



1、General Description

The 74HC14D,653 and 74HCT14D,653 are high-speed Si-gate CMOS devices and are pin compatible with lowpower Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC14D,653 and 74HCT14D,653 provide six inverting buffers with Schmitt-trigger action. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

Features:

- Applications:
 - Wave and pulse shapers
 - Astable multivibrators
 - Monostable multivibrators
- ESD protection:
 - HBM EIA/JESD22-A114-A exceeds 2000 V MM
 - EIA/JESD22-A115-A exceeds 200 V
- Specified from -40 to +85°C
- Multiple package options:DIP14/SOP14(SOIC-14)/TSSOP14

2、Block Diagram And Pin

Description 2.1、Block Diagram

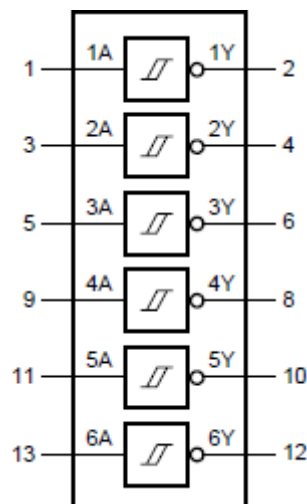


Fig.1 Logic symbol

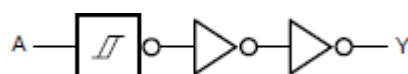


Fig.2 Logic diagram (one Schmitt trigger)



2.2、Pin Configurations

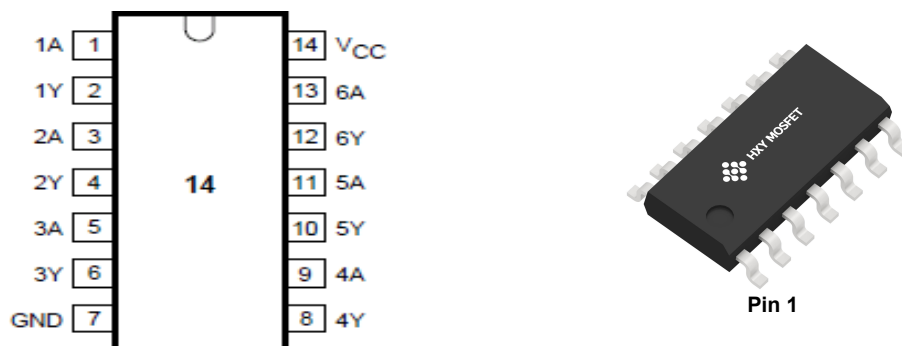


Fig.3 Pin configuration

2.3、Pin Description

PIN	Symbol	Description	PIN	Stmbol	Description
1	1A	data input	8	4Y	data output
2	1Y	data output	9	4A	data input
3	2A	data input	10	5Y	data output
4	2Y	data output	11	5A	data input
5	3A	data input	12	6Y	data output
6	3Y	data output	13	6A	data input
7	GND	ground (0 V)	14	V _{CC}	supply voltage

2.4、Function Table

Input	Output
nA	nY
L	H
H	L

Note:

H = HIGH voltage

level L = LOW

voltage level



3、Electrical Parameter

3.1、Absolute Maximum Ratings

In accordance with the Absolute Maximum System (IEC 60134); voltages are referenced to GND (ground = 0 V)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V_{CC}		-0.5	+7	V
input diode current	I_{Ik}	$V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$	—	± 20	mA
output diode current	I_{Ok}	$V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$	—	± 20	mA
output source or sink current	I_O	$-0.5V < V_O < V_{CC} + 0.5V$	—	± 25	mA
VCC or GND current	$I_{CC}; I_{GND}$		—	50	mA
storage temperature	T_{stg}		-65	+125	°C
power dissipation	P_{tot}	$T_{amb} = -40$ to $+125^{\circ}C$ DIP14 packages; note 1	—	750	mW
		$T_{amb} = -40$ to $+125^{\circ}C$ Other packages; note 2	—	500	
Soldering Temperature	T_L	10s	DIP	245	°C
			SOP	250	

Notes

1. For DIP14 packages: above 70 °C the value of PD derates linearly with 12 mW/K.
2. For SOP14 packages: above 70 °C the value of PD derates linearly with 8 mW/K.
3. For TSSOP14 packages: above 60 °C the value of PD derates linearly with 5.5 mW/K.

