



Integrated Device Technology, Inc.

3.3V CMOS SINGLE INVERTER GATE WITH 5 VOLT TOLERANT I/O

IDT74LVC1GU04A ADVANCE INFORMATION

FEATURES:

- 0.5 MICRON CMOS Technology
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- 0.65mm pitch PSOP package
- Extended commercial range of -40°C to +85°C
- V_{CC} = 3.3V ±0.3V, Normal Range
- V_{CC} = 1.65V to 3.6V, Extended Range
- V_{CC} = 2.5V ±0.2V
- CMOS power levels (0.4µW typ. static)
- Rail-to-Rail output swing for increased noise margin
- All inputs, outputs and I/O are 5 Volt tolerant
- Supports hot insertion

Drive Features for LVC1GU04A:

- High Output Drivers: ±24mA
- Suitable for heavy loads

DESCRIPTION:

This single inverter gate is built using advanced dual metal CMOS technology. The LVC1GU04A contains one inverter with an unbuffered output and is designed for 1.65V to 3.6V V_{CC} operation. The device performs the Boolean function $Y = \bar{A}$.

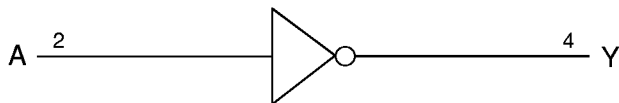
The LVC1GU04A has been designed with a ±24mA output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

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 supply system.

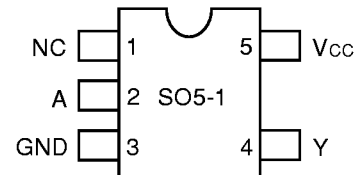
APPLICATIONS:

- 3.3V High Speed Systems
- 3.3V and lower voltage computing systems

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



PSOP
TOP VIEW

PIN DESCRIPTION

Pin Names	Description
A	Data Input
Y	Data Output
NC	No Internal Connection

FUNCTION TABLE⁽¹⁾

Input	Output
A	Y
H	L
L	H

NOTE:

1. H = HIGH Voltage Level
L = LOW Voltage Level

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ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

Symbol	Description	Max.	Unit
V _{TERM} ⁽²⁾	Terminal Voltage with Respect to GND	- 0.5 to + 6.5	V
V _{TERM} ⁽³⁾	Terminal Voltage with Respect to GND	-0.5 to +6.5	V
T _{STG}	Storage Temperature	- 65 to + 150	°C
I _{OUT}	DC Output Current	- 50 to + 50	mA
I _{IK} I _{OK}	Continuous Clamp Current, V _I < 0 or V _O < 0	- 50	mA
I _{CC} I _{SS}	Continuous Current through each V _{CC} or GND	±100	mA

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NOTES:

- 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.
- V_{CC} terminals.
- All terminals except V_{CC}.

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

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

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NOTE:

- As applicable to the device type.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: T_A = - 40°C To +85°C

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽¹⁾	Max.	Unit
V _{IH}	Input HIGH Voltage Level	V _{CC} = 1.65V to 1.95V		0.65 x V _{CC}	—	—	V
		V _{CC} = 2.3V to 2.7V		1.7	—	—	V
		V _{CC} = 2.7V to 3.6V		2	—	—	V
V _{IL}	Input LOW Voltage Level	V _{CC} = 1.65V to 1.95V		—	—	0.35 x V _{CC}	V
		V _{CC} = 2.3V to 2.7V		—	—	0.7	
		V _{CC} = 2.7V to 3.6V		—	—	0.8	
I _{IH} I _{IL}	Input Leakage Current	V _{CC} = 3.6V	V _I = 0 to 5.5V	—	—	±5	µA
I _{OZH} I _{OZL}	High Impedance Output Current (3-State Output pins)	V _{CC} = 3.6V	V _I = 0 to 5.5V	—	—	±10	µA
I _{OFF}	Input/Output Power Off Leakage	V _{CC} = 0V, V _{IN} or V _O ≤ 5.5V		—	—	±50	µA
V _{IK}	Clamp Diode Voltage	V _{CC} = 2.3V, I _{IN} = - 18mA		—	- 0.7	- 1.2	V
V _H	Input Hysteresis	V _{CC} = 3.3V		—	100	—	mV
I _{CC1} I _{CC2} I _{CC3}	Quiescent Power Supply Current	V _{CC} = 3.6V	V _{IN} = GND or V _{CC}	—	—	10	µA
			3.6 ≤ V _{IN} ≤ 5.5V ⁽²⁾	—	—	10	
ΔI _{CC}	Quiescent Power Supply Current Variation	One input at V _{CC} - 0.6V, other inputs at V _{CC} or GND		—	—	500	µA

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NOTE:

- Typical values are at V_{CC} = 3.3V, +25°C ambient.
- This applies to 3-state outputs in the disabled state only.

