



# AiP74HC/HCT138

## 3-to-8 Line Decoder/Demultiplexer; Inverting

### Product Specification

#### Specification Revision History:

Version	Date	Description
2019-06-A1	2019-06	New
2021-11-A2	2021-11	Modify Ordering Information; Modify ambient temperature to -40°C ~+105°C and add electrical characteristics of -40°C ~+105°C



## 1、 General Description

The AiP74HC/HCT138 decodes three binary weighted address inputs(A0, A1 and A2) to eight mutually exclusive outputs ( $\bar{Y}0$  to  $\bar{Y}7$ ). The device features three enable inputs ( $\bar{E}1$ ,  $\bar{E}2$  and E3). Every output will be HIGH unless  $\bar{E}1$  and  $\bar{E}2$  are LOW and E3 is HIGH. This multiple enable function allows easy parallel expansion to a 1-of-32(5 to 32 lines) decoder with just four AiP74HC/HCT138 ICs and one inverter. The AiP74HC/HCT138 can be used as an eight output demultiplexer by using one of the active LOW enable inputs as the data input and the remaining enable inputs as strobes. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

### Features:

- Input levels:  
For AiP74HC138: CMOS level  
For AiP74HCT138: TTL level
- Demultiplexing capability
- Multiple input enable for easy expansion
- Ideal for memory chip select decoding
- Active LOW mutually exclusive outputs
- Specified from -40°C to +105°C
- Packaging information: DIP16/SOP16/TSSOP16

**Ordering Information:****Tube packing specifications:**

Type number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Packing box number	Packing quantity	Notes
AiP74HC138DA.TB	DIP16	74HC138	25 PCS/tube	40 tube/box	1000 PCS/box	10 box/pack	10000 PCS/pack	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HCT138DA.TB	DIP16	74HCT138	25 PCS/tube	40 tube/box	1000 PCS/box	10 box/pack	10000 PCS/pack	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HC138SA.TB	SOP16	74HC138	50 PCS/tube	200 tube/box	10000 PCS/box	5 box/pack	50000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HCT138SA.TB	SOP16	74HCT138	50 PCS/tube	200 tube/box	10000 PCS/box	5 box/pack	50000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC138TA.TB	TSSOP16(1)	74HC138	96 PCS/tube	200 tube/box	19200 PCS/box	10 box/pack	192000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HC138TA.TB	TSSOP16(2)	74HC138	92 PCS/tube	100 tube/box	9200 PCS/box	10 box/pack	92000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT138TA.TB	TSSOP16(1)	74HCT138	96 PCS/tube	200 tube/box	19200 PCS/box	10 box/pack	192000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT138TA.TB	TSSOP16(2)	74HCT138	92 PCS/tube	100 tube/box	9200 PCS/box	10 box/pack	92000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

**Reel packing specifications:**

Type number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Packing quantity	Notes
AiP74HC138SA.TR	SOP16	74HC138	4000 PCS/reel	8000 PCS/box	64000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HCT138SA.TR	SOP16	74HCT138	4000 PCS/reel	8000 PCS/box	64000 PCS/pack	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HC138TA.TR	TSSOP16	74HC138	4000 PCS/reel	8000 PCS/box	64000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm
AiP74HCT138TA.TR	TSSOP16	74HCT138	4000 PCS/reel	8000 PCS/box	64000 PCS/pack	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.