3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
supply voltage	V_{CC}		2.0	5.0	6.0	V
input voltage	V_I		0	—	V_{CC}	V
output voltage	V_O		0	—	V_{CC}	V
operating ambient temperature	T_{amb}		-40	+25	+85	°C



3.3、Electrical Characteristics

3.3.1 DC Characteristics 1 ($T_{amb} = 25^{\circ}\text{C}$, $GND=0$)

At recommended operating conditions; voltages are referenced to GND. (ground = 0 V).

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	$V_{CC}=2.0V$ $I_O=-20\mu A$	1.9	2.0	—	V
			$V_{CC}=4.5V$ $I_O=-20\mu A$	4.4	4.5	—	V
			$V_{CC}=6.0V$ $I_O=-20\mu A$	5.9	6.0	—	V
			$V_{CC}=4.5V$ $I_O=-4.0mA$	3.98	4.32	—	V
			$V_{CC}=6.0V$ $I_O=-5.2mA$	5.48	5.81	—	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}	$V_{CC}=2.0V$ $I_O=20\mu A$	—	0	0.1	V
			$V_{CC}=4.5V$ $I_O=20\mu A$	—	0	0.1	V
			$V_{CC}=6.0V$ $I_O=20\mu A$	—	0	0.1	V
			$V_{CC}=4.5V$ $I_O=4.0mA$	—	0.15	0.26	V
			$V_{CC}=6.0V$ $I_O=5.2mA$	—	0.16	0.26	V
input leakage current	I_{LI}	$V_{CC}=6.0V$ $V_I = V_{CC}$ or GND		—	—	0.1	μA
quiescent supply current	I_{CC}	$V_{CC}=6.0V$ $V_I = V_{CC}$ or GND; $I_O=0$		—	—	2.0	μA

3.3.2 DC Characteristics 2 ($T_{amb} = -40 \sim +85^{\circ}\text{C}$, $GND=0$)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	$V_{CC}=2.0V$ $I_O=-20\mu A$	1.9	—	—	V
			$V_{CC}=4.5V$ $I_O=-20\mu A$	4.4	—	—	V
			$V_{CC}=6.0V$ $I_O=-20\mu A$	5.9	—	—	V
			$V_{CC}=4.5V$ $I_O=-4.0mA$	3.84	—	—	V
			$V_{CC}=6.0V$ $I_O=-5.2mA$	5.34	—	—	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}	$V_{CC}=2.0V$ $I_O=20\mu A$	—	—	0.1	V
			$V_{CC}=4.5V$ $I_O=20\mu A$	—	—	0.1	V
			$V_{CC}=6.0V$ $I_O=20\mu A$	—	—	0.1	V
			$V_{CC}=4.5V$ $I_O=4.0mA$	—	—	0.33	V
			$V_{CC}=6.0V$ $I_O=5.2mA$	—	—	0.33	V
input leakage current	I_{LI}	$V_{CC}=6.0V$ $V_I = V_{CC}$ or GND		—	—	1.0	μA
quiescent supply current	I_{CC}	$V_{CC}=6.0V$ $V_I =V_{CC}$ or GND; $I_O=0$		—	—	20	μA



3.3.3 Transfer Characteristics 1 (Tamb = 25°C, GND=0)

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
positive-going threshold	V _{T+}	See Figs 4 and 5	VCC=2.0V	0.7	1.18	1.5	V
			VCC=4.5V	1.7	2.38	3.15	V
			VCC=6.0V	2.1	3.14	4.2	V
negative-going threshold	V _{T-}		VCC=2.0V	0.3	0.52	0.90	V
			VCC=4.5V	0.9	1.40	2.00	V
			VCC=6.0V	1.2	1.89	2.60	V
hysteresis (V _{T+} – V _{T-})	V _H		VCC=2.0V	0.2	0.68	1.0	V
			VCC=4.5V	0.4	0.98	1.4	V
			VCC=6.0V	0.6	1.25	1.6	V

3.3.4 Transfer Characteristics 2 (Tamb = -40~+85°C, GND=0)

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
positive-going threshold	V _{T+}	See Figs 4 and 5	VCC=2.0V	0.7	—	1.5	V
			VCC=4.5V	1.7	—	3.15	V
			VCC=6.0V	2.1	—	4.2	V
negative-going threshold	V _{T-}		VCC=2.0V	0.3	—	0.90	V
			VCC=4.5V	0.90	—	2.00	V
			VCC=6.0V	1.20	—	2.60	V
hysteresis (V _{T+} – V _{T-})	V _H		VCC=2.0V	0.2	—	1.0	V
			VCC=4.5V	0.4	—	1.4	V
			VCC=6.0V	0.6	—	1.6	V

