HD74AC139/HD74ACT139

Dual 1-of-4 Decoder/Demultiplexer

HITACHI

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

Description

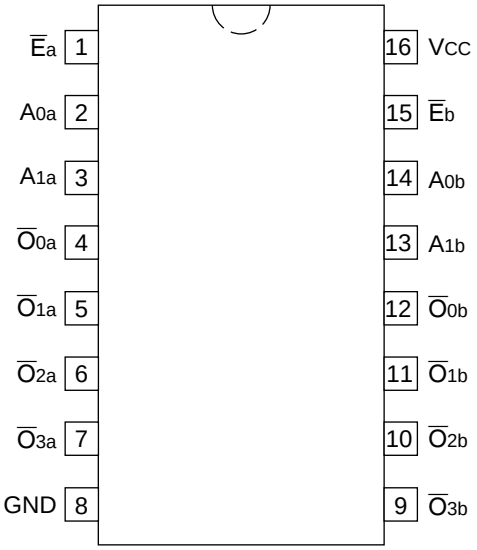
The HD74AC139/HD74ACT139 is a high-speed, dual 1-of-4 decoder/demultiplexer. The device has two independent decoders, each accepting two inputs and providing four mutually-exclusive active-Low outputs. Each decoder has an active-Low Enable input which can be used as a data input for a 4-output demultiplexer.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

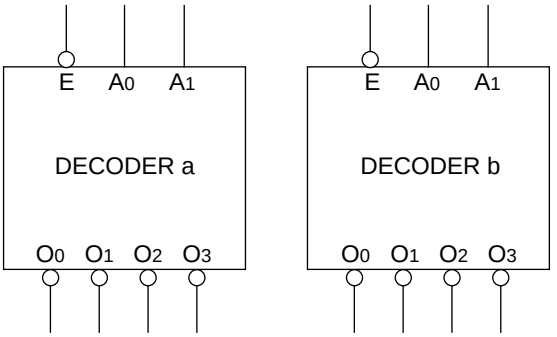
Hitachi semiconductor

Pin Arrangement



(Top view)

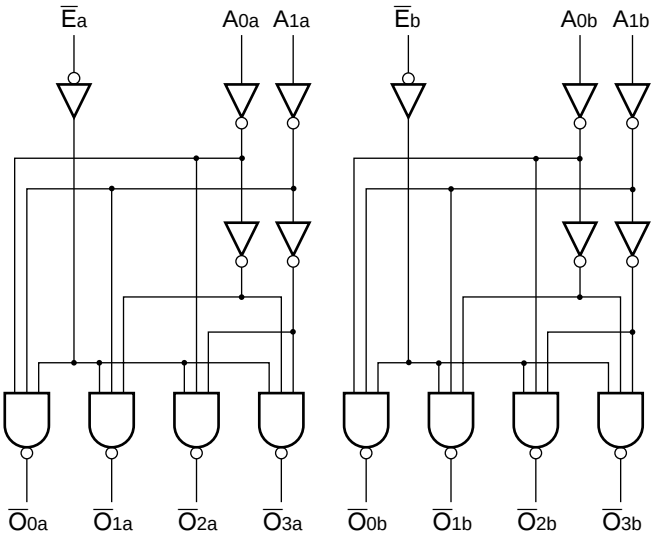
Logic Symbol



Pin Names

A_0, A_1	Address Inputs
$\overline{E}$	Enable Inputs
$\overline{O}_0$ to $\overline{O}_3$	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

