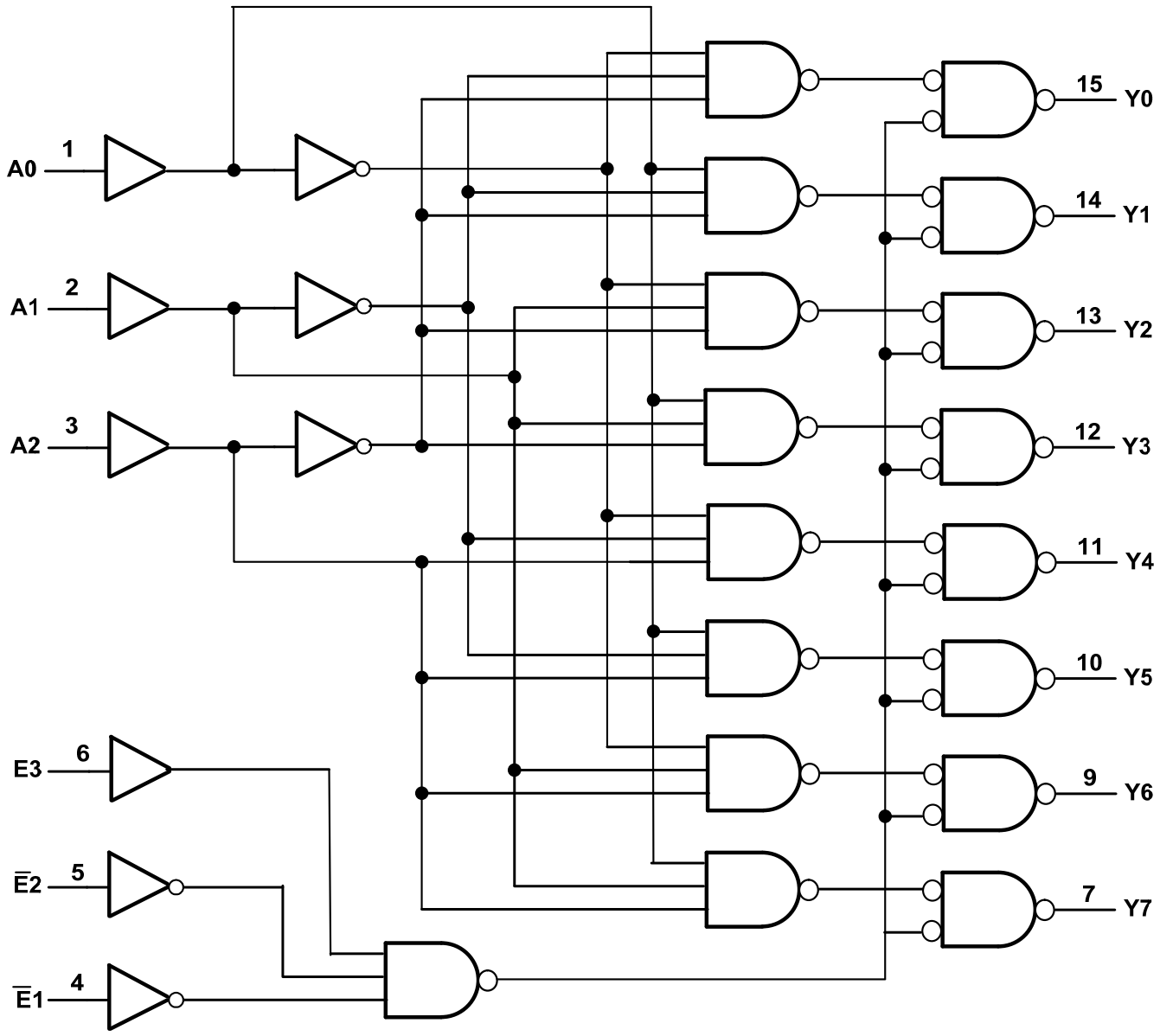
Pin Descriptions

Pin Number	Pin Name	Description
1	A0	Address Input 0
2	A1	Address Input 1
3	A2	Address Input 2
4	$\overline{E}1$	Enable Input 1 (active LOW)
5	$\overline{E}2$	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 o (active LOW)
16	V_{cc}	Supply Voltage