## 2、Block Diagram And Pin Description

### 2.1、Block Diagram

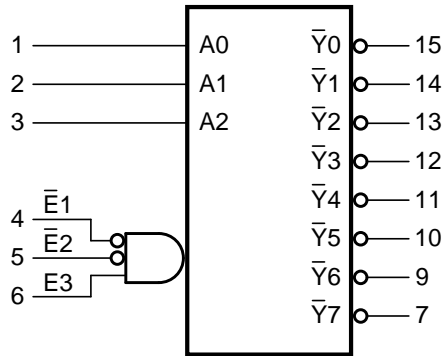


Figure 1. Logic symbol

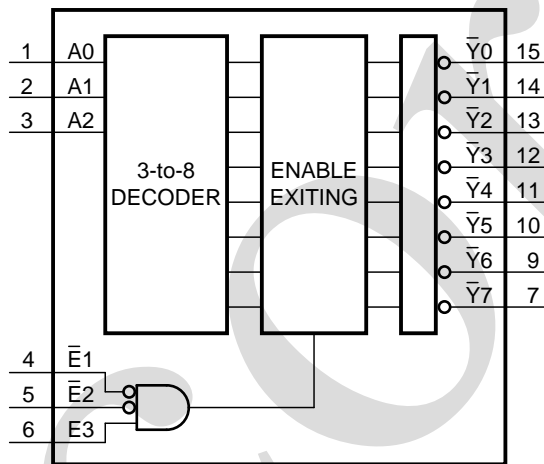


Figure 2. Functional diagram

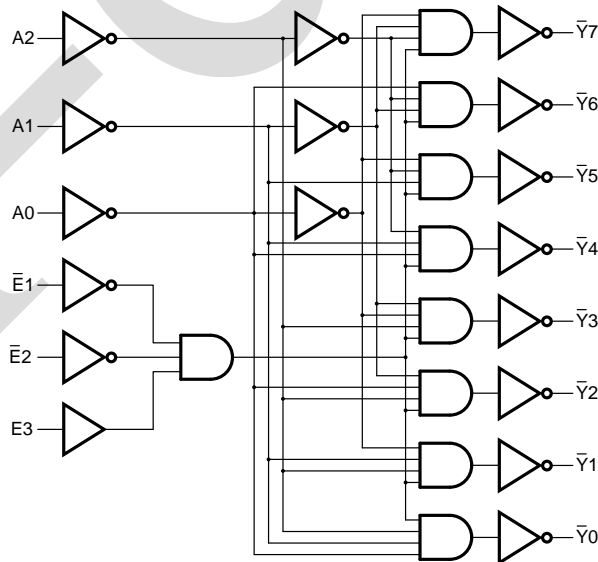
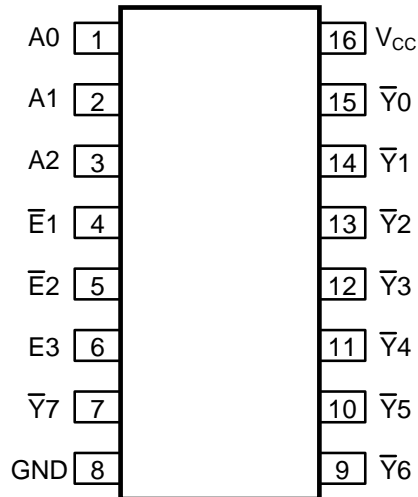


Figure 3. Logic diagram



## 2.2、Pin Configurations



## 2.3、Pin Description

Pin No.	Pin Name	Description
1	A0	address input
2	A1	address input
3	A2	address input
4	$\bar{E}1$	enable input (active LOW)
5	$\bar{E}2$	enable input (active LOW)
6	E3	enable input (active HIGH)
7	$\bar{Y}7$	output (active LOW)
8	GND	ground (0 V)
9	$\bar{Y}6$	output (active LOW)
10	$\bar{Y}5$	output (active LOW)
11	$\bar{Y}4$	output (active LOW)
12	$\bar{Y}3$	output (active LOW)
13	$\bar{Y}2$	output (active LOW)
14	$\bar{Y}1$	output (active LOW)
15	$\bar{Y}0$	output (active LOW)
16	V <sub>CC</sub>	supply voltage



## 2.4、Function Table

Input						Output							
$\bar{E}1$	$\bar{E}2$	E3	A2	A1	A0	$\bar{Y}7$	$\bar{Y}6$	$\bar{Y}5$	$\bar{Y}4$	$\bar{Y}3$	$\bar{Y}2$	$\bar{Y}1$	$\bar{Y}0$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	H	H	H	H	H	H	H	L
L	L	H	L	L	H	H	H	H	H	H	H	L	H
L	L	H	L	H	L	H	H	H	H	H	L	H	H
L	L	H	L	H	H	H	H	H	H	L	H	H	H
L	L	H	H	L	L	H	H	H	L	H	H	H	H
L	L	H	H	L	H	H	H	L	H	H	H	H	H
L	L	H	H	H	L	H	L	H	H	H	H	H	H
L	L	H	H	H	H	L	H	H	H	H	H	H	H

