General Description

The SN74HC/HCT21 provide the 4-input AND function. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of VCC.

Features

- Input levels:
- For SN74HC21: CMOS level
- For SN74HCT21: TTL level
- Low-power dissipation
- Specified from -40℃ to +125℃
- Packaging information: DIP14/SOP14/TSSOP14

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74HC21N	DIP-14	74HC21N	Tube	1000Pcs/Box
XBLW SN74HC21DTR	SOP-14	74HC21	Tape	2500Pcs/Reel
XBLW SN74HC21TDTR	TSSOP-14	74HC21	Tape	3000Pcs/Reel
XBLW SN74HCT21N	DIP-14	74HCT21N	Tube	1000Pcs/Box
XBLW SN74HCT21DTR	SOP-14	74HCT21	Tape	2500Pcs/Reel
XBLW SN74HCT21TDTR	TSSOP-14	74HCT21	Tape	3000Pcs/Reel

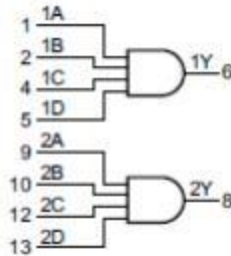## Block Diagram And Pin Description

2.1、Block Diagram

Figure 1. Logic symbol
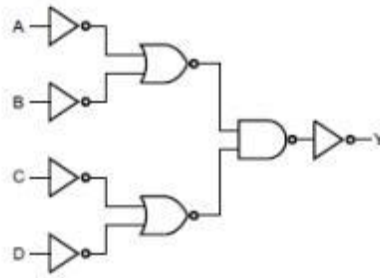

Figure 2. IEC logic symbol
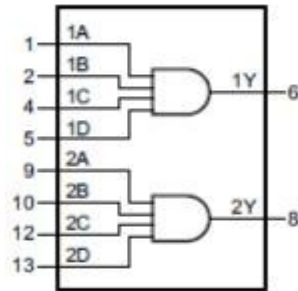
Figure 3. Logic diagram

Figure 4. Functional diagram

Pin Configurations
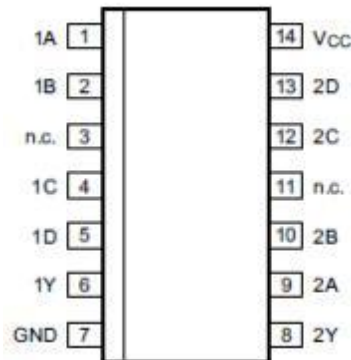
Pin Description

Pin No.	Pin Name	Description
1	1A	data input
2	1B	data input
3	n.c.	not connected
4	1C	data input
5	1D	data input
6	1Y	data output
7	GND	ground (0V)
8	2Y	data output
9	2A	data input
10	2B	data input
11	n.c.	not connected
12	2C	data input
13	2D	data input
14	V_{CC}	supply voltage

Function Table

Input				Output
nA	**nB**	**nC**	**nD**	**nY**
L	X	X	X	L
X	L	X	X	L
X	X	L	X	L
X	X	X	L	L
H	H	H	H	H

Note: H=HIGH voltage level; L=LOW voltage level; X = don't care.

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
storage temperature	T_{stg}	-		-65	+150	℃
total power dissipation	P_{tot}	-		-	500	mW
soldering temperature	T_L	10s	DIP	245		℃
			SOP/TSSOP	260		℃

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SN74HC21						
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
input transition rise and fall rate	$\Delta t/\Delta V$	V_{CC}=2.0V	-	-	625	ns/V
		V_{CC}=4.5V	-	1.67	139	ns/V
		V_{CC}=6.0V	-	-	83	ns/V
ambient temperature	T_{amb}	-	-40	-	+125	℃
SN74HCT21						
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
input transition rise and fall rate	$\Delta t/\Delta V$	V_{CC}=4.5V	-	1.67	139	ns/V
ambient temperature	T_{amb}	-	-40	-	+125	℃

DC Characteristics 1

(T_{amb}=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
SN74HC21						
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V	1.5	1.2	-	V
		V_{CC}=4.5V	3.15	2.4	-	V
		V_{CC}=6.0V	4.2	3.2	-	V

