

HD74LV139A

Dual 2-to-4-line Decoders / Demultiplexers

REJ03D0385-0100

Rev.1.00

Aug. 24, 2004

Description

The HD74LV139A has two independent two-to-four-line decoders each with a single active low enable input in a 16 pin package. Data on the select inputs cause one of the four normally high outputs to go low. Low voltage and high-speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

- $V_{CC} = 2.0 \text{ V to } 5.5 \text{ V}$
- All inputs $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V to } 5.5 \text{ V})$
- All outputs $V_O (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V})$
- Typical V_{OL} ground bounce $< 0.8 \text{ V} (@V_{CC} = 3.3 \text{ V}, T_a = 25^\circ\text{C})$
- Typical V_{OH} undershoot $> 2.3 \text{ V} (@V_{CC} = 3.3 \text{ V}, T_a = 25^\circ\text{C})$
- High output current $\pm 6 \text{ mA} (@V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}), \pm 12 \text{ mA} (@V_{CC} = 4.5 \text{ V to } 5.5 \text{ V})$
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LV139AFPEL	SOP-16 pin (JEITA)	FP-16DAV	FP	EL (2,000 pcs/reel)
HD74LV139ATELL	TSSOP-16 pin	TTP-16DAV	T	ELL (2,000 pcs/reel)

Note: Please consult the sales office for the above package availability.

Function Table

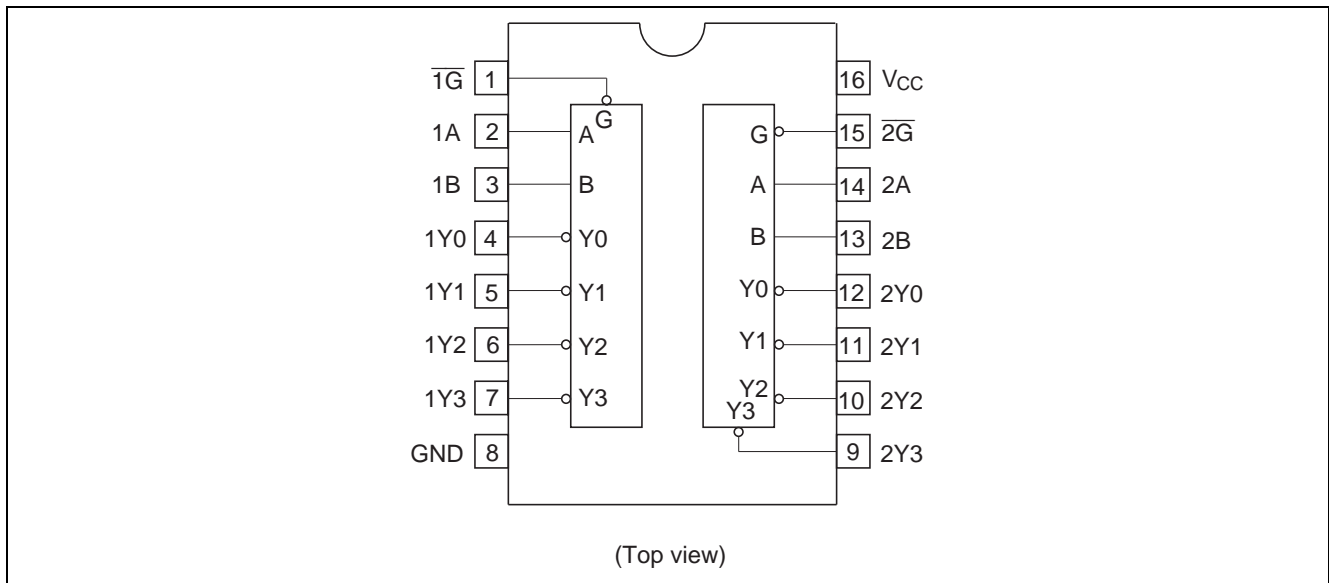
Input			Outputs			
Enable	Select					
\bar{G}	B	A	Y0	Y1	Y2	Y3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

H: High level

L: Low level

X: Immaterial

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	V_{CC}	-0.5 to 7.0	V	
Input voltage range* ¹	V_I	-0.5 to 7.0	V	
Output voltage range* ^{1, 2}	V_O	-0.5 to $V_{CC} + 0.5$	V	Output: H or L
		-0.5 to 7.0		V_{CC} : OFF
Input clamp current	I_{IK}	-20	mA	$V_I < 0$
Output clamp current	I_{OK}	±50	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	I_O	±25	mA	$V_O = 0$ to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	±50	mA	
Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air)* ³	P_T	785	mW	SOP
		500		TSSOP
Storage temperature	T_{stg}	-65 to 150	°C	

Notes: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V_{CC}	2.0	5.5	V	
Input voltage range	V_I	0	5.5	V	
Output voltage range	V_O	0	V_{CC}	V	
Output current	I_{OH}	—	−50	μA	$V_{CC} = 2.0\text{ V}$
		—	−2	mA	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		—	−6		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		—	−12		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
	I_{OL}	—	50	μA	$V_{CC} = 2.0\text{ V}$
		—	2	mA	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		—	6		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		—	12		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
Input transition rise or fall rate	$\Delta t / \Delta v$	0	200	ns/V	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		0	100		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		0	20		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
Operating free-air temperature	T_a	−40	85	$^{\circ}C$	

Note: Unused or floating inputs must be held high or low.

