Beijing Relitech Co., LTD.

RD74HC14

HEX SCHMITT INVERTER

Datasheet- production data

DIP

SOP

TSSOP

Features

- HIGH SPEED:
  t_{PD} = 12ns (TYP.) at V_{CC} = 6V
- LOW POWER DISSIPATION:
  I_{CC} = 1µA (MAX.) at T_A= 25°C
- HIGH NOISE IMMUNITY:
  V_H = 1.2V(TYP.) at V_{CC} = 6V
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}| = I_{OL}$ = 4mA (MIN.)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
  V_{CC}(OPR.) = 2V to 6V

Description

The RD74HC14 is a high speed CMOS HEX SCHMITT INVERTER fabricated with silicon gate CMOS technology. Pin configuration and functions are the same as those of the RD74HC14 but all inputs have a 20 % V_{CC} hysteresis level.

This, together with the Schmitt trigger function, allows the device to be used on line receivers with slow rise/fall input signals.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

Table 1. Device summary

PART NUMBER	PACKAGE
RD74HC14BDI	DIP14
RD74HC14BSO	SOP14
RD74HC14BTS	TSSOP14

1 Pin information

Figure 1. Pin connection and IEC logic symbols

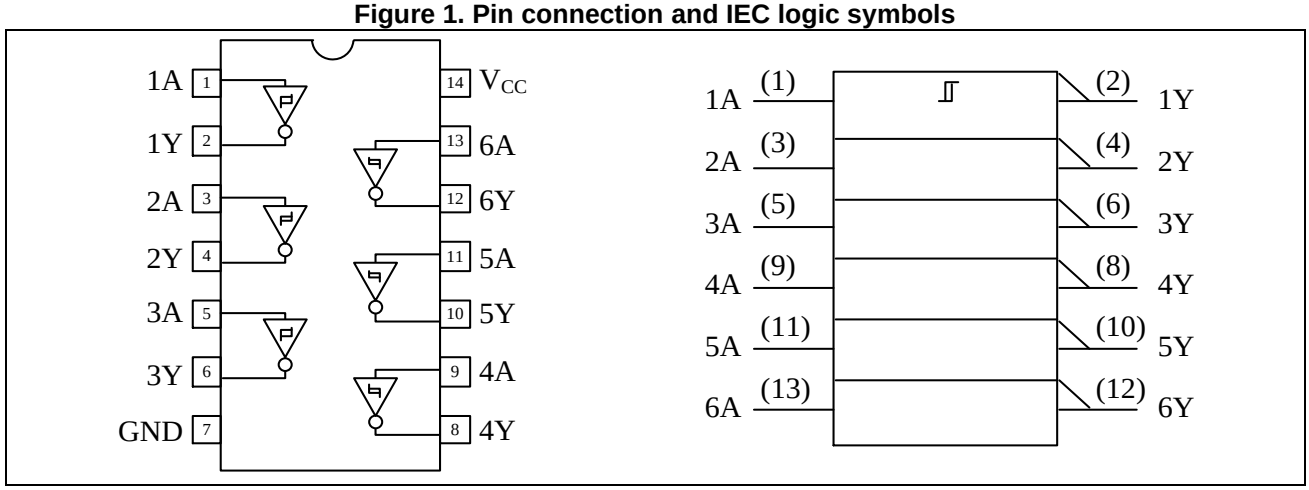


Table 2. Pin description

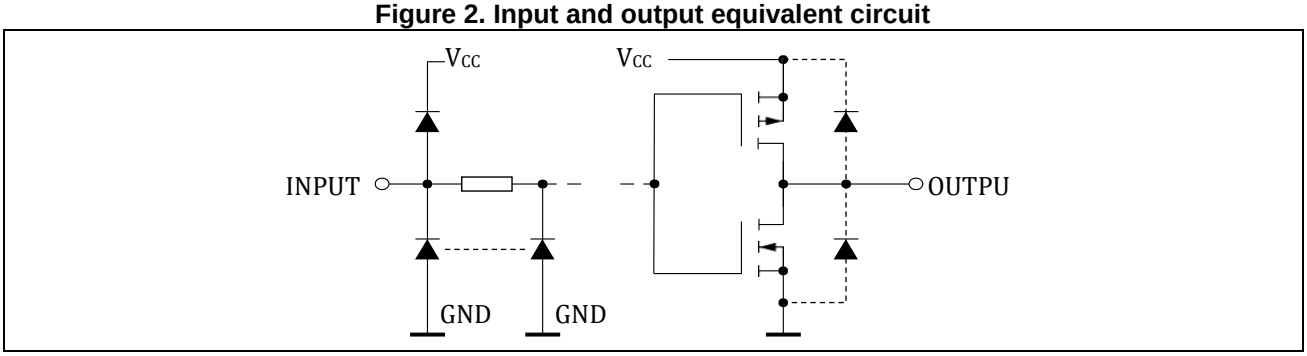
Pin number	Symbol	Name and function
1, 3, 5, 9, 11, 13	1A to 6A	Data Inputs
2, 4, 6, 8, 10, 12	1Y to 6Y	Data Outputs
7	GND	Ground (0V)
14	V_{CC}	Positive Supply Voltage

