3-to-8 Line Decoder/Demultiplexer; Inverting

CJ74HC/HCT138 Logic

1 Introduction

The CJ74HC/HCT138 decodes three binary weighted address inputs(A0, A1 and A2) to eight mutually exclusive outputs (/Y0 to /Y7). The device features three enable inputs (/E1, /E2 and E3). Every output will be HIGH unless/E1 and /E2 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 CJ74HC/HCT138 ICs and one inverter. The CJ74HC/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}.

2 Available Packages

PART NUMBER	PACKAGE
CJ74HC138	SOP16
	TSSOP16
CJ74HCT138	SOP16
	TSSOP16

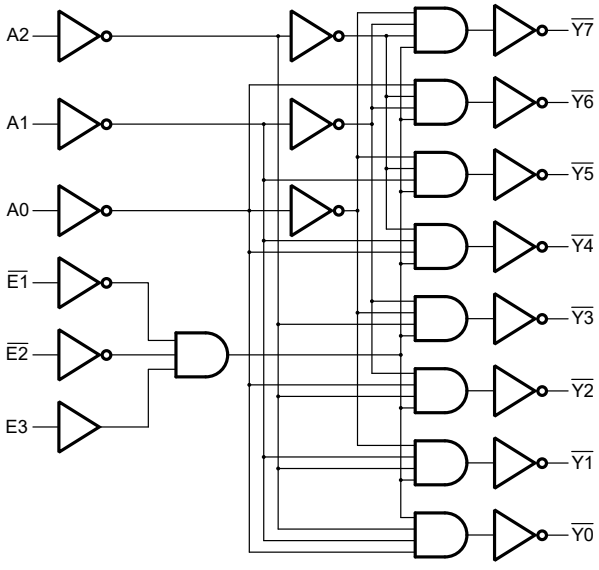
Note: For all available packages, please refer to the part Orderable Information.

3 Features

- Input levels:
  - For CJ74HC138: CMOS level
  - For CJ74HCT138: 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 +125°C

4 Applications

- LED Displays
- Servers
- White Goods
- Power Infrastructure
- Building Automation
- Factory Automation



Function block diagram

5 Orderable Information

DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
CJ74HC138AEN	SOP16	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 4000 Units / Reel	Active
CJ74HCT138AEN	SOP16	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 4000 Units / Reel	Active
CJ74HC138BEN	TSSOP16	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 5000 Units / Reel	Active
CJ74HCT138BEN	TSSOP16	-40~125°C	RoHS & Green	Level 3 168HR	Tape and Reel 5000 Units / Reel	Active

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:
Active: Recommended for new products;
Customized: Products manufactured to meet the specific needs of customers;
Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;
NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;
Obsolete: The device has been discontinued.

