



# 3.3V CMOS QUADRUPLE 2-INPUT POSITIVE-AND GATE WITH 5 VOLT TOLERANT I/O

**IDT74LVC08A**

## FEATURES:

- 0.5 MICRON CMOS Technology
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- Vcc = 3.3V ± 0.3V, Normal Range
- Vcc = 2.7V to 3.6V, Extended Range
- CMOS power levels (0.4µ W typ. static)
- Rail-to-Rail output swing for increased noise margin
- All inputs, outputs, and I/Os are 5V tolerant
- Supports hot insertion
- Available in SOIC, SSOP, and TSSOP packages

## DRIVE FEATURES:

- High Output Drivers: ±24mA
- Reduced system switching noise

## DESCRIPTION:

This quadruple 2-input positive-AND gate is built using advanced dual metal CMOS technology. The LVC08A device performs the Boolean function  $Y = A \cdot B$  or  $Y = \overline{A + B}$  in positive logic.

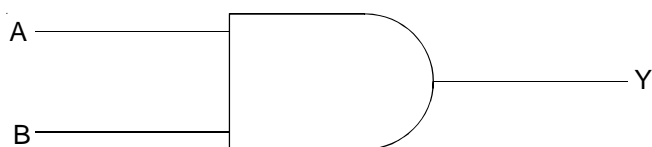
The LVC08A has been designed with a ±24mA output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in a mixed 3.3V/5V system environment.

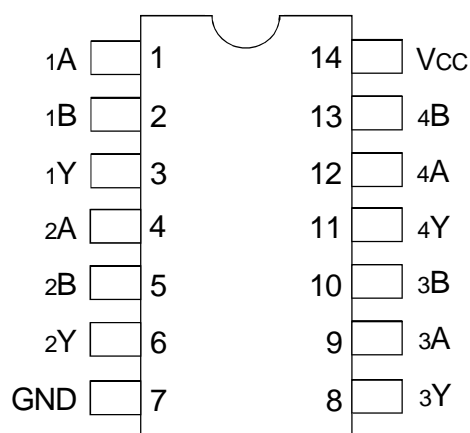
## APPLICATIONS:

- 5V and 3.3V mixed voltage systems
- Data communication and telecommunication systems

## FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION



SOIC/ SSOP/ TSSOP  
TOP VIEW

## PIN DESCRIPTION

Pin Names	Description
xA, xB	Data Inputs
xY	Data Outputs

## FUNCTION TABLE (EACH GATE)<sup>(1)</sup>

Inputs		Output
xA	xB	xY
H	H	H
L	X	L
X	L	L

### NOTE:

1. H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care

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INDUSTRIAL TEMPERATURE RANGE

FEBRUARY 2000

### ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Description	Max	Unit
VTERM	Terminal Voltage with Respect to GND	-0.5 to +6.5	V
TSTG	Storage Temperature	-65 to +150	°C
IOUT	DC Output Current	-50 to +50	mA
I <sub>IK</sub> I <sub>OK</sub>	Continuous Clamp Current, V <sub>I</sub> < 0 or V <sub>O</sub> < 0	-50	mA
I <sub>CC</sub> I <sub>SS</sub>	Continuous Current through each V <sub>CC</sub> or GND	±100	mA

**NOTE:**

1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### CAPACITANCE (T<sub>A</sub> = +25°C, F = 1.0MHz)

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	4.5	6	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	5.5	8	pF
C <sub>I/O</sub>	I/O Port Capacitance	V <sub>IN</sub> = 0V	6.5	8	pF

**NOTE:**

1. As applicable to the device type.

### DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: T<sub>A</sub> = -40°C to +85°C

Symbol	Parameter	Test Conditions		Min.	Typ. <sup>(1)</sup>	Max.	Unit
V <sub>IH</sub>	Input HIGH Voltage Level	V <sub>CC</sub> = 2.3V to 2.7V		1.7	—	—	V
		V <sub>CC</sub> = 2.7V to 3.6V		2	—	—	
V <sub>IL</sub>	Input LOW Voltage Level	V <sub>CC</sub> = 2.3V to 2.7V		—	—	0.7	V
		V <sub>CC</sub> = 2.7V to 3.6V		—	—	0.8	
I <sub>IH</sub> I <sub>IL</sub>	Input Leakage Current	V <sub>CC</sub> = 3.6V	V <sub>I</sub> = 0 to 5.5V	—	—	±5	μA
I <sub>OZH</sub> I <sub>OZL</sub>	High Impedance Output Current (3-State Output pins)	V <sub>CC</sub> = 3.6V	V <sub>O</sub> = 0 to 5.5V	—	—	±10	μA
I <sub>OFF</sub>	Input/Output Power Off Leakage	V <sub>CC</sub> = 0V, V <sub>IN</sub> or V <sub>O</sub> ≤ 5.5V		—	—	±50	μA
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>CC</sub> = 2.3V, I <sub>IN</sub> = -18mA		—	-0.7	-1.2	V
V <sub>H</sub>	Input Hysteresis	V <sub>CC</sub> = 3.3V		—	100	—	mV
I <sub>CC1</sub> I <sub>CC2</sub> I <sub>CC3</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = 3.6V, V <sub>IN</sub> = GND or V <sub>CC</sub>		—	—	10	μA
ΔI <sub>CC</sub>	Quiescent Power Supply Current Variation	One input at V <sub>CC</sub> - 0.6V, other inputs at V <sub>CC</sub> or GND		—	—	500	μA

**NOTE:**

1. Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient.

## OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Max.	Unit
VOH	Output HIGH Voltage	VCC = 2.3V to 3.6V	IOH = - 0.1mA	VCC - 0.2	—	V
		VCC = 2.3V	IOH = - 6mA	2	—	
		VCC = 2.3V	IOH = - 12mA	1.7	—	
		VCC = 2.7V		2.2	—	
		VCC = 3V		2.4	—	
		VCC = 3V	IOH = - 24mA	2.2	—	
VOL	Output LOW Voltage	VCC = 2.3V to 3.6V	IOL = 0.1mA	—	0.2	V
		VCC = 2.3V	IOL = 6mA	—	0.4	
			IOL = 12mA	—	0.7	
		VCC = 2.7V	IOL = 12mA	—	0.4	
		VCC = 3V	IOL = 24mA	—	0.55	

**NOTE:**  
1. VIH and VIL must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate VCC range. TA = - 40°C to + 85°C.

## OPERATING CHARACTERISTICS, TA = 25°C

Symbol	Parameter	Test Conditions	VCC = 2.5V ± 0.2V	VCC = 3.3V ± 0.3V	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance per Gate	CL = 0pF, f = 10Mhz	—	10	pF

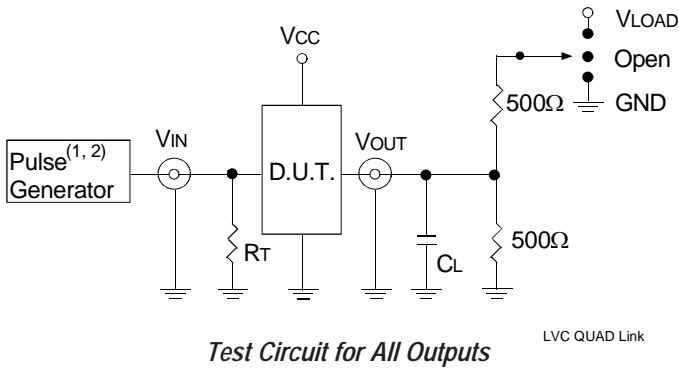
## SWITCHING CHARACTERISTICS<sup>(1)</sup>

Symbol	Parameter	VCC = 2.7V		VCC = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	
tPLH	Propagation Delay xA or xB to xY	—	4.8	1	4.1	ns
tPHL						
tSK(0)	Output Skew <sup>(2)</sup>	—	—	—	1	ns

**NOTES:**  
1. See TEST CIRCUITS AND WAVEFORMS. TA = - 40°C to + 85°C.  
2. Skew between any two outputs of the same package and switching in the same direction.

TEST CIRCUITS AND WAVEFORMS  
TEST CONDITIONS

Symbol	V <sub>CC</sub> <sup>(1)</sup> = 2.5V ± 0.2V	V <sub>CC</sub> <sup>(2)</sup> = 3.3V ± 0.3V & 2.7V	Unit
V <sub>LOAD</sub>	2 x V <sub>CC</sub>	6	V
V <sub>IH</sub>	V <sub>CC</sub>	2.7	V
V <sub>T</sub>	V <sub>CC</sub> / 2	1.5	V
V <sub>LZ</sub>	150	300	mV
V <sub>HZ</sub>	150	300	mV
C <sub>L</sub>	30	50	pF



Test Circuit for All Outputs

DEFINITIONS:

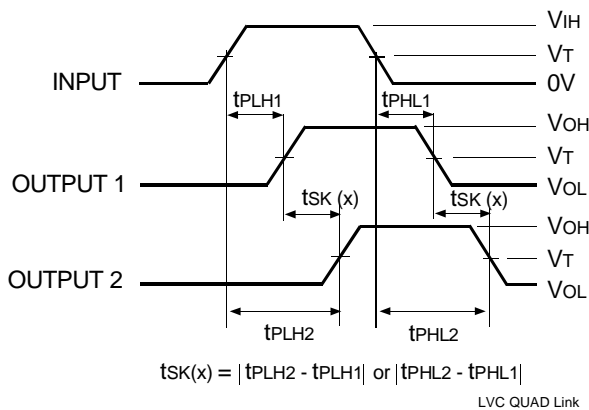
C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.  
R<sub>T</sub> = Termination resistance: should be equal to Z<sub>out</sub> of the Pulse Generator.

NOTES:

1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>r</sub> ≤ 2ns; t<sub>r</sub> ≤ 2ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>r</sub> ≤ 2.5ns; t<sub>r</sub> ≤ 2.5ns.

SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	V <sub>LOAD</sub>
Disable High Enable High	GND
All Other Tests	Open

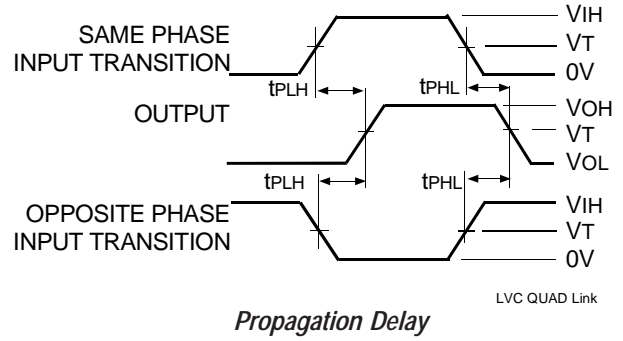


$$tsk(x) = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

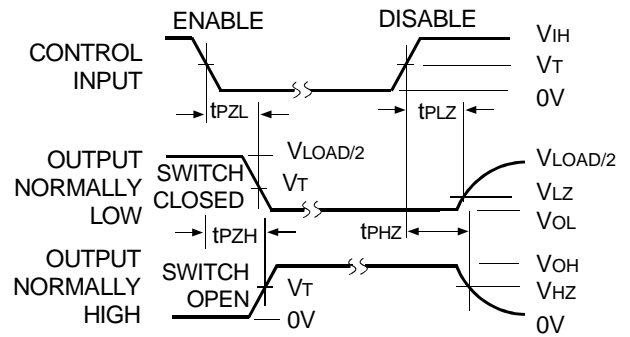
Output Skew - tsk(x)

NOTES:

1. For tsk(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For tsk(b) OUTPUT1 and OUTPUT2 are in the same bank.



Propagation Delay

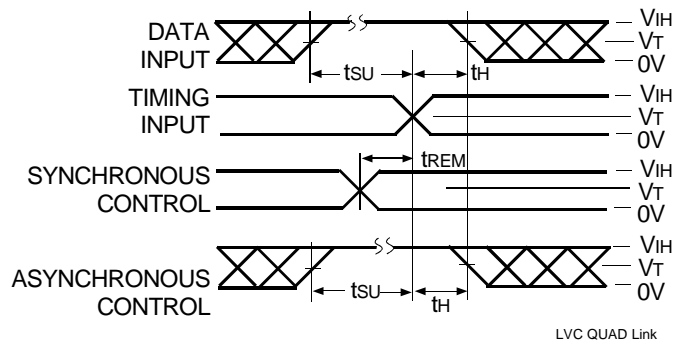


LVC QUAD Link

NOTE:

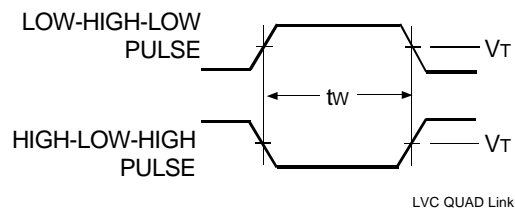
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

Enable and Disable Times



LVC QUAD Link

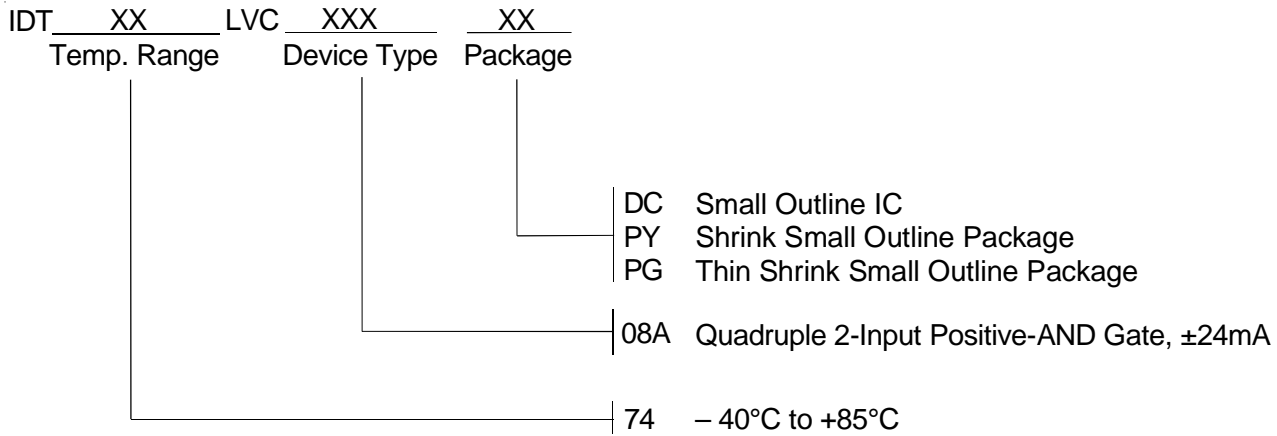
Set-up, Hold, and Release Times



LVC QUAD Link

Pulse Width

## ORDERING INFORMATION



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