3.3.5 AC Characteristics 1

(Tamb=25°C, GND=0, $t_r=t_f=6.0\text{ns}$, $C_L=50\text{pF}$, See Figs 6 and 7)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
propagation delay nA to nY	t_{PHL}/t_{PLH}	VCC=2.0V	—	41	125	ns
		VCC=4.5V	—	15	25	ns
		VCC=6.0V	—	12	21	ns
output transition time	t_{THL}/t_{TLH}	VCC=2.0V	—	19	75	ns
		VCC=4.5V	—	7	15	ns
		VCC=6.0V	—	6	13	ns



3.3.6、AC Characteristics 2

($T_{amb}=25^{\circ}C$, $GND=0$, $t_r=t_f=6.0ns$, $C_L=50pF$, See Figs 6 and 7)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
propagation delay nA to nY	t_{PHL}/t_{PLH}	$V_{CC}=2.0V$	—	—	155	ns
		$V_{CC}=4.5V$	—	—	31	ns
		$V_{CC}=6.0V$	—	—	26	ns
output transition time	t_{THL}/t_{TLH}	$V_{CC}=2.0V$	—	—	95	ns
		$V_{CC}=4.5V$	—	—	19	ns
		$V_{CC}=6.0V$	—	—	15	ns

4、AC Testing Circuit

4.1、Transfer Characteristic Waveforms

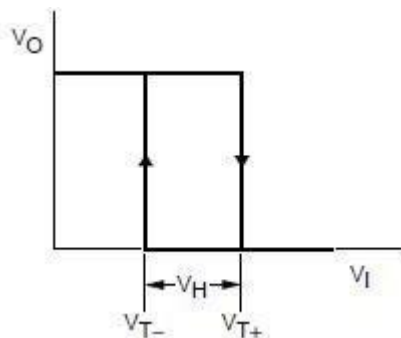


Fig.4 Transfer characteristic

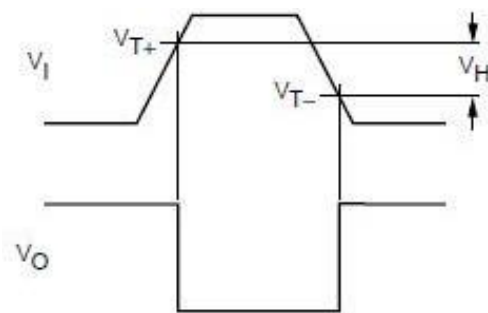


Fig.5 The definitions of V_{T+} , V_{T-} and V_H and 70%.

NOTE: V_{T+} and V_{T-} are between limits of 20%

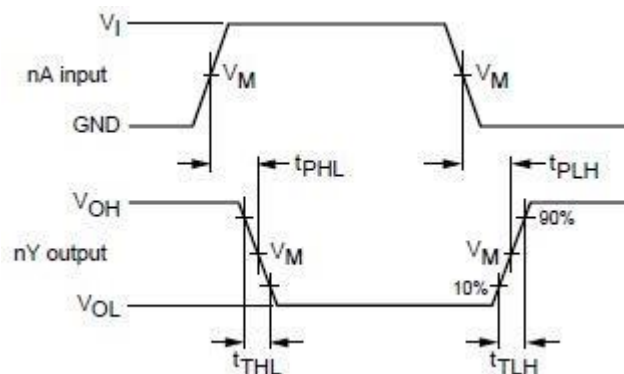


Fig.6 The input (nA) to output (nY) propagation delays and output transitions times. 74HC14/74HCT14: $V_M = 50\%$; $V_I = GND$ to V_{CC} . 74HCT14: $V_M = 1.3V$; $V_I = GND$ to $3.0V$.



