
HD74AC138/HD74ACT138

1-of-8 Decoder/Demultiplexer

HITACHI

ADE-205-368 (Z)
1st. Edition
Sep. 2000

Description

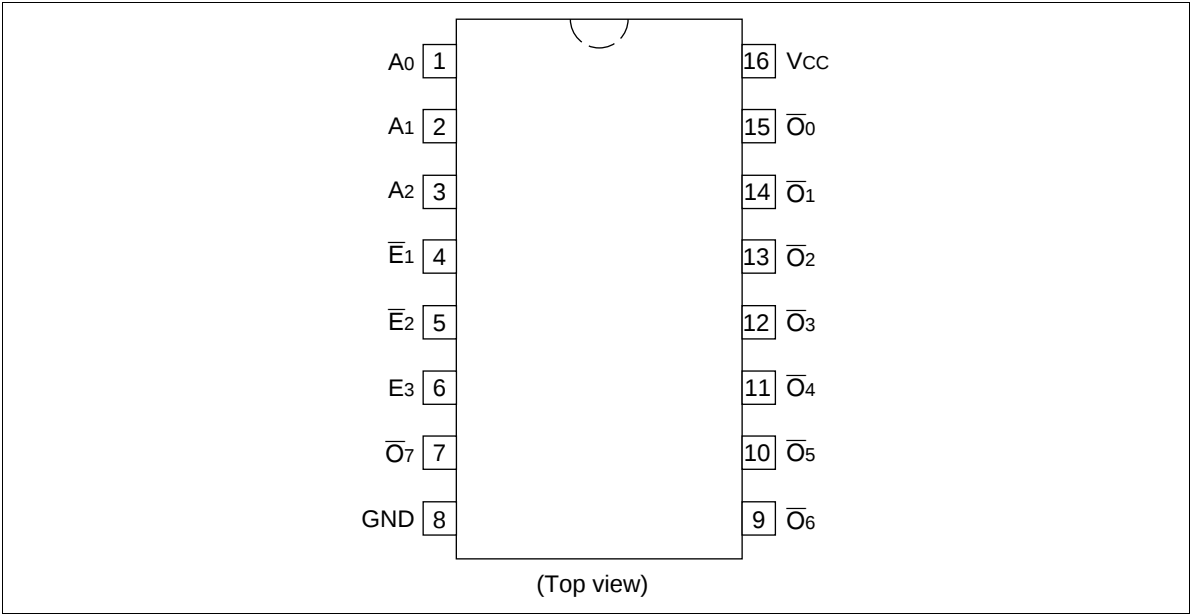
The HD74AC138/HD74ACT138 is a high-speed 1-of-8 decoder/demultiplexer. This device is ideally suited for high-speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three HD74AC138/HD74ACT138 devices or a 1-of-32 decoder using four HD74AC138/HD74ACT138 devices and one inverter.

Features

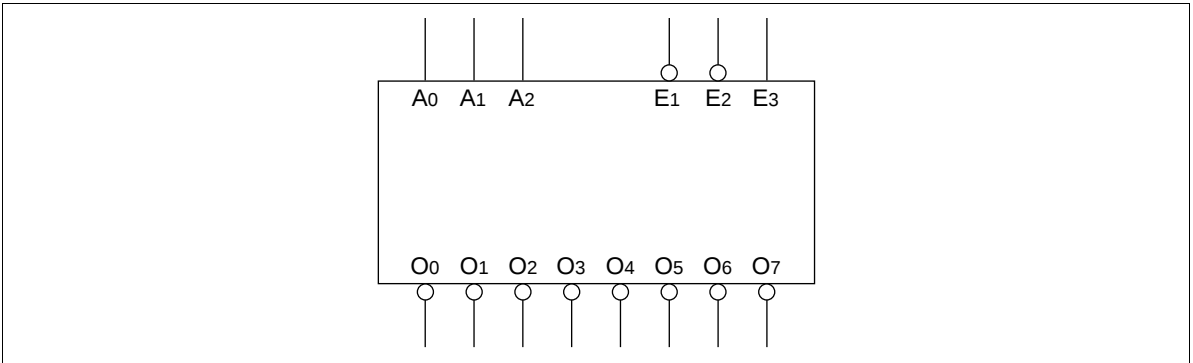
- Demultiplexing Capability
- Multiple Input Enable for Easy Expansion
- Active LOW Mutually Exclusive Outputs
- Outputs Source/Sink 24 mA
- HD74ACT138 has TTL-Compatible Inputs