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

## 3、Electrical Parameter

### 3.1、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 $V_I > V_{CC}+0.5V$	-	$\pm 20$	mA
output clamping current	$I_{OK}$	$V_O < -0.5V$ or $V_O > V_{CC}+0.5V$	-	$\pm 20$	mA
output current	$I_O$	$-0.5V < V_O < V_{CC}+0.5V$	-	$\pm 25$	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	$^{\circ}C$
soldering temperature	$T_L$	10s	DIP	245	$^{\circ}C$
			SOP	250	

Note:

- [1] For DIP16 packages: above 70 $^{\circ}C$  the value of  $P_{tot}$  derates linearly with 12mW/K.
- [2] For SOP16 packages: above 70 $^{\circ}C$  the value of  $P_{tot}$  derates linearly with 8mW/K.
- [3] For (T)SSOP16 packages: above 60 $^{\circ}C$  the value of  $P_{tot}$  derates linearly with 5.5mW/K.



### 3.2、Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>AiP74HC138</b>						
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	-	+105	°C
<b>AiP74HCT138</b>						
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	-	+105	°C

### 3.3、Electrical Characteristics

#### 3.3.1、DC Characteristics 1

( $T_{amb}=25^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC138</b>							
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	
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 $V_{IL}$	$I_O=-20\mu A; V_{CC}=2.0V$	1.9	2.0	-	V
			$I_O=-20\mu A; V_{CC}=4.5V$	4.4	4.5	-	V
			$I_O=-20\mu A; V_{CC}=6.0V$	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 $V_{IL}$	$I_O=20\mu A; V_{CC}=2.0V$	-	0	0.1	V
			$I_O=20\mu A; V_{CC}=4.5V$	-	0	0.1	V
			$I_O=20\mu A; V_{CC}=6.0V$	-	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; $V_{CC}=6.0V$	-	-	$\pm 0.1$	$\mu A$	
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=6.0V$	-	-	8.0	$\mu A$	
input capacitance	$C_I$	-	-	3.5	-	pF	
<b>AiP74HCT138</b>							





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 $V_{IL}$	$I_O=-20\mu A$ ; $V_{CC}=4.5V$	4.4	4.5	-	V
			$I_O=-4.0mA$ ; $V_{CC}=4.5V$	3.98	4.32	-	V
LOW-level output voltage	$V_{OL}$	$V_I=V_{IH}$ or $V_{IL}$	$I_O=20\mu A$ ; $V_{CC}=4.5V$	-	0	0.1	V
			$I_O=4.0mA$ ; $V_{CC}=4.5V$	-	0.15	0.26	V
input leakage current	$I_I$	$V_I=V_{CC}$ or GND; $V_{CC}=5.5V$		-	-	$\pm 0.1$	$\mu A$
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=5.5V$		-	-	8.0	$\mu A$
additional supply current	$\Delta I_{CC}$	$V_I=V_{CC}-2.1V$ ; $I_O=0A$ ; other inputs at $V_{CC}$ or GND; $V_{CC}=4.5V$ to $5.5V$	An inputs	-	150	540	$\mu A$
			$\bar{E}n$ inputs	-	125	450	
			E3 input	-	100	360	
input capacitance	$C_I$	-		-	3.5	-	pF

### 3.3.2、DC Characteristics 2

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC138</b>							
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 $V_{IL}$	$I_O=-20\mu A$ ; $V_{CC}=2.0V$	1.9	-	-	V
			$I_O=-20\mu A$ ; $V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-20\mu A$ ; $V_{CC}=6.0V$	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 $V_{IL}$	$I_O=20\mu A$ ; $V_{CC}=2.0V$	-	-	0.1	V
			$I_O=20\mu A$ ; $V_{CC}=4.5V$	-	-	0.1	V
			$I_O=20\mu A$ ; $V_{CC}=6.0V$	-	-	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; $V_{CC}=6.0V$	-	-	$\pm 1.0$	$\mu A$	
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=6.0V$	-	-	80	$\mu A$	
<b>AiP74HCT138</b>							
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 $V_{IL}$	$I_O=-20\mu A$ ; $V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-4.0mA$ ; $V_{CC}=4.5V$	3.84	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I=V_{IH}$ or $V_{IL}$	$I_O=20\mu A$ ; $V_{CC}=4.5V$	-	-	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; $V_{CC}=5.5V$		-	-	$\pm 1.0$	$\mu A$
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=5.5V$		-	-	80	$\mu A$
additional supply current	$\Delta I_{CC}$	$V_I=V_{CC}-2.1V$ ; $I_O=0A$ ; other inputs at $V_{CC}$ or GND; $V_{CC}=4.5V$ to $5.5V$	An inputs	-	-	675	$\mu A$
			$\bar{E}_n$ inputs	-	-	562.5	
			E3 input	-	-	450	

