General Description

The SN74HC/HCT14 is a hex inverter with Schmitt-trigger inputs. This device features reduced input threshold levels to allow interfacing to TTL logic levels. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}. Schmitt trigger inputs transform slowly changing input signals into sharply defined jitter-free output signals.

Features

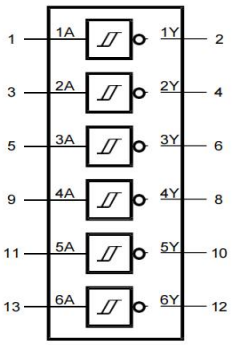
- Input levels:
  For SN74HC14: CMOS level
  For SN74HCT14: TTL level
- Low-power dissipation
- Specified from -40℃ to +125℃
- Packaging information: DIP14/SOP14/TSSOP14

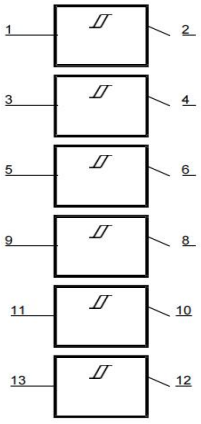
ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing QTY
SN74HC14N	DIP-14	74HC14N	Tube	1000/Box
SN74HC14DTR	SOP-14	74HC14	Tape	2500/Reel
SN74HC14TDTR	TSSOP-14	74HC14	Tape	3000/Reel
SN74HCT14N	DIP-14	74HCT14N	Tube	1000/Box
SN74HCT14DTR	SOP-14	74HCT14	Tape	2500/Reel
SN74HCT14TDTR	TSSOP-14	74HCT14	Tape	3000/Reel

Block Diagram And Pin Description

Block Diagram





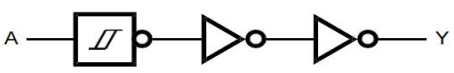
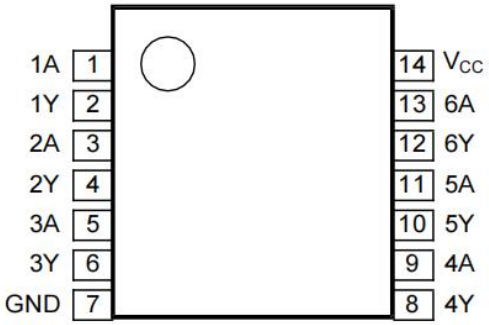


Figure 1. Logic symbol Figure 2. IEC logic symbol Figure 3. Logic diagram for one gate

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1Y	data output
3	2A	data input
4	2Y	data output
5	3A	data input
6	3Y	data output
7	GND	ground (0V)
8	4Y	data output
9	4A	data input
10	5Y	data output
11	5A	data input
12	6Y	data output
13	6A	data input
14	V_{CC}	supply voltage

Function Table

Input	Output
nA	**nY**
L	H
H	L

Note: H=HIGH voltage level; L=LOW voltage level.

Electrical Parameter

Absolute Maximum Ratings (Voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V_{CC}			-0.5	+7	V
input clamping current	I_{IK}	V_I<-0.5V or V_I>V_{CC}+0.5V		-	±20	mA
output clamping current	I_{OK}	V_O<-0.5V or V_O>V_{CC}+0.5V		-	±20	mA
output current	I_O	-0.5V<V_O<V_{CC}+0.5V		-	±25	mA
supply current	I_{CC}	-		-	50	mA
ground current	I_{GND}	-		-50	-	mA
total power dissipation	P_{tot}	-		-	500	mW
storage temperature	T_{stg}	-		-65	+150	℃
soldering temperature	T_L	10s	DIP	245		℃
			SOP	250		

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SN74HC14						
supply voltage	V_{CC}	-	2.0	5.0	6.0	V
input voltage	V_I	-	0	-	V_{CC}	V
output voltage	V_O	-	0	-	I_{CC}	V
ambient temperature	T_{amb}	-	-40	-	+125	℃
SN74HCT14						
supply voltage	V_{CC}	-	4.5	5.0	5.5	V
input voltage	V_I	-	0	-	V_{CC}	V
output voltage	V_O	-	0	-	V_{CC}	V
ambient **temperature**	T_{amb}	-	-40	-	+125	℃