6 Pin Configuration and Marking Information

6.1 Pin Configuration

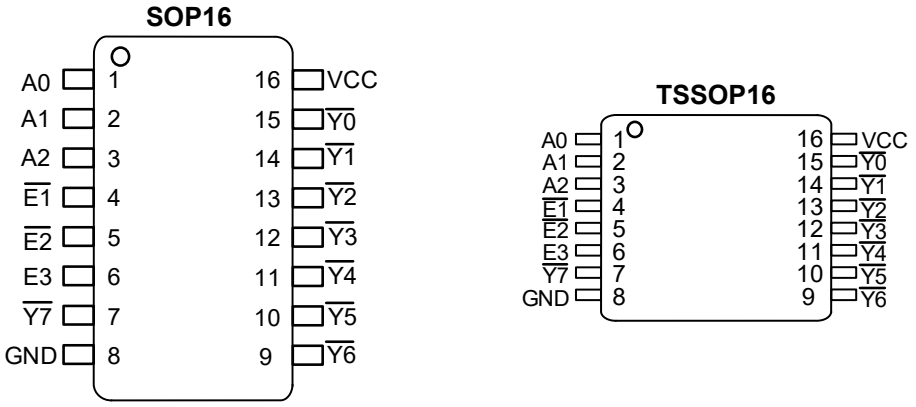


Figure 6-1 Pin configuration

6.2 Pin Function

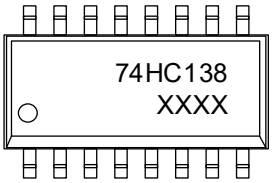
PIN		I/O(1)	DESCRIPTION
No.	NAME		
1	A0	I	Address input
2	A1	I	Address input
3	A2	I	Address input
4	$\overline{E1}$	I	Enable input (active LOW)
5	$\overline{E2}$	I	Enable input (active LOW)
6	E3	I	Enable input (active HIGH)
7	$\overline{Y7}$	O	Output (active LOW)
8	GND	G	Ground (0 V)
9	$\overline{Y6}$	O	Output (active LOW)
10	$\overline{Y5}$	O	Output (active LOW)
11	$\overline{Y4}$	O	Output (active LOW)
12	$\overline{Y3}$	O	Output (active LOW)
13	$\overline{Y2}$	O	Output (active LOW)
14	$\overline{Y1}$	O	Output (active LOW)
15	$\overline{Y0}$	O	Output (active LOW)
16	V_{CC}	P	Supply voltage

(1) I-Input, O-Output, P-Power, G-Ground

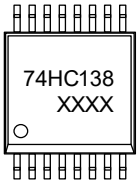
6.3 Marking Information

6.3.1 CJ74HC138

SOP16



TSSOP16



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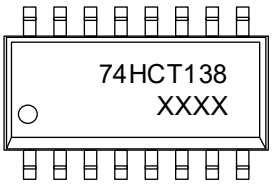
6.3.2 CJ74HCT138

SOP16



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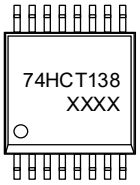

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7 Specifications

7.1 Absolute Maximum Ratings

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	MAX.	UNIT
V_{CC}	Supply voltage	-		-0.5	+7	V
I_{IK}	Input clamping current	V_I < -0.5V or V_I > V_{CC}+0.5V		-	±20	mA
I_{OK}	Output clamping current	V_O < -0.5V or V_O > V_{CC}+0.5V		-	±20	mA
I_O	Output current	-0.5V < V_O < V_{CC}+0.5V		-	±25	mA
I_{CC}	Supply current	-		-	50	mA
I_{GND}	Ground current	-		-50	-	mA
P_{tot}	Total power dissipation	-		-	500	mW
T_{stg}	Storage temperature	-		-65	+150	°C
T_L	Soldering temperature	10s	SOP/TSSOP	-	260	°C

Note: Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to GND. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

7.2 Recommended Operating Conditions

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
CJ74HC138						
V_{CC}	Supply voltage	-	2.0	5.0	6.0	V
V_I	Input voltage	-	0	-	V_{CC}	V
V_O	Output voltage	-	0	-	V_{CC}	V
Δt/ΔV	Input transition rise and fall rate	V_{CC}=2.0V	-	-	625	ns/V
		V_{CC}=4.5V	-	1.67	139	ns/V
		V_{CC}=6.0V	-	-	83	ns/V
T_{amb}	Ambient temperature	-	-40	-	+125	°C
CJ74HCT138						
V_{CC}	Supply voltage	-	4.5	5.0	5.5	V
V_I	Input voltage	-	0	-	V_{CC}	V
V_O	Output voltage	-	0	-	V_{CC}	V
Δt/ΔV	Input transition rise and fall rate	V_{CC}=4.5V	-	1.67	139	ns/V
T_{amb}	Ambient temperature	-	-40	-	+125	°C

7.3 ESD Ratings

SYMBOL	ESD RATINGS		VALUE	UNIT
$V_{ESD-HBM}$	Electrostatic discharge	Human body model (HBM)(1)	±4000	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