Function Table Diagram

Control			Input			Output							
$\overline{E}1$	$\overline{E}2$	E3	A2	A1	A0	$\overline{Y}7$	$\overline{Y}6$	$\overline{Y}5$	$\overline{Y}4$	$\overline{Y}3$	$\overline{Y}2$	$\overline{Y}1$	$\overline{Y}0$
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_{OK}	Output Clamp Current V_O < -0.5V	-20	mA
I_{OK}	Output Clamp Current V_O > V_{CC} +0.5 V	20	mA
I_O	Continuous output current	+/- 25	mA
I_{CC}	Continuous current through V_{CC}	75	mA
I_{GND}	Continuous current through GND	-75	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

Notes: 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	5.5	V
V_I	Input Voltage	–	0	5.5	V
V_O	Output Voltage	Active Mode	0	V_{CC}	V
$\Delta t/\Delta V$	Input transition rise or fall rate	V_{CC} = 3.0 V ± 0.3 V	–	100	ns/V
		V_{CC} = 5.0 V ± 0.5 V	–	20	
T_A	Operating free-air temperature	–	-40	+125	°C

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

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

Symbol	Parameter	Test Conditions	Vcc	T_A = +25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V_{IH}	High-level Input Voltage	–	2.0V	1.5	–	–	1.5	–	1.5	–	V
		–	3.0V	2.1	–	–	2.1	–	2.1	–	
		–	5.5V	3.85	–	–	3.85	–	3.85	–	
V_{IL}	Low-level input voltage	–	2.0V	–	–	0.5	–	0.5	–	0.5	V
		–	3.0V	–	–	0.9	–	0.9	–	0.9	
		–	5.5V	–	–	1.65	–	1.65	–	1.65	
V_{OH}	High Level Output Voltage	I_{OH} = -50 µA	2.0V	1.9	2.0	–	1.9	–	1.9	–	V
		I_{OH} = -50 µA	3.0V	2.9	3.0	–	2.9	–	2.9	–	
		I_{OH} = -50 µA	4.5V	4.4	4.5	–	4.4	–	4.4	–	
		I_{OH} = -4 mA	3.0V	2.58	–	–	2.48	–	2.40	–	
		I_{OH} = -8 mA	4.5V	3.94	–	–	3.80	–	3.70	–	
V_{OL}	Low-level Output Voltage	I_{OL} = 50 µA	2.0V	–	–	0.1	–	0.1	–	0.1	V
		I_{OL} = 50 µA	3.0V	–	–	0.1	–	0.1	–	0.1	
		I_{OL} = 50 µA	4.5V	–	–	0.1	–	0.1	–	0.1	
		I_{OL} = 4 mA	3.0V	–	–	0.36	–	0.44	–	0.55	
		I_{OL} = 8 mA	4.5V	–	–	0.36	–	0.44	–	0.55	
I_I	Input Current	V_I =GND or 5.5 V	5.5V	–	–	0.1	–	± 1	–	± 2	µA
I_{CC}	Supply Current	V_I = GND or V_{CC} I_O=0 A	5.5V	–	–	4.0	–	40	–	80	µA
C_i	Input Capacitance	V_i = V_{CC} or GND	5.5V	–	4.0	10	–	10	–	10	pF