### 3.3.3. DC Characteristics 3

( $T_{amb}=-40^{\circ}C$  to  $+105^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC138</b>							
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 $V_{IL}$	$I_O=-20\mu A$ ; $V_{CC}=2.0V$	1.9	-	-	V
			$I_O=-20\mu A$ ; $V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-20\mu A$ ; $V_{CC}=6.0V$	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 $V_{IL}$	$I_O=20\mu A$ ; $V_{CC}=2.0V$	-	-	0.1	V
			$I_O=20\mu A$ ; $V_{CC}=4.5V$	-	-	0.1	V
			$I_O=20\mu A$ ; $V_{CC}=6.0V$	-	-	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; $V_{CC}=6.0V$		-	-	$\pm 1.0$	$\mu A$
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=6.0V$		-	-	160	$\mu A$
<b>AiP74HCT138</b>							
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 $V_{IL}$	$I_O=-20\mu A$ ; $V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-4.0mA$ ; $V_{CC}=4.5V$	3.7	-	-	V
LOW-level output voltage	$V_{OL}$	$V_I=V_{IH}$ or $V_{IL}$	$I_O=20\mu A$ ; $V_{CC}=4.5V$	-	-	0.1	V
			$I_O=4.0mA$ ; $V_{CC}=4.5V$	-	-	0.4	V
input leakage	$I_I$	$V_I=V_{CC}$ or GND;		-	-	$\pm 1.0$	$\mu A$



current		$V_{CC}=5.5V$						
supply current	$I_{CC}$	$V_I=V_{CC}$ or GND; $I_O=0A$ ; $V_{CC}=5.5V$			-	-	160	uA
additional supply current	$\Delta I_{CC}$	$V_I=V_{CC}-2.1V$ ; $I_O=0A$ ; other inputs at $V_{CC}$ or GND; $V_{CC}=4.5V$ to $5.5V$	An inputs	-	-	735	uA	
			$\bar{E}n$ inputs	-	-	612.5		
			E3 input	-	-	490		

### 3.3.4、AC Characteristics 1

( $T_{amb}=25^{\circ}C$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC138</b>							
An to $\bar{Y}n$ propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=2.0V$	-	41	150	ns
			$V_{CC}=4.5V$	-	15	30	ns
			$V_{CC}=5.0V; C_L=15pF$	-	12	-	ns
			$V_{CC}=6.0V$	-	12	26	ns
E3 to $\bar{Y}n$ propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=2.0V$	-	47	150	ns
			$V_{CC}=4.5V$	-	17	20	ns
			$V_{CC}=5.0V; C_L=15pF$	-	14	-	ns
			$V_{CC}=6.0V$	-	14	26	ns
$\bar{E}n$ to $\bar{Y}n$ propagation delay	$t_{pd}$	see Figure 6 <sup>[1]</sup>	$V_{CC}=2.0V$	-	47	150	ns
			$V_{CC}=4.5V$	-	17	20	ns
			$V_{CC}=5.0V; C_L=15pF$	-	14	-	ns
			$V_{CC}=6.0V$	-	14	26	ns
transition time	$t_t$	see Figure 5 <sup>[2]</sup>	$V_{CC}=2.0V$	-	19	75	ns
			$V_{CC}=4.5V$	-	7	15	ns
			$V_{CC}=6.0V$	-	6	13	ns
power dissipation capacitance	$C_{PD}$	$C_L=50pF$ ; $f=1MHz$ ; $V_I=GND$ to $V_{CC}$ <sup>[3]</sup>	-	67	-	pF	
<b>AiP74HCT138</b>							
An to $\bar{Y}n$ propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=4.5V$	-	20	35	ns
			$V_{CC}=5.0V; C_L=15pF$	-	17	-	ns
E3 to $\bar{Y}n$ propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=4.5V$	-	18	40	ns
			$V_{CC}=5.0V; C_L=15pF$	-	19	-	ns
$\bar{E}n$ to $\bar{Y}n$ propagation delay	$t_{pd}$	see Figure 6 <sup>[1]</sup>	$V_{CC}=4.5V$	-	19	40	ns
			$V_{CC}=5.0V; C_L=15pF$	-	19	-	ns
transition time	$t_t$	see Figure 5 <sup>[2]</sup>	$V_{CC}=4.5V$	-	7	15	ns
power dissipation capacitance	$C_{PD}$	$C_L=50pF$ ; $f=1MHz$ ; $V_I=GND$ to $V_{CC}-1.5V$ <sup>[3]</sup>	-	67	-	pF	

Note:

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

[2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .



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

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

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

### 3.3.5、AC Characteristics 2

( $T_{amb} = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC138</b>							
An to $\bar{Y}_n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=2.0\text{V}$	-	-	190	ns
			$V_{CC}=4.5\text{V}$	-	-	38	ns
			$V_{CC}=6.0\text{V}$	-	-	33	ns
E3 to $\bar{Y}_n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=2.0\text{V}$	-	-	190	ns
			$V_{CC}=4.5\text{V}$	-	-	38	ns
			$V_{CC}=6.0\text{V}$	-	-	33	ns
$\bar{E}_n$ to $\bar{Y}_n$ ; propagation delay	$t_{pd}$	see Figure 6 <sup>[1]</sup>	$V_{CC}=2.0\text{V}$	-	-	190	ns
			$V_{CC}=4.5\text{V}$	-	-	38	ns
			$V_{CC}=6.0\text{V}$	-	-	33	ns
transition time	$t_t$	see Figure 5 <sup>[2]</sup>	$V_{CC}=2.0\text{V}$	-	-	95	ns
			$V_{CC}=4.5\text{V}$	-	-	19	ns
			$V_{CC}=6.0\text{V}$	-	-	16	ns
<b>AiP74HCT138</b>							
An to $\bar{Y}_n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=4.5\text{V}$	-	-	44	ns
E3 to $\bar{Y}_n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=4.5\text{V}$	-	-	50	ns
$\bar{E}_n$ to $\bar{Y}_n$ ; propagation delay	$t_{pd}$	see Figure 6 <sup>[1]</sup>	$V_{CC}=4.5\text{V}$	-	-	50	ns
transition time	$t_t$	see Figure 5 <sup>[2]</sup>	$V_{CC}=4.5\text{V}$	-	-	19	ns

Note:

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

[2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .



### 3.3.6. AC Characteristics 3

( $T_{amb} = -40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$ , voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>AiP74HC138</b>							
An to $\bar{Y}n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=2.0\text{V}$	-	-	225	ns
			$V_{CC}=4.5\text{V}$	-	-	45	ns
			$V_{CC}=6.0\text{V}$	-	-	38	ns
E3 to $\bar{Y}n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=2.0\text{V}$	-	-	225	ns
			$V_{CC}=4.5\text{V}$	-	-	45	ns
			$V_{CC}=6.0\text{V}$	-	-	38	ns
$\bar{E}n$ to $\bar{Y}n$ ; propagation delay	$t_{pd}$	see Figure 6 <sup>[1]</sup>	$V_{CC}=2.0\text{V}$	-	-	225	ns
			$V_{CC}=4.5\text{V}$	-	-	45	ns
			$V_{CC}=6.0\text{V}$	-	-	38	ns
transition time	$t_t$	see Figure 5 <sup>[2]</sup>	$V_{CC}=2.0\text{V}$	-	-	110	ns
			$V_{CC}=4.5\text{V}$	-	-	22	ns
			$V_{CC}=6.0\text{V}$	-	-	19	ns
<b>AiP74HCT138</b>							
An to $\bar{Y}n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=4.5\text{V}$	-	-	53	ns
E3 to $\bar{Y}n$ ; propagation delay	$t_{pd}$	see Figure 5 <sup>[1]</sup>	$V_{CC}=4.5\text{V}$	-	-	60	ns
$\bar{E}n$ to $\bar{Y}n$ ; propagation delay	$t_{pd}$	see Figure 6 <sup>[1]</sup>	$V_{CC}=4.5\text{V}$	-	-	60	ns
transition time	$t_t$	see Figure 5 <sup>[2]</sup>	$V_{CC}=4.5\text{V}$	-	-	22	ns

Note:

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

[2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .



### 4、 Testing Circuit

#### 4.1、 AC Testing Circuit

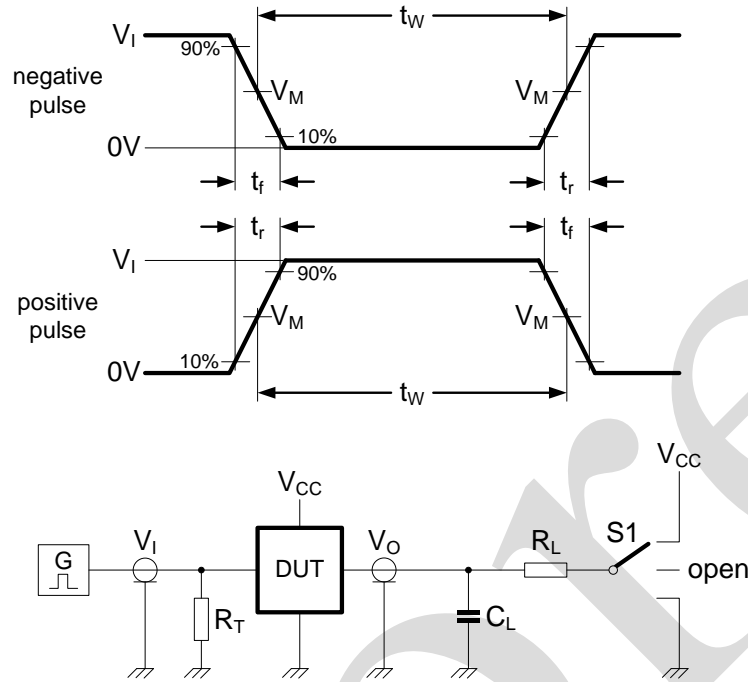


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

$C_L$ =load capacitance including jig and probe capacitance.

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

$R_L$ =Load resistance.

S1=Test selection switch.

#### 4.2、 AC Testing Waveforms

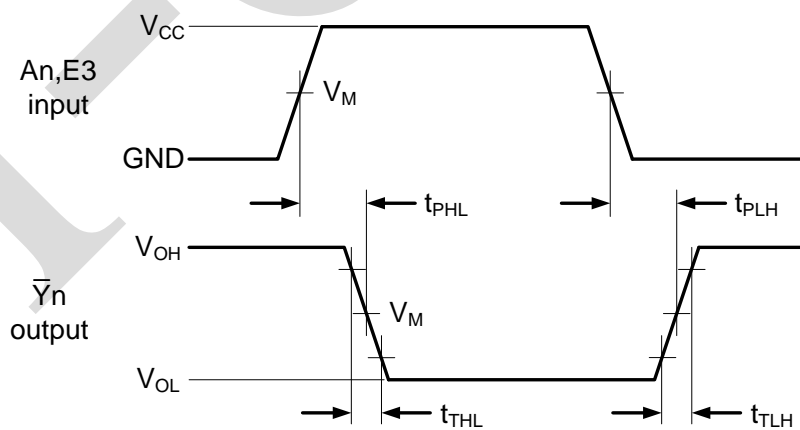


Figure 5. Propagation delay input (An) and enable input (E3) to output ( $\bar{Y}_n$ ) and transition time output ( $\bar{Y}_n$ )

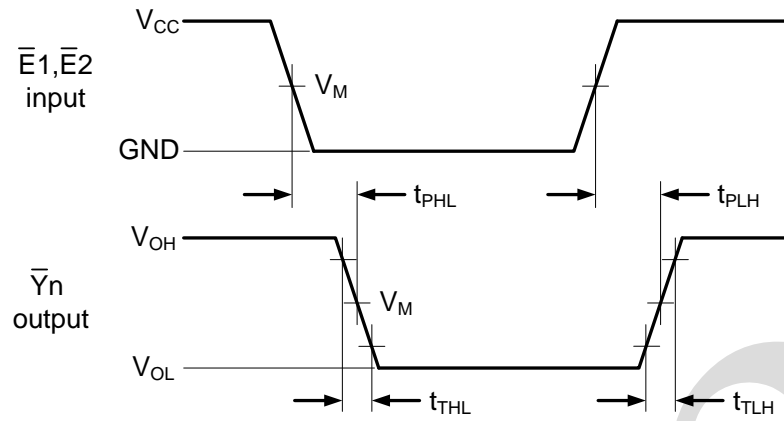


Figure 6. Propagation delay enable input ( $\bar{E}_n$ ) to output ( $\bar{Y}_n$ ) and transition time output ( $\bar{Y}_n$ )