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	0.8	0.5	V
		V_{CC}=4.5V		-	2.1	1.35	V
		V_{CC}=6.0V		-	2.8	1.8	V
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	I_O=-20uA; V_{CC}=2.0V	1.9	2.0	-	V
			I_O=-20uA; V_{CC}=4.5V	4.4	4.5	-	V
			I_O=-20uA; 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}	$V_I=V_{IH}$ or V_{IL}	I_O=20uA; 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	$V_I=V_{CC}$ or GND; V_{CC}=6.0V		-	-	±1	uA
supply current	I_{CC}	$V_I=V_{CC}$ or GND; I_O=0A; V_{CC}=6.0V		-	-	2.0	uA
input capacitance	C_I	-		-	3.5	-	pF
SN74HCT21							
HIGH-level input voltage	V_{IH}	V_{CC}=4.5V to 5.5V		2.0	1.6	-	V
LOW-level input voltage	V_{IL}	V_{CC}=4.5V to 5.5V		-	1.2	0.8	V
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}; V_{CC}=4.5V	I_O=-20uA	4.4	4.5	-	V
			I_O=-4.0mA	3.98	4.32	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}; V_{CC}=4.5V	I_O=20uA	-	0	0.1	V
			I_O=5.2mA	-	0.15	0.26	V
input leakage current	I_I	$V_I=V_{CC}$ or GND; V_{CC}=5.5V		-	-	±1	uA
supply current	I_{CC}	$V_I=V_{CC}$ or GND; I_O=0A; V_{CC}=5.5V		-	-	2.0	uA
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		-	-	108	uA
input capacitance	C_I	-		-	3.5	-	pF

DC Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC21							
HIGH-level input voltage	V_{IH}	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
LOW-level input voltage	V_{IL}	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}	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$_{IH}$ or V$_{IL}$	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	uA
supply current	I$_{CC}$	V$_I$=V$_{CC}$ or GND; I$_O$=0A; V$_{CC}$=6.0V		-	-	20	uA
SN74HCT21							
HIGH-level input voltage	V$_{IH}$	V$_{CC}$=4.5V to 5.5V		2.0	-	-	V
LOW-level input voltage	V$_{IL}$	V$_{CC}$=4.5V to 5.5V		-	-	0.8	V
HIGH-level output voltage	V$_{OH}$	V$_I$=V$_{IH}$ or V$_{IL}$; V$_{CC}$=4.5V	I$_O$=-20uA	4.4	-	-	V
			I$_O$=-4.0mA	3.84	-	-	V
LOW-level output voltage	V$_{OL}$	V$_I$=V$_{IH}$ or V$_{IL}$; V$_{CC}$=4.5V	I$_O$=20uA	-	-	0.1	V
			I$_O$=5.2mA	-	-	0.33	V
input leakage current	I$_I$	V$_I$=V$_{CC}$ or GND; V$_{CC}$=5.5V		-	-	±1	uA
supply current	I$_{CC}$	V$_I$=V$_{CC}$ or GND; I$_O$=0A; V$_{CC}$=5.5V		-	-	20	uA
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	uA

DC Characteristics 3

(T$_{amb}$=-40℃ to +125℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC21							
HIGH-level input voltage	V$_{IH}$	V$_{CC}$=2.0V		1.5	-	-	V
		V$_{CC}$=4.5V		3.15	-	-	V
		V$_{CC}$=6.0V		4.2	-	-	V
LOW-level input voltage	V$_{IL}$	V$_{CC}$=2.0V		-	-	0.5	V
		V$_{CC}$=4.5V		-	-	1.35	V
		V$_{CC}$=6.0V		-	-	1.8	V
HIGH-level output voltage	V$_{OH}$	V$_I$=V$_{IH}$ or V$_{IL}$	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$_{OL}$	V$_I$=V$_{IH}$ or V$_{IL}$	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$_I$	V$_I$=V$_{CC}$ or GND; V$_{CC}$=6.0V		-	-	±1	uA
supply current	I$_{CC}$	V$_I$=V$_{CC}$ or GND; I$_O$=0A; V$_{CC}$=6.0V		-	-	40	uA
SN74HCT21							
HIGH-level input voltage	V$_{IH}$	V$_{CC}$=4.5V to 5.5V		2.0	-	-	V