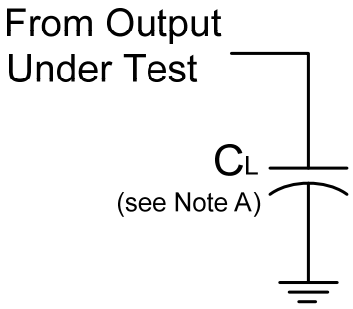
Switching Characteristics

Symbol	Parameter	Test Conditions	Vcc	T_A = +25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ.	Max	Min	Max	Min	Max	
t_{PD}	Propagation Delay An to $\overline{Y}$n	Figure 2 C_L=15 pF	3.0 V to 3.6V	0.5	4.4	8.0	0.5	9.5	0.5	11.5	ns
			4.5 V to 5.5 V	0.5	3.0	5.5	0.5	6.5	0.5	7.0	
		Figure 2 C_L=50pF	3.0 V to 3.6V	0.5	6.2	11.5	0.5	13.0	0.5	14.5	
			4.5 V to 5.5 V	0.5	4.3	7.5	0.5	8.5	0.5	9.5	
	Propagation Delay E3 to $\overline{Y}$n	Figure 2 C_L=15 pF	3.0 V to 3.6V	0.5	4.7	8.0	0.5	9.5	0.5	11.5	ns
			4.5 V to 5.5 V	0.5	3.3	5.1	0.5	6.0	0.5	7.5	
		Figure 2 C_L=50pF	3.0 V to 3.6V	0.5	6.8	11.5	0.5	13.0	0.5	14.5	
			4.5 V to 5.5 V	0.5	4.7	7.1	0.5	8.0	0.5	9.0	
	Propagation Delay $\overline{E}$n to $\overline{Y}$n	Figure 2 C_L=15 pF	3.0 V to 3.6V	0.5	6.7	9.7	0.5	11.5	0.5	12.5	ns
			4.5 V to 5.5 V	0.5	4.8	6.8	0.5	8.0	0.5	8.5	
		Figure 2 C_L=50pF	3.0 V to 3.6V	0.5	9.6	13.2	0.5	15.0	0.5	16.5	
			4.5 V to 5.5 V	0.5	6.8	8.8	0.5	10.0	0.5	11.0	

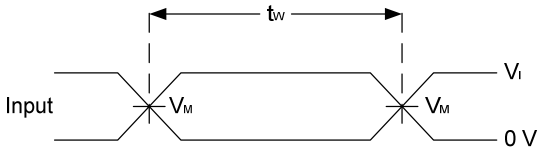
Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

Parameter		Test Conditions	V_{CC} = 5 V	Unit
			TYP	
C_{pd}	Power dissipation capacitance	f = 1 MHz all outputs switching-no load	18	pF

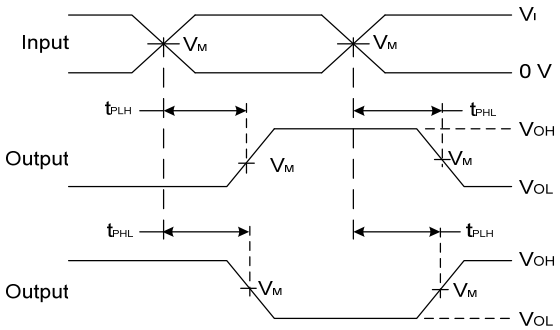
Parameter Measurement Information



Vcc	Inputs		V_M	C_L
	V_I	t_r/t_f		
2.0V -6.0V	V_{CC}	6ns	$V_{CC}/2$	50pF
5.0V	V_{CC}	6ns	$V_{CC}/2$	15pF used for 5V typical test