Electrical Characteristics

DC Characteristics 1 (Tamb=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC14							
HIGH-level output voltage	V_{OH}	$V_I=V_{T+}$ or V_{T-}	I_O=-2OuA;V_{CC}=2.0V	1.9	2.0	-	V
			I_O=-20uA;V_{CC}=4.5V	4.4	4.5	-	V
			I_O=-2OuA;V_{CC}=6.0V	5.9	6.0	-	V
			I_O=-4.0mA;V_{CC}=4.5V	3.98	4.32	-	V
			I_O=-5.2mA;V_{CC}=6.0V	5.48	5.81	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{T+}$ or V_{T-}	I_O=2OuA;V_{CC}=2.0V	-	0	0.1	V
			I_O=20uA;V_{CC}=4.5V	-	0	0.1	V
			I_O=20uA; V_{CC}=6.0V	-	0	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	0.15	0.26	V
			I_O=5.2mA;V_{CC}=6.0V	-	0.16	0.26	V
input leakage current	I_I	Vi=Vcc or GND; V_{CC}=6.0V		-	-	±1	μA
supply current	I_{CC}	Vi=V_{CC} or GND;I_O=0A; V_{CC}=6.0V		-	-	2.0	μA
input capacitance	C_I			-	3.5	-	pF
SN74HCT14							
HIGH-level output voltage	V_{OH}	Vi=V_{T+} or V_{T-}	I_O=-20uA;V_{CC}=4.5V	4.4	4.5	-	V
			I_O=-4.0mA; V_{CC}=4.5V	3.98	4.32	-	V
LOW-level output voltage	V_{OL}	Vi=V_{T+} or V_{T-}	I_O=20uA;V_{CC}=4.5V	-	0	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	0.15	0.26	V
input leakage current	I_I	Vi=V_{CC} or GND; V_{CC}=5.5V		-	-	±1	μA
supply current	I_{CC}	Vi=V_{CC} or GND;I_O=0A; V_{CC}=5.5V		-	-	2.0	μA
additional supply current	ΔI_{CC}	per input pin; Vi=V_{CC}-2.1V; I_O=0A; other inputs at V_{CC} or GND; V_{CC}=4.5V to 5.5V		-	30	108	μA
input capacitance	C_I			-	3.5	-	pF

DC Characteristics 2

(Tamb=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC14							
HIGH-level output voltage	V_{OH}	$V_i=V_{T+}$or V_{T-}	I_O=-20uA;V_{CC}=2.0V	1.9	-	-	V
			I_O=-20uA;V_{CC}=4.5V	4.4	-	-	V
			I_O=-20uA;V_{CC}=6.0V	5.9	-	-	V
			I_O=-4.0mA;V_{CC}=4.5V	3.84	-	-	V
			I_O=-5.2mA;V_{CC}=6.0V	5.34	-	-	V
LOW-level output voltage	V_{OL}	$V_i=V_{T+}$or V_{T-}	I_O=20uA;V_{CC}=2.0V	-	-	0.1	V
			I_O=20uA;V_{CC}=4.5V	-	-	0.1	V
			I_O=20uA;V_{CC}=6.0V	-	-	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	-	0.33	V
			I_O=5.2mA;V_{CC}=6.0V	-	-	0.33	V
input leakage current	I_I	V_i= V_{CC} or GND; V_{CC}=6.0V		-	-	±1	μA
supply current	I_{CC}	Vi=Vcc or GND;Io=0A; V_{CC}=6.0V		-	-	20	μA
SN74HCT14							
HIGH-level output voltage	V_{OH}	Vi=VT+or VT-	I_O=-20uA;V_{CC}=4.5V	4.4	-	-	V
			I_O=-4.0mA; V_{CC}=4.5V	3.84	-	-	V
LOW-level output voltage	V_{OL}	Vi=VT+or VT-	I_O=20uA;V_{CC}=4.5V	-	-	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	-	0.33	V
input leakage current	I_I	V_i= V_{CC} or GND; V_{CC}=5.5V		-	-	±1	μA
supply current	I_{CC}	V_i=V_{CC} or GND;I_O=0A; V_{CC}=5.5V		-	-	20	μA
additional supply current	ΔI_{CC}	per input pin;V_i=V_{CC}-2.1V; I_O=0A; other inputs at V_{CC} or GND; V_{CC}=4.5V to 5.5V		-	-	135	μA

