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# HD74AC139/HD74ACT139

Dual 1-of-4 Decoder/Demultiplexer

## HITACHI

ADE-205-369 (Z)  
1st. Edition  
Sep. 2000

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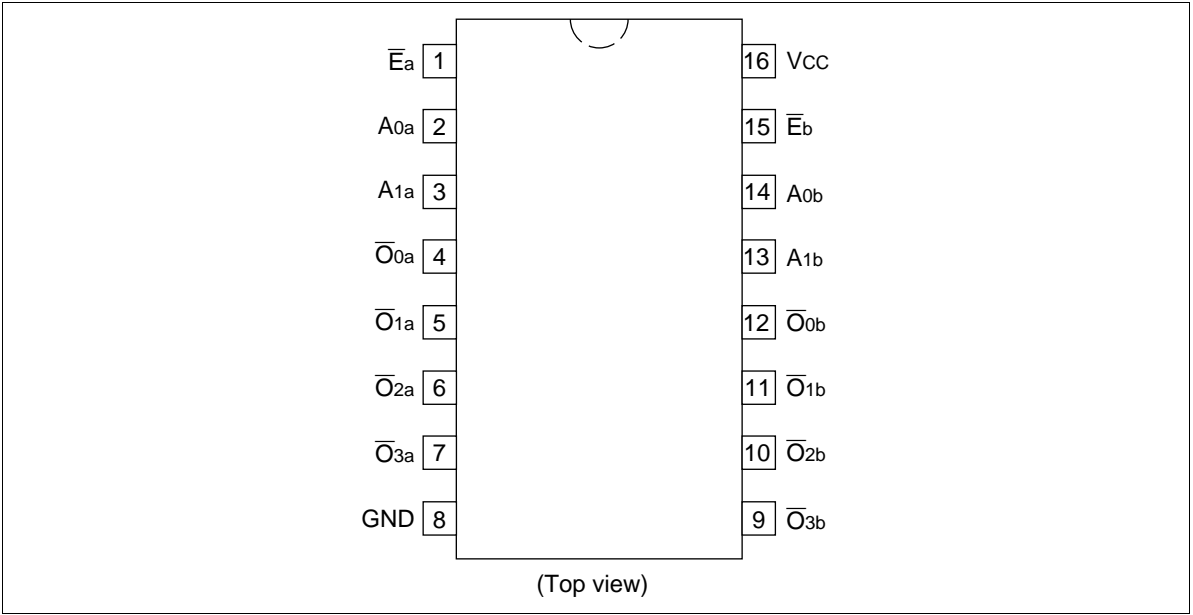
### Description

The HD74AC139/HD74ACT139 is a high-speed, dual 1-of-4 decoder/demultiplexer. The device has two independent decoders, each accepting two inputs and providing four mutually-exclusive active-Low outputs. Each decoder has an active-Low Enable input which can be used as a data input for a 4-output demultiplexer. Each half of the HD74AC139/HD74ACT139 can be used as a function generator providing all four minterms of two variables.

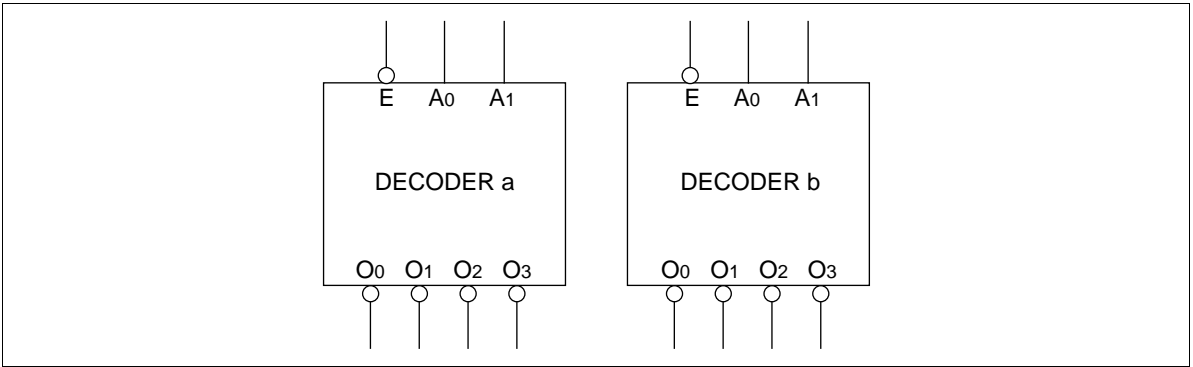
### Features

- Multifunction Capability
- Two Completely Independent 1-of-4 Decoders
- Active Low Mutually Exclusive Outputs
- Outputs Source/Sink 24 mA
- HD74ACT139 has TTL-Compatible Inputs