Voltage Waveform
Pulse Duration

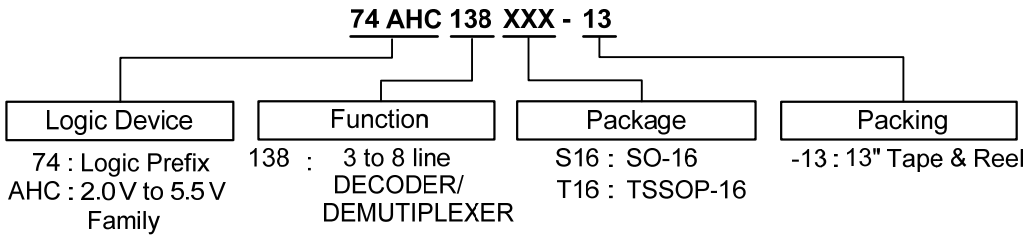


Voltage Waveform
Propagation Delay Times
Inverting and Non Inverting Outputs

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

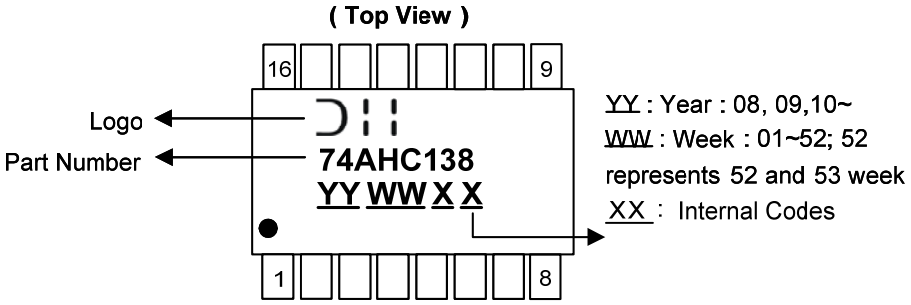


Device	Package Code	Packaging (Note 6)	7" Tape and Reel (Note 7	
			Quantity	Part Number Suffix
74AHC138S16-13	S16	SO-16	2500/Tape & Reel	-13
74AHC138T16-13	T16	TSSOP-16	2500/Tape & Reel	-13

Notes: 6. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf
7. The taping orientation is located on our website at http://www.diodes.com/datasheets/ap02007.pdf

Marking Information

(1) SO-16, TSSOP-16

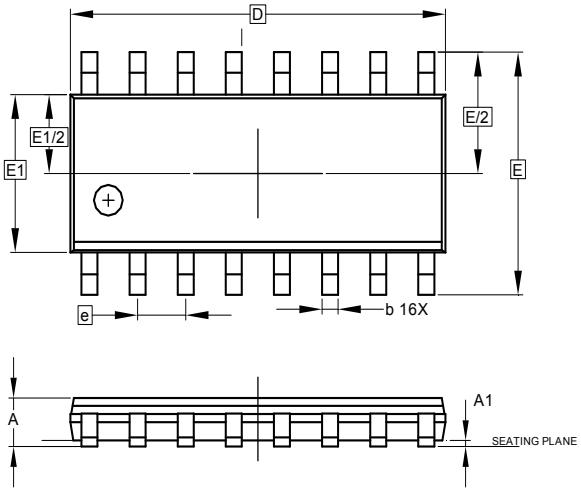


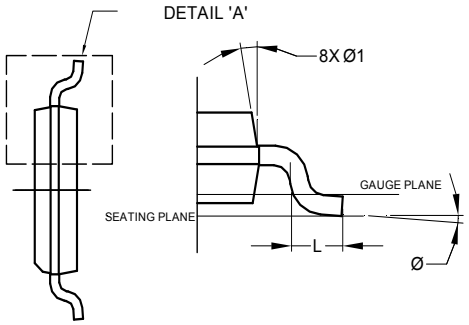
Part Number	Package
74AHC138S16	SO-16
74AHC138T16	TSSOP-16

Package Outline Dimensions (All Dimensions in mm)