DC Characteristics 3

(Tamb=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC14							
HIGH-level output voltage	V_{OH}	Vi=V_{T+} or V_{T-}	I_O=-20uA;V_{CC}=2.0V	1.9	-	-	V
			I_O=-20uA;V_{CC}=4.5V	4.4	-	-	V
			I_O=-20uA;V_{CC}=6.0V	5.9	-	-	V
			I_O=-4.0mA;V_{CC}=4.5V	3.7	-	-	V
			I_O=-5.2mA;V_{CC}=6.0V	5.2	-	-	V
LOW-level output voltage	V_{OL}	Vi=V_{T+} or V_{T-}	I_O=20uA;V_{CC}=2.0V	-	-	0.1	V
			I_O=20uA;V_{CC}=4.5V	-	-	0.1	V
			I_O=20uA;V_{CC}=6.0V	-	-	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	-	0.4	V
			I_O=5.2mA;V_{CC}=6.0V	-	-	0.4	V
input leakage current	I_I	Vi= V_{CC} or GND; V_{CC}=6.0V		-	-	±1	μA
supply current	I_{CC}	Vi=V_{CC} or GND;Io=0A; V_{CC}=6.0V		-	-	40	μA
SN74HCT14							
HIGH-level output voltage	V_{OH}	Vi=V_{T+} or V_{T-}	I_O=-20uA;V_{CC}=4.5V	4.4	-	-	V
			I_O=-4.0mA; V_{CC}=4.5V	3.7	-	-	V
LOW-level output voltage	V_{OL}	Vi=V_{T+} or V_{T-}	I_O=20uA;V_{CC}=4.5V	-	-	0.1	V
			I_O=4.0mA;V_{CC}=4.5V	-	-	0.4	V
input leakage current	I_I	Vi= V_{CC} or GND; V_{CC}=5.5V		-	-	±1	μA
supply current	I_{CC}	Vi=V_{CC} or GND;I_O=0A; V_{CC}=5.5V		-	-	40	μA
additional supply current	ΔI_{CC}	per input pin;Vi=V_{CC}-2.1V; I_O=0A; other inputs at V_{CC} or GND; V_{CC}=4.5V to 5.5V		-	-	147	μA

AC Characteristics 1 (Tamb=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC14							
nA,nB to nY Propagation delay	t_{PLH},t_{PHL}	see Figure5	V_{CC}=2.0V	-	41	125	ns
			V_{CC}=4.5V	-	15	25	ns
			VCC=5.0V;CL=15pF	-	12	-	ns
			V_{CC}=6.0V	-	12	21	ns
transition time	t_{THL},t_{TLH}	see Figure5	V_{CC}=2.0V	-	19	75	ns
			V_{CC}=4.5V	-	7	15	ns
			V_{CC}=6.0V	-	6	13	ns
SN74HCT14							
nA,nB to nY Propagation delay	t_{PLH},t_{PHL}	see Figure5	V_{CC}=4.5V	-	20	34	ns
			VCC=5.0V;CL=15pF	-	17	-	ns
transition time	t_{THL},t_{TLH}	see Figure5	V_{CC}=4.5V	-	7	15	ns

AC Characteristics 2

(Tamb=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC14							
nA,nB to nY Propagation delay	t_{PLH},t_{PHL}	see Figure5	V_{CC}=2.0V	-	-	155	ns
			V_{CC}=4.5V	-	-	31	ns
			V_{CC}=6.0V	-	-	26	ns
transition time	t_{THL},t_{TLH}	see Figure5	V_{CC}=2.0V	-	-	95	ns
			V_{CC}=4.5V	-	-	19	ns
			V_{CC}=6.0V	-	-	15	ns
SN74HCT14							
nA,nB to nY Propagation delay	t_{PLH},t_{PHL}	see Figure5	V_{CC}=4.5V	-	-	43	ns
transition time	t_{THL},t_{TLH}	see Figure5	V_{CC}=4.5V	-	-	19	ns

