

3 To 8 Line Decoder Demultiplexer

Description

74HC238 is a high speed CMOS decoder circuit, it accepts a three bit binary weighed address on input pins A0, A1, A2 and when enabled will produce one active high output and other seven output low level.

In addition, the circuit has two low-level enable pins $\overline{E1}$ and $\overline{E2}$ and high-level enable pin E3. When the circuit is in the non enable state, all output pins output low level; When the circuit is enabled, $\overline{E1}$ and $\overline{E2}$ are low level and E3 is high level.

The circuit uses multiple enable signals to realize the expansion of the decoder. Without using additional devices, it can be expanded into a 4-16 decoder, while expanding 5-32 decoding requires an inverter.

Features

- Supply voltage range: 2.0 ~ 6.0V
- Sinks or sources current 8mA@V_{CC}=4.5V
- CMOS low power consumption
- Schmitt trigger action at input pins
- Inputs accepts up to 6.0V
- Products information

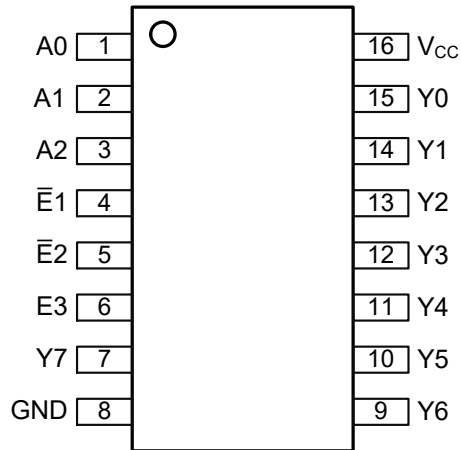
Product Name	Package
74HC238M	SOP16
74HC238V	TSSOP16