LOW-level input voltage	V_{IL}	V_{CC}=4.5V to 5.5V		-	-	0.8	V
HIGH-level output voltage	V_{OH}	$V_I=V_{IH}$ or V_{IL}; V_{CC}=4.5V	I_O=-20uA	4.4	-	-	V
			I_O=-4.0mA	3.7	-	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH}$ or V_{IL}; V_{CC}=4.5V	I_O=20uA	-	-	0.1	V
			I_O=5.2mA	-	-	0.4	V
input leakage current	I_I	$V_I=V_{CC}$ or GND; V_{CC}=5.5V		-	-	±1	uA
supply current	I_{CC}	$V_I=V_{CC}$ or GND; I_O=0A; V_{CC}=5.5V		-	-	40	uA
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		-	-	147	uA

AC Characteristics 1

(T_{amb}=25℃, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC21							
nA, nB, nC, nD to nY propagation delay	t_{pd}	see Figure 6[1]	V_{CC}=2.0V	-	33	110	ns
			V_{CC}=4.5V	-	12	22	ns
			V_{CC}=5.0V;C_L=15pF	-	10	-	ns
			V_{CC}=6.0V	-	10	19	ns
transition time	t_t	see Figure 6[2]	V_{CC}=2.0V	-	19	75	ns
			V_{CC}=4.5V	-	7	15	ns
			V_{CC}=6.0V	-	6	13	ns
power dissipation capacitance	C_{PD}	V_I=GND to V_{CC}[3]		-	15	-	pF
SN74HCT21							
nA, nB, nC, nD to nY propagation delay	t_{pd}	see Figure 6[1]	V_{CC}=4.5V	-	15	27	ns
			V_{CC}=5.0V;C_L=15pF	-	12	-	ns
transition time	t_t	see Figure 6[2]	V_{CC}=4.5V	-	7	15	ns
power dissipation capacitance	C_{PD}	V_I=GND to V_{CC}-1.5V[3]		-	16	-	pF

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.

[2] t_t is the sameas t_{THL} and t_{TLH}.

[3] C_{PD} isused to determine the dynamic power dissipation (P_D in uW).

$P_D=C_{PD}\times V_{CC}^2\times f_i+\Sigma(C_L\times V_{CC}^2\times f_o)$ where:

f_i=input frequency in MHz;

f_o=output frequency in MHz;

C_L=output load capacitance in pF;

V_{CC}=supply voltage in V;

$\Sigma(C_L\times V_{CC}^2\times f_o)$=sum of outputs.

AC Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC21							
nA, nB, nC, nD to nY propagation delay	t_{pd}	see Figure 6[1]	V_{CC}=2.0V	-	-	140	ns
			V_{CC}=4.5V	-	-	28	ns
			V_{CC}=6.0V	-	-	24	ns
transition time	t_t	see Figure 6[2]	V_{CC}=2.0V	-	-	95	ns
			V_{CC}=4.5V	-	-	19	ns
			V_{CC}=6.0V	-	-	16	ns
SN74HCT21							
nA, nB, nC, nD to nY propagation delay	t_{pd}	see Figure 6[1]	V_{CC}=4.5V	-	-	34	ns
transition time	t_t	see Figure 6[2]	V_{CC}=4.5V	-	-	19	ns

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.

[2] t_t is the sameast_{THL} and t_{TLH}.

AC Characteristics 2

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

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
SN74HC21							
nA, nB, nC, nD to nY propagation delay	t_{pd}	see Figure 6[1]	V_{CC}=2.0V	-	-	165	ns
			V_{CC}=4.5V	-	-	33	ns
			V_{CC}=6.0V	-	-	28	ns
transition time	t_t	see Figure 6[2]	V_{CC}=2.0V	-	-	110	ns
			V_{CC}=4.5V	-	-	22	ns
			V_{CC}=6.0V	-	-	19	ns
SN74HCT21							
nA, nB, nC, nD to nY propagation delay	t_{pd}	see Figure 6[1]	V_{CC}=4.5V	-	-	41	ns
transition time	t_t	see Figure 6[2]	V_{CC}=4.5V	-	-	22	ns

Note:

[1] t_{pd} is the same as t_{PLH} and t_{PHL}.