HD74AC138/HD74ACT138

Pin Arrangement



Logic Symbol



Pin Names

- A_0 to A_2 Address Inputs
- $\overline{E}_1$ to $\overline{E}_2$ Enable Inputs
- E_3 Enable Input
- $\overline{O}_0$ to $\overline{O}_7$ Outputs

Functional Description

The HD74AC138/HD74ACT138 high-speed 1-of-8 decoder/demultiplexer accepts three binary weighted inputs (A_0 , A_1 , A_2) and, when enabled, provides eight mutually exclusive active-LOW outputs ($\overline{O}_0$ to $\overline{O}_7$). The HD74AC138/HD74ACT138 features three Enable inputs, two active-Low ($\overline{E}_1$, $\overline{E}_2$) and one active-High (E_3). All outputs will be High unless $\overline{E}_1$ and $\overline{E}_2$ are Low and E_3 is High. This multiple enabled function allows easy parallel expansion of the device to a 1-of-32 (5 lines to 32 lines) decoder with just four HD74AC138/HD74ACT138 devices and one inverter (See Figure a). The HD74AC138/HD74ACT138 can be used as an 8-output demultiplexer by using one of the active Low Enable inputs as the data input and the other Enable inputs as strobes. The Enables inputs which are not used must be permanently tied to their appropriate active-High or active-Low state.

Truth Table

Inputs						Outputs							
$\overline{E}_1$	$\overline{E}_2$	E_3	A_0	A_1	A_2	$\overline{O}_0$	$\overline{O}_1$	$\overline{O}_2$	$\overline{O}_3$	$\overline{O}_4$	$\overline{O}_5$	$\overline{O}_6$	$\overline{O}_7$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	H	H	H	H	H
L	L	H	H	L	L	H	L	H	H	H	H	H	H
L	L	H	L	H	L	H	H	L	H	H	H	H	H
L	L	H	H	H	L	H	H	H	L	H	H	H	H
L	L	H	L	L	H	H	H	H	H	L	H	H	H
L	L	H	H	L	H	H	H	H	H	H	L	H	H
L	L	H	L	H	H	H	H	H	H	H	H	L	H
L	L	H	H	H	H	H	H	H	H	H	H	H	L

H :

High Voltage Level

L :

Low Voltage Level

X :