Pin Arrangement



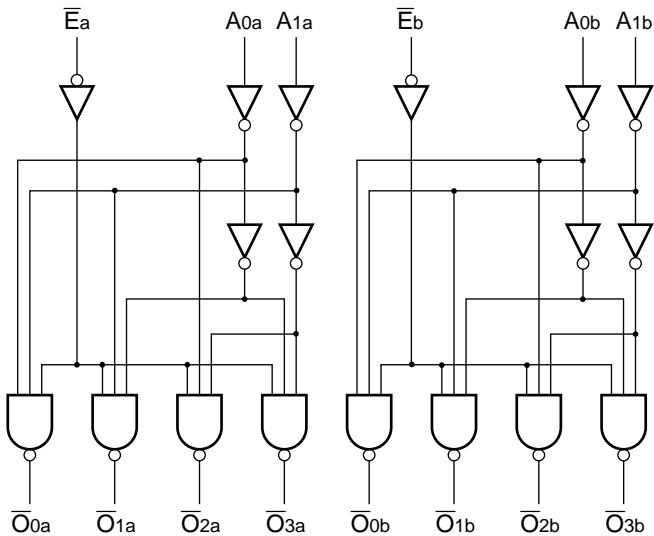
Logic Symbol



Pin Names

- $A_0, A_1$  Address Inputs
- $\bar{E}$  Enable Inputs
- $\bar{O}_0$  to  $\bar{O}_3$  Outputs

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Functional Description

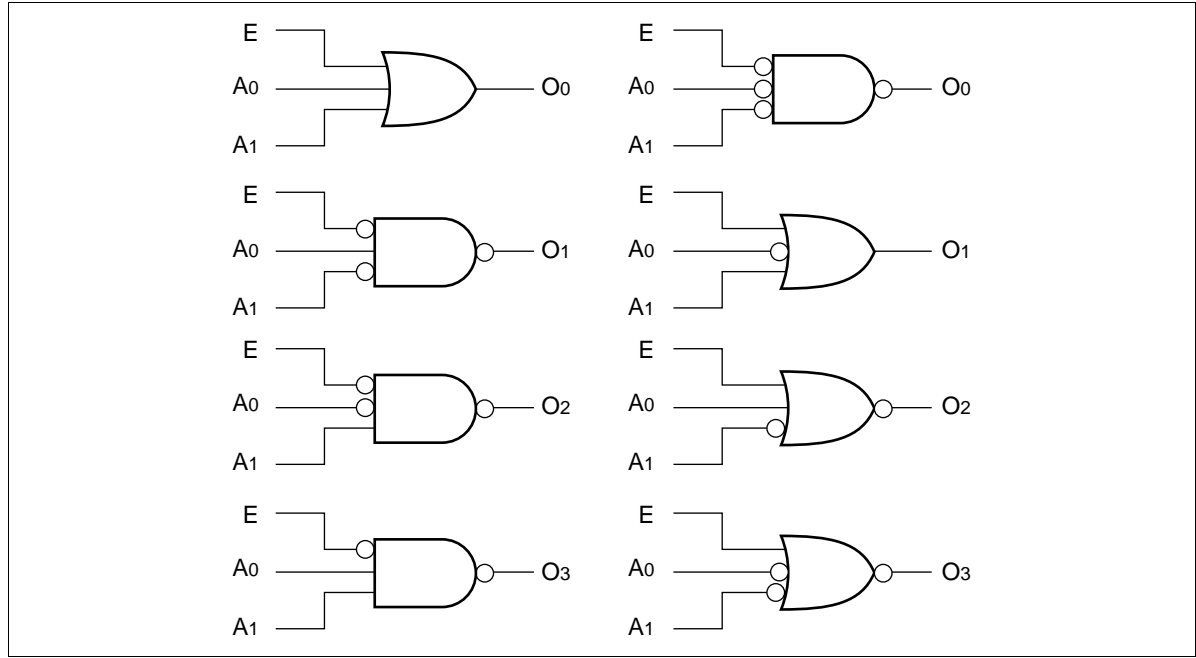
The HD74AC139/HD74ACT139 is a high-speed dual 1-of-4 decoder/demultiplexer. The device has two independent decoders, each of which accepts two binary weighted inputs ( $A_0$  to  $A_1$ ) and provides four mutually exclusive active-Low outputs ( $\overline{O}_0$  to  $\overline{O}_3$ ). Each decoder has an active-Low enable ( $\overline{E}$ ). When  $\overline{E}$  is High all outputs are forced High. The enable can be used as the data input for a 4-output demultiplexer application. Each half of the HD74AC139/HD74ACT139 generates all four minterms of two variables. These four minterms are useful in some applications, replacing multiple gate functions as shown in Figure a, and thereby reducing the number of packages required in a logic network.