[2] t_t is the sameast_{THL} and t_{TLH}.
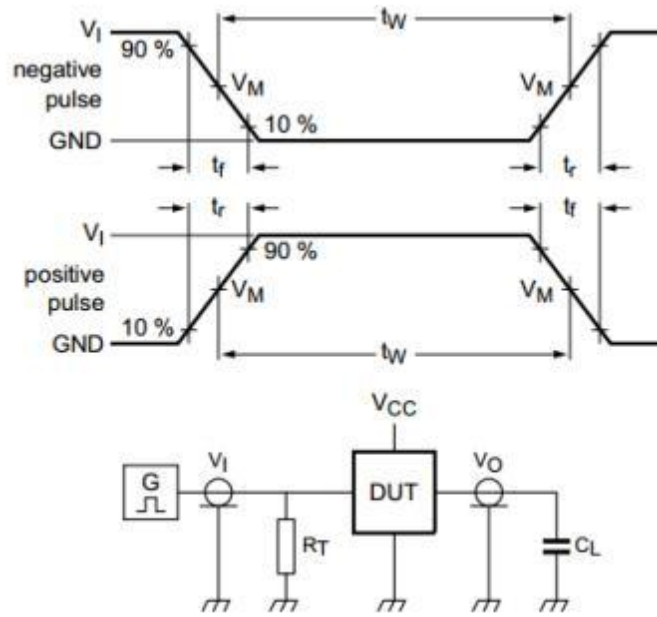
Testing Circuit

AC Testing Circuit

Figure 5. 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 Z_o of the pulse generator.
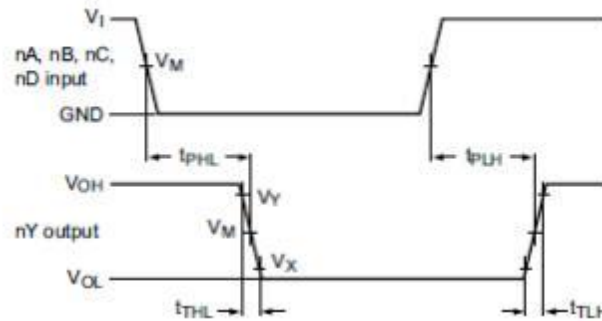
AC Testing Waveforms

Figure 6. Waveforms showing the input (nA, nB, nC, nD) to output (nY) propagation delays and the output transition times
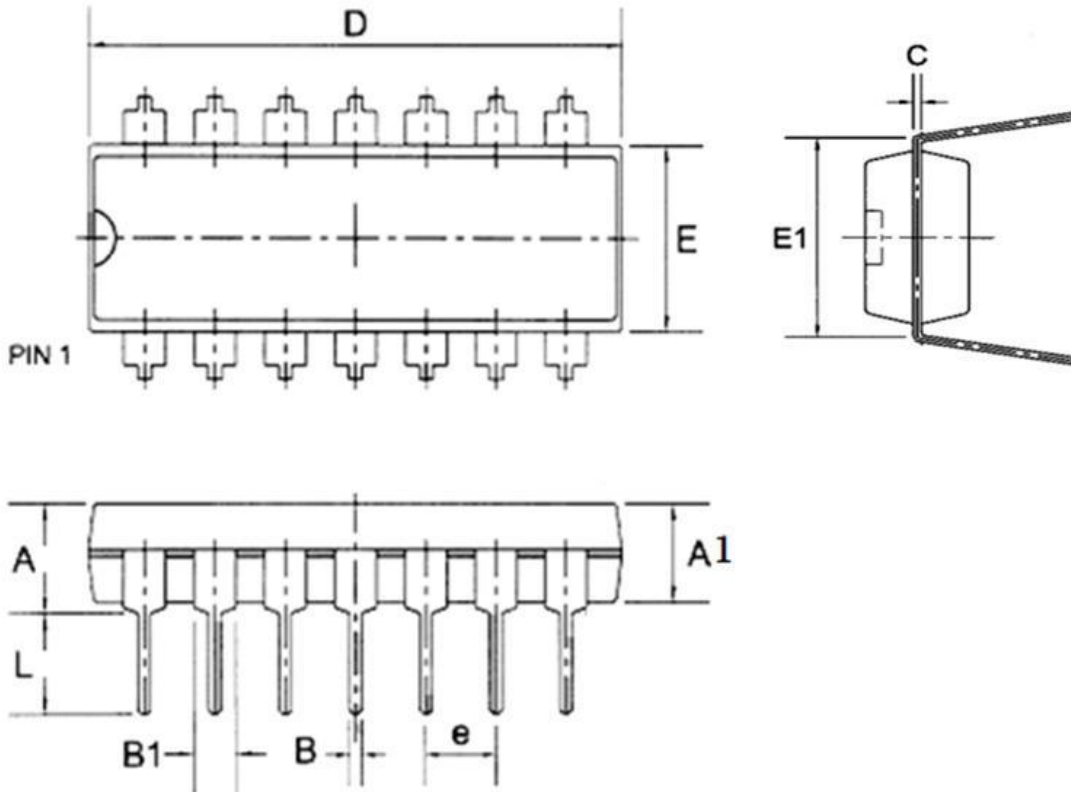
Measurement Points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
SN74HC21	0.5×V_{CC}	0.5×V_{CC}	0.1×V_{CC}	0.9×V_{CC}
SN74HCT21	1.3V	1.3V	0.1×V_{CC}	0.9×V_{CC}

