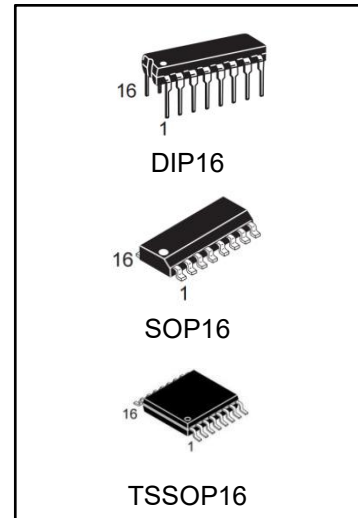


## 3-to-8 line decoder/demultiplexer

### FEATURES

- Demultiplexing capability
- Multiple input enable for easy expansion
- Ideal for memory chip select decoding
- Active HIGH mutually exclusive outputs
- Output capability: standard
- ICC category: MSI



### ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
74HC238N	DIP16	74HC238	TUBE	1000/box
74HC238M/TR	SOP16	74HC238	REEL	2500/reel
74HC238MT/TR	TSSOP16	HC238	REEL	2500/reel

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## GENERAL DESCRIPTION

The HC238 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The HC238 decoders accept three binary weighted address inputs (A0, A1, A2) and when enabled, provide 8 mutually exclusive active HIGH outputs (Y0 to Y7).

The HC238 features three enable inputs: two active LOW ( $\bar{E}1$  and  $\bar{E}2$ ) and one active HIGH (E3). Every output will be LOW unless  $\bar{E}1$  and  $\bar{E}2$  are LOW and E3 is HIGH.

This multiple enable function allows easy parallel expansion of the HC238 to a 1-of-32 (5 lines to 32 lines) decoder with just four HC238 ICs and one inverter.

The HC238 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. Unused enable inputs must be permanently tied to their appropriate active HIGH or LOW state.

The HC238 is identical to the HC138 but has non-inverting outputs.

**PIN DESCRIPTION**

PIN NO.	SYMBOL	NAME AND FUNCTION
1, 2, 3	A <sub>0</sub> to A <sub>2</sub>	address inputs
4, 5	$\bar{E}_1, \bar{E}_2$	enable inputs (active LOW)
6	E <sub>3</sub>	enable input (active HIGH)
8	GND	ground (0 V)
15, 14, 13, 12, 11, 10, 9, 7	Y <sub>0</sub> to Y <sub>7</sub>	outputs (active HIGH)
16	VCC	positive supply voltage

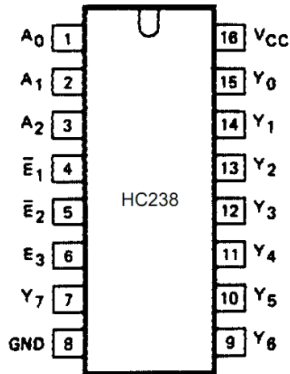


Fig.1 Pin configuration.

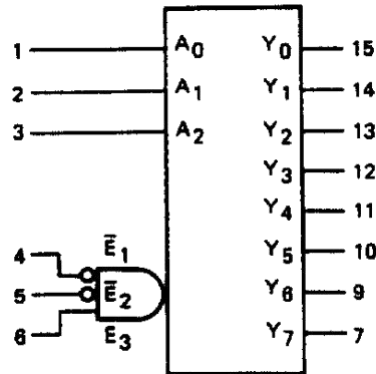


Fig.2 Logic symbol.

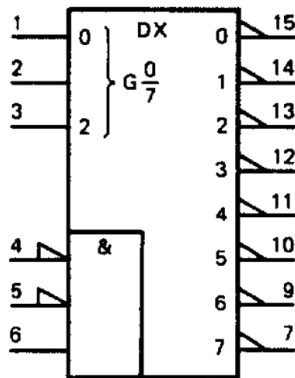


Fig.3 IEC logic symbol.