Truth Table

Inputs			Outputs			
$\overline{E}$	$A_0$	$A_1$	$\overline{O}_0$	$\overline{O}_1$	$\overline{O}_2$	$\overline{O}_3$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L

H : High Voltage Level  
L : Low Voltage Level  
X : Immaterial

Figure a: Gate Functions (each half)



DC Characteristics (unless otherwise specified)

Item	Symbol	Max	Unit	Condition
Maximum quiescent supply current	$I_{CC}$	80	$\mu A$	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$ , $T_a = \text{Worst case}$
Maximum quiescent supply current	$I_{CC}$	8.0	$\mu A$	$V_{IN} = V_{CC}$ or ground, $V_{CC} = 5.5 V$ , $T_a = 25^{\circ}C$
Maximum $I_{CC}/\text{input}$ (HD74ACT139)	$I_{CCT}$	1.5	mA	$V_{IN} = V_{CC} - 2.1 V$ , $V_{CC} = 5.5 V$ $T_a = \text{Worst case}$

AC Characteristics: HD74AC139

Item	Symbol	V <sub>CC</sub> (V)*1	Ta = +25°C C <sub>L</sub> = 50 pF			Ta = −40°C to +85°C C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Propagation delay A <sub>n</sub> to $\overline{O}_n$	t <sub>PLH</sub>	3.3	1.0	8.0	11.5	1.0	13.0	ns
		5.0	1.0	6.5	8.5	1.0	9.5	
Propagation delay A <sub>n</sub> to $\overline{O}_n$	t <sub>PHL</sub>	3.3	1.0	7.0	10.0	1.0	11.0	ns
		5.0	1.0	5.5	7.5	1.0	8.5	
Propagation delay $\overline{E}_n$ to $\overline{O}_n$	t <sub>PLH</sub>	3.3	1.0	9.5	12.0	1.0	13.0	ns
		5.0	1.0	7.0	8.5	1.0	10.0	
Propagation delay $\overline{E}_n$ to $\overline{O}_n$	t <sub>PHL</sub>	3.3	1.0	8.0	10.0	1.0	11.0	ns
		5.0	1.0	6.0	7.5	1.0	8.5	

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

AC Characteristics: HD74ACT139

Item	Symbol	V <sub>CC</sub> (V)*1	Ta = +25°C C <sub>L</sub> = 50 pF			Ta = −40°C to +85°C C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Propagation delay A <sub>n</sub> to $\overline{O}_n$	t <sub>PLH</sub>	5.0	1.0	6.0	8.5	1.0	9.5	ns
Propagation delay A <sub>n</sub> to $\overline{O}_n$	t <sub>PHL</sub>	5.0	1.0	6.0	9.5	1.0	10.5	ns
Propagation delay $\overline{E}_n$ to $\overline{O}_n$	t <sub>PLH</sub>	5.0	1.0	7.0	10.0	1.0	11.0	ns
Propagation delay $\overline{E}_n$ to $\overline{O}_n$	t <sub>PHL</sub>	5.0	1.0	7.0	9.5	1.0	10.5	ns