AC Characteristics 3

(Tamb=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC14							
nA,nB to nY Propagation delay	t_{PLH},t_{PHL}	see Figure5	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	32	ns
transition time	t_{THL},t_{TLH}	see Figure5	V_{CC}=2.0V	-	-	110	ns
			V_{CC}=4.5V	-	-	22	ns
			V_{CC}=6.0V	-	-	19	ns
SN74HCT14							
nA,nB to nY Propagation delay	t_{PLH},t_{PHL}	see Figure5	V_{CC}=4.5V	-	-	51	ns
transition time	t_{THL},t_{TLH}	see Figure5	V_{CC}=4.5V	-	-	22	ns

Transfer Characteristics 1(Tamb=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SN74HC14						
positive-going threshold voltage	V_{T+}	V_{CC}=2.0V	0.7	1.18	1.5	V
		V_{CC}=4.5V	1.7	2.38	3.15	V
		V_{CC}=6.0V	2.1	3.14	4.2	V
negative-going threshold voltage	V_{T-}	V_{CC}=2.0V	0.3	0.52	0.9	V
		V_{CC}=4.5V	0.9	1.4	2.0	V
		V_{CC}=6.0V	1.2	1.89	2.6	V
hysteresis voltage	V_H	V_{CC}=2.0V	-	0.66	-	V
		V_{CC}=4.5V	-	0.98	-	V
		V_{CC}=6.0V	-	1.25	-	V
SN74HCT14						
positive-going threshold voltage	V_{T+}	V_{CC}=4.5V	1.2	1.41	1.9	V
		V_{cc}=5.5V	1.4	1.59	2.1	V
negative-going threshold voltage	V_{T-}	V_{cc}=4.5V	0.5	0.85	1.2	V
		V_{cc}=5.5V	0.6	0.99	1.4	V
hysteresis voltage	V_H	V_{cc}=4.5V	-	0.56	-	V
		V=5.5V	-	0.6	-	V

Transfer Characteristics 2

(Tamb=-40℃ to +85℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SN74HC14						
positive-going threshold voltage	V_{T+}	V_{CC}=2.0V	0.7	-	1.5	V
		V_{CC}=4.5V	1.7	-	3.15	V
		V_{CC}=6.0V	2.1	-	4.2	V
negative-going threshold voltage	V_{T-}	V_{CC}=2.0V	0.3	-	0.9	V
		V_{CC}=4.5V	0.9	-	2.0	V
		V_{CC}=6.0V	1.2	-	2.6	V
hysteresis voltage	V_H	V_{CC}=2.0V	-	0.66	-	V
		V_{CC}=4.5V	-	0.98	-	V
		V_{CC}=6.0V	-	1.25	-	V
SN74HCT14						
positive-going threshold voltage	V_{T+}	V_{CC}=4.5V	1.2	-	1.9	V
		V_{cc}=5.5V	1.4	-	2.1	V
negative-going threshold voltage	V_{T-}	V_{cc}=4.5V	0.5	-	1.2	V
		V_{cc}=5.5V	0.6	-	1.4	V
hysteresis voltage	V_H	V_{cc}=4.5V	-	0.56	-	V
		V=5.5V	-	0.6	-	V

Transfer Characteristics 3

(Tamb=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SN74HC14						
positive-going threshold voltage	V_{T+}	V_{CC}=2.0V	0.7	-	1.5	V
		V_{CC}=4.5V	1.7	-	3.15	V
		V_{CC}=6.0V	2.1	-	4.2	V
negative-going threshold voltage	V_{T-}	V_{CC}=2.0V	0.3	-	0.9	V
		V_{CC}=4.5V	0.9	-	2.0	V
		V_{CC}=6.0V	1.2	-	2.6	V
hysteresis voltage	V_H	V_{CC}=2.0V	-	0.66	-	V
		V_{CC}=4.5V	-	0.98	-	V
		V_{CC}=6.0V	-	1.25	-	V
SN74HCT14						
positive-going threshold voltage	V_{T+}	V_{CC}=4.5V	1.2	-	1.9	V
		V_{cc}=5.5V	1.4	-	2.1	V
negative-going threshold voltage	V_{T-}	V_{cc}=4.5V	0.5	-	1.2	V
		V_{cc}=5.5V	0.6	-	1.4	V
hysteresis voltage	V_H	V_{cc}=4.5V	-	0.56	-	V
		V=5.5V	-	0.6	-	V

