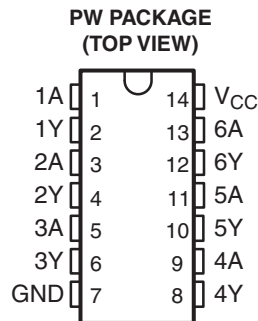


HEX SCHMITT-TRIGGER INVERTER

Check for Samples: [SN74AC14-Q1](#)

FEATURES

- Qualified for Automotive Applications
- 2-V to 6-V V_{CC} Operation
- Inputs Accept Voltages to 6 V



DESCRIPTION

This Schmitt-trigger device contains six independent inverters. They perform the Boolean function $Y = \overline{A}$. Because of the Schmitt action, they have different input threshold levels for positive-going (V_{T+}) and for negative-going (V_{T-}) signals.

These circuits are temperature compensated and can be triggered from the slowest of input ramps and still give clean, jitter-free output signals. They also have a greater noise margin than conventional inverters.

ORDERING INFORMATION

T_A	PACKAGE		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 125°C	TSSOP - PW	Reel of 2000	SN74AC14QPWRQ1	AC14Q

FUNCTION TABLE (Each Inverter)

INPUT A	OUTPUT Y
H	L
L	H

LOGIC DIAGRAM Each Inverter (Positive Logic)



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted⁽¹⁾)

		VALUE	UNIT
Supply voltage range, V_{CC}		-0.5 V to 7	V
Input voltage range, V_I ⁽²⁾		-0.5 V to $V_{CC} + 0.5$	V
Output voltage range, V_O ⁽²⁾		-0.5 V to $V_{CC} + 0.5$	V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)		± 20	mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)		± 20	mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})		± 50	mA
Continuous current through V_{CC} or GND		± 200	mA
Package thermal impedance, θ_{JA} ⁽³⁾	PW package	113	$^{\circ}\text{C}/\text{W}$
Storage temperature range, T_{stg}		-65 to 150	$^{\circ}\text{C}$

- (1) 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.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMEND OPERATING CONDITIONS⁽¹⁾

		MIN	MAX	UNIT
V_{CC}	Supply voltage	2	6	V
V_I	Input voltage	0	V_{CC}	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 3\text{ V}$	-12	mA
		$V_{CC} = 4.5\text{ V}$	-24	
		$V_{CC} = 5.5\text{ V}$	-24	
I_{OL}	Low-level output current	$V_{CC} = 3\text{ V}$	12	mA
		$V_{CC} = 4.5\text{ V}$	24	
		$V_{CC} = 5.5\text{ V}$	24	
T_A	Operating free-air temperature	-40	125	$^{\circ}\text{C}$

- (1) 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}	$T_A = 25^{\circ}\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
V_{T+} Positive-going threshold		3 V	0.8	1.8	2.2	0.8	2.2	V
		4.5 V	1.5	2.6	3.2	1.5	3.2	
		5.5 V	1.6	3.2	3.9	1.6	3.9	
V_{T-} Negative-going threshold		3 V	0.5	0.8	1	0.5	1.2	V
		4.5 V	0.9	1.4	1.8	0.9	1.8	
		5.5 V	1.1	1.8	2.3	1.1	2.3	
ΔV_T Hysteresis ($V_{T+} - V_{T-}$)		3 V	0.3	1	1.2	0.3	1.2	V
		4.5 V	0.4	1.2	1.4	0.4	1.4	
		5.5 V	0.5	1.4	1.6	0.5	1.6	

ELECTRICAL CHARACTERISTICS (continued)

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V _{OH}	I _{OH} = -50 μA	3 V	2.9			2.9	V	
		4.5 V	4.4			4.4		
		5.5 V	5.4			5.4		
	I _{OH} = -12 mA	3 V	2.56			2.4		
		4.5 V	3.86			3.7		
		5.5 V	4.86			4.7		
V _{OL}	I _{OL} = 50 μA	3 V	0.1			0.1	V	
		4.5 V	0.1			0.1		
		5.5 V	0.1			0.1		
	I _{OL} = 12 mA	3 V	0.36			0.5		
		4.5 V	0.36			0.5		
		5.5 V	0.36			0.5		
I _I	V _I = V _{CC} or GND	5.5 V	±0.1			±1	μA	
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V	2			40	μA	
C _i	V _I = V _{CC} or GND	5 V	4.5				pF	

