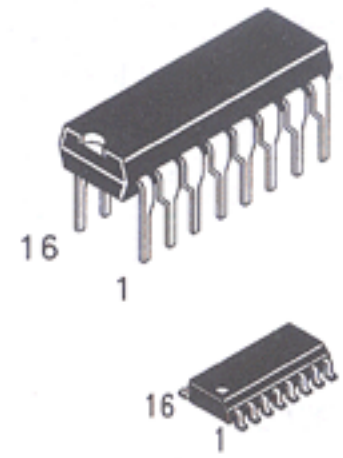
DV74AC139
DV74ACT139

Dual 1-of-4 Decoder/ Demultiplexer

This device is a high speed, dual 1-of-4 decoder/multiplexer. 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 this device can be used as a function generator providing four minterms of two variables.

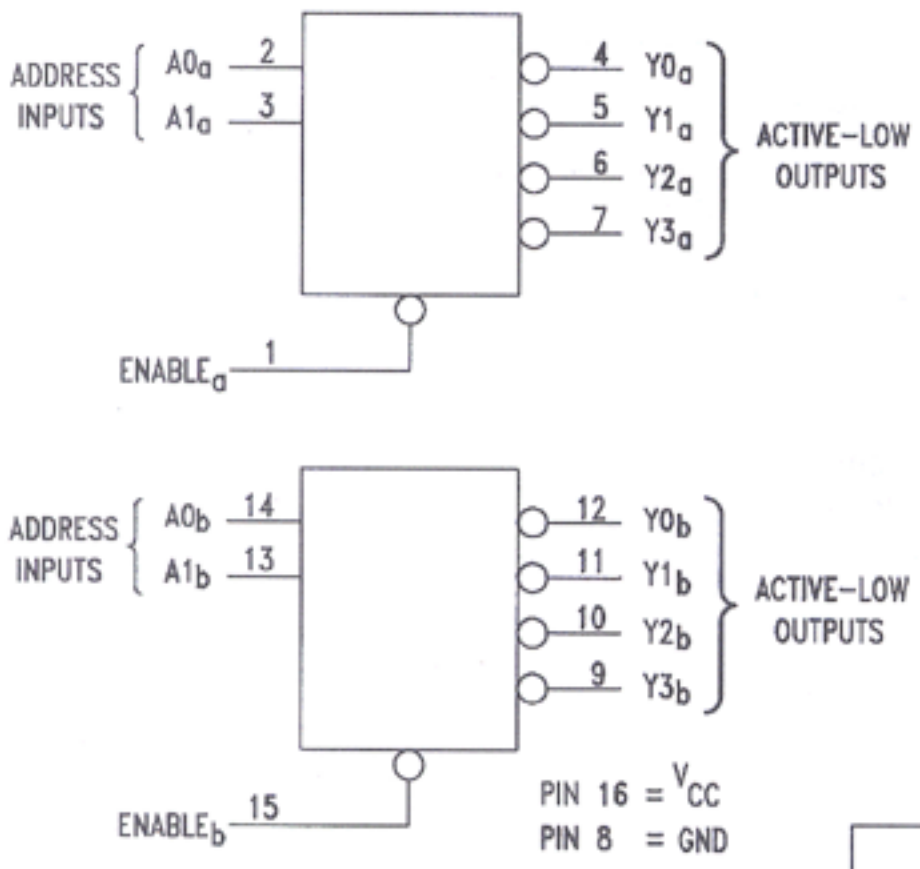
- **Advanced very high speed CMOS**
- **Outputs source/sink 24 mA**
- **Transmission line driving 50 ohms**
- **ACT has TTL compatible inputs**
- **AC Device Operation from 2 to 6 volts guaranteed**
- **DC & AC Parameters guaranteed over –40 to +85°C**