7.4 Electrical Characteristics

7.4.1 DC Characteristics 1

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
CJ74HC138							
V_{IH}	HIGH-level input voltage	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
V_{OH}	HIGH-level output voltage	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
V_{OL}	LOW-level output voltage	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
I_I	Input leakage current	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1.0	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	8.0	uA
C_I	Input capacitance	-		-	3.5	-	pF
CJ74HCT138							
V_{IH}	HIGH-level input voltage	V_{CC}=4.5V to 5.5V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=4.5V to 5.5V		-	-	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=4.5V	4.4	4.5	-	V
			I_O=-4.0 mA; V_{CC}=4.5V	3.98	4.32	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}	I_O=20uA; V_{CC}=4.5V	-	0	0.1	V
			I_O=4.0mA; V_{CC}=4.5V	-	0.15	0.26	V
I_I	Input leakage current	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	±1.0	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	8.0	uA
ΔI_{CC}	Additional supply current	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	-	-	540	uA
			$\overline{En}$ inputs	-	-	450	uA
			E3 input	-	-	360	uA
C_I	Input capacitance	-		-	3.5	-	pF

7.4.2 DC Characteristics 2

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
CJ74HC138							
V_{IH}	HIGH-level input voltage	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
V_{OH}	HIGH-level output voltage	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
V_{OL}	LOW-level output voltage	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
I_I	Input leakage current	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1.0	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	80	uA
CJ74HCT138							
V_{IH}	HIGH-level input voltage	V_{CC}=4.5V to 5.5V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=4.5V to 5.5V		-	-	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL};	I_O=-20uA; V_{CC}=4.5V	4.4	-	-	V
			I_O=-4.0mA; V_{CC}=4.5V	3.84	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}	I_O=20uA; V_{CC}=4.5V	-	-	0.1	V
			I_O=4.0mA; V_{CC}=4.5V	-	-	0.33	V
I_I	Input leakage current	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	±1.0	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	80	uA
ΔI_{CC}	Additional supply current	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	uA
			$\overline{En}$ inputs	-	-	562.5	uA
			E3 input	-	-	450	uA

7.4.3 DC Characteristics 3

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
CJ74HC138							
V_{IH}	HIGH-level input voltage	V_{CC}=2.0V		1.5	-	-	V
		V_{CC}=4.5V		3.15	-	-	V
		V_{CC}=6.0V		4.2	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=2.0V		-	-	0.5	V
		V_{CC}=4.5V		-	-	1.35	V
		V_{CC}=6.0V		-	-	1.8	V
V_{OH}	HIGH-level output voltage	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
V_{OL}	LOW-level output voltage	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
I_I	Input leakage current	V_I=V_{CC} or GND; V_{CC}=6.0V		-	-	±1.0	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=6.0V		-	-	160	uA
CJ74HCT138							
V_{IH}	HIGH-level input voltage	V_{CC}=4.5V to 5.5V		2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC}=4.5V to 5.5V		-	-	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}	I_O=-20uA; V_{CC}=4.5V	4.4	-	-	V
			I_O=-4.0mA; V_{CC}=4.5V	3.7	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}	I_O=20uA; V_{CC}=4.5V	-	-	0.1	V
			I_O=4.0mA; V_{CC}=4.5V	-	-	0.4	V
I_I	Input leakage current	V_I=V_{CC} or GND; V_{CC}=5.5V		-	-	±1.0	uA
I_{CC}	Supply current	V_I=V_{CC} or GND; I_O=0A; V_{CC}=5.5V		-	-	160	uA
ΔI_{CC}	Additional supply current	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
			$\overline{En}$ inputs	-	-	612.5	uA
			E3 input	-	-	490	uA