2 Functional description

Table 3. Truth table

A	Y
L	H
H	L

Figure 2. Input and output equivalent circuit



3 Electrical characteristics

Stressing the device above the ratings listed in the “Absolute maximum ratings” table may cause permanent damage to the device. These are stress ratings only, and operation of the device at these or any other conditions above those indicated in the operating sections of this specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to + 7.0	V
V_I	DC Input Voltage	-0.5 to V_{CC}+ 0.5	V
V_O	DC Output Voltage	-0.5 to V_{CC}+ 0.5	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Current	± 25	mA
I_{CC}or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	-65 to + 150	°C
T_L	Lead Temperature (10 sec)	300	°C

(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

Table 5. Recommended operating conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2 to 6	V
V_I	Input Voltage	0 to V_{CC}	V
V_O	Output Voltage	0 to V_{CC}	V
T_{oper}	Operating Temperature	-40 to +85	°C

Table 6. DC specification

Symbol	Parameter	Test Condition		Value					Unit
		V_{CC} (V)		T_A = 25 °C			-40 to 85°C		
				Min	Typ	Max	Min	Max	
V_{t+}	High-Level Input Voltage	2.0		1.0	1.28	1.5	1.0	1.5	V
		4.5		2.3	2.8	3.15	2.3	3.15	
		6.0		3.0	3.7	4.2	3.0	4.2	
V_{t-}	Low-Level Input Voltage	2.0		0.3	0.74	0.9	0.3	0.9	V
		4.5		1.13	1.8	2.0	1.13	2.0	
		6.0		1.5	2.4	2.6	1.5	2.6	
V_H	Hysteresis Voltage	2.0		0.3	0.54	1.0	0.3	1.0	V
		4.5		0.6	1.0	1.4	0.6	1.4	
		6.0		0.8	1.3	1.4	0.8	1.7	
V_{OH}	High-Level Output Voltage	2.0	I_O=-20 μA	1.9	2.0		1.9		V
		4.5	I_O=-20 μA	4.4	4.5		4.4		
		6.0	I_O=-20 μA	5.9	6.0		5.9		
		4.5	I_O=-4.0 mA	4.18	4.13		4.13		
		6.0	I_O=-5.2 mA	5.68	5.8		5.63		
V_{OL}	Low-Level Output Voltage	2.0	I_O=20 μA		0.0	0.1		0.1	V
		4.5	I_O=20 μA		0.0	0.1		0.1	
		6.0	I_O=20 μA		0.0	0.1		0.1	
		4.5	I_O=4.0 mA		0.17	0.26		0.33	
		6.0	I_O=5.2 mA		0.18	0.26		0.33	
I_I	Input Leakage Current	6.0	V_I = V_{CC}or GND			± 0.1		± 1	μA
I_{CC}	Quiescent Supply Current	6.0	V_I= V_{CC}or GND			1		10	μA

Table 7. AC electrical characteristics (C_L = 50pF, input t_r = t_f = 6ns)

Symbol	Parameter	Test Condition	Value					Unit
		V_{CC} (V)	T_A= 25°C			-40 to 85°C		
			Min	Typ	Max	Min	Max	
$t_{TLH}t_{THL}$	Output Transition Time	2.0		30	75		95	ns
		4.5		8	15		19	
		6.0		7	13		16	
$t_{PLH}t_{PHL}$	Propagation Delay Time	2.0		42	125		155	ns
		4.5		14	25		31	
		6.0		12	21		16	

