

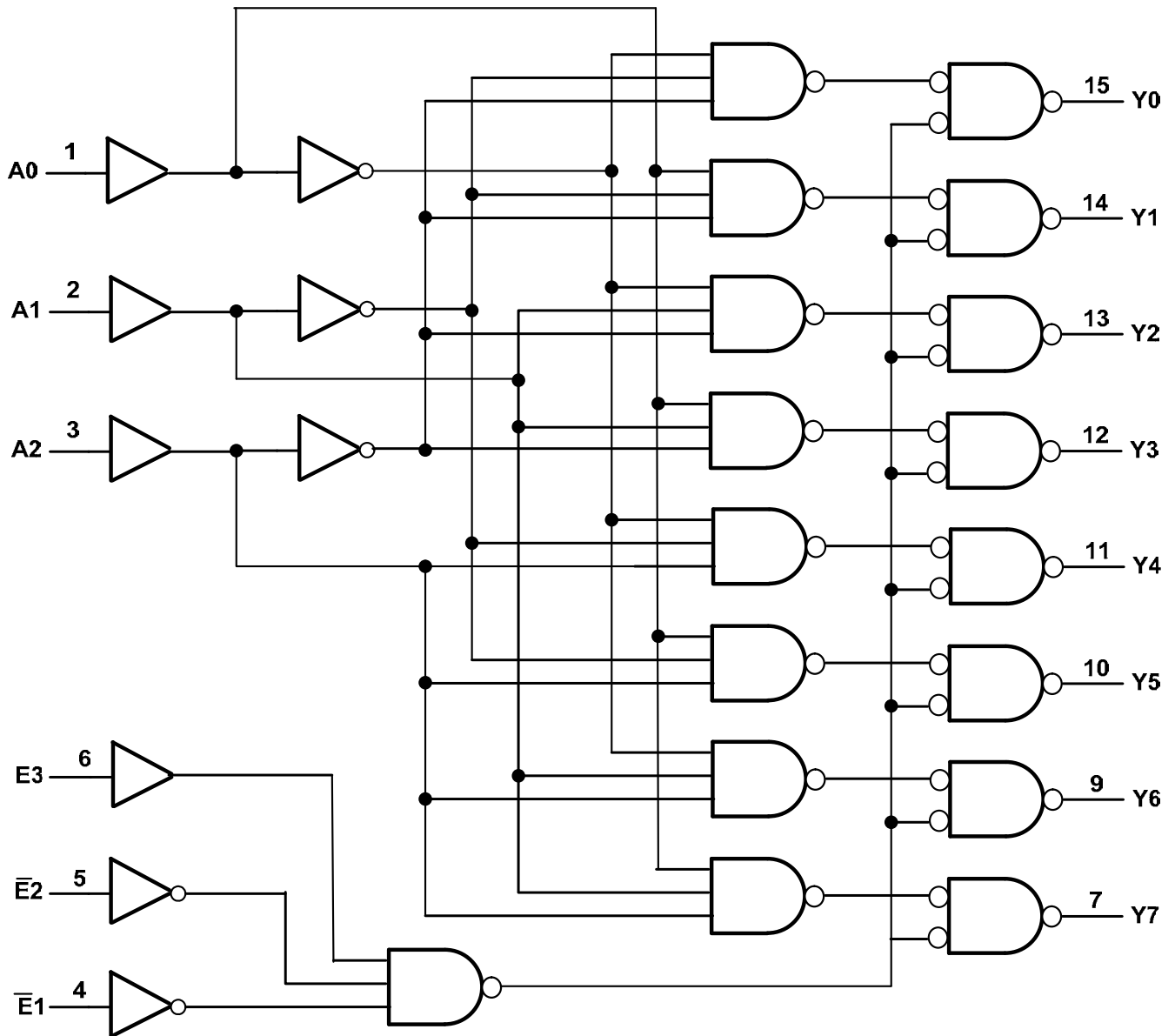
Pin Descriptions

Pin Number	Pin Name	Description
1	A0	Address Input 0
2	A1	Address Input 1
3	A2	Address Input 2
4	$\bar{E}1$	Enable Input 1 (active LOW)
5	$\bar{E}2$	Enable Input 2 (active LOW)
6	E3	Enable Input 3 (active HIGH)
7	Y7	Output 7 (active LOW)
8	GND	Ground
9	Y6	Output 6 (active LOW)
10	Y5	Output 5 (active LOW)
11	Y4	Output 4 (active LOW)
12	Y3	Output 3 (active LOW)
13	Y2	Output 2 (active LOW)
14	Y1	Output 1 (active LOW)
15	Y0	Output 0 (active LOW)
16	Vcc	Supply Voltage