7.4.4 AC Characteristics 1

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
CJ74HC138							
t_{pd}	An to $\overline{Y}n$ propagation delay	See Figure 8-5(1)	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
t_{pd}	E3 to $\overline{Y}n$ propagation delay	See Figure 8-5(1)	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
t_{pd}	$\overline{E}n$ to $\overline{Y}n$ propagation delay	See Figure 8-6(1)	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
t_t	Transition time	See Figure 8-5(2)	V_{CC}=2.0V	-	19	75	ns
			V_{CC}=4.5V	-	7	15	ns
			V_{CC}=6.0V	-	6	13	ns
C_{PD}	Power dissipation capacitance	C_L=50pF; f=1MHz; V_I=GND to V_{CC}(3)		-	67	-	pF
CJ74HCT138							
t_{pd}	An to $\overline{Y}n$ propagation delay	See Figure 8-5(1)	V_{CC}=4.5V	-	20	35	ns
			V_{CC}=5.0V; C_L=15pF	-	17	-	ns
t_{pd}	E3 to $\overline{Y}n$ propagation delay	See Figure 8-5(1)	V_{CC}=4.5V	-	18	40	ns
			V_{CC}=5.0V; C_L=15pF	-	19	-	ns
t_{pd}	$\overline{E}n$ to $\overline{Y}n$ propagation delay	See Figure 8-6(1)	V_{CC}=4.5V	-	19	40	ns
			V_{CC}=5.0V; C_L=15pF	-	19	-	ns
t_t	Transition time	See Figure 8-5(2)	V_{CC}=4.5V	-	7	15	ns
C_{PD}	Power dissipation capacitance	C_L=50pF; f=1MHz; V_I=GND to V_{CC}–1.5V (3)		-	67	-	pF

(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).

$P_D=(C_{PD}xV_{CC}^2xf_ixN)+\sum(C_LxV_{CC}^2xf_o)$ 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;

N=number of inputs switching;

$\sum(C_LxV_{CC}^2xf_o)$=sum of outputs.

7.4.5 AC Characteristics 2

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
CJ74HC138							
t_{pd}	An to $\overline{Y}n$; propagation delay	See Figure 8-5(1)	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
t_{pd}	E3 to $\overline{Y}n$; propagation delay	See Figure 8-5(1)	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
t_{pd}	$\overline{E}n$ to $\overline{Y}n$; propagation delay	See Figure 8-6(1)	V_{CC}=2.0V	-	-	190	ns
			V_{CC}=4.5V	-	-	38	ns
			V_{CC}=6.0V	-	-	33	ns
t_t	Transition time	See Figure 8-5(2)	V_{CC}=2.0V	-	-	95	ns
			V_{CC}=4.5V	-	-	19	ns
			V_{CC}=6.0V	-	-	16	ns
CJ74HCT138							
t_{pd}	An to $\overline{Y}n$; propagation delay	See Figure 8-5(1)	V_{CC}=4.5V	-	-	44	ns
t_{pd}	E3 to $\overline{Y}n$; propagation delay	See Figure 8-5(1)	V_{CC}=4.5V	-	-	50	ns
t_{pd}	$\overline{E}n$ to $\overline{Y}n$; propagation delay	See Figure 8-6(1)	V_{CC}=4.5V	-	-	50	ns
t_t	Transition time	See Figure 8-5(2)	V_{CC}=4.5V	-	-	19	ns

(1) t_{pd} is the same as t_{PLH} and t_{PHL}.

(2) t_t is the same as t_{THL} and t_{TLH}.