Table 8. Capacitive characteristics

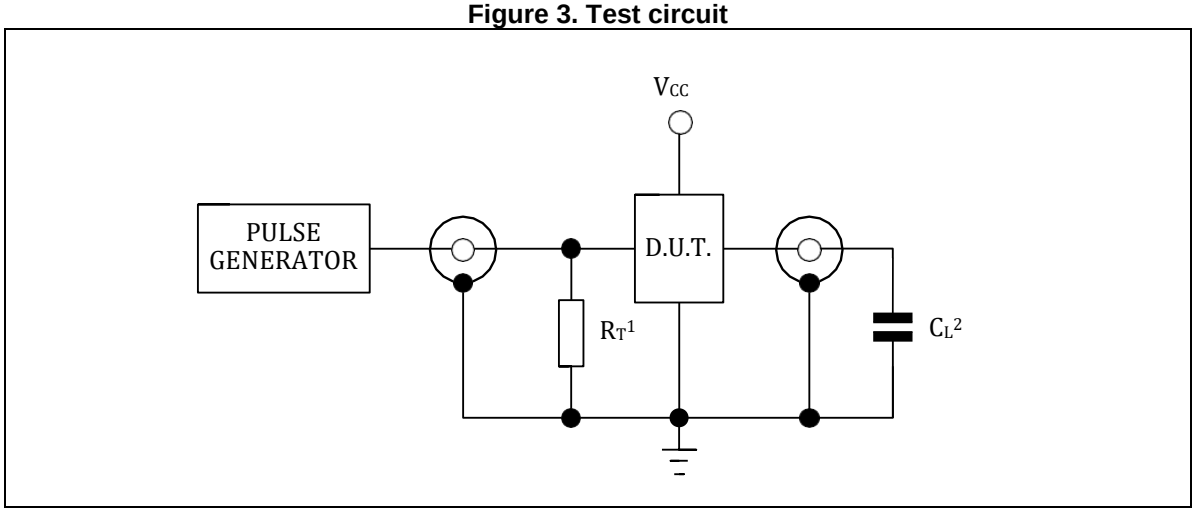
Symbol	Parameter	Test Condition		Value					Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		
				Min	Typ	Max	Min	Max	
C_{IN}	Input Capacitance	5.0			5	10		10	pF
C_{PD}	Power Dissipation Capacitance(1)	5.0	f_{IN} = 10MHz		28				pF

1. C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to test circuit). Average operating current can be obtained by the following equation:

   $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/6$ (per gate)