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see [Figure 1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t _{PLH}	A	Y	1.5	6	13.5	1.0	16	ns
t _{PHL}			1.5	6	11.5	1.0	14	

SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see [Figure 1](#))

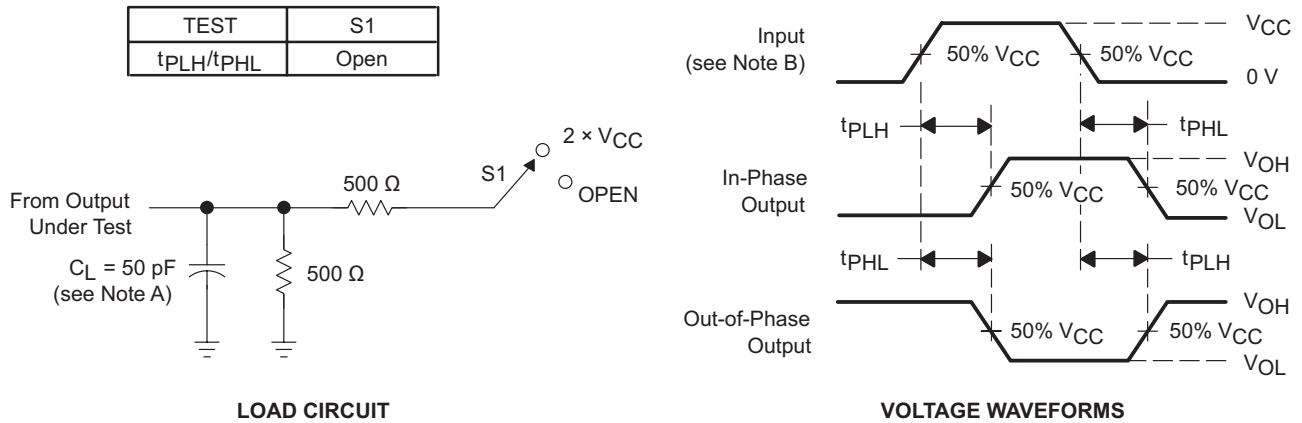
PARAMETER	FROM (INPUT)	TO (OUTPUT)	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
t _{PLH}	A	Y	1.5	5	10	1.5	12	ns
t _{PHL}			1.5	5	8.5	1.5	10	

OPERATING CHARACTERISTICS

V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance	C _L = 50 pF, f = 1 MHz	30	pF

PARAMETER MEASUREMENT INFORMATION



- A. C_L includes probe and jig capacitance.
- B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
- C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
SN74AC14QPWRQ1	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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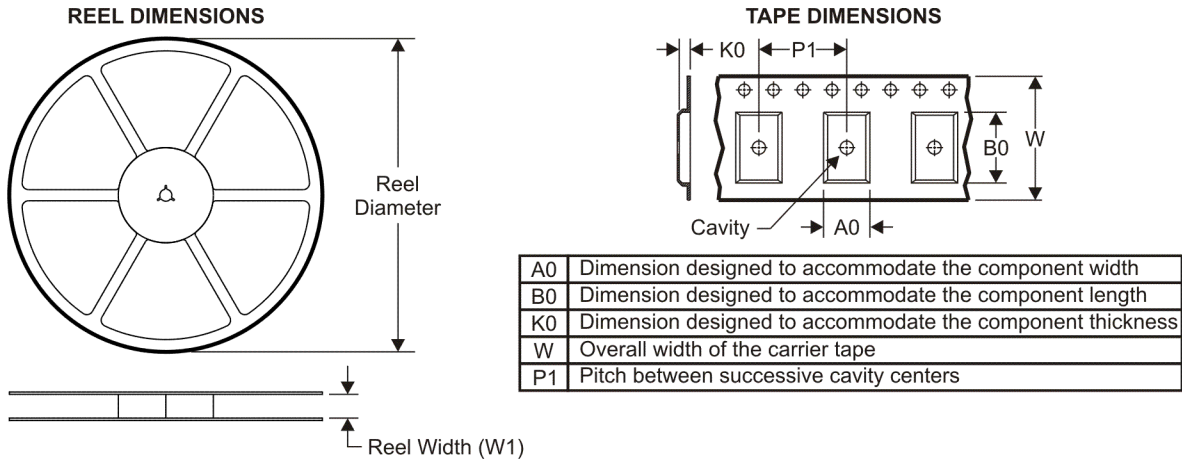
OTHER QUALIFIED VERSIONS OF SN74AC14-Q1 :