#### 4.3. Measurement Points

Type	Input	Output
	$V_M$	$V_M$
AiP74HC138	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
AiP74HCT138	1.3V	1.3V

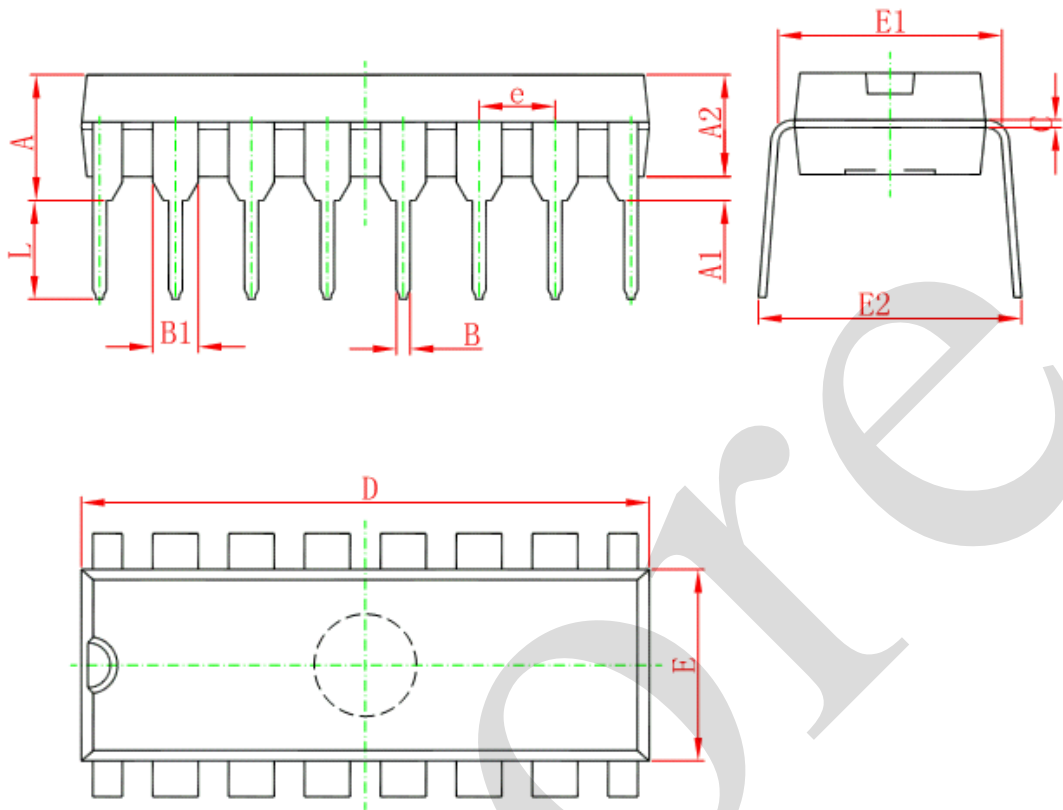
#### 4.4. Test Data

Type	Input		Load		S1 position		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
AiP74HC138	$V_{CC}$	6.0ns	15pF, 50pF	1k $\Omega$	open	GND	$V_{CC}$
AiP74HCT138	3.0V	6.0ns	15pF, 50pF	1k $\Omega$	open	GND	$V_{CC}$