Function Table Diagram

Control			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	L	–	–	–	–	–	–	–	–	–	–	–
L	L	H	–	–	–	–	–	–	–	–	–	–	–
–	–	–	L	L	L	H	H	H	H	H	H	H	L
–	–	–	L	L	H	H	H	H	H	H	H	L	H
–	–	–	L	H	L	H	H	H	H	H	L	H	H
–	–	–	L	H	H	H	H	H	H	L	H	H	H
–	–	–	H	L	L	H	H	H	L	H	H	H	H
–	–	–	H	L	H	H	H	L	H	H	H	H	H
–	–	–	H	H	L	H	L	H	H	H	H	H	H
–	–	–	H	H	H	L	H	H	H	H	H	H	H

Logic Diagram



Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
ESD MM	Machine Model ESD Protection	200	V
V _{CC}	Supply Voltage Range	-0.5 to +7.0	V
V _I	Input Voltage Range	-0.5 to +7.0	V
V _O	Voltage applied to output in high or low state	-0.3 to V _{CC} +0.5	V
I _{IK}	Input Clamp Current V _I < -0.5V	-20	mA
I _{IK}	Input Clamp Current V _I > V _{CC} +0.5V	20	mA
I _{OK}	Output Clamp Current V _O < -0.5V	-20	mA
I _{OK}	Output Clamp Current V _O > V _{CC} + 0.5V	20	mA
I _O	Continuous output current	±25	mA
I _{CC}	Continuous current through V _{CC}	50	mA
I _{GND}	Continuous current through GND	-50	mA
T _J	Operating Junction Temperature	-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C
P _{TOT}	Total Power Dissipation	500	mW

Note: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

Recommended Operating Conditions (Note 5) (@T_A = +25°C, unless otherwise specified.)

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 Mode	0	V _{CC}	V
Δt/ΔV	Input transition Rise or Fall Rate	V _{CC} = 2.0V	–	1000	ns/V
		V _{CC} = 4.5V	–	500	
		V _{CC} = 6.0V	–	400	–
T _A	Operating Free-Air Temperature	–	-40	+125	°C

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V _{CC}	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} = -20 µA 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} = -4 mA	4.5V	3.98	4.32	—	3.84	—	3.7	—	
			6.0V	5.48	5.81	—	5.34	—	5.2	—	
V _{OL}	Low-Level Output Voltage	I _{OL} = 20 µA 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} = 4 mA	4.5V	—	0.15	0.26	—	0.33	—	0.4	
			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

Switching Characteristics

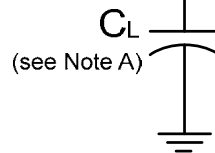
Symbol / Parameter	Pins	Test Conditions	V _{CC}	T _A = +25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PLH} Propagation Delay	An to $\bar{Y}_n$	Figure 1	2.0V	—	41	150	—	190	—	225	ns
			4.5V	—	15	30	—	38	—	45	
			5.0V	—	12	—	—	—	—	—	
			6.0V	—	12	26	—	33	—	38	
	E3 to $\bar{Y}_n$	Figure 1	2.0V	—	47	150	—	190	—	225	
			4.5V	—	17	30	—	38	—	45	
			5.0V	—	14	—	—	—	—	—	
			6.0V	—	14	26	—	33	—	38	
	$\bar{E}_n$ to $\bar{Y}_n$	Figure 1	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	$\bar{Y}_n$	Figure 1	2.0V	—	19	75	—	95	—	110	ns
			5.0V	—	7	15	—	19	—	22	
			6.0V	—	6	13	—	16	—	19	

Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

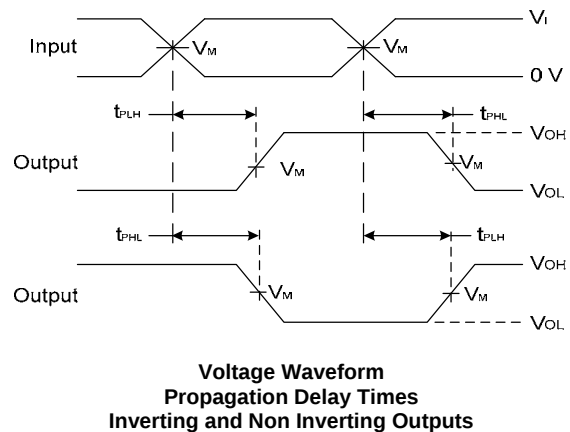
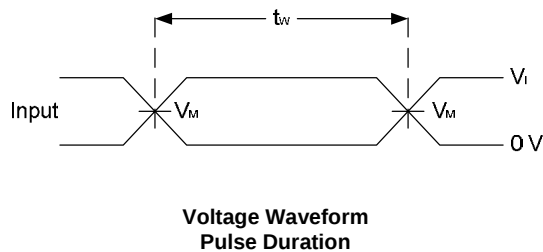
Parameter		Test Conditions	V _{CC} = 5V	Unit
			Typ	
C _{pd}	Power dissipation capacitance	f = 1 MHz all outputs switching-no load	19	pF

Parameter Measurement Information

From Output
Under Test



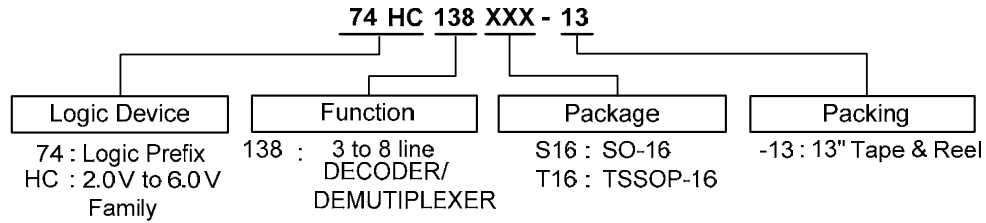
V _{CC}	Inputs		V _M	C _L
	V _I	t _r /t _f		
2.0V -6.0V	V _{CC}	6 ns	V _{CC} /2	50pF
5.0V	V _{CC}	6 ns	V _{CC} /2	15pF used for 5V typical test



- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
 - C. Inputs are measured separately one transition per measurement
 - D. t_{PLH} and t_{PHL} are the same as t_{PD}

Figure 1 Load Circuit and Voltage Waveforms

Ordering Information

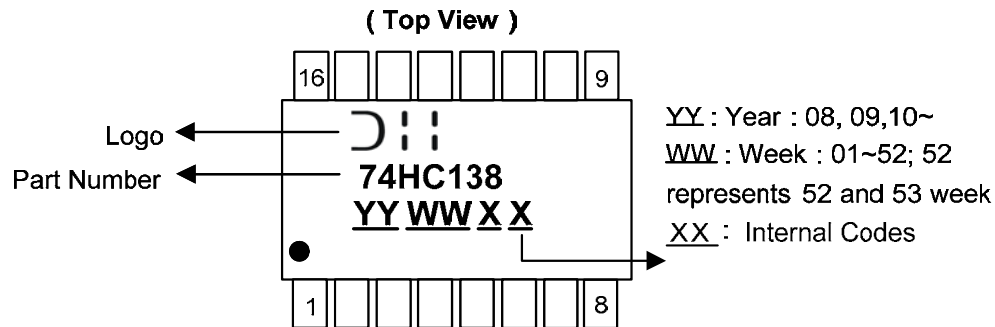


Part Number	Package Code	Packaging	7" Tape and Reel (Note 6)	
			Quantity	Part Number Suffix
74HC138S16-13	S16	SO-16	2500/Tape & Reel	-13
74HC138T16-13	T16	TSSOP-16	2500/Tape & Reel	-13

Notes: 6. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>

Marking Information

(1) SO-16, TSSOP16

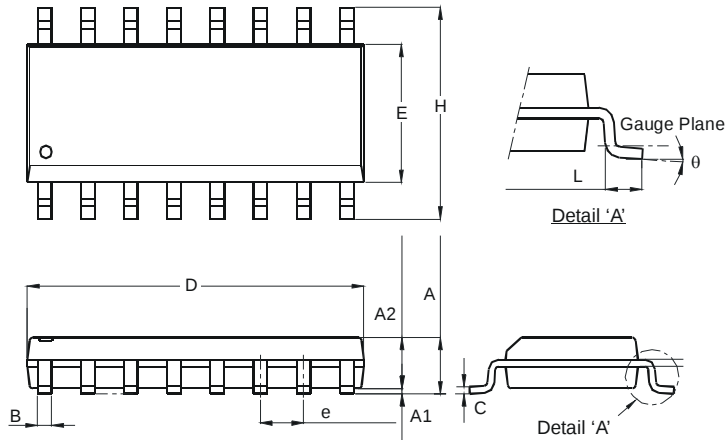


Part Number	Package
74HC138S16	SO-16
74HC138T16	TSSOP-16

Package Outline Dimensions (All dimensions in mm.)

