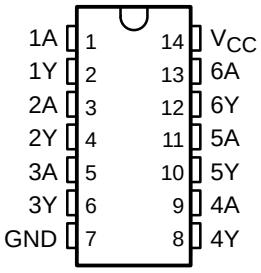
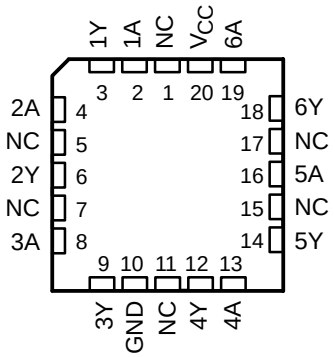
- **Typical V_{OLP} (Output Ground Bounce) <0.8 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Typical V_{OHV} (Output V_{OH} Undershoot) >2 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Inputs Accept Voltages to 5.5 V**
- **Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II**
- **ESD Protection Exceeds JESD 22**
  - **2000-V Human-Body Model (A114-A)**
  - **200-V Machine Model (A115-A)**
  - **1000-V Charged-Device Model (C101)**

SN54LVC14A . . . J OR W PACKAGE
SN74LVC14A . . . D, DB, DGV, NS, OR PW PACKAGE
(TOP VIEW)



SN54LVC14 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

The SN54LVC14A hex Schmitt-trigger inverter is designed for 2.7-V to 3.6-V V_{CC} operation, and the SN74LVC14A hex Schmitt-trigger inverter is designed for 1.65-V to 3.6-V V_{CC} operation.

The devices contain six independent inverters, and perform the Boolean function $Y = \overline{A}$.

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

ORDERING INFORMATION

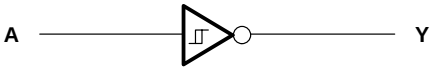
T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – D	Tube	SN74LVC14AD	LVC14A
		Tape and reel	SN74LVC14ADR	
	SOP – NS	Tape and reel	SN74LVC14ANSR	LVC14A
	SSOP – DB	Tape and reel	SN74LVC14ADBR	LC14A
	TSSOP – PW	Tape and reel	SN74LVC14APWR	LC14A
	TVSOP – DGV	Tape and reel	SN74LVC14ADGVR	LC14A
–55°C to 125°C	CDIP – J	Tube	SNJ54LVC14AJ	SNJ54LVC14AJ
	CFP – W	Tube	SNJ54LVC14AW	SNJ54LVC14AW
	LCCC – FK	Tube	SNJ54LVC14AFK	SNJ54LVC14AFK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

logic diagram, each inverter (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC} . . . . . –0.5 V to 6.5 V
Input voltage range, V_I (see Note 1) . . . . . –0.5 V to 6.5 V
Output voltage range, V_O (see Notes 1 and 2) . . . . . –0.5 V to V_{CC} + 0.5 V
Input clamp current, I_{IK} (V_I < 0) . . . . . –50 mA
Output clamp current, I_{OK} (V_O < 0) . . . . . –50 mA
Continuous output current, I_O . . . . . ±50 mA
Continuous current through V_{CC} or GND . . . . . ±100 mA
Package thermal impedance, θ_{JA} (see Note 3): D package . . . . . 86°C/W
DB package . . . . . 96°C/W
DGV package . . . . . 127°C/W
NS package . . . . . 76°C/W
PW package . . . . . 113°C/W
Storage temperature range, T_{stg} . . . . . –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The value of V_{CC} is provided in the recommended operating conditions table.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 4)

			SN54LVC14A		SN74LVC14A		UNIT
			MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	Operating	2	3.6	1.65	3.6	V
		Data retention only	1.5		1.5		
V_I	Input voltage		0	5.5	0	5.5	V
V_O	Output voltage		0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 1.65 V				–4	mA
		V_{CC} = 2.3 V				–8	
		V_{CC} = 2.7 V		–12		–12	
		V_{CC} = 3 V		–24		–24	
I_{OL}	Low-level output current	V_{CC} = 1.65 V				4	mA
		V_{CC} = 2.3 V				8	
		V_{CC} = 2.7 V		12		12	
		V_{CC} = 3 V		24		24	
T_A	Operating free-air temperature		–55	125	–40	85	°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V_{CC}	SN54LVC14A			SN74LVC14A			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{T+} Positive-going threshold		2.7 V	0.8		2	0.8		2	V
		3 V	0.8		2	0.8		2	
		3.6 V	0.8		2	0.8		2	
V_{T-} Negative-going threshold		2.7 V	0.4		1.4	0.4		1.4	V
		3 V	0.6		1.5	0.6		1.5	
		3.6 V	0.8		1.8	0.8		1.8	
ΔV_T Hysteresis ($V_{T+} - V_{T-}$)		2.7 V	0.3		1.1	0.3		1.1	V
		3 V	0.3		1.2	0.3		1.2	
		3.6 V	0.3		1.2	0.3		1.2	
V_{OH}	I_{OH} = –100 μA	1.65 V to 3.6 V				V_{CC}–0.2			V
		2.7 V to 3.6 V	V_{CC}–0.2						
	I_{OH} = –4 mA	1.65 V				1.2			
	I_{OH} = –8 mA	2.3 V				1.7			
	I_{OH} = –12 mA	2.7 V	2.2			2.2			
		3 V	2.4			2.4			
	I_{OH} = –24 mA	3 V	2.2			2.2			
V_{OL}	I_{OL} = 100 μA	1.65 V to 3.6 V						0.2	V
		2.7 V to 3.6 V			0.2				
	I_{OL} = 4 mA	1.65 V						0.45	
	I_{OL} = 8 mA	2.3 V						0.7	
	I_{OL} = 12 mA	2.7 V			0.4			0.4	
	I_{OL} = 24 mA	3 V			0.55			0.55	
I_I	V_I = 5.5 V or GND	3.6 V			±5			±5	μA
I_{CC}	$V_I = V_{CC}$ or GND, I_O = 0	3.6 V			10			10	μA
ΔI_{CC}	One input at V_{CC} – 0.6 V, Other inputs at V_{CC} or GND	2.7 V to 3.6 V			500			500	μA
C_i	$V_I = V_{CC}$ or GND	3.3 V		5			5		pF

† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVC14A				UNIT
			V_{CC} = 2.7 V		V_{CC} = 3.3 V ± 0.3 V		
			MIN	MAX	MIN	MAX	
t_{pd}	A	Y		7.5	1	6.4	ns

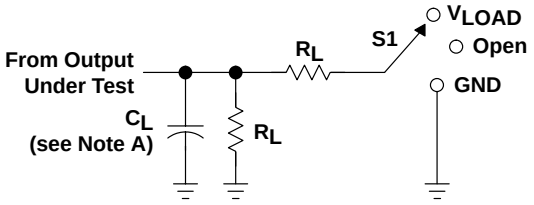
switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74LVC14A						UNIT
			V_{CC} = 1.8 V	V_{CC} = 2.5 V ± 0.2 V		V_{CC} = 2.7 V		V_{CC} = 3.3 V ± 0.3 V		
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	13.7		7.8		7.5	1	6.4	ns
$t_{sk(o)}$									1	ns

operating characteristics, T_A = 25°C

PARAMETER		TEST CONDITIONS	V_{CC} = 1.8 V	V_{CC} = 2.5 V	V_{CC} = 3.3 V	UNIT
			TYP	TYP	TYP	
C_{pd}	Power dissipation capacitance per inverter	f = 10 MHz	11	12	15	pF

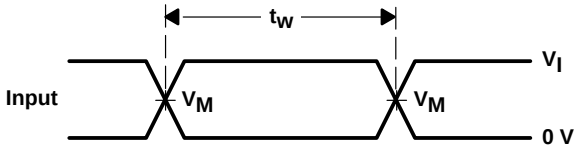
PARAMETER MEASUREMENT INFORMATION



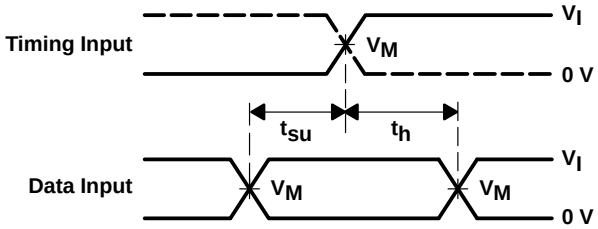
LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

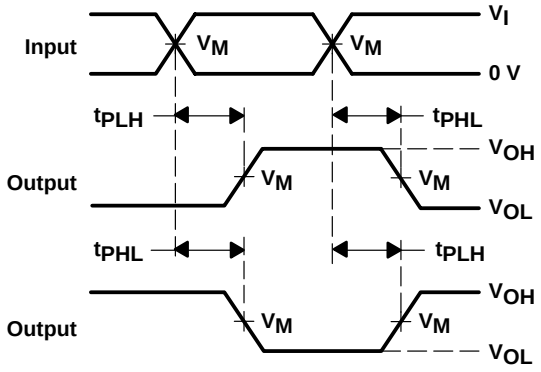
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	t_r/t_f					
1.8 V ± 0.15 V	V_{CC}	≤2 ns	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 kΩ	0.15 V
2.5 V ± 0.2 V	V_{CC}	≤2 ns	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
2.7 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
3.3 V ± 0.3 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V



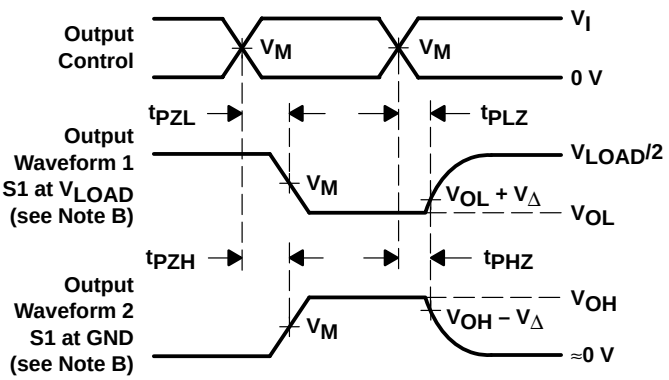
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω.
D. The outputs are measured one at a time with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
G. t_{PLH} and t_{PHL} are the same as t_{pd}.
H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

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