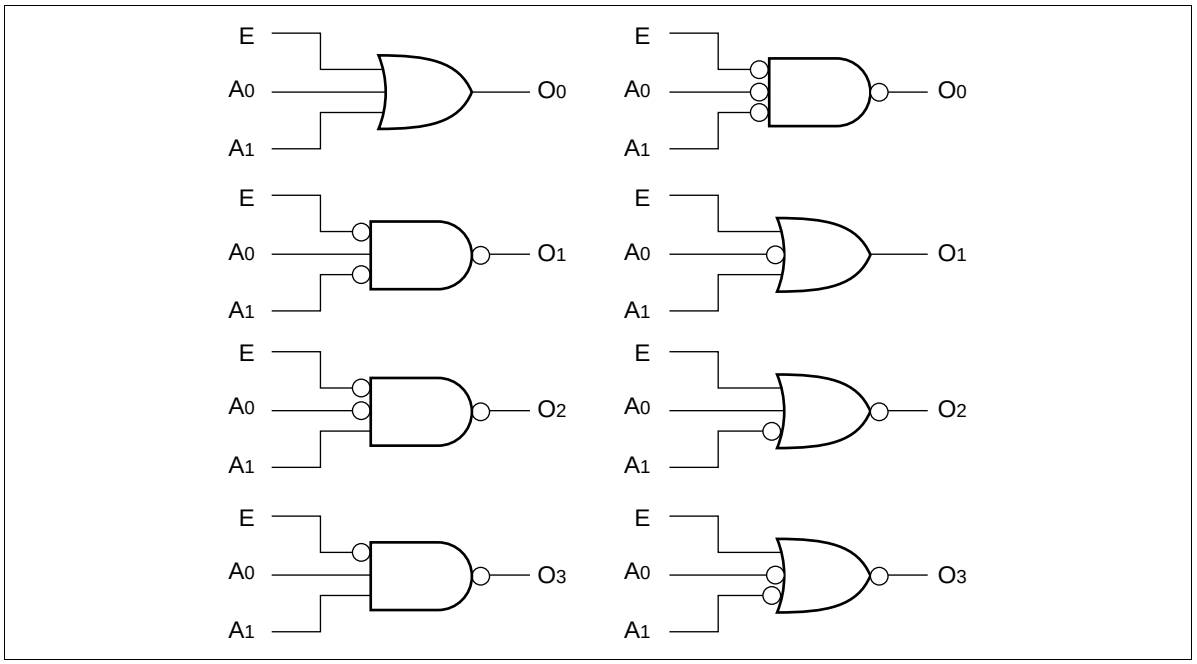
The HD74AC139/HD74ACT139 is a high-speed dual 1-of-4 decoder/demultiplexer. The device has two independent decoders, each of which accepts two binary weighted inputs (A_0 to A_1) and provides four mutually exclusive active-Low outputs ($\overline{O}_0$ to $\overline{O}_3$). Each decoder has an active-Low 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	µA	V_{IN} = V_{CC} or ground, V_{CC} = 5.5 V, Ta = Worst case
Maximum quiescent supply current	I_{CC}	8.0	µA	V_{IN} = V_{CC} or ground, V_{CC} = 5.5 V, Ta = 25°C
Maximum I_{CC}/input (HD74ACT139)	I_{CCT}	1.5	mA	V_{IN} = V_{CC} – 2.1 V, V_{CC} = 5.5 V Ta = Worst case

AC Characteristics: HD74AC139

			Ta = +25°C C_L = 50 pF			Ta = –40°C to +85°C C_L = 50 pF		
Item	**Symbol**	**V_{CC} (V)*[1]**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**
Propagation delay	t_{PLH}	3.3	1.0	8.0	11.5	1.0	13.0	ns
A_n to $\overline{O}_n$		5.0	1.0	6.5	8.5	1.0	9.5	
Propagation delay	t_{PHL}	3.3	1.0	7.0	10.0	1.0	11.0	ns
A_n to $\overline{O}_n$		5.0	1.0	5.5	7.5	1.0	8.5	
Propagation delay	t_{PLH}	3.3	1.0	9.5	12.0	1.0	13.0	ns
$\overline{E}_n$ to $\overline{O}_n$		5.0	1.0	7.0	8.5	1.0	10.0	
Propagation delay	t_{PHL}	3.3	1.0	8.0	10.0	1.0	11.0	ns
$\overline{E}_n$ to $\overline{O}_n$		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

			Ta = +25°C C_L = 50 pF			Ta = –40°C to +85°C C_L = 50 pF		
Item	**Symbol**	**V_{CC} (V)*[1]**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**
Propagation delay A_n to $\overline{O}_n$	t_{PLH}	5.0	1.0	6.0	8.5	1.0	9.5	ns
Propagation delay A_n to $\overline{O}_n$	t_{PHL}	5.0	1.0	6.0	9.5	1.0	10.5	ns
Propagation delay $\overline{E}_n$ to $\overline{O}_n$	t_{PLH}	5.0	1.0	7.0	10.0	1.0	11.0	ns
Propagation delay $\overline{E}_n$ to $\overline{O}_n$	t_{PHL}	5.0	1.0	7.0	9.5	1.0	10.5	ns

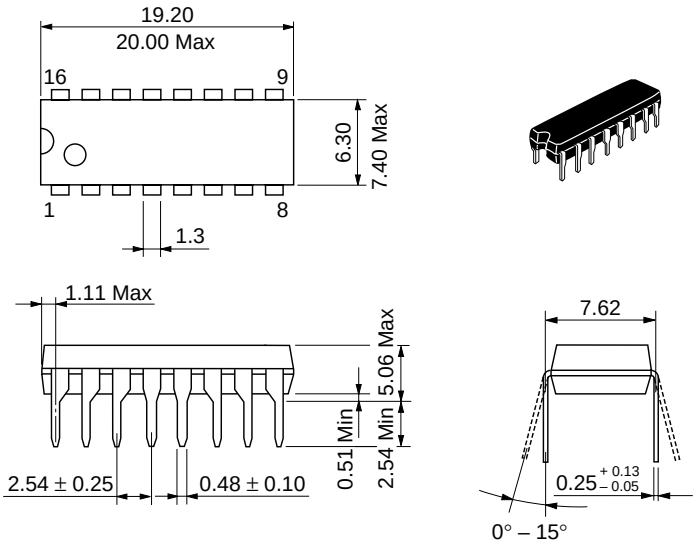
Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