DC Electrical Characteristics

$T_a = -40\text{ to }85^{\circ}C$

Item	Symbol	$V_{CC}\text{ (V)}^*$	Min	Typ	Max	Unit	Test Conditions
Input voltage	V_{IH}	2.0	1.5	—	—	V	
		2.3 to 2.7	$V_{CC} \times 0.7$	—	—		
		3.0 to 3.6	$V_{CC} \times 0.7$	—	—		
		4.5 to 5.5	$V_{CC} \times 0.7$	—	—		
	V_{IL}	2.0	—	—	0.5		
		2.3 to 2.7	—	—	$V_{CC} \times 0.3$		
		3.0 to 3.6	—	—	$V_{CC} \times 0.3$		
		4.5 to 5.5	—	—	$V_{CC} \times 0.3$		
Output voltage	V_{OH}	Min to Max	$V_{CC} - 0.1$	—	—	V	$I_{OH} = -50\text{ }\mu A$
		2.3	2.0	—	—		$I_{OH} = -2\text{ mA}$
		3.0	2.48	—	—		$I_{OH} = -6\text{ mA}$
		4.5	3.8	—	—		$I_{OH} = -12\text{ mA}$
	V_{OL}	Min to Max	—	—	0.1		$I_{OL} = 50\text{ }\mu A$
		2.3	—	—	0.4		$I_{OL} = 2\text{ mA}$
		3.0	—	—	0.44		$I_{OL} = 6\text{ mA}$
		4.5	—	—	0.55		$I_{OL} = 12\text{ mA}$
Input current	I_{IN}	0 to 5.5	—	—	± 1	μA	$V_{IN} = 5.5\text{ V or GND}$
Quiescent supply current	I_{CC}	5.5	—	—	20	μA	$V_{IN} = V_{CC}\text{ or GND, } I_O = 0$
Output leakage current	I_{OFF}	0	—	—	5	μA	$V_I\text{ or }V_O = 0\text{ V to }5.5\text{ V}$
Input capacitance	C_{IN}	3.3	—	3.3	—	pF	$V_I = V_{CC}\text{ or GND}$

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

Switching Characteristics

$$V_{CC} = 2.5 \pm 0.2 \text{ V}$$

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t_{PLH}/t_{PHL}	—	7.5	17.6	1.0	21.0	ns	$C_L = 15 \text{ pF}$	A or B	Y
		—	10.5	22.5	1.0	26.5		$C_L = 50 \text{ pF}$		
		—	7.5	15.8	1.0	19.0		$C_L = 15 \text{ pF}$	\overline{G}	
		—	10.0	20.2	1.0	24.0		$C_L = 50 \text{ pF}$		

$$V_{CC} = 3.3 \pm 0.3 \text{ V}$$

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t_{PLH}/t_{PHL}	—	5.5	11.0	1.0	13.0	ns	$C_L = 15 \text{ pF}$	A or B	Y
		—	7.5	14.5	1.0	16.5		$C_L = 50 \text{ pF}$		
		—	5.5	9.2	1.0	11.0		$C_L = 15 \text{ pF}$	\overline{G}	
		—	7.0	12.7	1.0	14.5		$C_L = 50 \text{ pF}$		

$$V_{CC} = 5.0 \pm 0.5 \text{ V}$$

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t_{PLH}/t_{PHL}	—	4.0	7.2	1.0	8.5	ns	$C_L = 15 \text{ pF}$	A or B	Y
		—	5.5	9.2	1.0	10.5		$C_L = 50 \text{ pF}$		
		—	4.0	6.3	1.0	7.5		$C_L = 15 \text{ pF}$	\overline{G}	
		—	5.5	8.3	1.0	9.5		$C_L = 50 \text{ pF}$		

Operating Characteristics

$$C_L = 50 \text{ pF}$$

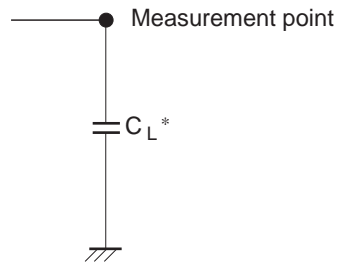
Item	Symbol	V _{CC} (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C _{PD}	3.3	—	17.3	—	pF	f = 10 MHz
		5.0	—	18.2	—		