7.4.6 AC Characteristics 3

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

SYMBOL	PARAMETER	CONDITIONS		MIN.	TYP.	MAX.	UNIT
CJ74HC138							
t_{pd}	An to $\overline{Y}$n; propagation delay	See Figure 8-5 (1)	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
t_{pd}	E3 to $\overline{Y}$n; propagation delay	See Figure 8-5 (1)	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
t_{pd}	$\overline{E}$n to $\overline{Y}$n; propagation delay	See Figure 8-6(1)	V_{CC}=2.0V	-	-	225	ns
			V_{CC}=4.5V	-	-	45	ns
			V_{CC}=6.0V	-	-	38	ns
t_t	Transition time	See Figure 8-5(2)	V_{CC}=2.0V	-	-	110	ns
			V_{CC}=4.5V	-	-	22	ns
			V_{CC}=6.0V	-	-	19	ns
CJ74HCT138							
t_{pd}	An to $\overline{Y}$n; propagation delay	See Figure 8-5(1)	V_{CC}=4.5V	-	-	53	ns
t_{pd}	E3 to $\overline{Y}$n; propagation delay	See Figure 8-5(1)	V_{CC}=4.5V	-	-	60	ns
t_{pd}	$\overline{E}$n to $\overline{Y}$n; propagation delay	See Figure 8-6(1)	V_{CC}=4.5V	-	-	60	ns
t_t	Transition time	See Figure 8-5(2)	V_{CC}=4.5V	-	-	22	ns

(1) t_{pd} is the same as t_{PLH} and t_{PHL}.

(2) t_t is the same as t_{THL} and t_{TLH}.

8 Detailed Description

8.1 Overview

The CJ74HC/HCT138 decodes three binary weighted address inputs(A0, A1 and A2) to eight mutually exclusive outputs (/Y0 to /Y7). The device features three enable inputs (/E1, /E2 and E3). Every output will be HIGH unless/E1 and /E2 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 CJ74HC/HCT138 ICs and one inverter. The CJ74HC/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}.