Immaterial

Logic Diagram

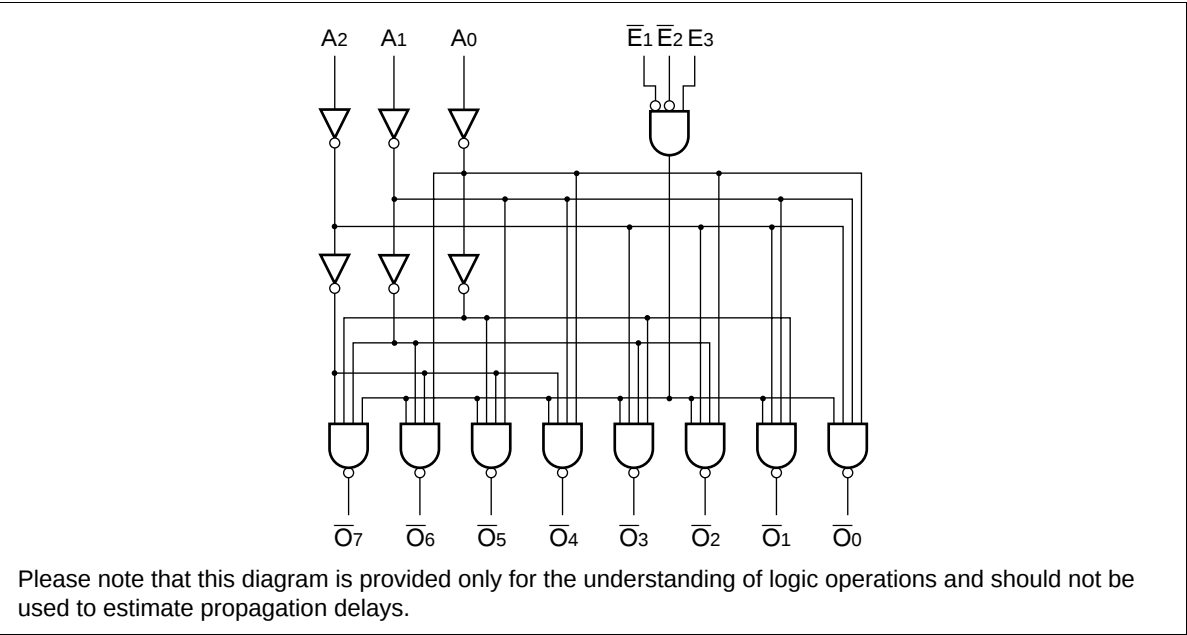
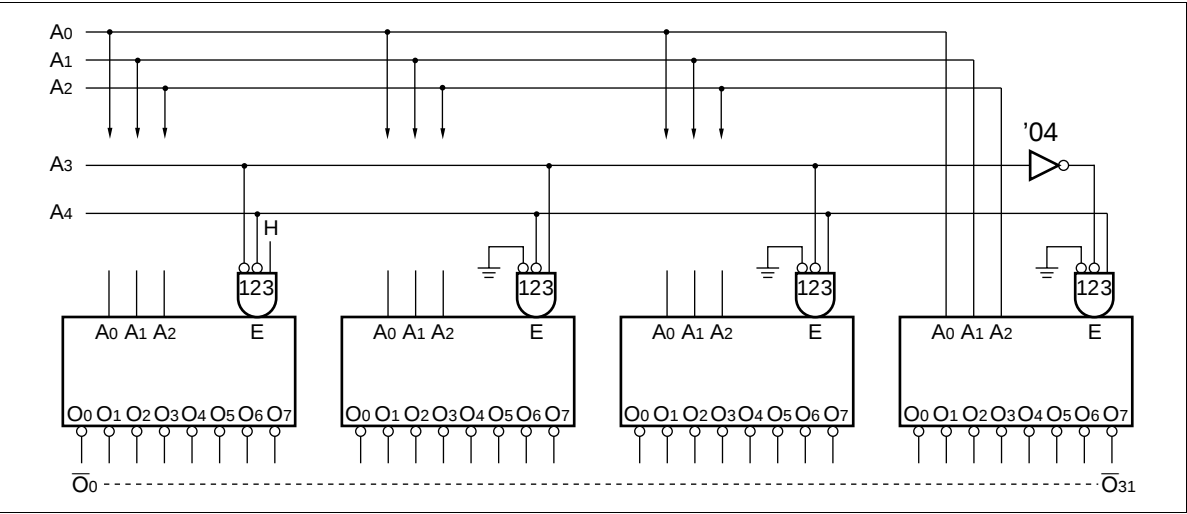


Figure a: Expansion of 1-of-32 Decoding



DC Characteristics (unless otherwise specified)

Item	Symbol	Max	Unit	Condition
Maximum quiescent supply current	I_{CC}	80	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = \text{Worst case}$
Maximum quiescent supply current	I_{CC}	8.0	μA	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$, $T_a = 25^\circ C$
Maximum I_{CC}/input (HD74ACT138)	I_{CCT}	1.5	mA	$V_{IN} = V_{CC} - 2.1 V$, $V_{CC} = 5.5 V$ $T_a = \text{Worst case}$

AC Characteristics: HD74AC138

Item	Symbol	$V_{CC} (V)^{*1}$	$T_a = +25^\circ C$ $C_L = 50 pF$			$T_a = -40^\circ C \text{ to } +85^\circ C$ $C_L = 50 pF$		Unit
			Min	Typ	Max	Min	Max	
Propagation delay	t_{PLH}	3.3	1.0	8.5	13.0	1.0	15.0	ns
$A_n \text{ to } \overline{O}_n$		5.0	1.0	6.5	9.5	1.0	10.5	
Propagation delay	t_{PHL}	3.3	1.0	8.0	12.5	1.0	14.0	ns
$A_n \text{ to } \overline{O}_n$		5.0	1.0	6.0	9.0	1.0	10.5	
Propagation delay	t_{PLH}	3.3	1.0	11.0	15.0	1.0	16.0	ns
$\overline{E}_1 \text{ or } \overline{E}_2 \text{ to } \overline{O}_n$		5.0	1.0	8.0	11.0	1.0	12.0	
Propagation delay	t_{PHL}	3.3	1.0	9.5	13.5	1.0	15.0	ns
$\overline{E}_1 \text{ or } \overline{E}_2 \text{ to } \overline{O}_n$		5.0	1.0	7.0	9.5	1.0	10.5	
Propagation delay	t_{PLH}	3.3	1.0	11.0	15.5	1.0	16.5	ns
$E_3 \text{ to } \overline{O}_n$		5.0	1.0	8.0	11.0	1.0	12.5	
Propagation delay	t_{PHL}	3.3	1.0	8.5	13.0	1.0	14.0	ns
$E_3 \text{ to } \overline{O}_n$		5.0	1.0	6.0	8.0	1.0	9.5	

