



3.3V CMOS HEX SCHMITT-TRIGGER INVERTER WITH 5 VOLT TOLERANT I/O

IDT74LVC14A

FEATURES:

- 0.5 MICRON CMOS Technology
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- 1.27mm pitch SOIC, 0.65mm pitch SSOP and 0.65mm pitch TSSOP packages
- Extended commercial range of - 40°C to +85°C
- Vcc = 3.3V ±0.3V, Normal Range
- Vcc = 2.3V to 3.6V, Extended Range
- 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 LVC14A:

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

DESCRIPTION:

The LVC14A Hex Schmitt-trigger inverter is built using advanced dual metal CMOS technology. This device contains six independent inverters and performs the Boolean function $Y = \bar{A}$.

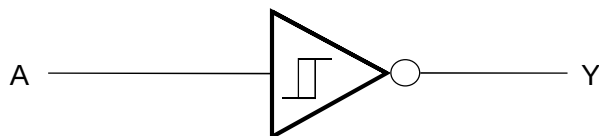
Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in a mixed 3.3V/5V supply system.

The LVC14A has been designed with a ±24mA output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

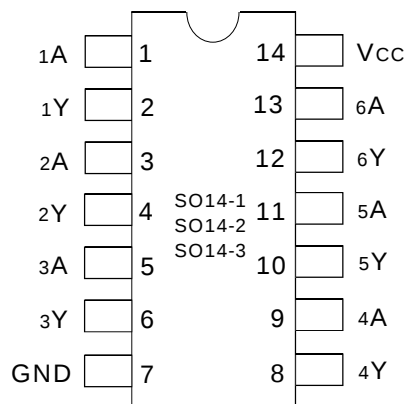
APPLICATIONS:

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

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SOIC/ SSOP/ TSSOP
TOP VIEW

FUNCTION TABLE (each inverter) ⁽¹⁾

Inputs	Outputs
xA	xY
H	L
L	H

NOTE:

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

PIN DESCRIPTION

Pin Names	Description
xA	Inputs
xY	Outputs

ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

Symbol	Description	Max.	Unit
V _{TERM}	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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NOTE:

- 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_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
I _{IH} I _{IL}	Input Leakage Current	V _{CC} = 3.6V	V _I = 0 to 5.5V	—	—	±5	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
I _{CC} I _{CH}	Quiescent Power Supply Current	V _{CC} = 3.6V	V _{IN} = GND or V _{CC}	—	—	10	μA
ΔI _{CC}	Quiescent Power Supply Current Variation	One input at V _{CC} – 0.6V other inputs at V _{CC} or GND		—	—	500	μA

NOTE:

- Typical values are at V_{CC} = 3.3V, +25°C ambient.

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		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 = 3.0V		2.4	—	
		VCC = 3.0V	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 = 3.0V	IOL = 24mA	—	0.55	

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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.

HYSTERESIS CHARACTERISTICS

Parameter	Test Conditions	VCC	Min.	Typ.	Max.	Unit
VT+ Positive-going threshold	Input Voltage, from VIL to VIH, in a linear ramp observing the output transition.	2.7V 3V 3.6V	0.8 0.8 0.8		2 2 2	V
VT- Negative-going threshold	Input Voltage, from VIH to VIL, in a linear ramp observing the output transition.	2.7V 3V 3.6V	0.4 0.6 0.8		1.4 1.5 1.8	V
ΔVT Hysteresis (VT+ - VT-)	ΔVT min = VT+ min - VT- max ΔVT max = VT+ max - VT- min	2.7V 3V 3.6V	0.3 0.3 0.3		1.1 1.2 1.2	V

OPERATING CHARACTERISTICS, VCC = 3.3V ± 0.3V, TA = 25°C

Symbol	Parameter	Test Conditions	Typical	Unit
CPD	Power Dissipation Capacitance per inverter	CL = 0pF, f = 10Mhz	7	pF

SWITCHING CHARACTERISTICS ⁽¹⁾

Symbol	Parameter	VCC = 2.5V±0.2V		VCC = 2.7V		VCC = 3.3V±0.3V		Unit
		Min	Max	Min	Max	Min	Max	
tPLH tPHL	Propagation Delay xA to xY	—	—	—	7.5	1	6.4	ns
tsk(0)	Output Skew ⁽²⁾	—	—	—	—	—	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.