8.2 Functional Block Diagram

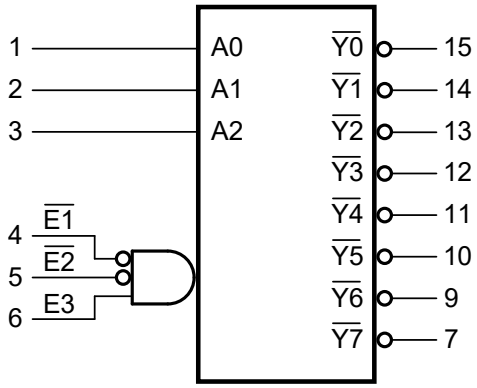


Figure 8-1 Logic symbol

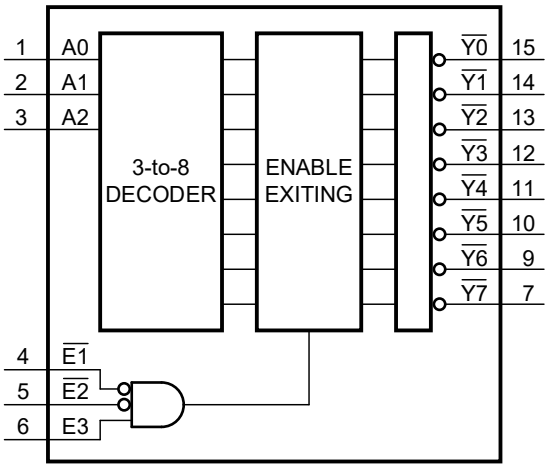


Figure 8-2 Functional diagram

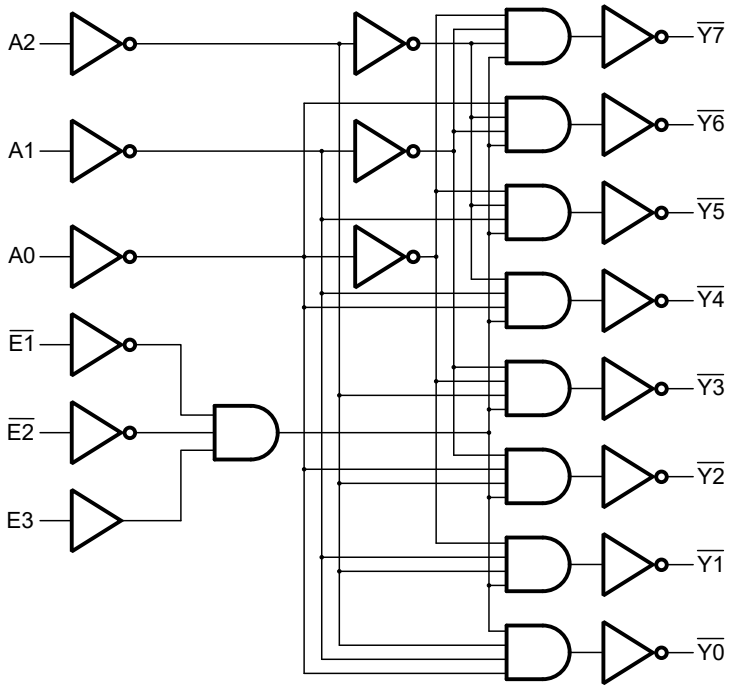


Figure 8-3 Logic diagram

8.3 Function Table(1)

INPUT						OUTPUT							
$\overline{E1}$	$\overline{E2}$	E3	A2	A1	A0	$\overline{Y7}$	$\overline{Y6}$	$\overline{Y5}$	$\overline{Y4}$	$\overline{Y3}$	$\overline{Y2}$	$\overline{Y1}$	$\overline{Y0}$
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

(1) H=HIGH voltage level; L=LOW voltage level; X=don't care.

8.4 Testing Circuit

8.4.1 AC Testing Circuit

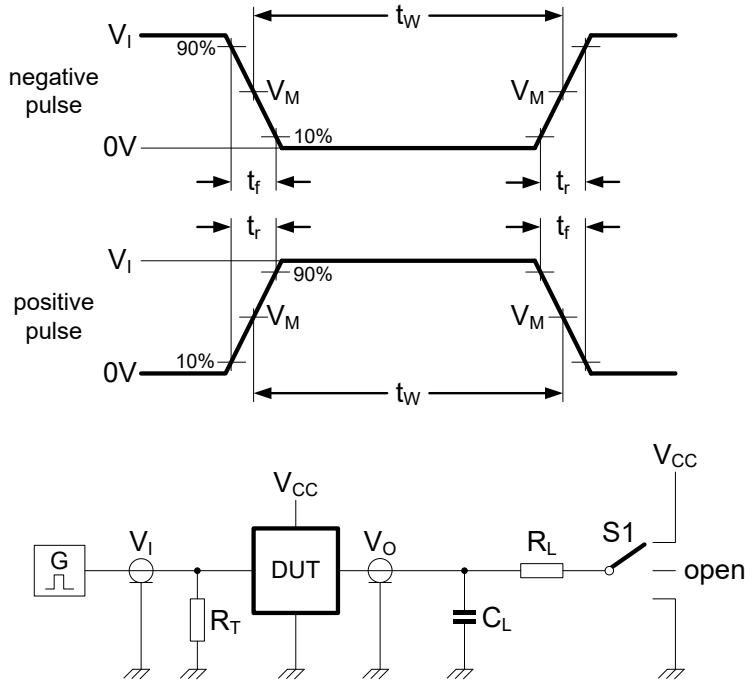


Figure 8-4 Test circuit for measuring switching times

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.

