



74AHCT138

3 TO 8 LINE DECODER DEMULTIPLEXER

Description

The 74AHCT138 is an advanced high speed CMOS device that is designed to be pin compatable with 74LS low power Schottky types.

The device accepts a three bit binary weighted address on input pins A0, A1 and A2 and when enabled will produce one active low output with the remaining seven being high.

There are two active LOW enable inputs $\overline{E}1$ and $\overline{E}2$, and one active HIGH enable input E3. The disabled device state results in all outputs being high. The enable state occurs with $\overline{E}1$ and $\overline{E}2$ asserted low and E3 asserted high.

The multiple enable lines allow for the parallel expansion of decoders to create 4-to-16 line versions with no additional parts and 5-to-32 versions with the addition of a single inverter.

Features

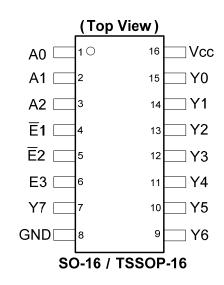
- Supply Voltage Range from 4.5V to 5.5V
- Sinks or Sources 8mA at V_{CC} = 4.5V
- CMOS Low Power Consumption
- Schmitt Trigger Action at All Inputs
- Inputs Accept up to 6.0V
- ESD Protection Tested per JESD 22
- Exceeds 200-V Machine Model (A115-A)
- Exceeds 2000-V Human Body Model (A114-A)
- Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 250mA per JESD 78, Class II
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)

Notes:

- es: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 - See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Click here for ordering information, located at the end of datasheet

Pin Assignments



Applications

- Memory chip select decoding
- Demultiplexing
- Single line peripheral control
- Allow simple serial bit streams from a microcontroller to control as many peripheral lines as needed



Pin Descriptions

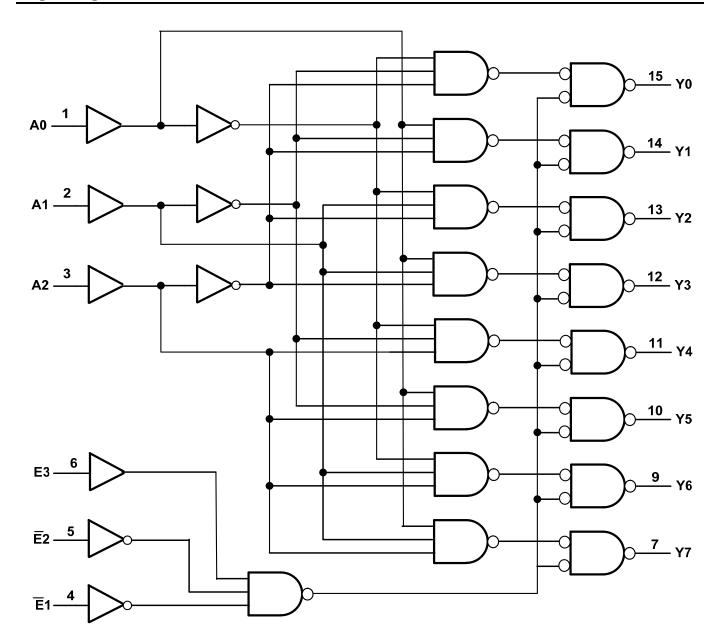
Pin Number	Pin Name	Description
1	A0	Address Input 0
2	A1	Address Input 1
3	A2	Address Input 2
4	Ē1	Enable Input 1 (active LOW)
5	E2	Enable Input 2 (active LOW)
6	E3	Enable Input 3 (active HIGH)
7	Y7	Output 7 (active LOW)
8	GND	Ground
9	Y6	Output 6 (active LOW)
10	Y5	Output 5 (active LOW)
11	Y4	Output 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	Vcc	Supply Voltage

Function Table Diagram

	Control			Input					(Output			
Ē1	E2	E3	A2	A1	A0	¥7	¥6	¥5	<u>¥</u> 4	¥3	<u>¥</u> 2	<u>¥</u> 1	Y0
Н	Х	Х	Х	Х	Х	Н	Н	Н	Н	Н	Н	Н	Н
Х	Н	Х											
Х	Х	L											
L	L	Н											
			L	L	L	Н	Н	Н	Н	Н	Н	Н	L
			L	L	Н	Н	Н	Н	Н	Н	Н	L	Н
			L	Н	L	Н	Н	Н	Н	Н	L	Н	Н
			L	Н	Н	Н	Н	Н	Н	L	Н	Н	Н
			Н	L	L	Н	Н	Н	L	Н	Н	Н	Н
			Н	L	Н	Н	Н	L	Н	Н	Н	Н	Н
			Н	Н	L	Н	L	Н	Н	Н	Н	Н	Н
			Н	Н	Н	L	Н	Н	Н	Н	Н	Н	Н