Test Data

Type	Input		Load	Test
	V_I	t_r ,t_f	C_L	
SN74HC21	V_{CC}	6.0ns	15pF,50pF	t_{PLH}, t_{PHL}
SN74HCT21	3.0V	6.0ns	15pF,50pF	t_{PLH}, t_{PHL}

Package Information

DIP14

Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A	--	--	4.31
A1	3.15	3.30	3.65
B	--	0.46	--
B1	--	1.60	--
C	--	0.25	--
D	19.00	19.30	19.60
E	6.20	6.40	6.60
E1	--	7.60	--
e	--	2.54	--
L	3.00	3.35	3.60

SOP14
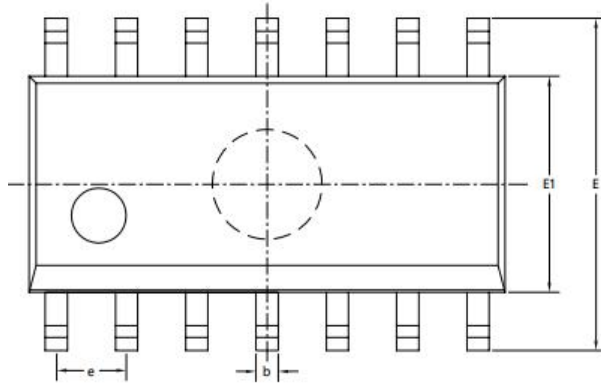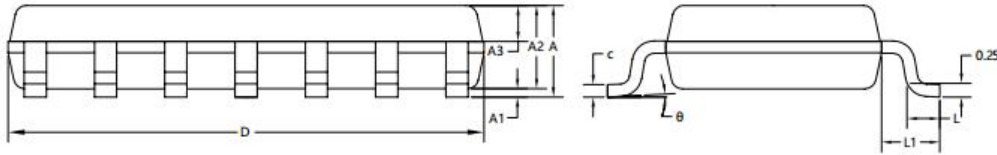
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.50	1.60	1.70
A1	0.10	0.15	0.25
A2	1.40	1.45	1.50
A3	0.60	0.65	0.70
b	0.35	0.40	0.45
c	0.15	0.20	0.25
D	8.50	8.60	8.70
E	5.80	6.00	6.20
E1	3.85	3.90	3.95
e	1.27BSC		
L	0.50	0.60	0.70
L1	1.05REF		
θ	0°	4°	8°

Statement：

✧ 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.

单击下面可查看定价，库存，交付和生命周期等信息

>>XBLW(芯伯乐)