## 5、 Package Information

### 5.1、 DIP16

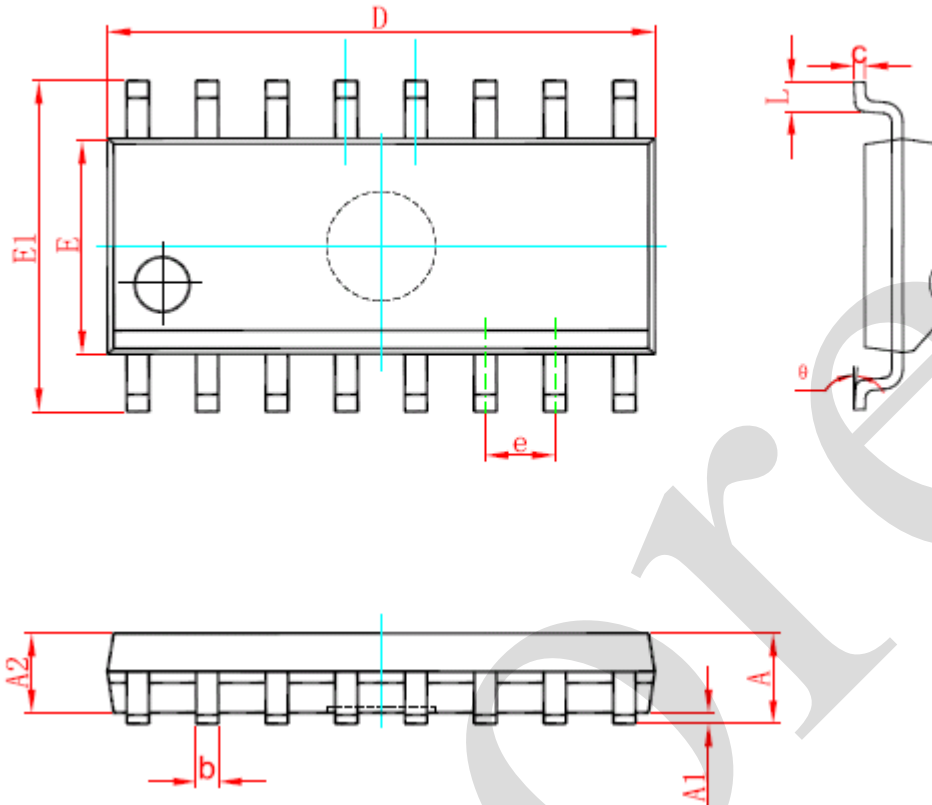


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312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





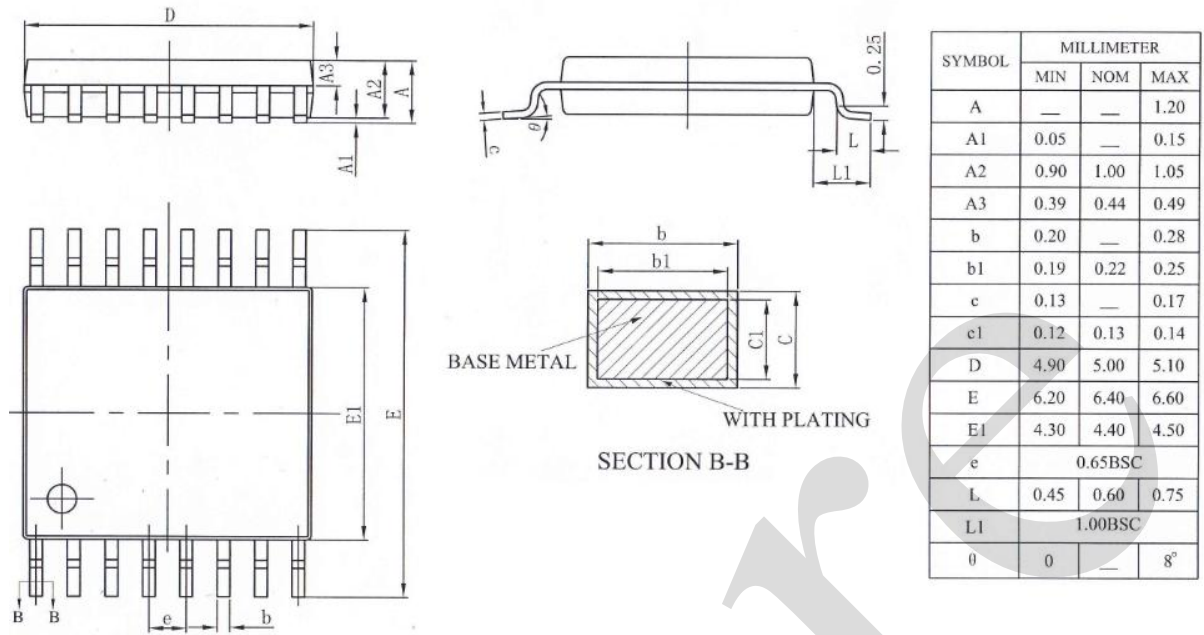
## 5.2、SOP16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



### 5.3、TSSOP16





## 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	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
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.									

### 6.2、 Notion

Recommended carefully reading this information before the use of this product;

The information in this document are subject to change without notice;

This information is using to the reference only, the company is not responsible for any loss;

The company is not responsible for the any infringement of the third party patents or other rights of the responsibility.