Note: 1. Voltage Range 3.3 is $3.3 V \pm 0.3 V$
Voltage Range 5.0 is $5.0 V \pm 0.5 V$

HD74AC138/HD74ACT138

AC Characteristics: HD74ACT138

Item	Symbol	V _{CC} (V)* ¹	Ta = +25°C C _L = 50 pF			Ta = −40°C to +85°C C _L = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Propagation delay An to $\overline{O}_n$	t _{PLH}	5.0	1.0	7.0	10.5	1.0	11.5	ns
Propagation delay An to $\overline{O}_n$	t _{PHL}	5.0	1.0	6.5	10.5	1.0	11.5	ns
Propagation delay $\overline{E}_1$ or $\overline{E}_2$ to $\overline{O}_n$	t _{PLH}	5.0	1.0	8.0	11.5	1.0	12.5	ns
Propagation delay $\overline{E}_1$ or $\overline{E}_2$ to $\overline{O}_n$	t _{PHL}	5.0	1.0	7.5	11.5	1.0	12.5	ns
Propagation delay E_3 to $\overline{O}_n$	t _{PLH}	5.0	1.0	8.0	12.0	1.0	13.0	ns
Propagation delay E_3 to $\overline{O}_n$	t _{PHL}	5.0	1.0	6.5	10.5	1.0	11.5	ns

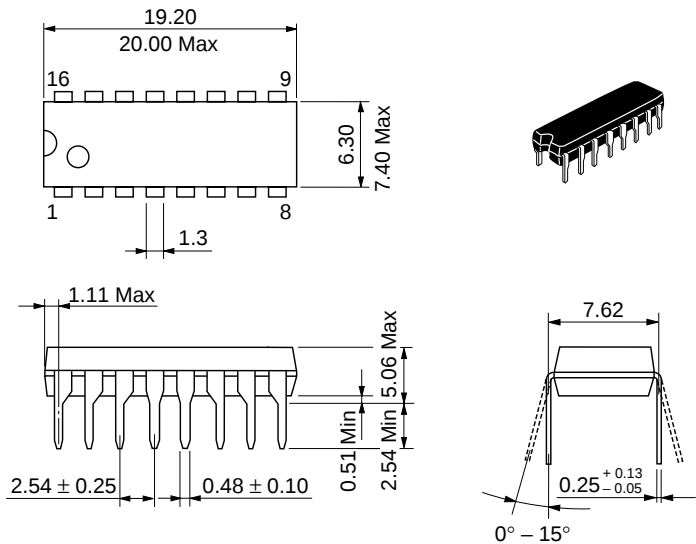
Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C _{IN}	4.5	pF	V _{CC} = 5.5 V
Power dissipation capacitance	C _{PD}	60.0	pF	V _{CC} = 5.0 V