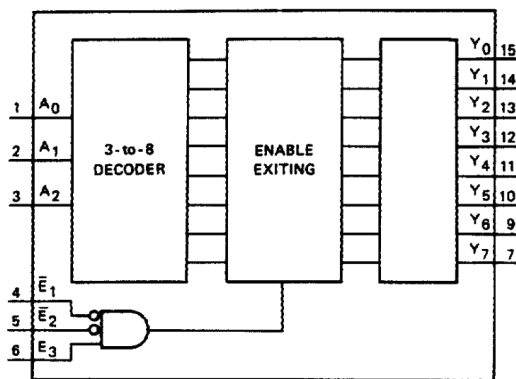
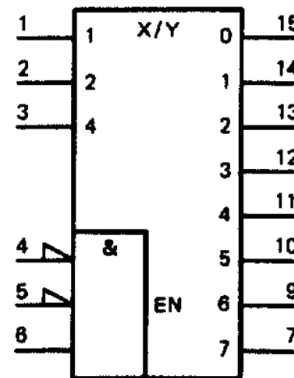


Fig.4 Functional diagram.

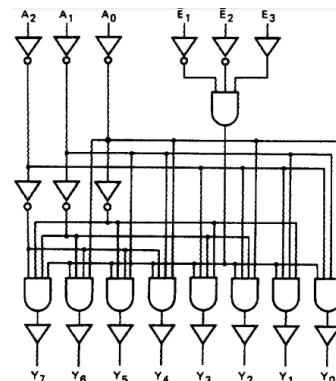


Fig.5 Logic diagram.

**FUNCTION TABLE**

INPUTS						OUTPUTS							
$\bar{E}_1$	$\bar{E}_2$	$E_3$	$A_0$	$A_1$	$A_2$	$Y_0$	$Y_1$	$Y_2$	$Y_3$	$Y_4$	$Y_5$	$Y_6$	$Y_7$
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	H	L	L	L	L	L	L	L
L	L	H	H	L	L	L	H	L	L	L	L	L	L
L	L	H	L	H	L	L	L	H	L	L	L	L	L
L	L	H	H	H	L	L	L	L	H	L	L	L	L
L	L	H	L	L	H	L	L	L	L	H	L	L	L
L	L	H	H	L	H	L	L	L	L	L	H	L	L
L	L	H	L	H	H	L	L	L	L	L	L	H	L
L	L	H	H	H	H	L	L	L	L	L	L	L	H

**Note**

1. H = HIGH voltage level
2. L = LOW voltage level
3. X = don't care

**QUICK REFERENCE DATA**

GND = 0 V;  $T_{amb} = 25^{\circ}\text{C}$ ;  $t_r = t_f = 6 \text{ ns}$

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
$t_{PHL}/t_{PLH}$	propagation delay $A_n$ to $Y_n$ $E_3$ to $Y_n$ $\bar{E}_n$ to $Y_n$	$C_L = 15 \text{ pF}$ ; $V_{CC} = 5 \text{ V}$	14 16 17	ns ns ns
$C_i$	input capacitance		3.5	pF
CPD	power dissipation capacitance per package	notes 1 and 2	72	pF

**Notes**

CPD is used to determine the dynamic power dissipation (PD in  $\mu\text{W}$ ):

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

$f_i$  = input frequency in MHz

$f_o$  = output frequency in MHz

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

$C_L$  = output load capacitance in pF

$V_{CC}$  = supply voltage in V

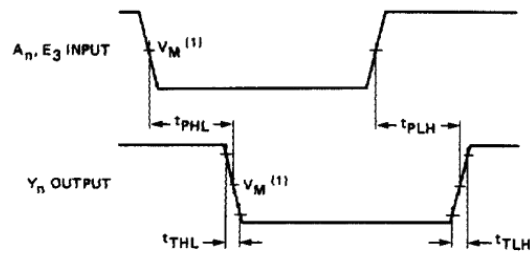
For HC238 the condition is  $V_I = \text{GND to } V_{CC}$