4.2、AC Testing Circuit

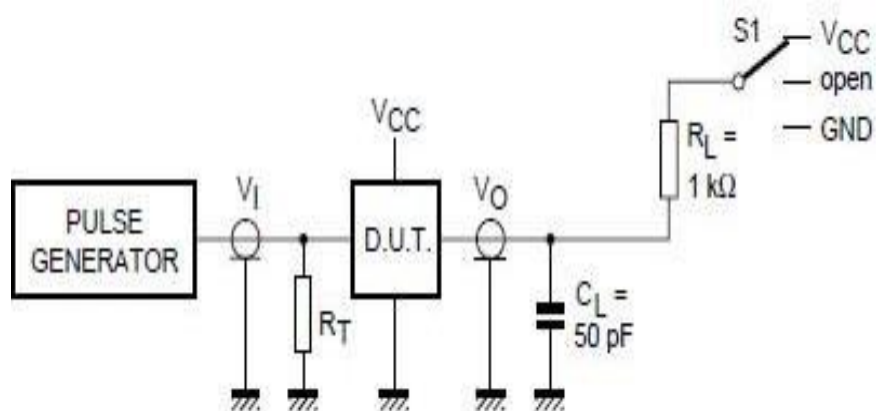


Fig.7 Load circuitry for switching times.

Test	S1
T_{PLH}/T_{PHL}	OPEN
T_{PLZ}/T_{PZL}	VCC
T_{PHZ}/T_{PZH}	GND

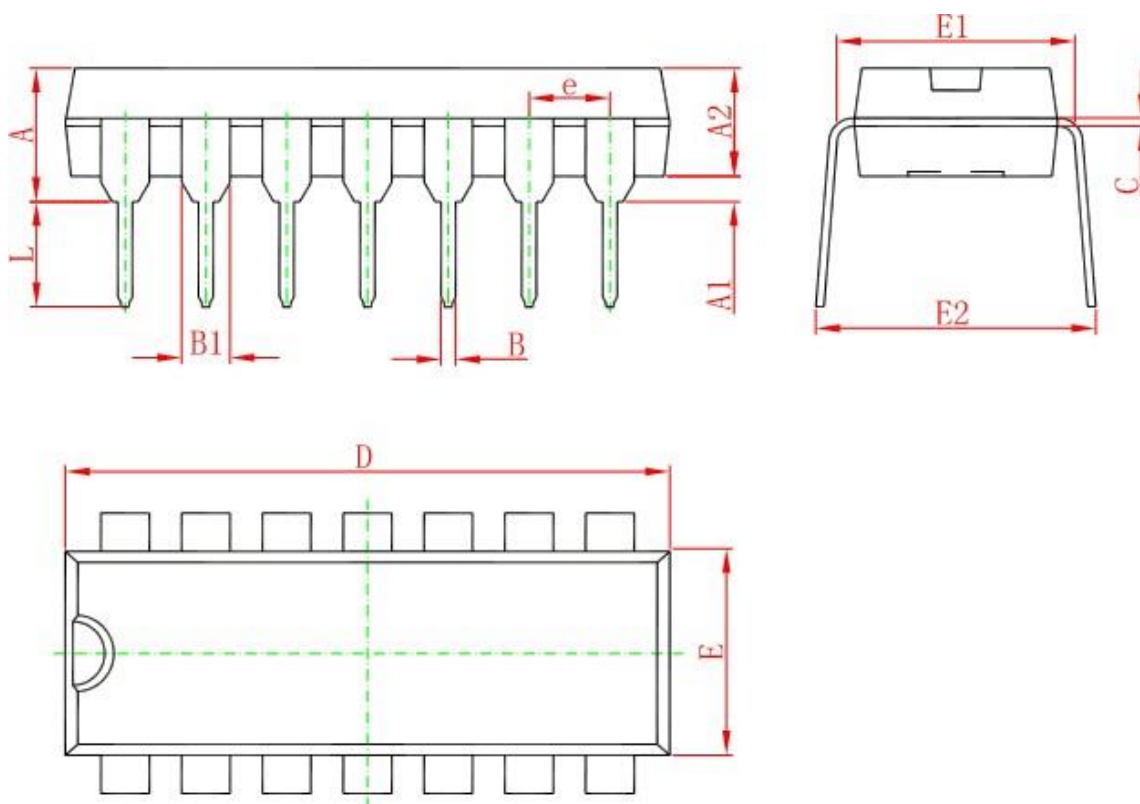
Definitions for test circuit:

1. R_L = Load resistor.
2. C_L = load capacitance including jig and probe capacitance.
3. R_T = termination resistance should be equal to the output impedance Z_o of the pulse generator.