Testing Circuit

AC Testing Circuit

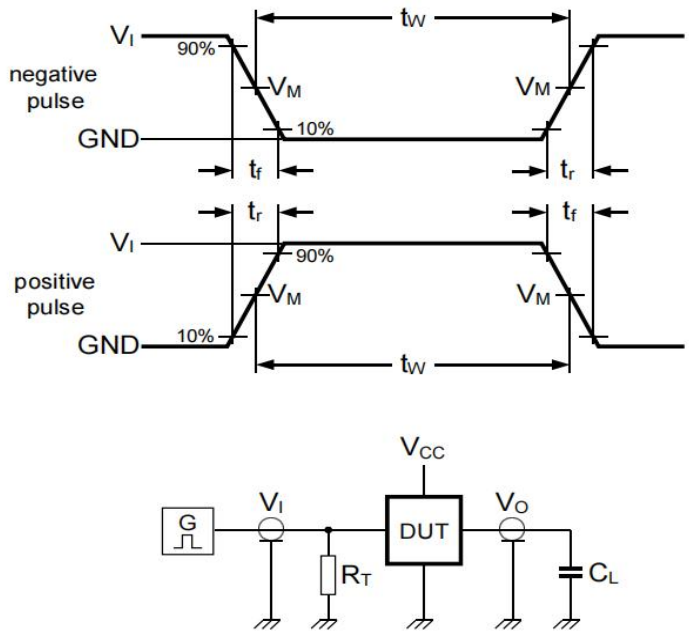


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

C_L=load capacitance including jig and probe capacitance.

R_T=termination resistance should be equal to the output impedance Zo of the pulse generator.