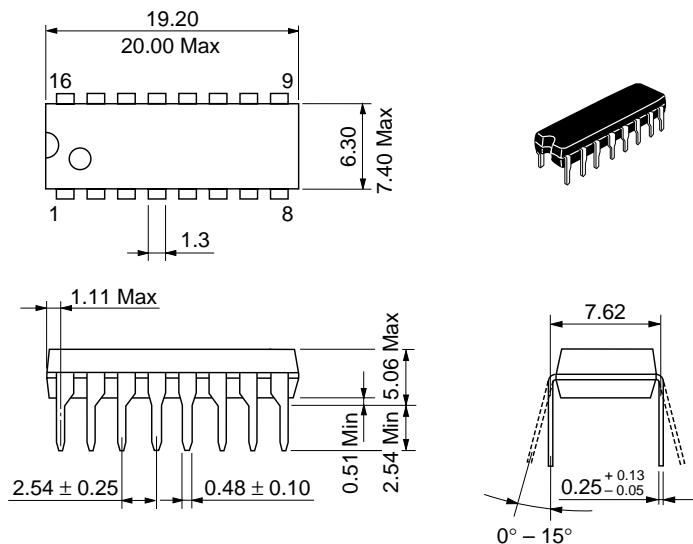
Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C <sub>IN</sub>	4.5	pF	V <sub>CC</sub> = 5.5 V
Power dissipation capacitance	C <sub>PD</sub>	40.0	pF	V <sub>CC</sub> = 5.0 V

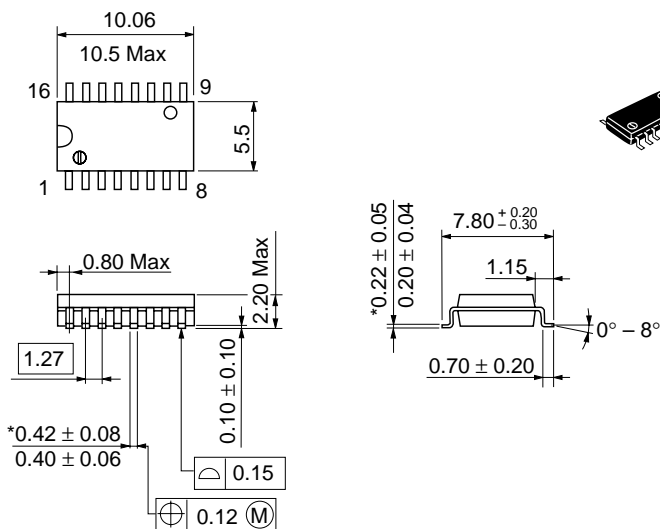
## Package Dimensions

Unit: mm



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

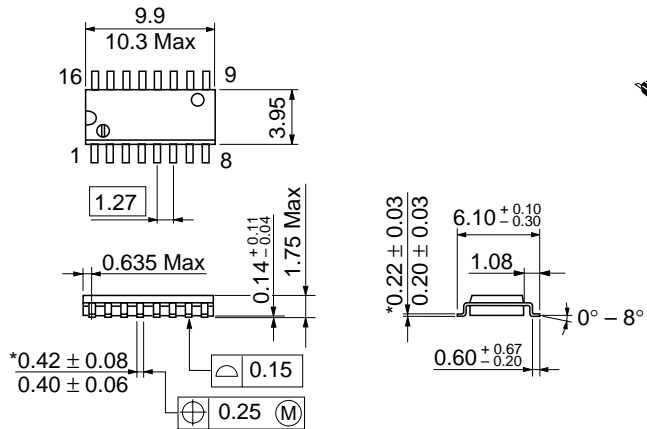
Unit: mm



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

$$\frac{\text{*Dimension including the plating thickness}}{\text{Base material dimension}}$$

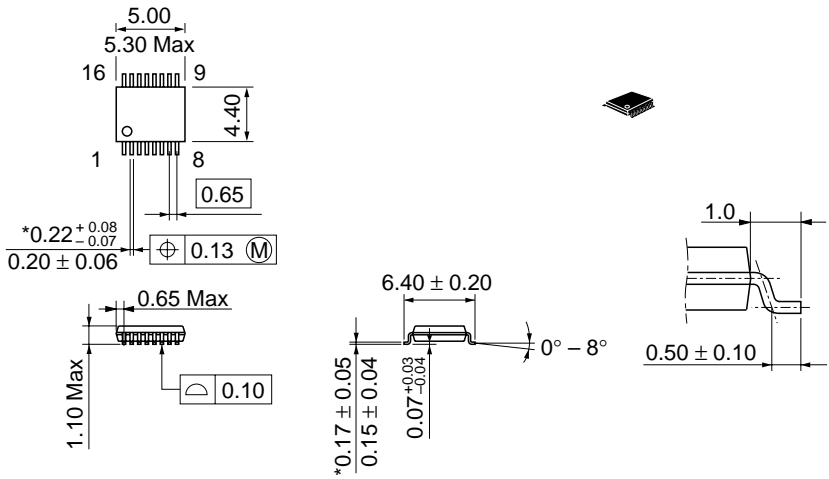
Unit: mm



\*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

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