Applications

- Memory chip select decoding
- Data transmission system

74HC238

Pin Configuration



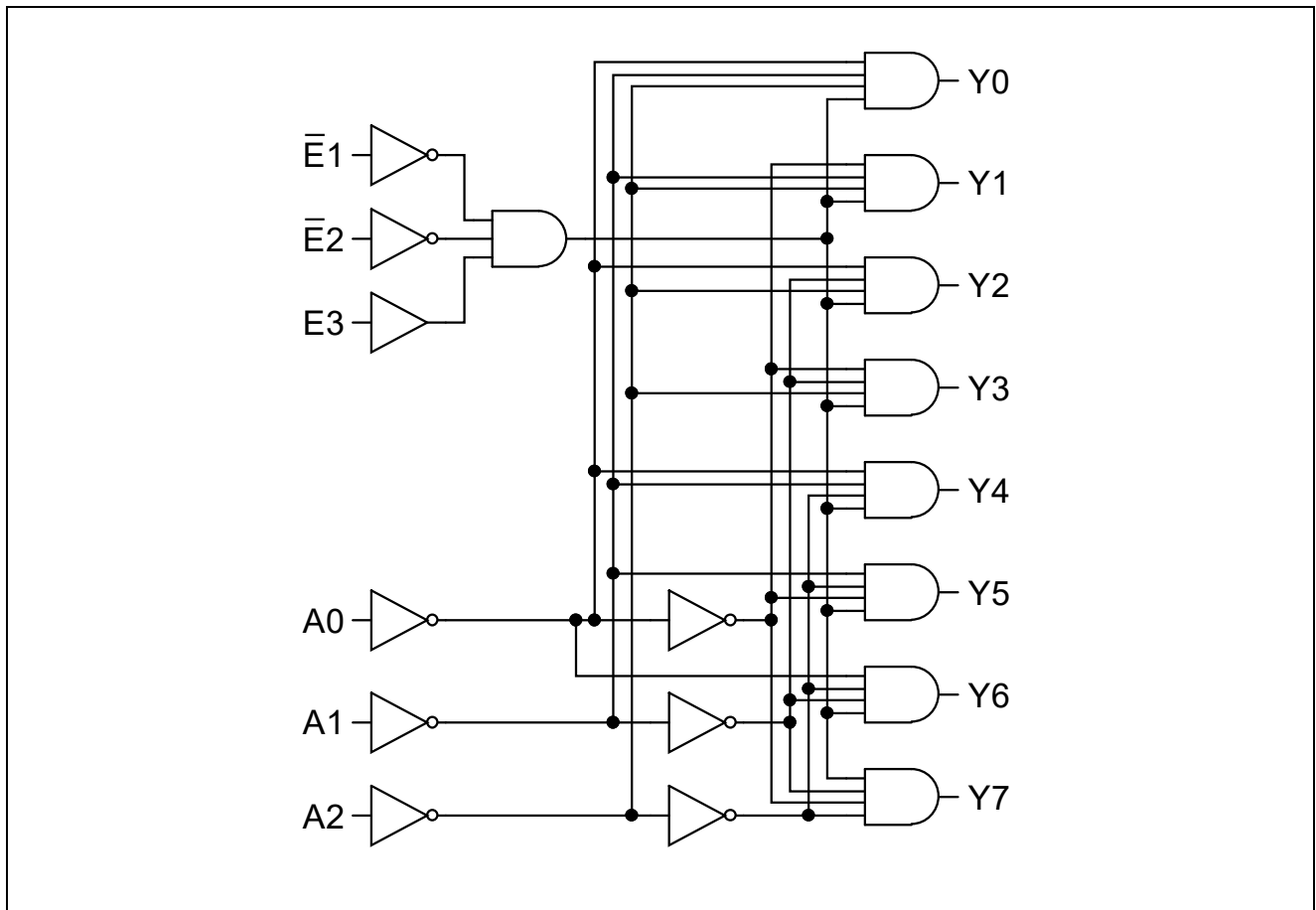
TOP VIEW

Pin Function

Pin Number	Symbol	Description
1	A0	Address input 0
2	A1	Address input 1
3	A2	Address input 2
4	$\overline{E1}$	Enable input 1(active low)
5	$\overline{E2}$	Enable input 2(active low)
6	E3	Enable input 3(active high)
7	Y7	Output 7(active high)
8	GND	Ground
9	Y6	Output 6(active high)
10	Y5	Output 5(active high)
11	Y4	Output 4(active high)
12	Y3	Output 3(active high)
13	Y2	Output 2(active high)
14	Y1	Output 1(active high)
15	Y0	Output 0(active high)
16	V _{cc}	Supply Voltage

74HC238

Block Diagram



Functional Description

Control			Input			Output							
$\overline{E1}$	$\overline{E2}$	$E3$	$A2$	$A1$	$A0$	$Y7$	$Y6$	$Y5$	$Y4$	$Y3$	$Y2$	$Y1$	$Y0$
H	X	X	X	X	X	L	L	L	L	L	L	L	L
X	H	X	X	X	X	L	L	L	L	L	L	L	L
X	X	L	X	X	X	L	L	L	L	L	L	L	L
L	L	H	L	L	L	L	L	L	L	L	L	L	H
L	L	H	L	L	H	L	L	L	L	L	L	H	L
L	L	H	L	H	L	L	L	L	L	L	H	L	L
L	L	H	L	H	H	L	L	L	L	H	L	L	L
L	L	H	H	L	L	L	L	L	H	L	L	L	L
L	L	H	H	L	H	L	L	H	L	L	L	L	L
L	L	H	H	H	L	L	H	L	L	L	L	L	L
L	L	H	H	H	H	H	L	L	L	L	L	L	L

74HC238

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Rating	Unit
V_{CC}	Supply Voltage		-0.5~7.0	V
V_I	Input Voltage		-0.5~7.0	V
V_O	Output Voltage		-0.3~ $V_{CC}+0.5$	V
I_{IK}	Input Diode Current	$V_I < -0.5V$	-20	mA
I_{IK}	Input Diode Current	$V_I > V_{CC}+0.5V$	20	mA
I_{OK}	Output Diode Current	$V_O < -0.5V$	-20	mA
I_{OK}	Output Diode Current	$V_O > V_{CC}+0.5V$	20	mA
I_O	Output Source/Sink Current		± 25	mA
I_{CC}	Supply Current		50	mA
I_{GND}	Ground Current		-50	mA
T_J	Operate Temperature Range		-40~150	°C
T_{STG}	Storage Temperature Range		-65~150	°C