AC Testing Waveforms

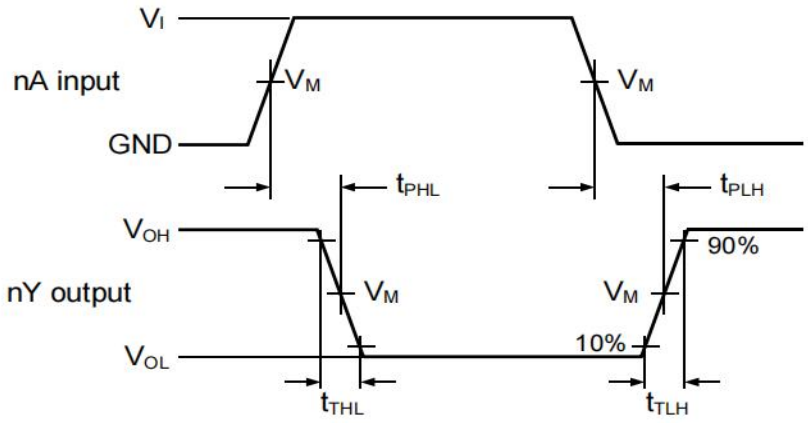


Figure 5. Input to output propagation delays

Transfer Characteristics Waveform

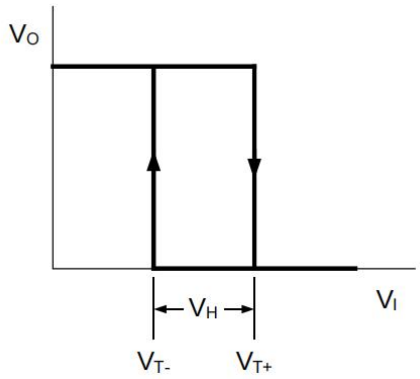


Figure 6. Transfer characteristics

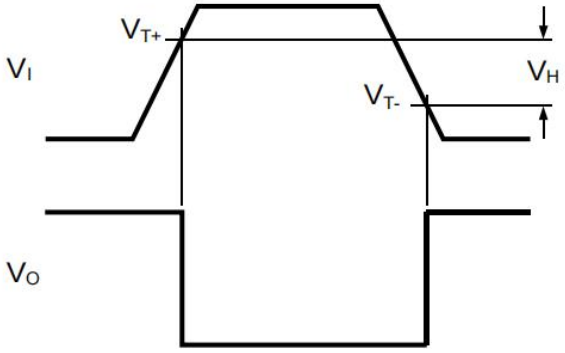


Figure 7. Transfer characteristics definitions

Measurement Points

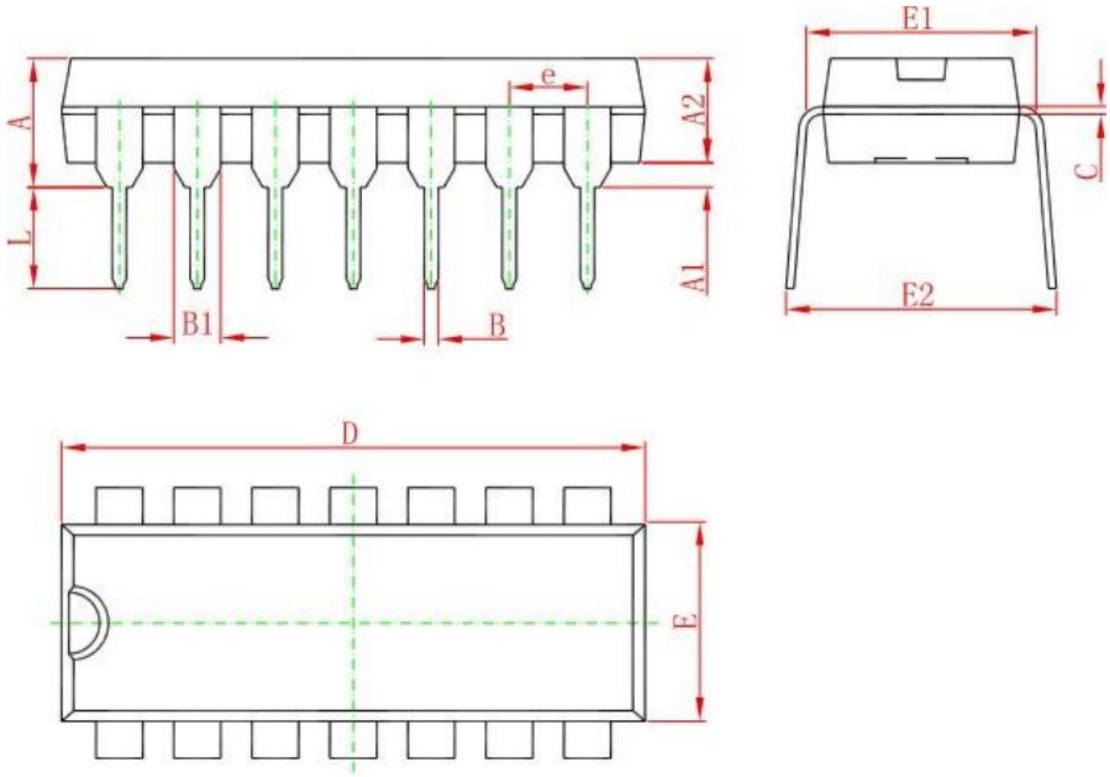
Type	Input	Output		
	V_M	V_M	V_X	V_Y
SN74HC14	$0.5\times V_{CC}$	$0.5\times V_{CC}$	$0.1\times V_{CC}$	$0.9\times V_{CC}$
SN74HCT14	1.3V	1.3V	$0.1\times V_{CC}$	$0.9\times V_{CC}$

Test Data

Type	Input		Load	Test
	V_I	t_r,t_f	C_L	
SN74HC14	V_{CC}	6.0ns	15pF,50pF	t_{PLH},t_{PHL}
SN74HCT14	3.0V	6.0ns	15pF,50pF	t_{PLH},t_{PHL}