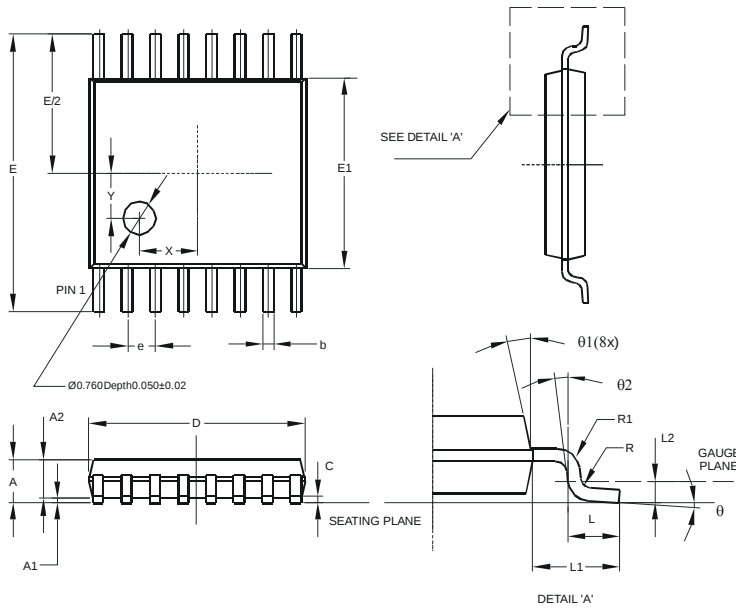
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

Package Type: SO-16



SO-16		
Dim	Min	Max
A	1.40	1.75
A1	0.10	0.25
A2	1.30	1.50
B	0.33	0.51
C	0.19	0.25
D	9.80	10.00
E	3.80	4.00
e	1.27 Typ	
H	5.80	6.20
L	0.38	1.27
θ	0°	8°
All Dimensions in mm		

Package Type: TSSOP-16

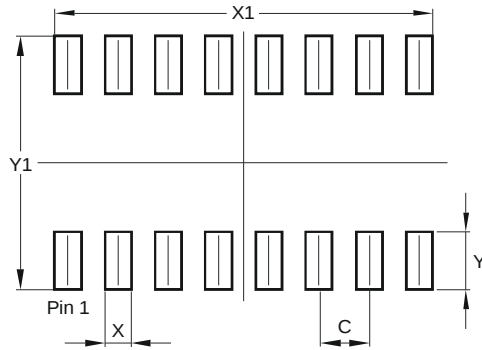


TSSOP-16			
Dim	Min	Max	Typ
A	-	1.08	-
A1	0.05	0.15	-
A2	0.80	0.93	-
b	0.19	0.30	-
c	0.09	0.20	-
D	4.90	5.10	-
E	6.40 BSC		
E1	4.30	4.50	-
e	0.65 BSC		
L	0.45	0.75	-
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
X	-	-	1.350
Y	-	-	1.050
θ	0°	8°	-
θ1	5°	15°	-
θ2	0°	-	-
All Dimensions in mm			

Suggested Pad Layout

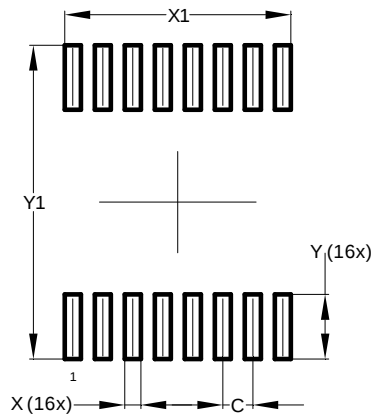
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

Package Type: SO-16



Dimensions	Value (in mm)
C	1.270
X	0.670
X1	9.560
Y	1.450
Y1	6.400

Package Type: TSSOP-16



Dimensions	Value (in mm)
C	0.650
X	0.350
X1	4.900
Y	1.400
Y1	6.800

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