● Catalog: [SN74AC14](#)

● Military: [SN54AC14](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74AC14QPWRQ1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AC14QPWRQ1	TSSOP	PW	14	2000	346.0	346.0	29.0

PW (R-PDSO-G14)

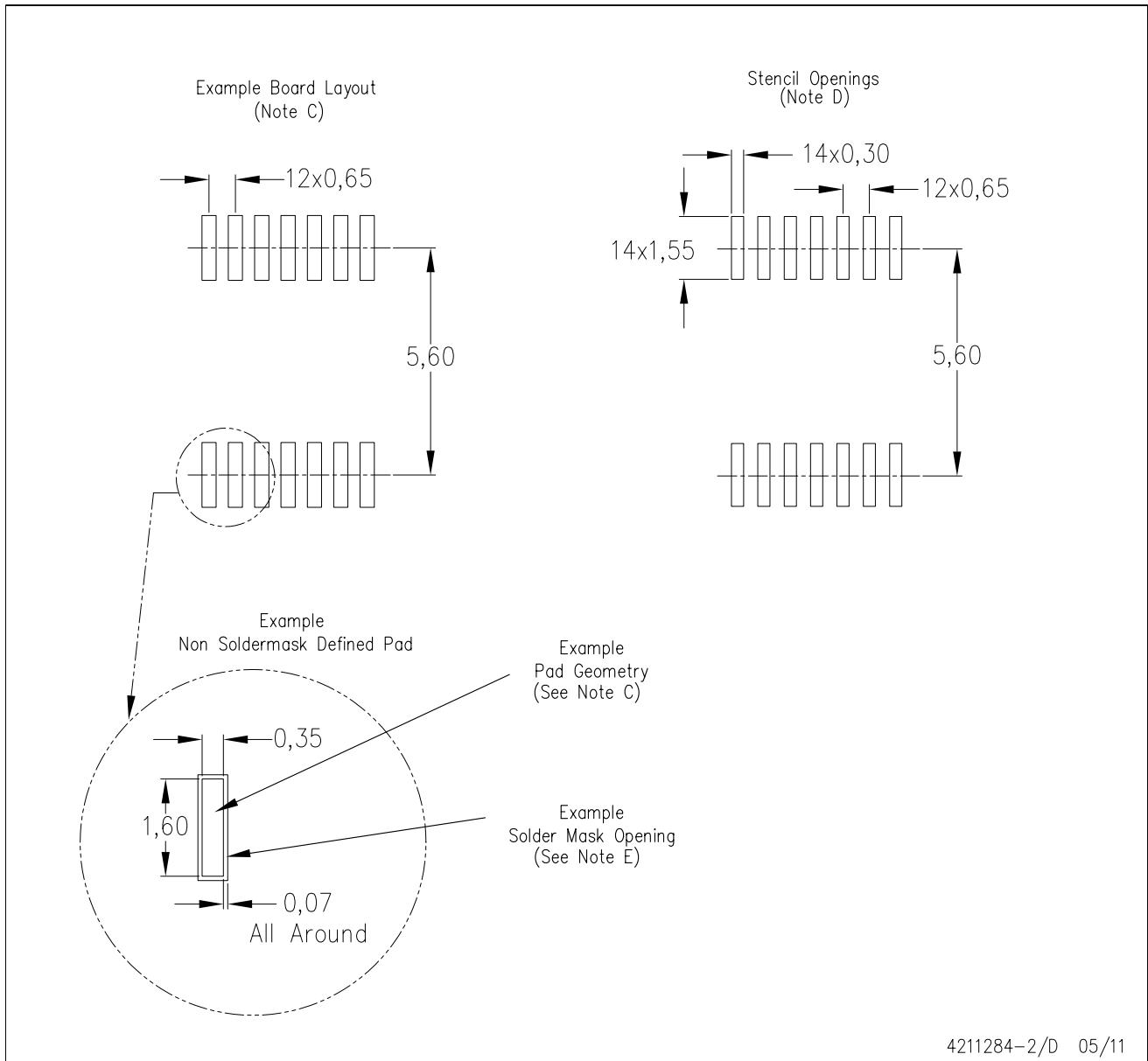
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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