8.4.2 AC Testing Waveforms

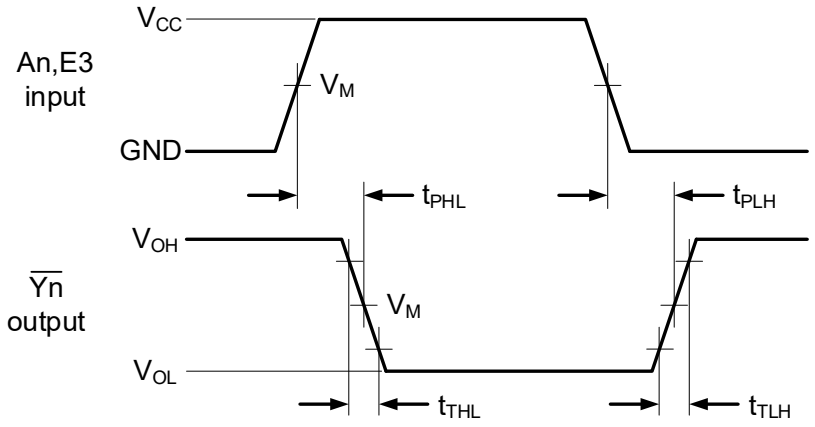


Figure 8-5 Propagation delay input (An) and enable input (E3) to output ($\overline{Yn}$) and transition time output ($\overline{Yn}$)

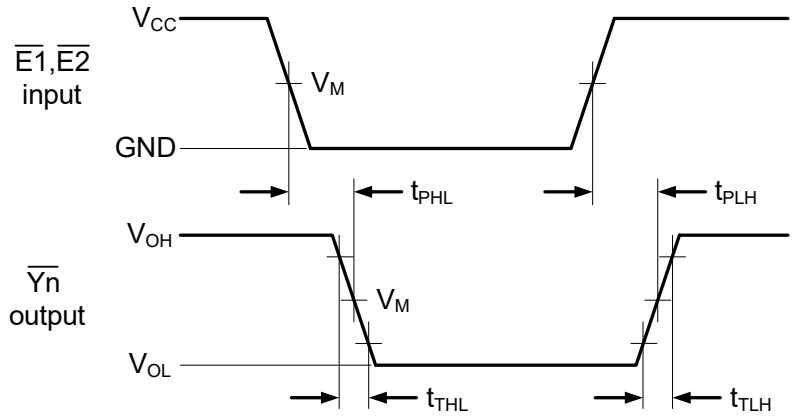


Figure 8-6 Propagation delay enable input ($\overline{En}$) to output ($\overline{Yn}$) and transition time output ($\overline{Yn}$)