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Max.	Unit
		V _{CC}	I _{OH}			
V _{OH}	Output HIGH Voltage	V _{CC} = 1.65V to 3.6V	I _{OH} = -0.1mA	V _{CC} - 0.2	—	V
		V _{CC} = 1.65V	I _{OH} = -4mA	1.2	—	
		V _{CC} = 2.3V	I _{OH} = -8mA	1.7	—	
		V _{CC} = 2.7V	I _{OH} = -12mA	2.2	—	
		V _{CC} = 3.0V		2.4	—	
		V _{CC} = 3.0V	I _{OH} = -24mA	2.2	—	
V _{OL}	Output LOW Voltage	V _{CC} = 1.65V to 3.6V	I _{OL} = 0.1mA	—	0.2	V
		V _{CC} = 1.65V	I _{OL} = 4mA	—	0.45	
		V _{CC} = 2.3V	I _{OL} = 8mA	—	0.7	
		V _{CC} = 2.7V	I _{OL} = 12mA	—	0.4	
		V _{CC} = 3.0V	I _{OL} = 24mA	—	0.55	
		V _{CC} = 3.0V		—	0.55	

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NOTE:

- V_{IH} and V_{IL} must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V_{CC} range. T_A = -40°C to +85°C.

OPERATING CHARACTERISTICS, T_A = 25°C

Symbol	Parameter	Test Conditions	V _{CC} = 1.8V ± 0.15V	V _{CC} = 2.5V ± 0.2V	V _{CC} = 3.3V ± 0.3V	Unit
			Typical	Typical	Typical	
CPD	Power Dissipation Capacitance	C _L = 0pF, f = 10Mhz				pF

SWITCHING CHARACTERISTICS⁽¹⁾

Symbol	Parameter	V _{CC} = 1.8V ± 0.15V		V _{CC} = 2.5V ± 0.2V		V _{CC} = 2.7V		V _{CC} = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
t _{PLH}	Propagation Delay A to Y									ns
t _{PHL}										

NOTE:

- See test circuits and waveforms. T_A = -40°C to +85°C.

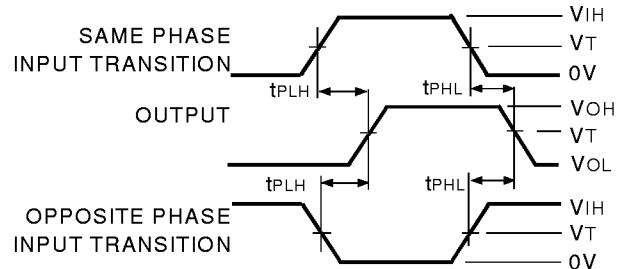
TEST CIRCUITS AND WAVEFORMS:

TEST CONDITIONS

Symbol	Vcc ⁽¹⁾ = 3.3V±0.3V	Vcc ⁽¹⁾ = 2.7V	Vcc ⁽²⁾ = 2.5V±0.2V	Unit
V _{LOAD}	6	6	2 x V _{cc}	V
V _{IH}	2.7	2.7	V _{cc}	V
V _T	1.5	1.5	V _{cc} / 2	V
V _{LZ}	300	300	150	mV
V _{HZ}	300	300	150	mV
CL	50	50	30	pF

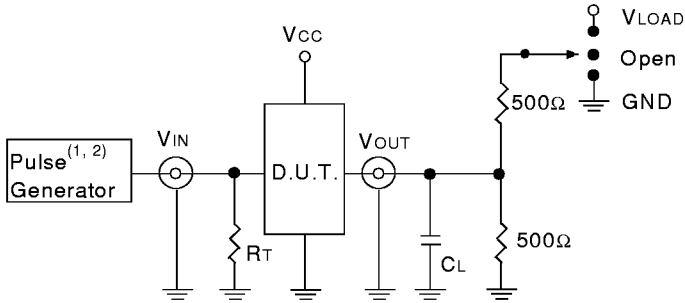
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PROPAGATION DELAY



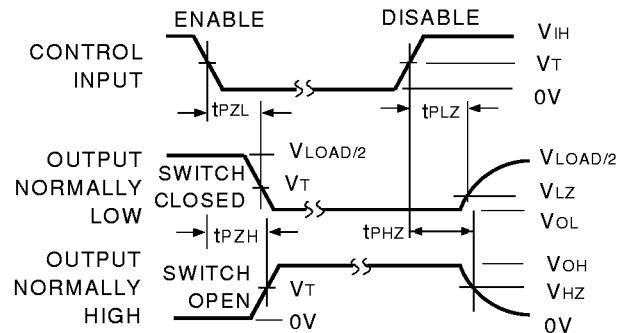
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TEST CIRCUITS FOR ALL OUTPUTS



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ENABLE AND DISABLE TIMES



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DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

NOTE:

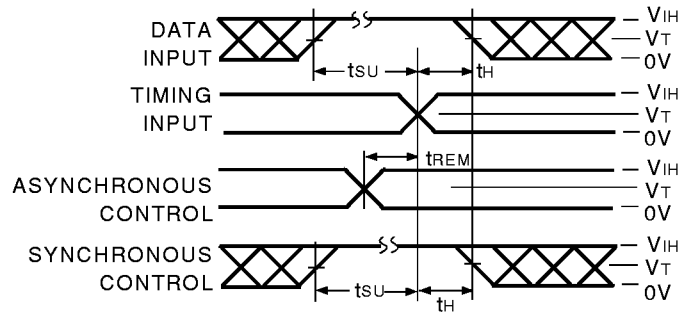
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SWITCH POSITION:

Test	Switch
Open Drain Disable Low Enable Low	V _{LOAD}
Disable High Enable High	GND
All Other tests	Open

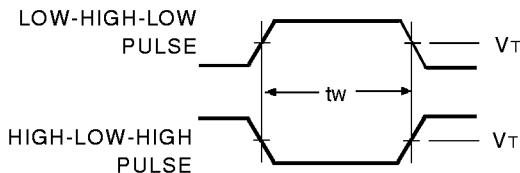
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SET-UP, HOLD AND RELEASE TIMES



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PULSE WIDTH



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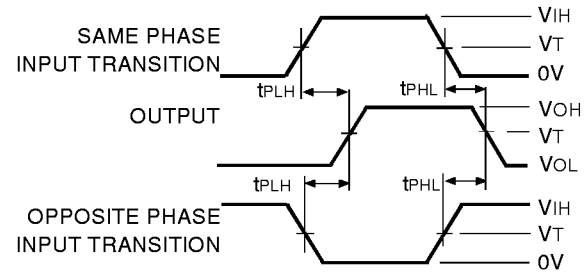
1.8V ± 0.15V TEST CIRCUITS AND WAVEFORMS:

TEST CONDITIONS

Symbol	V _{CC} ⁽¹⁾ = 1.8V ± 0.15V	Unit
V _{LOAD}	2 x V _{CC}	V
V _{IH}	V _{CC}	V
V _T	V _{CC} / 2	V
V _{LZ}	150	mV
V _{HZ}	150	mV
C _L	30	pF

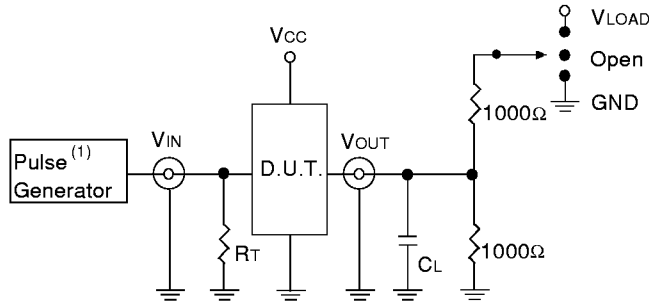
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PROPAGATION DELAY



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TEST CIRCUITS FOR ALL OUTPUTS



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DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTE:

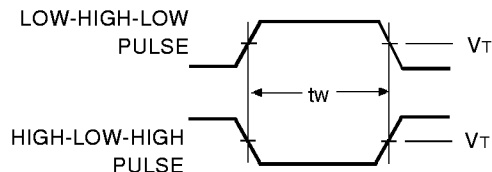
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_r ≤ 2ns; t_r ≤ 2ns.

SWITCH POSITION:

Test	Switch
Open Drain Disable Low Enable Low	V _{LOAD}
Disable High Enable High	GND
All Other tests	Open

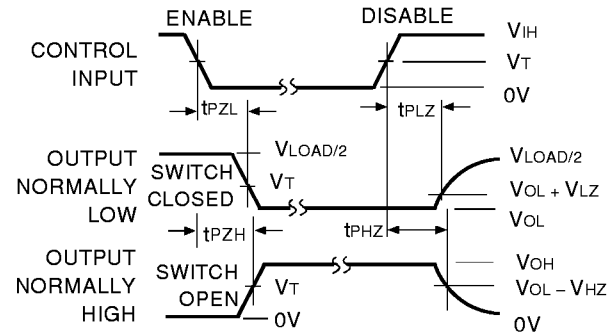
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PULSE WIDTH



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ENABLE AND DISABLE TIMES

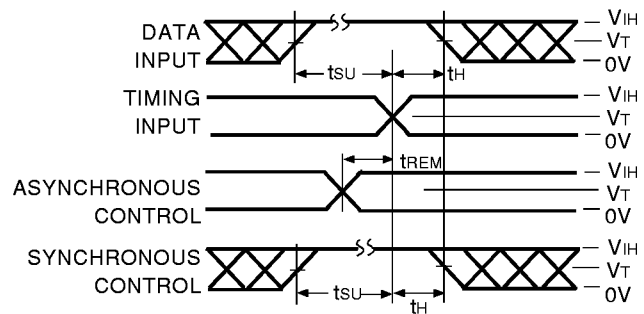


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NOTE:

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

SET-UP, HOLD AND RELEASE TIMES



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