## AC CHARACTERISTICS FOR

GND = 0 V;  $t_r = t_f = 6$  ns; CL = 50 pF

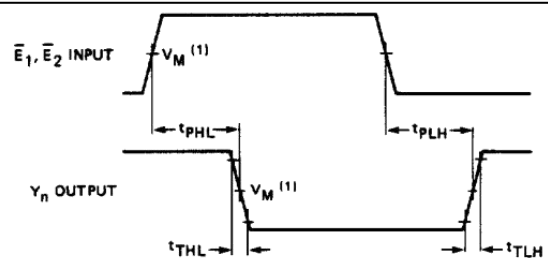
SYMBOL	PARAMETER	$T_{amb}(^{\circ}C)$							UNIT	TEST CONDITIONS	
		HC238								VCC(V)	WAVEFORMS
		+25			-40 to +85		-40 to +125				
		min.	typ.	max.	min.	max.	min.	max.			
$t_{PHL}/t_{PLH}$	propagation delay $A_n$ to $Y_n$		47	150		190		225	ns	2.0 4.5 6.0	Fig.6
			17	30		38		45			
			14	26		33		38			
$t_{PHL}/t_{PLH}$	propagation delay $E_3$ to $Y_n$		52	160		200		240	ns	2.0 4.5 6.0	Fig.6
			19	32		40		48			
			15	27		34		41			
$t_{PHL}/t_{PLH}$	propagation delay $E_n$ to $Y_n$		50	155		195		235	ns	2.0 4.5 6.0	Fig.7
			18	31		39		47			
			14	26		33		40			
$t_{THL}/t_{TLH}$	output transition time		19	75		95		110	ns	2.0 4.5 6.0	Figs 6 and 7
			7	15		19		22			
			6	13		16		19			

## AC WAVEFORMS



(1)HC238:  $V_M = 50\%$ ;  $V_I = \text{GND to } V_{CC}$ .

Fig.6 Waveforms showing the address input ( $A_n$ ) and enable input ( $E_3$ ) to output ( $Y_n$ ) propagation delays and the output transition times.

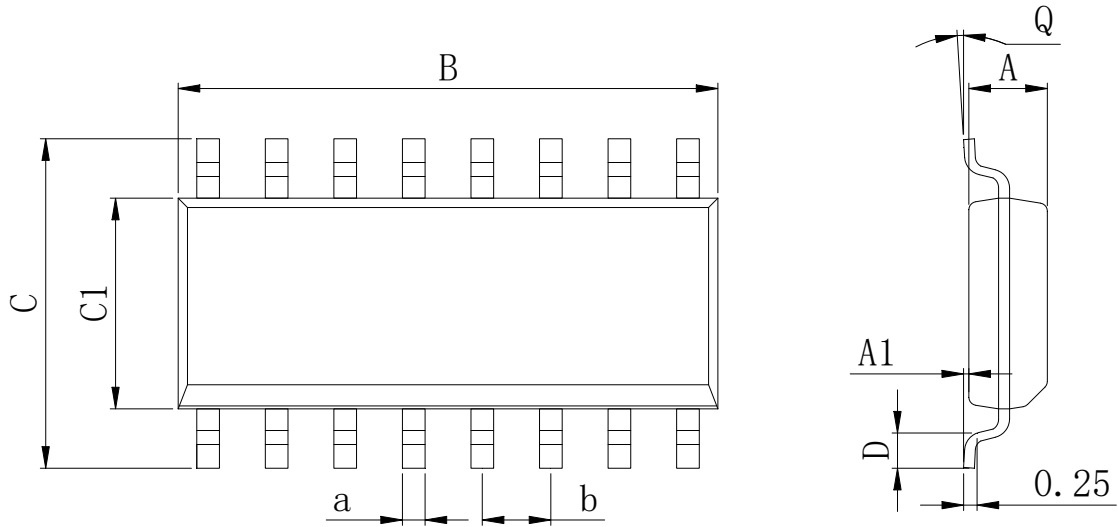


(1)HC238:  $V_M = 50\%$ ;  $V_I = \text{GND to } V_{CC}$ .