Capacitance

Item	**Symbol**	**Typ**	**Unit**	**Condition**
Input capacitance	C_{IN}	4.5	pF	V_{CC} = 5.5 V
Power dissipation capacitance	C_{PD}	40.0	pF	V_{CC} = 5.0 V

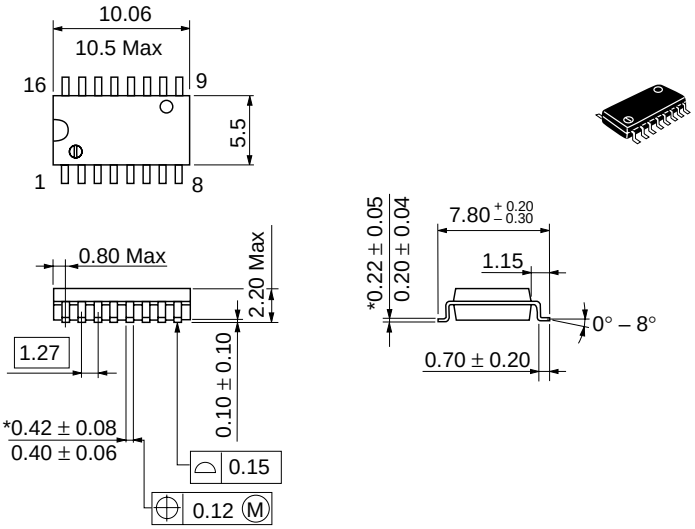
Package Dimensions

Unit: mm



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

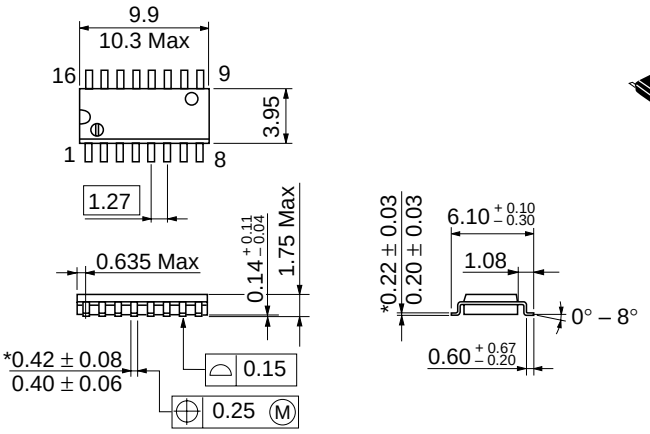
Unit: mm



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

*Dimension including the plating thickness
Base material dimension

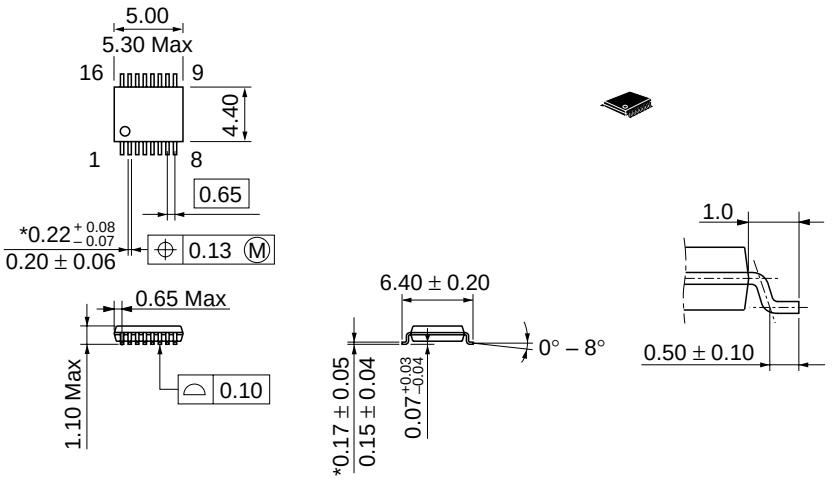
Unit: mm



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

*Dimension including the plating thickness
Base material dimension

Unit: mm



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

*Dimension including the plating thickness
Base material dimension

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