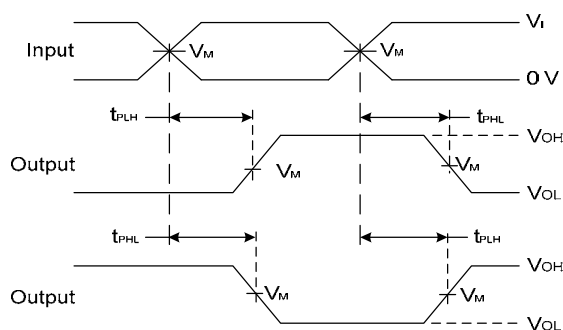**Figure 1. Load Circuit and Voltage Waveforms**

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Parameter Measurement Information (Continued)

From Output
Under Test

C_L
(see Note A)

R_L
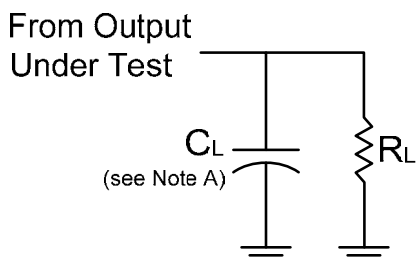
Vcc	Inputs		V_M	C_L	R_L
	V_I	t_r/t_f			
1.5V±0.1V	V_{CC}	≤2ns	$V_{CC}/2$	30pF	1KΩ
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	30pF	1KΩ
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	30pF	500Ω
3.3V±0.3V	3V	≤2.5ns	1.5V	50pF	500Ω
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	50pF	500Ω

t_W

Input

V_M V_M

V_I

0 V

**Voltage Waveform
Pulse Duration**

Input

V_M V_M

V_I

0 V

t_{PLH} t_{PHL}

Output

V_M V_M

V_{OH}

V_{OL}

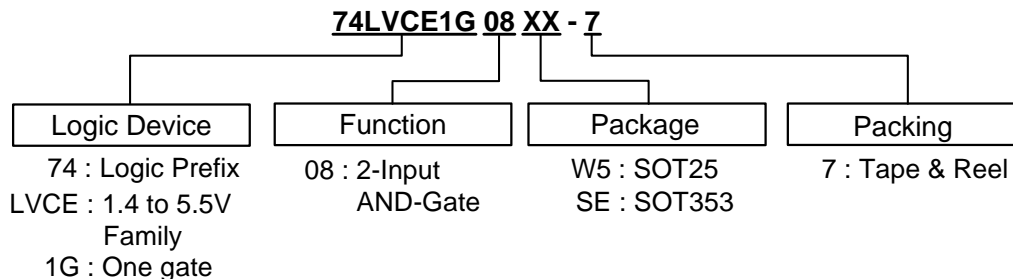t_{PHL} t_{PLH}

Output

V_M V_M

V_{OH}

V_{OL}

**Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs**

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}.

Figure 2. Load Circuit and Voltage Waveforms

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Ordering Information

74LVCE1G 08 XX - 7

Logic Device	Function	Package	Packing
74 : Logic Prefix LVCE : 1.4 to 5.5V Family 1G : One gate	08 : 2-Input AND-Gate	W5 : SOT25 SE : SOT353	7 : Tape & Reel

Device	Package Code	Packaging (Note 5)	7" Tape and Reel	
			Quantity	Part Number Suffix
74LVCE1G08W5-7	W6	SOT25	3000/Tape & Reel	-7
74LVCE1G08SE-7	SE	SOT353	3000/Tape & Reel	-7

Notes: 5. 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

(Top View)

```
 5        4

   XX Y W X

 1    2    3
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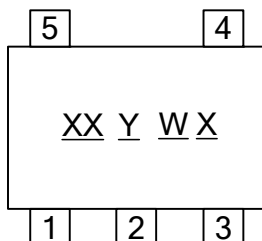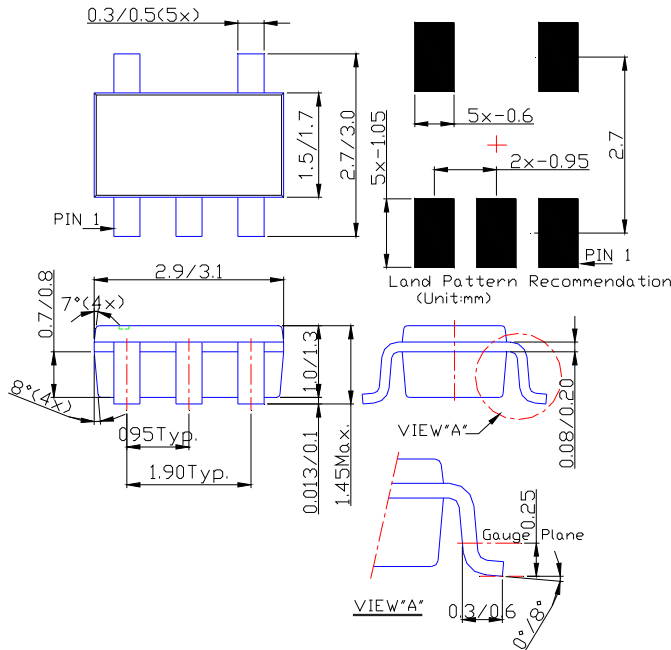
XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
     a~z : 27~52 week; z represents
     52 and 53 week
X : A~Z : Internal code

Part Number	Package	Identification Code
74LVCE1G08W5	SOT25	PV
74LVCE1G08SE	SOT353	PU

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Package Outline Dimensions (All Dimensions in mm)

(1) Package Type: SOT25

(2) Package Type: SOT353

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NEW PRODUCT
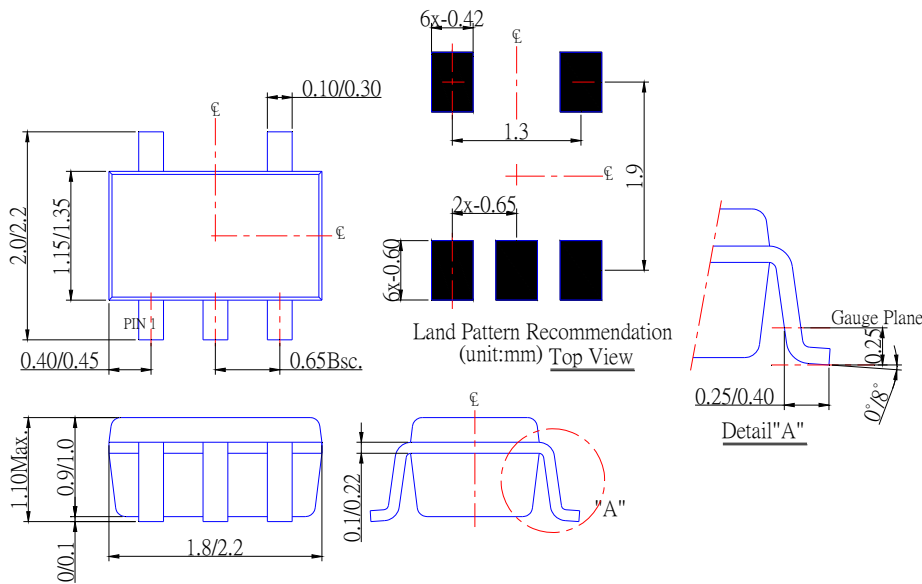
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