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

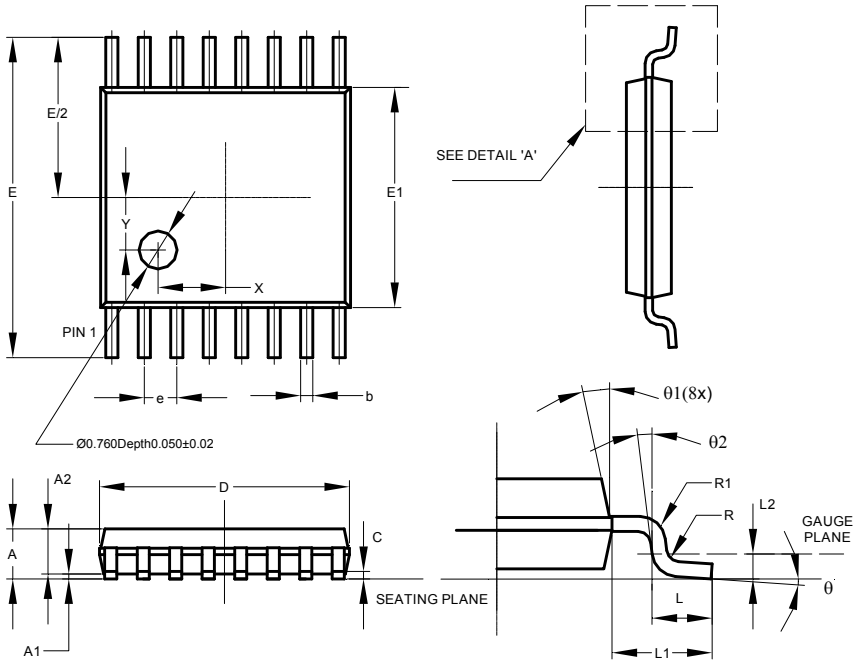
(1) Package Type: SO-16





SOIC-16			
Dim	Min	Max	Typ
A	-	1.75	-
A1	0.10	0.25	-
b	0.31	0.51	-
c	0.10	0.25	-
D	9.80	10.00	-
E	5.80	6.20	-
E1	3.80	4.00	-
e	-	-	1.27
L	0.40	1.27	-
Ø	0°	8°	-
Ø1	5°	15°	-
All Dimensions in mm			

(2) Package Type: TSSOP-16

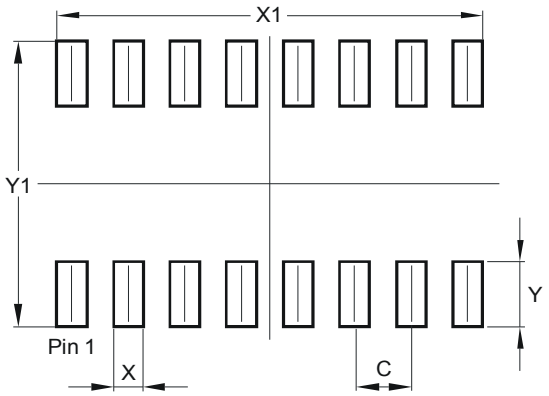


TSSOP-16			
Dim	Min	Max	Typ
A	-	1.08	-
A1	0.05	0.15	-
A2	0.80	0.93	-
b	0.19	0.30	-
c	0.09	0.20	-
D	4.90	5.10	-
E	6.40 BSC		
E1	4.30	4.50	-
e	0.65 BSC		
L	0.45	0.75	-
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	-	-
R1	0.09	-	-
X	-	-	1.350
Y	-	-	1.050
θ	0°	8°	-
θ1	5°	15°	-
θ2	0°	-	-
All Dimensions in mm			

Suggested Pad Layout

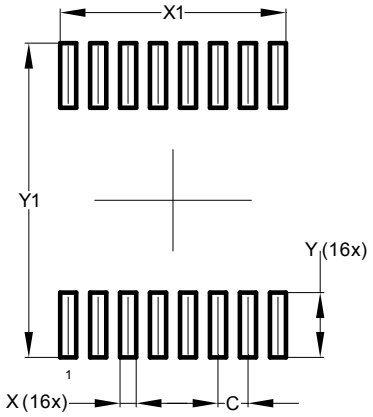
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(1) Package Type: SO-16



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

(2) 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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