4 Test circuit

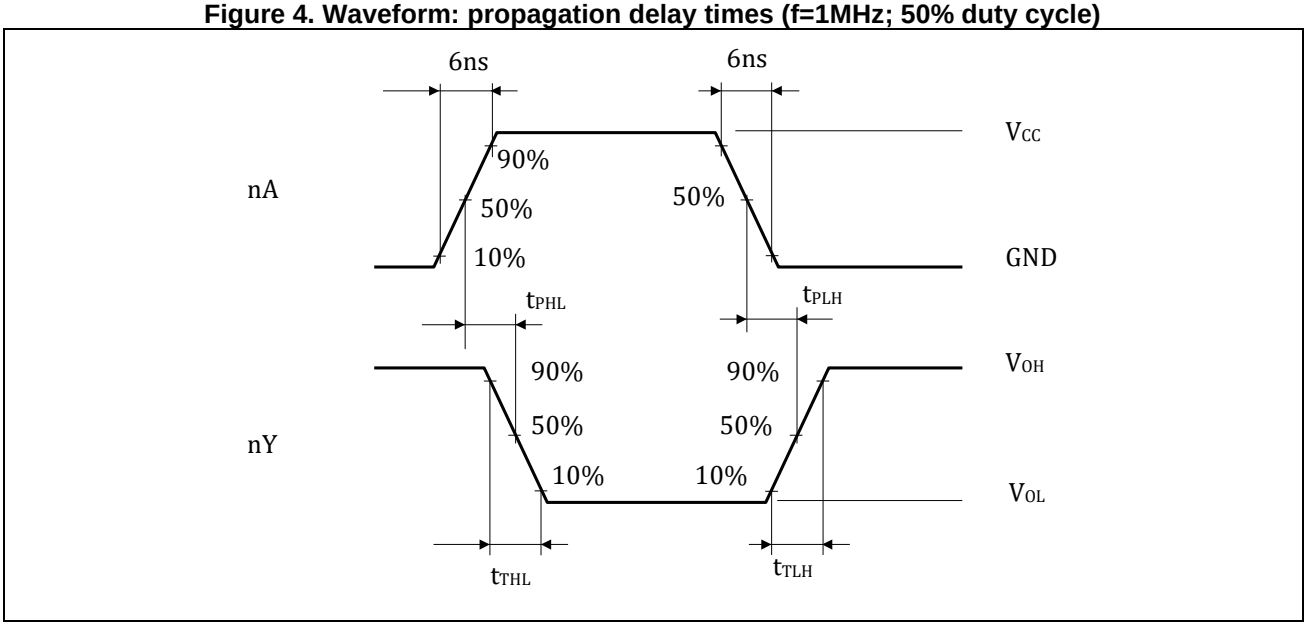
Figure 3. Test circuit



$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

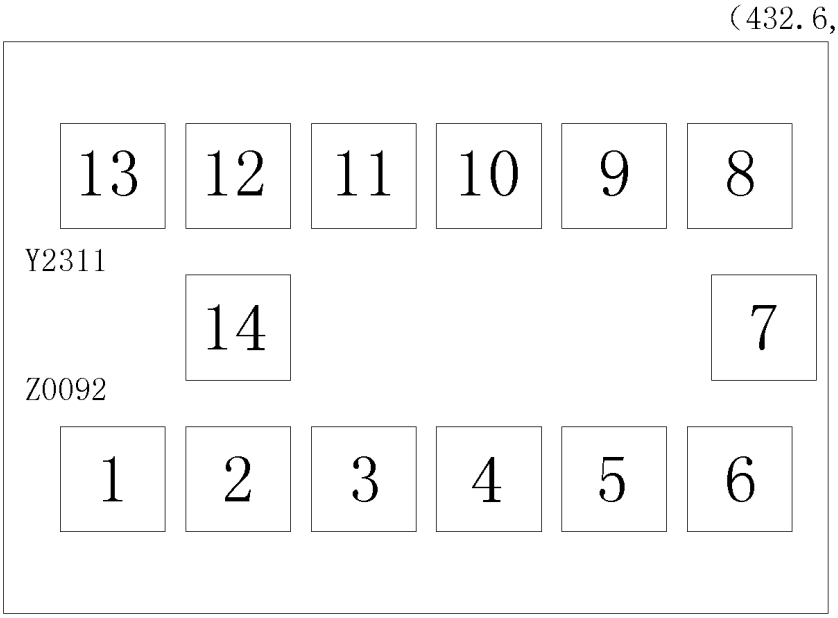
C_L = 50pF or equivalent (includes jig and probe capacitance)

Figure 4. Waveform: propagation delay times (f=1MHz; 50% duty cycle)



5 Die Information

Die Type	RD74HC14	Wafer Size	8 Inch
Die Size (μm)	X/Y:432.6/300	Bond Area (μm)	X/Y: 55/55
Scribeline (μm)	60	Chip Thickness	
Metal	Front	Al+0.5%Cu	
	Back	Si	
	Top Metal Thickness	12000Å	



Pin No.	Pin Name	Coordinate			Pin No.	Pin Name	Coordinate	
		X	Y				X	Y
1	1A	57.3	70.5		8	4Y	386.3	229.5
2	1Y	123.1	70.5		9	4A	320.5	229.5
3	2A	188.9	70.5		10	5Y	254.7	229.5
4	2Y	254.7	70.5		11	5A	188.9	229.5
5	3A	320.5	70.5		12	6Y	123.1	229.5
6	3Y	386.3	70.5		13	6A	57.3	229.5
7	GND	398.95	150.0		14	V_{CC}	123.1	150.0

6 Ordering information

Table 9. Device summary

Order code	Package	Packing
RD74HC14BDI	DIP14	Tape and reel
RD74HC14BSO	SOP14	
RD74HC14BTS	TSSOP14	
RD74HC14B		Wafer

7 Revision history

Table 10. Document revision history [1]

Date	Revision	Changes
18-Jan-2022	1	Initial release
12-Dec-2023	2	Added : Die information Revised document presentation, minor textual updates

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