Recommended Operating Conditions ($T_A=25^{\circ}C$ without instruction):

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply Voltage		2.0	6.0	V
V_I	Input Voltage		0	V_{CC}	V
V_O	Output Voltage	Active	0	V_{CC}	V
$\Delta t/\Delta v$	Input Transition Rise or Fall Rate	$V_{CC}=2.0V$		1000	ns/V
		$V_{CC}=4.5V$		500	ns/V
		$V_{CC}=6.0V$		400	ns/V
T_A	Operating Temperature		-40	125	°C

74HC238

DC Electrical Characteristics

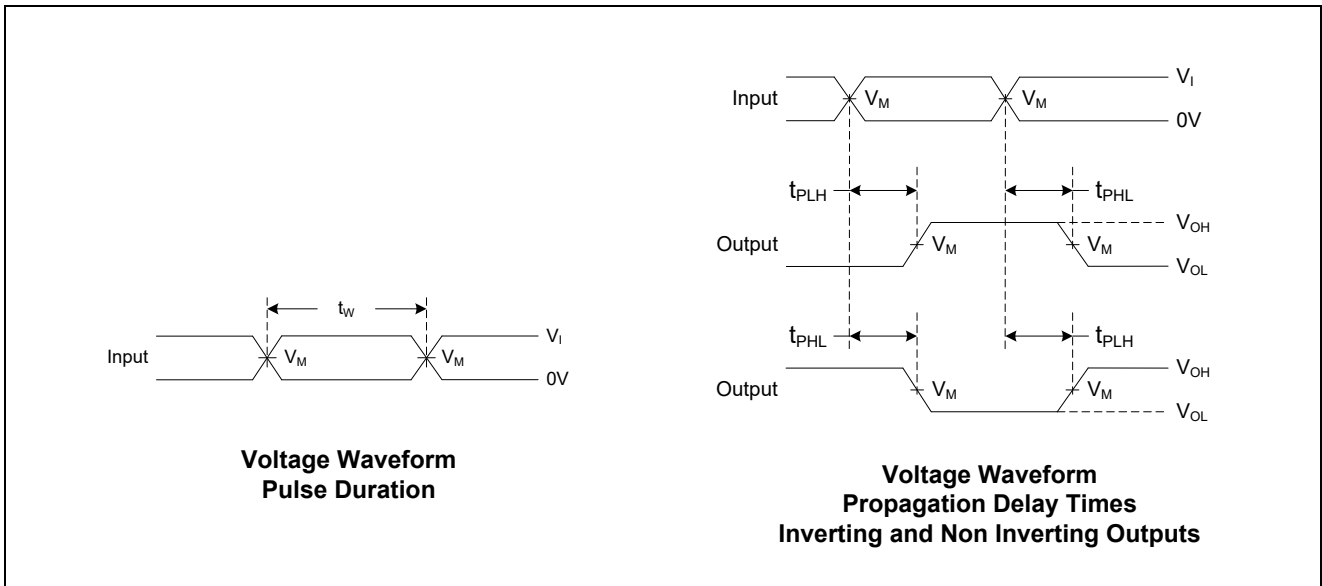
Symbol	Characteristic	Condition	Voltage	T _A =+25°C			T _A = -40°C to +85°C		T _A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _{IH}	High-Level Input Voltage	-	2.0V	1.5	1.2	-	1.5	-	1.5	-	V
		-	4.5V	3.15	2.4	-	3.15	-	3.15	-	
		-	6.0V	4.2	3.2	-	4.2	-	4.2	-	
V _{IL}	Low-Level Input Voltage	-	2.0V	-	0.8	0.5	-	0.5	-	0.5	V
		-	4.5V	-	2.1	1.35	-	1.35	-	1.35	
		-	6.0V	-	2.8	1.8	-	1.8	-	1.8	
V _{OH}	High-Level Output Voltage	I _{OH} = -20μA All outputs	2.0V	1.9	2.0	-	1.9	-	1.9	-	V
			4.5V	4.4	4.5	-	4.4	-	4.4	-	
			6.0V	5.9	6.0	-	5.9	-	5.9	-	
		I _{OH} = -4mA	4.5V	3.98	4.32	-	3.84	-	3.7	-	
		I _{OH} = -5.2mA	6.0V	5.48	5.81	-	5.34	-	5.2	-	
V _{OL}	Low-Level Output Voltage	I _{OL} = 20μA All outputs	2.0V	-	0	0.1	-	0.1	-	0.1	V
			4.5V	-	0	0.1	-	0.1	-	0.1	
			6.0V	-	0	0.1	-	0.1	-	0.1	
		I _{OL} = 4mA	4.5V	-	0.15	0.26	-	0.33	-	0.4	
		I _{OL} = 5.2mA	6.0V	-	0.16	0.26	-	0.33	-	0.4	
I _I	Input Current	V _I = GND or 6.0V	6.0V	-	-	±0.1	-	±1	-	±1	μA
I _{CC}	Supply Current	V _I = GND or V _{CC} , I _O = 0	6.0V	-	-	8.0	-	80	-	160	μA
C _i	Input Capacitance	V _i = V _{CC} or GND	6.0V	-	4	10	-	10	-	10	pF