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
VI	Input Voltage Range	-0.5 to +7.0	V
Vo	Voltage applied to output in high or low state	-0.3 to V _{CC} +0.5	V
l _{IK}	Input Clamp Current VI< -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	25	mA
lo	Continuous output current	+/- 25	mA
Icc	Continuous current through V _{DD} or GND	75	mA
I _{GND}	Continuous current through V _{DD} or GND	-75	mA
T _J Operating Junction Temperature		-40 to +150	°C
T _{STG}	Storage Temperature	-65 to +150	°C
Ртот	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		4.5	5.5	V
VI	Input Voltage		0	5.5	V
Vo	Output Voltage	Active Mode	0	V _{CC}	V
$\Delta t / \Delta V$	Input transition Rise or Fall Rate	V _{CC} = 4.5V to 5.5V		20	ns/V
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	TA	= +25°	C	T _A = -40°C	to +85°C	T _A = -40°C	to +125°C	Unit
Symbol	Parameter	Test Conditions	V _{cc}	Min	Тур	Max	Min	Max	Min	Max	Unit
VIH	High-level Input Voltage		4.5V to 5.5V	2.0	-	-	2.0	-	2.0	-	V
V _{IL}	Low-level input voltage		4.5V to 5.5V	-	-	0.8	-	0.8	-	0.8	V
V	High Level	I _{OH} = -50μA	4.5V	4.4	4.5	-	4.4	-	4.4	-	V
V _{OH}	Output Voltage	I _{OH} = -8mA	4.5V	3.94	-	_	3.80	_	3.70	_	_ V
	Low-level Output	I _{OL} = 50μΑ	4.5V	_	0	0.1	_	0.1	_	0.1	V
Vol	Voltage	I _{OL} = 8mA	4.5V	-	-	0.36	-	0.44	-	0.55	v
II.	Input Current	V _I = GND or 5.5V	0V to 5.5V	_	0.1	±0.1	-	± 1	-	± 2	μA
Icc	Supply Current	$V_I = GND \text{ or } V_{CC}$ $I_O = 0$	5.5V	_	-	4.0	-	40	-	80	μA
ΔI_{CC}	Additional Supply Current per Input	$V_{I} = Vcc - 2.1V$ $I_{O} = 0$	4.5V to 5.5V	_	-	1.35	_	1.5	_	1.5	mA
Ci	Input Capacitance	$V_i = V_{CC}$ or GND	5.5V	_	4	10	-	10	-	10	pF

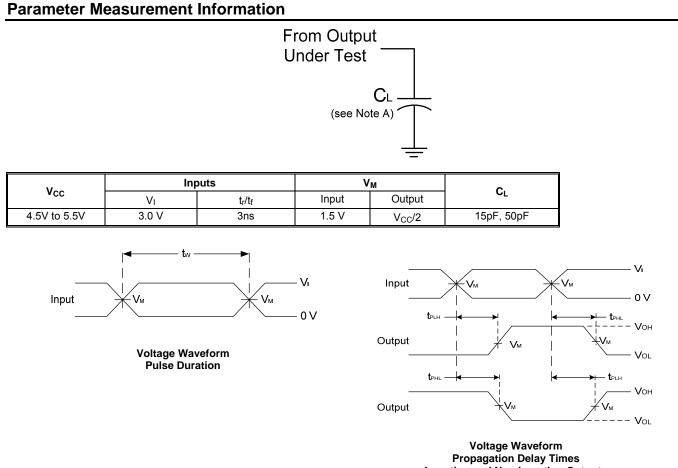


Switching Characteristics

Symbol	makel Denometer Test Cou		Test Conditions Vcc		T _A = +25°C		-40°C to +85°C		-40°C to +125°C		Unit
Symbol	Symbol Parameter Test Conditions	V _{cc}	Min	Тур	Max	Min	Max	Min	Max	Unit	
	Propagation Delay An to Yn	Figure 2 C _L =15pF	4.5V to 5.5V	0.5	4.4	10.4	1.0	12.0	1.0	13.0	
		Figure 2 C _L = 50pF	4.5V to 5.5V	0.5	6.2	11.4	1.0	13.0	1.0	14.5	ns
	Propagation Delay	Figure 2 C _L = 15pF	4.5V to 5.5V	0.5	4.3	9.1	1.0	10.5	1.0	11.5	
t _{PD}	E3 to Yn	Figure 2 C _L = 50pF	4.5V to 5.5V	0.5	6.2	10.1	1.0	11.5	1.0	13.0	ns
	Propagation Delay	Figure 2 C _L = 15pF	4.5V to 5.5V	0.5	4.3	9.6	1.0	11.0	1.0	12.0	
	Figure 2 C _L = 50pF	4.5V to 5.5V	0.5	6.2	10.6	1.0	12.0	1.0	13.5	ns	