Fig.7 Waveforms showing the enable input ( $\bar{E}_n$ ) to output ( $Y_n$ ) propagation delays and the output transition times.

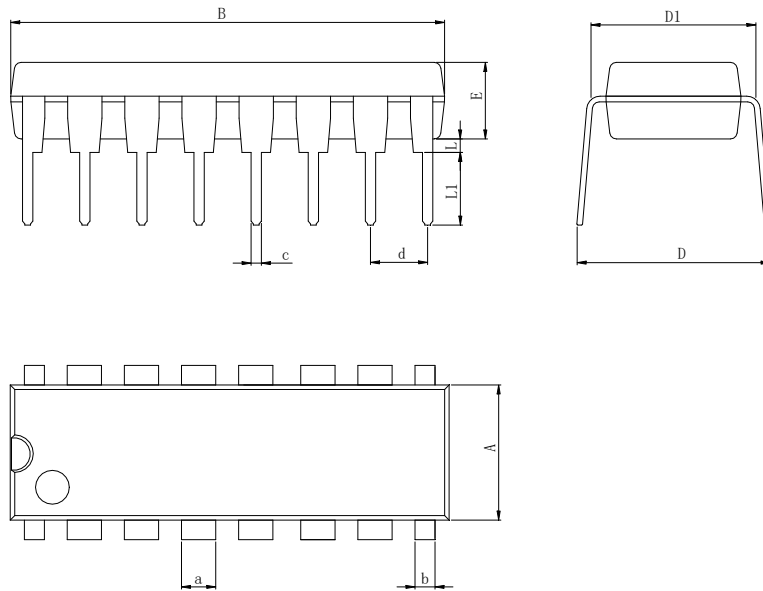
**Physical Dimensions**

SOP16



Dimensions In Millimeters(SOP16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	9.80	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	10.0	6.20	4.00	0.80	8°	0.45	

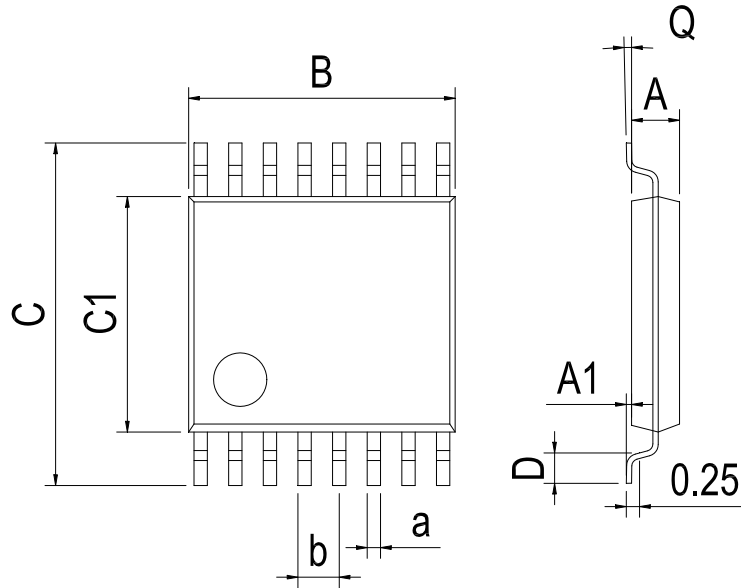
DIP16



Dimensions In Millimeters(DIP16)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	18.94	8.40	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	19.56	9.00	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

**Physical Dimensions**

TSSOP16



Dimensions In Millimeters(TSSOP16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

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