74HC238

AC Electrical Characteristics

Symbol	Pin	Condition	Voltage	T _A =+25°C			T _A = -40°C to +85°C		T _A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Typ	Min	Max	
t _{PLH} , t _{PLH} Propagation Delay	An to Yn	Figure1	2.0V	-	41	150	-	190	-	225	ns
			4.5V	-	15	30	-	38	-	45	
			5.0V	-	12	-	-	-	-	-	
			6.0V	-	12	26	-	33	-	38	
	E3 to Yn	Figure1	2.0V	-	47	150	-	190	-	225	
			4.5V	-	17	30	-	38	-	45	
			5.0V	-	14	-	-	-	-	-	
			6.0V	-	14	26	-	33	-	38	
	$\overline{E}n$ to Yn	Figure1	2.0V	-	47	150	-	190	-	225	
			4.5V	-	17	30	-	38	-	45	
			5.0V	-	14	-	-	-	-	-	
			6.0V	-	14	26	-	33	-	38	
t _{TLH} , t _{THL} Transition Time	Yn	Figure1	2.0V	-	19	75	-	95	-	110	ns
			5.0V	-	7	15	-	19	-	22	
			6.0V	-	6	13	-	16	-	19	

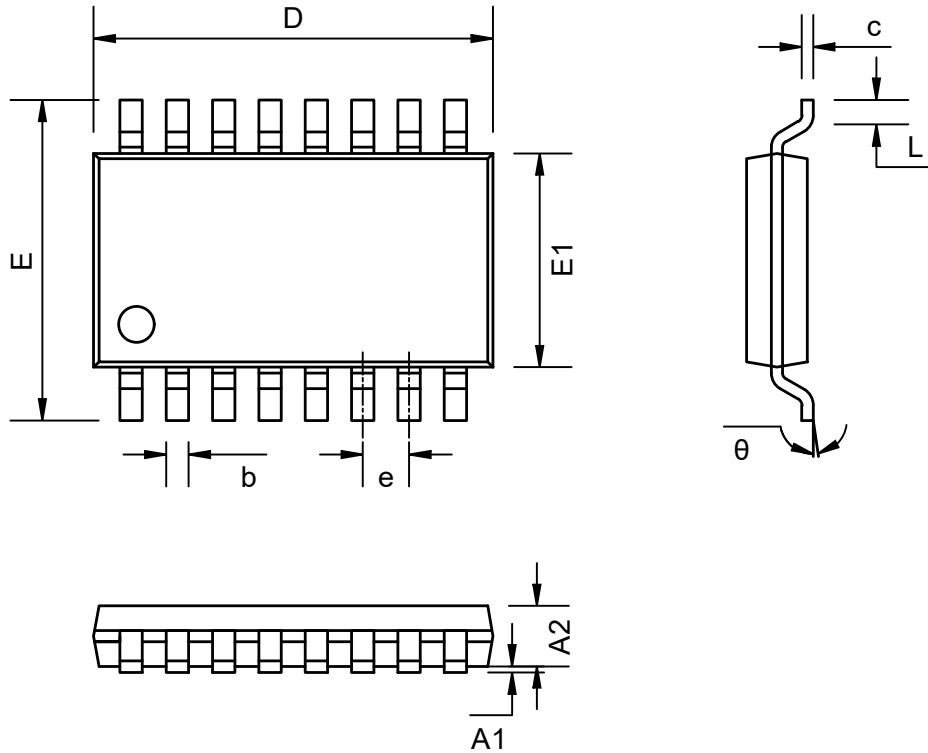
Parameter Test Input/Output Waveform:



74HC238

Package Dimension

SOP16(74HC238M)

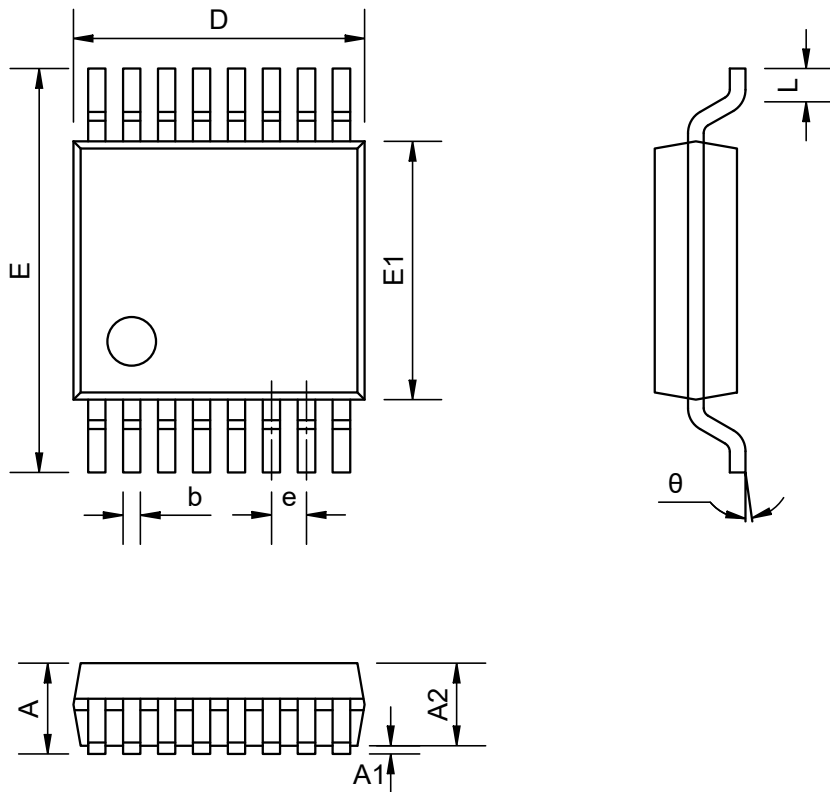


COMMON DIMENSIONS
(Units: mm)

SYMBOL	MIN	NOM	MAX
A1	0.10	0.20	0.30
A2	1.35	1.45	1.55
b	0.306	0.406	0.506
c	--	0.203	--
D	9.90	10.00	10.10
E	5.84	6.04	6.24
E1	3.85	3.95	4.05
e	1.27BSC		
L	0.35	0.55	0.75
θ	2°	--	8°

74HC238

TSSOP16 (74HC238V)



COMMON DIMENSIONS
(Units: mm)

SYMBOL	MIN	NOM	MAX
A	--	--	1.20
A1	0.05	--	0.15
A2	0.90	--	1.05
b	0.20	--	0.28
D	4.86	4.96	5.06
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65BSC		
L	0.45	0.60	0.75
θ	0°	--	8°

74HC238

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2022-07-19	Original Version	Shibo	Shilj	Shibo
1.1	2023-07-24	Original Version	Shibo	Geh	Shibo