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

	Parameter	Test Conditions	V _{CC} = 5V Typ	Unit
C _{pd}	Power dissipation capacitance	f = 1 MHz all outputs switching-no load	23	pF



Inverting and Non Inverting Outputs

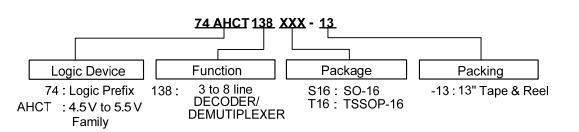
Notes: A. Includes test lead and test apparatus capacitance.

- B. All pulses are supplied at pulse repetition rate \leq 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

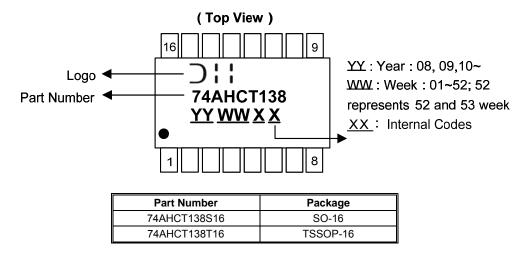


Part Number	Deekere Code	Deekening	7" Tape an	d Reel (Note 7)
Part Number	Package Code	Packaging	Quantity	Part Number Suffix
74AHCT138S16-13	S16	SO-16	2500/Tape & Reel	-13
74AHCT138T16-13	T16	TSSOP-16	2500/Tape & Reel	-13

Notes: 7. The taping orientation is located on our website at http://www.diodes.com/datasheets/ap02007.pdf

Marking Information

(1) SO-16, TSSOP16

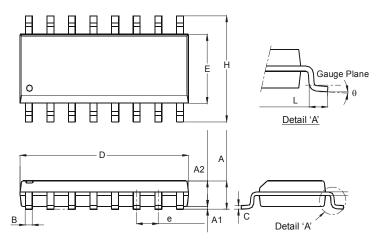




Package Outline Dimensions (All dimensions in mm.)

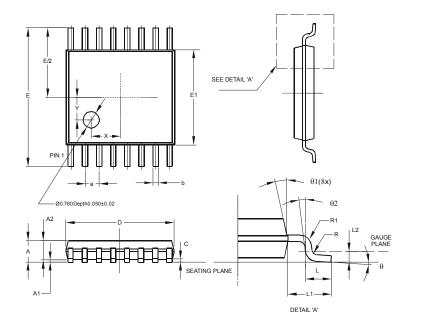
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

Package Type: SO-16



	SO-16							
Dim	Min	Max						
Α	1.40	1.75						
A1	0.10	0.25						
A2	1.30	1.50						
В	0.33	0.51						
С	0.19	0.25						
D	9.80	10.00						
ш	3.80	4.00						
е	1.27	Тур						
Н	5.80	6.20						
L	0.38	1.27						
Θ	0°	8°						
All D	imension	s in mm						

Package Type: TSSOP-16



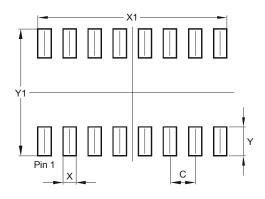
	TSS	OP-16	
Dim	Min	Max	Тур
Α	1	1.08	-
A1	0.05	0.15	-
A2	0.80	0.93	-
b	0.19	0.30	-
С	0.09	0.20	-
D	4.90	5.10	-
Е	6	6.40 BS	SC
E1	4.30	4.50	-
е	0	.65 BS	SC
L	0.45	0.75	-
L1			EF
L2	0	.25 BS	SC
R	0.09	1	-
R1	0.09	1	-
Х	-	-	1.350
Y	-	-	1.050
Θ	0°	8°	-
Θ1	5°	15°	-
Θ2	0°	-	-
All D	Dimen	sions	in mm



Suggested Pad Layout

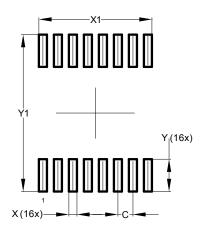
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

Package Type: SO-16



Dimensions	Value (in mm)
С	1.270
Х	0.670
X1	9.560
Y	1.450
Y1	6.400

Package Type: TSSOP-16



Dimensions	Value (in mm)
С	0.650
Х	0.350
X1	4.900
Y	1.400
Y1	6.800



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