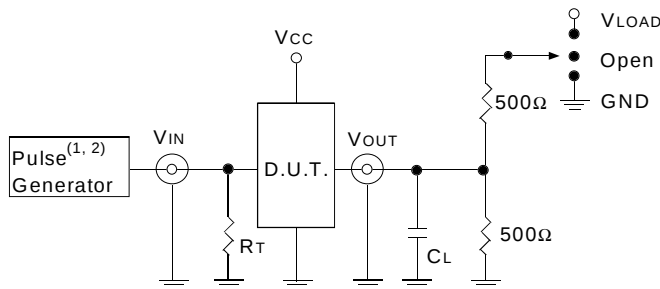
TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

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

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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.

NOTES:

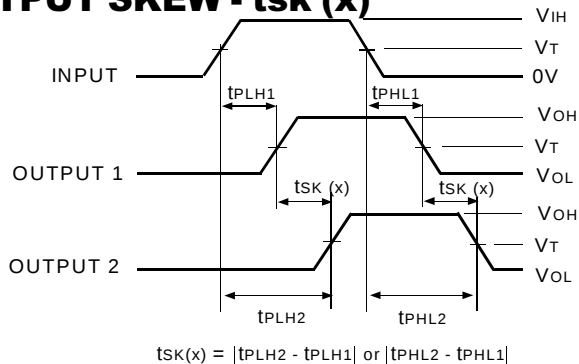
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.

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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OUTPUT SKEW - t_{SK}(x)



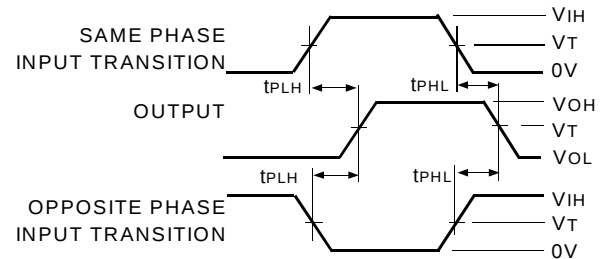
$$t_{SK}(x) = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

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NOTES:

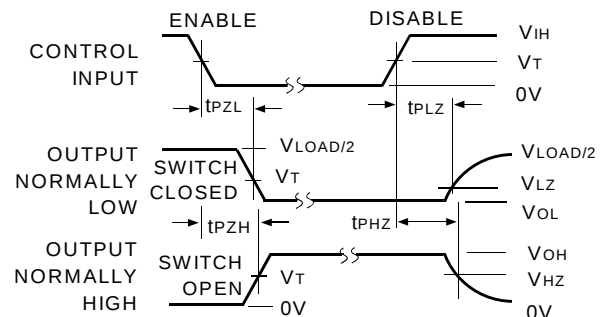
1. For t_{SK}(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



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ENABLE AND DISABLE TIMES

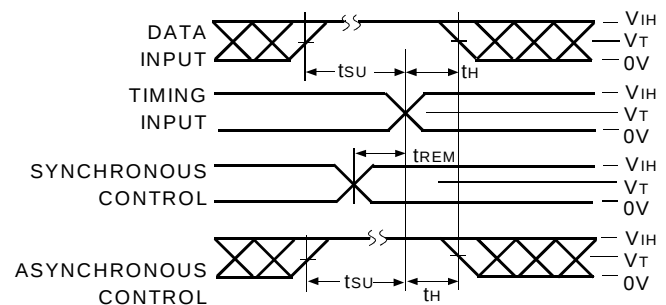


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NOTE:

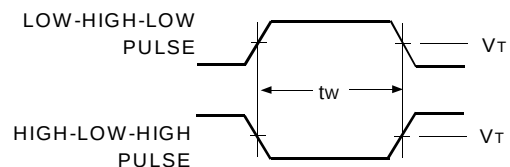
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SET-UP, HOLD, AND RELEASE TIMES



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PULSE WIDTH



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ORDERING INFORMATION

IDT	XX	LVC	XXX	XX	
Temp. Range			Device Type	Package	
				DC	Small Outline IC (SO14-1)
				PY	Shrink Small Outline Package (SO14-2)
				PG	Thin Shrink Small Outline Package (SO14-3)
			14A		Hex Schmitt-Trigger Inverter with 5 Volt Tolerant I/O, $\pm 24\text{mA}$
				74	-40°C to $+85^{\circ}\text{C}$



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