5、Package Information

5.1、DIP14



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354



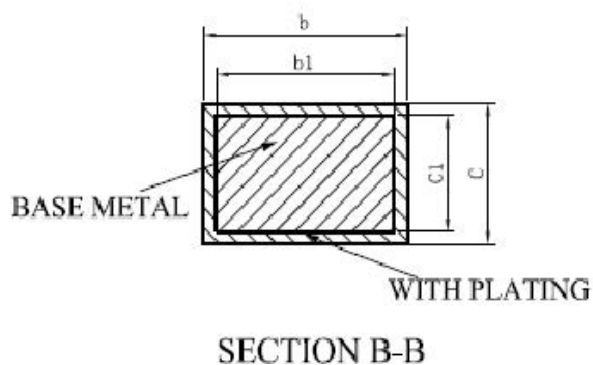
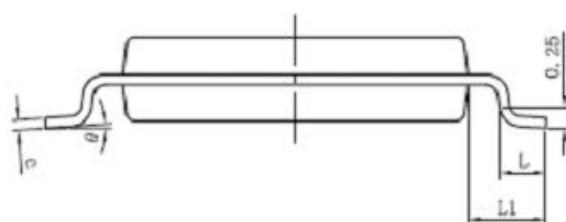
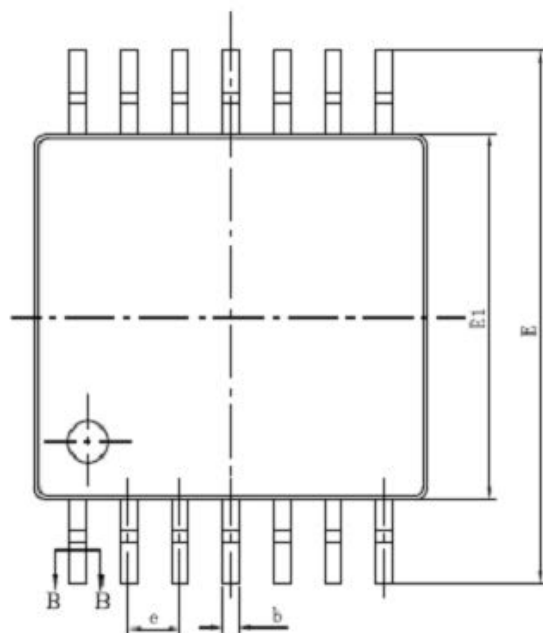
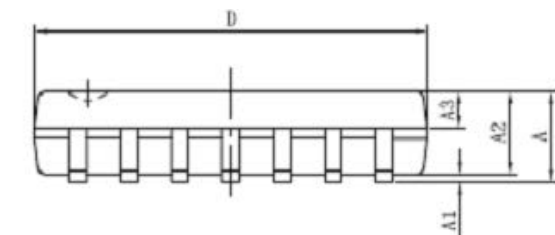
74HC14D,653
Hex inverting Schmitt trigger

The drawing consists of three views of a BTM package:

- Top View:** Shows a rectangular package with overall dimensions of 8.73 ± 0.10 (width) and 6.04 ± 0.2 (length). The central area is labeled "BTM PKG" with dimensions 3.95 ± 0.10 and 1.00 . A circular feature is dimensioned as $\phi 1.00 \times 0.100P$. A dashed green circle is labeled $\phi 2.00 \times (0.06 \sim 0.10) 0P$ with a note "FAR SIDE". A dimension of 1.30 is shown for a specific feature.
- Side View:** Shows the profile of the package with a total height of 1.45 ± 0.10 . The base thickness is 0.20 ± 0.1 . A central feature has a width of 1.27 and a height of 0.406 . A dashed green line indicates a feature on the "FAR SIDE".
- Detail View:** A close-up of the bottom edge showing a lead with a thickness of 0.10 and a width of 0.55 ± 0.20 . The lead is bent at a $2 \sim 8^\circ$ angle. The distance from the lead to the package body is 0.2032 . The package body has a thickness of $0.40 \times 45^\circ$.



5.3、TSSOP14



SYMBOL	MILLIMETER	
	MIN	MAX
A	—	1.20
A1	0.05	0.15
A2	0.90	1.05
A3	0.39	0.49
b	0.20	0.30
b1	0.19	0.25
c	0.13	0.19
c1	0.12	0.14
D	4.86	5.06
E1	4.30	4.50
E	6.20	6.60
e	0.65BSC	
L	0.45	0.75
L1	1.00BSC	
θ	0	8°



6、Statements And Notes:

6.1 、 The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements					
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers
Lead frame	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○
Chip	○	○	○	○	○	○
The lead	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○
explanation	○： Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard。 ×： Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements。					



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