Noise Characteristics

$$C_L = 50 \text{ pF}$$

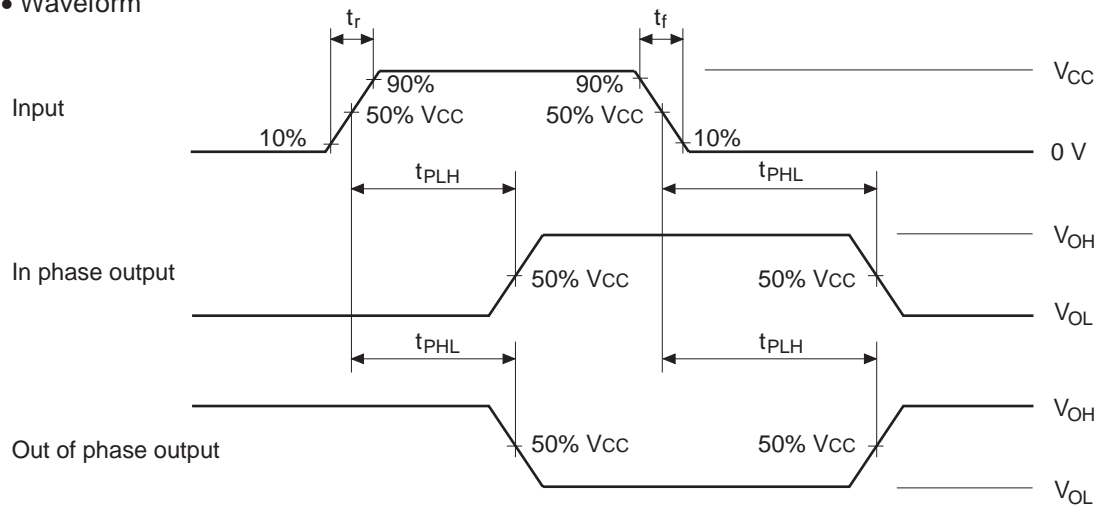
Item	Symbol	V _{CC} (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Quiet output, maximum dynamic V _{OL}	V _{OL (P)}	3.3	—	0.3	0.8	V	
Quiet output, minimum dynamic V _{OL}	V _{OL (V)}	3.3	—	-0.2	-0.8	V	
Quiet output, minimum dynamic V _{OH}	V _{OH (V)}	3.3	—	3.0	—	V	
High-level dynamic input voltage	V _{IH (D)}	3.3	2.31	—	—	V	
Low-level dynamic input voltage	V _{IL (D)}	3.3	—	—	0.99	V	

Test Circuit



Note: C_L includes the probe and fig capacitance.

• Waveform

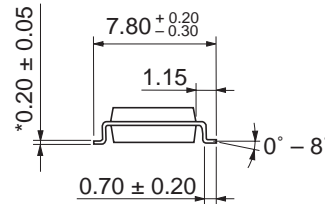
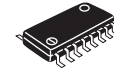
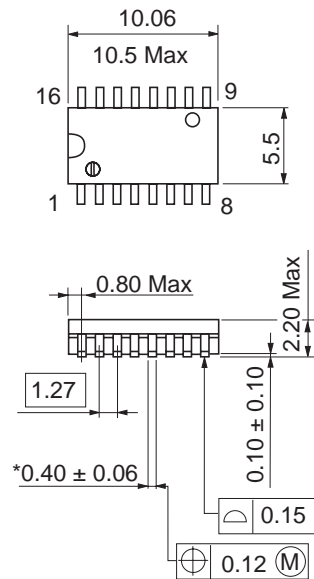


Notes: 1. Input waveform: $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 3 \text{ ns}$, $t_f \leq 3 \text{ ns}$
 2. The output are measured one at a time with one transition per measurement.

Package Dimensions

As of January, 2003

Unit: mm

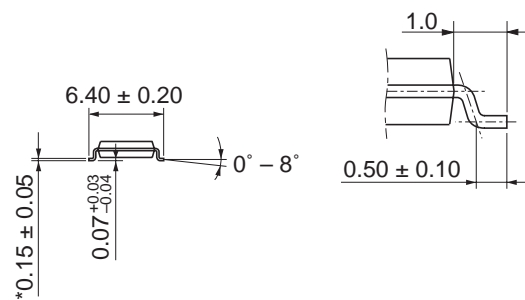
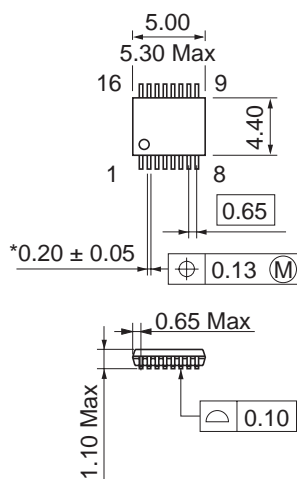


*Ni/Pd/Au plating

Package Code	FP-16DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.24 g

As of January, 2003

Unit: mm



*Ni/Pd/Au plating

Package Code	TTP-16DAV
JEDEC	—
JEITA	—
Mass (reference value)	0.05 g

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