8.4.3 Measurement Points

TYPE	INPUT	OUTPUT
	V_M	V_M
CJ74HC138	0.5xV_{CC}	0.5xV_{CC}
CJ74HCT138	1.3V	1.3V

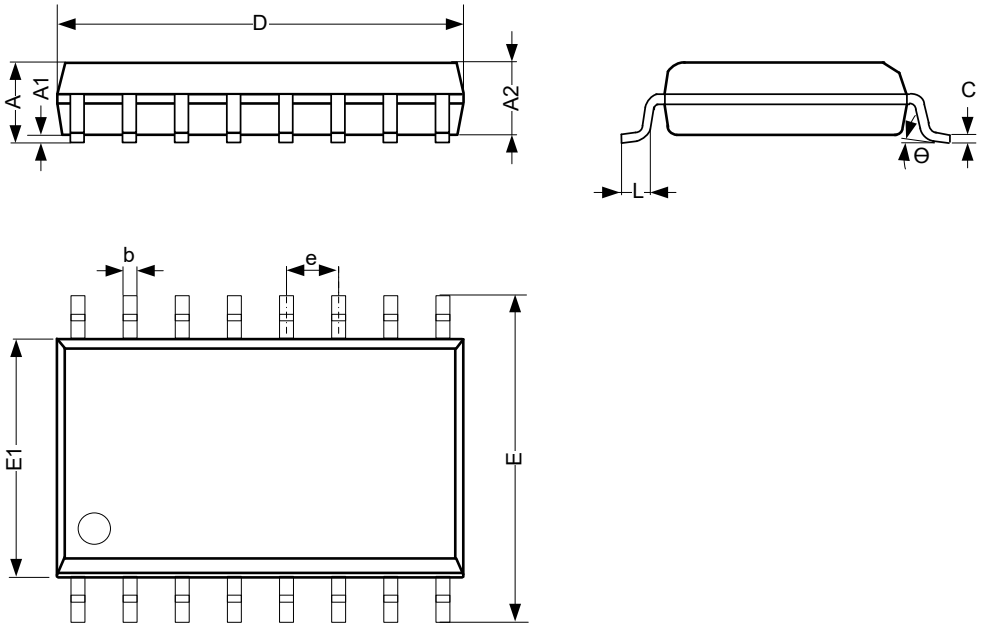
8.4.4 Test Data

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}
CJ74HC138	V_{CC}	6.0ns	15pF, 50pF	1kΩ	Open	GND	V_{CC}
CJ74HCT138	3.0V	6.0ns	15pF, 50pF	1kΩ	Open	GND	V_{CC}

9 Mechanical Information

9.1 SOP16 Mechanical Information

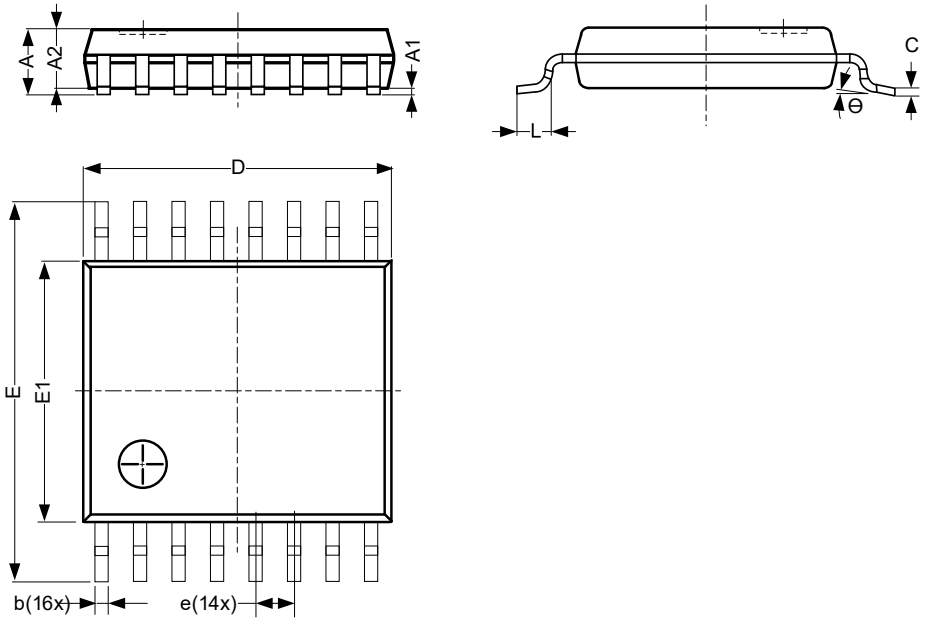
9.1.1 SOP16 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	1.35	-	1.80
A1	0.10	-	0.25
A2	1.25	-	1.55
b	0.33	-	0.51
c	0.19	-	0.25
D	9.50	-	10.10
E	5.80	-	6.30
E1	3.70	-	4.10
e	1.27 BSC		
L	0.35	-	0.89
θ	0°	-	8°
Unit: mm			

9.2 TSSOP16 Mechanical Information

9.2.1 TSSOP16 Outline Dimensions



SYMBOL	Dimensions In Millimeters		
	Min.	Typ.	Max.
A	-	-	1.20
A1	0.05	-	0.15
A2	0.80	-	1.05
b	0.19	-	0.30
c	0.09	-	0.20
D	4.90	-	5.10
E	6.20	-	6.60
E1	4.30	-	4.50
e	0.65 BSC		
L	0.45	-	0.75
Θ	0°	-	8°
Unit: mm			

10 Notes and Revision History

10.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- ***https:www.jscj-elec.com*** for more details.

10.2 Notes

Electrostatic Discharge Caution

This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

DISCLAIMER

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