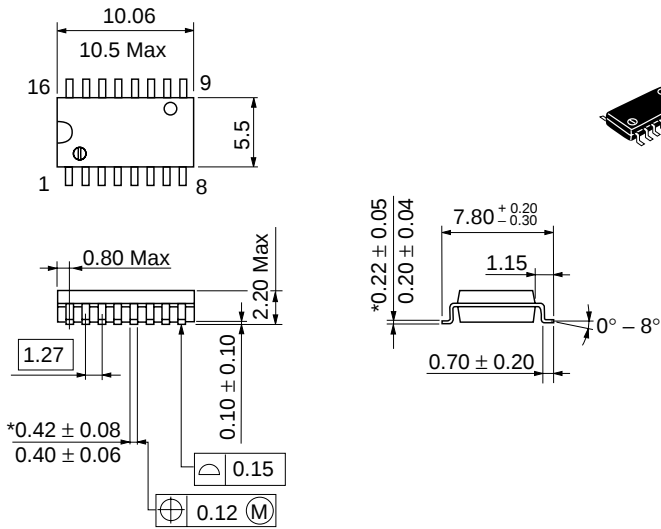
Package Dimensions

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.07 g

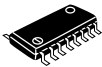
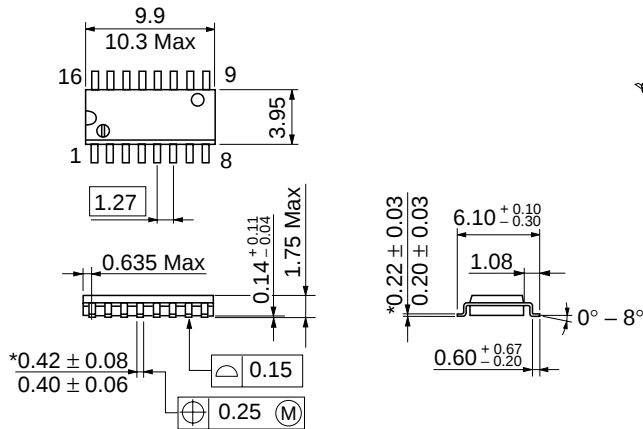
Unit: mm



Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.24 g

*Dimension including the plating thickness
Base material dimension

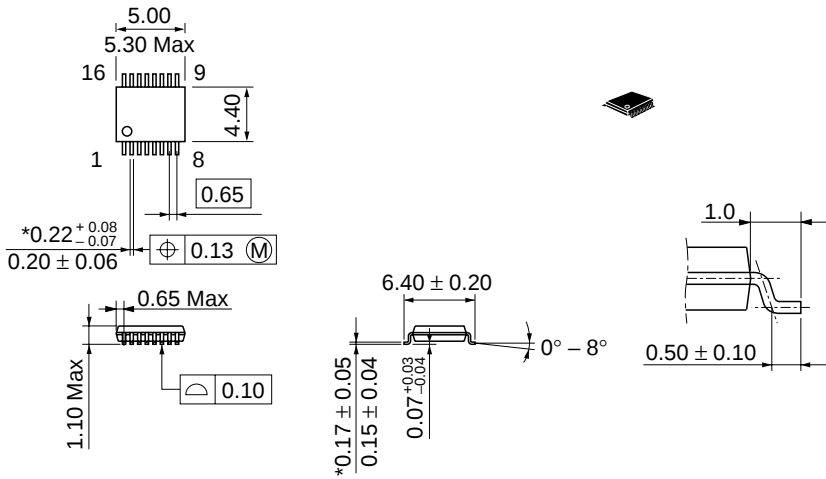
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.15 g

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	TTP-16DA
JEDEC	—
EIAJ	—
Mass (reference value)	0.05 g

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohite-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL	North America	: http://semiconductor.hitachi.com/
	Europe	: http://www.hitachi-eu.com/hel/ecg
	Asia	: http://sicapac.hitachi-asia.com
	Japan	: http://www.hitachi.co.jp/Sicd/indx.htm

For further information write to:

Hitachi Semiconductor (America) Inc. 179 East Tasman Drive, San Jose, CA 95134 Tel: <1> (408) 433-1990 Fax: <1> (408) 433-0223	Hitachi Europe GmbH Electronic Components Group Dornacher Straße 3 D-85622 Feldkirchen, Munich Germany Tel: <49> (89) 9 9180-0 Fax: <49> (89) 9 29 30 00
	Hitachi Europe Ltd. Electronic Components Group. Whitebrook Park Lower Cookham Road Maidenhead Berkshire SL6 8YA, United Kingdom Tel: <44> (1628) 585000 Fax: <44> (1628) 585160

Hitachi Asia Ltd. Hitachi Tower 16 Collyer Quay #20-00, Singapore 049318 Tel: <65>-538-6533/538-8577 Fax: <65>-538-6933/538-3877 URL: http://www.hitachi.com.sg	Hitachi Asia Ltd. (Taipei Branch Office) 4/F, No. 167, Tun Hwa North Road, Hung-Kuo Building, Taipei (105), Taiwan Tel: <886>-(2)-2718-3666 Fax: <886>-(2)-2718-8180 Telex: 23222 HAS-TP URL: http://www.hitachi.com.tw
---	---

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon,
Hong Kong
Tel: <852>-(2)-735-9218
Fax: <852>-(2)-730-0281
URL: <http://www.hitachi.com.hk>

Copyright © Hitachi, Ltd., 2000. All rights reserved. Printed in Japan.
Colophon 2.0

HITACHI