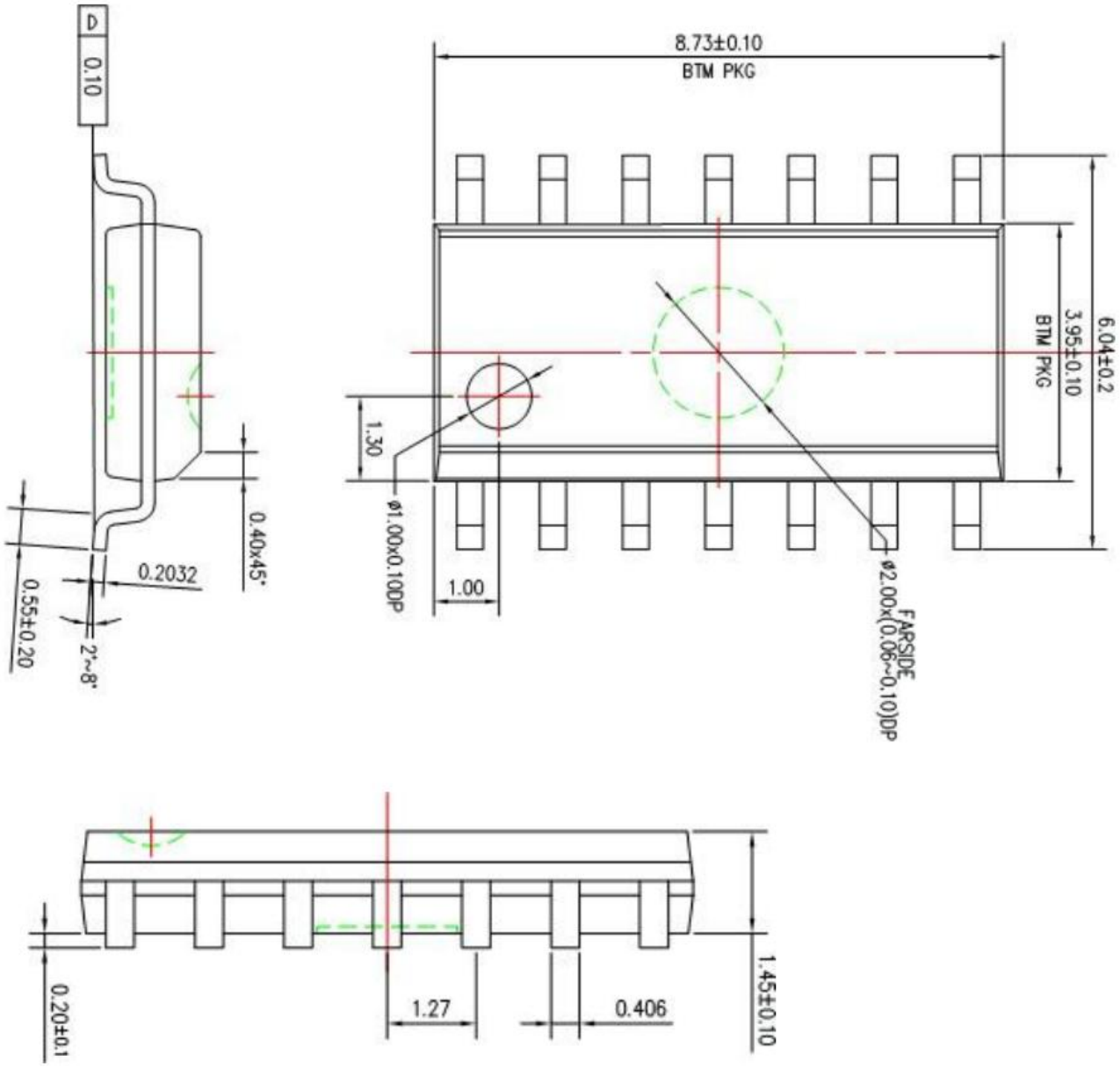
Package Information

DIP14

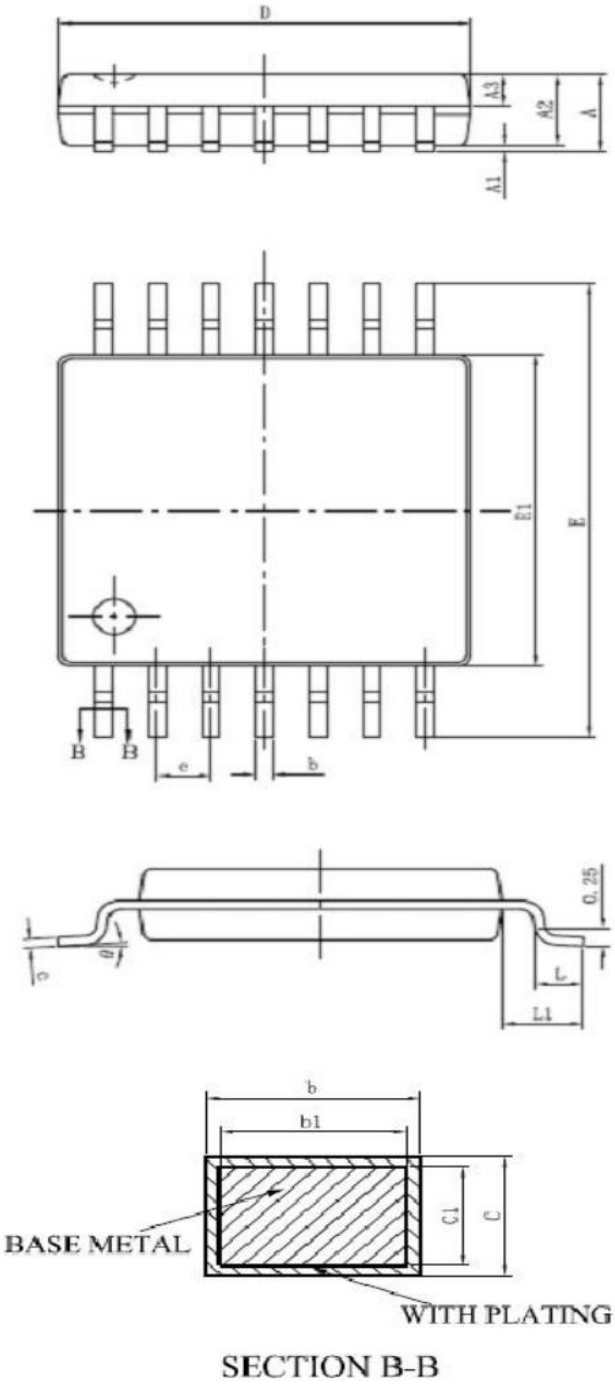


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312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

SOP14


0.10
8.73±0.10
BTM PKG
6.04±0.2
3.95±0.10
BTM PKG
1.30
Ø1.00x0.10DP
1.00
Ø2.00x(0.06~0.10)DP
FARSIDE
0.40x45°
0.2032
0.55±0.20
2°~8°
0.20±0.1
1.27
0.406
1.45±0.10

TSSOP14



SECTION B-B

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°

Satement：

- ✧ Shenzhen xinbole electronics co., ltd. reserves the right to change the product specifications, without notice! Before placing an order, the customer needs to confirm whether the information obtained is the latest version, and verify the integrity of the relevant information.
- ✧ Any semiconductor product is liable to fail or malfunction under certain conditions, and the buyer shall be responsible for complying with safety standards in the system design and whole machine manufacturing using Shenzhen xinbole electronics co., ltd products, and take appropriate security measures to avoid the potential risk of failure may result in personal injury or property losses of the situation occurred!
- ✧ This document is for referenceonly,and the actual use should be based on the application test results.
- ✧ Product performance is never ending, Shenzhen xinbole electronics co., ltd will be dedicated to provide customers with better performance, better quality of integrated circuit products.

Version revision history:

Version	Date	Information
version1.0	2019-03	New document
version2.0	2023-11	Add ordering information: 1,SN74HC14TDTR TSSOP-14. 2,SN74HCT14N DIP-14