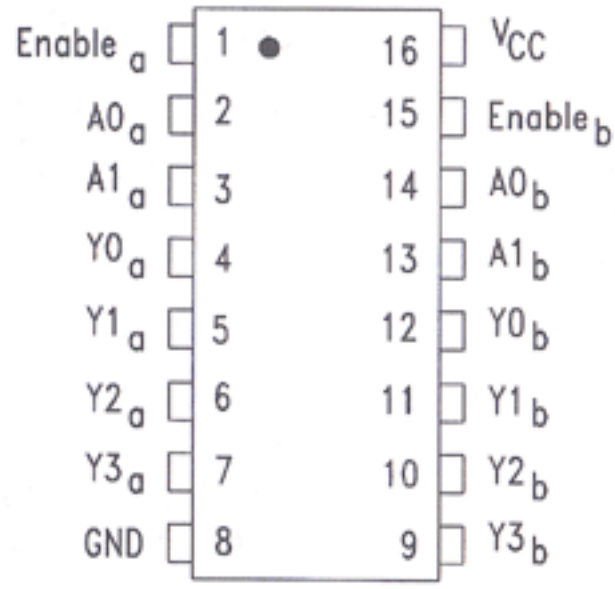
N Suffix
Plastic DIP
AVG-003 Case

D Suffix
Plastic SOP
AVG-004 Case

LOGIC DIAGRAM



PIN ASSIGNMENT



TRUTH TABLE

Inputs			Outputs			
Enable	A_0	A_1	Y_0	Y_1	Y_2	Y_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 = Either Low or High Logic Level

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ABSOLUTE MAXIMUM RATINGS

Maximum ratings are those values beyond which damage to the device may occur.

Symbol	Parameter	AC139, ACT139	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	– 0.5 to +7.0	V
V_{IN}	DC Input Voltage (Referenced to GND)	– 0.5 to V_{CC} +0.5	V
V_{OUT}	DC Output Voltage (Referenced to GND)	– 0.5 to V_{CC} +0.5	V
I_{IN}	DC Input Current, per Pin	± 20	mA
I_{OUT}	DC Output Sink/Source Current, per Pin	± 50	mA
I_{CC}	DC V_{CC} or GND Current per Output Pin	± 50	mA
Tstg	Storage Temperature	– 65 to +150	°C

GUARANTEED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V_{IN}, V_{OUT}	DC Input Voltage, Output Voltage, (Ref. to GND)		0		V_{CC}	V
t_r, t_f	Input Rise and Fall Time (Note 1) **AC** Devices	V_{CC} @ 3.0 V			150	ns/V
		V_{CC} @ 4.5 V			40	ns/V
		V_{CC} @ 5.5 V			25	ns/V
t_r, t_f	Input Rise and Fall Time (Note 2) **ACT** Devices	V_{CC} @ 4.5 V			10	ns/V
		V_{CC} @ 5.5 V			8.0	ns/V
T_A	Operating Ambient Temperature Range		–40	25	85	°C
C_{IN}	Input Capacitance V_{CC} = 5.0 V	V_{CC} = 5.0 V		4.5		pF
C_{PD}	Power Dissipation Capacitance	V_{CC} = 5.0 V		40		pF

1. V_{IN} from 30% to 70% V_{CC}
2. V_{IN} from 0.8 to 2.0 V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V_{CC} (V)	AC139			Unit
				T_A = +25°C	T_A = –40 to +85°C		
				Typ	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage	V_{OUT} = 0.1V or V_{CC} – 0.1 V	3.0	1.5	2.1	2.1	V
			4.5	2.25	3.15	3.15	
			5.5	2.75	3.85	3.85	
V_{IL}	Maximum Low Level Input Voltage	V_{OUT} = 0.1V or V_{CC} – 0.1 V	3.0	1.5	0.9	0.9	V
			4.5	2.25	1.35	1.35	
			5.5	2.75	1.65	1.65	
V_{OH}	Minimum High Level Output Voltage	I_{OUT}= –50 µA	3.0	2.99	2.9	2.9	V
			4.5	4.49	4.4	4.4	
			5.5	5.49	5.4	5.4	
		V_{IN} = V_{IL} or V_{IH}					
		I_{OH} –12mA	3.0		2.56	2.46	V
		I_{OH} –24mA	4.5		3.86	3.76	
		I_{OH} –24mA	5.5		4.86	4.76	
V_{OL}	Maximum Low Level Output Voltage	I_{OUT} = 50 µA	3.0	0.002	0.1	0.1	V
			4.5	0.001	0.1	0.1	
			5.5	0.001	0.1	0.1	
		V_{IN} = V_{IL} or V_{IH}					
		I_{OL} 12mA	3.0		0.36	0.44	V
		I_{OL} 24mA	4.5		0.36	0.44	
		I_{OL} 24mA	5.5		0.36	0.44	

DC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Conditions	V_{CC} (V)	AC139			Unit
				T_A = +25°C	T_A = –40 to +85°C		
				Typ	Guaranteed Limits		
I_{IN}	Maximum Input Leakage Current	V_{IN} = V_{CC} or GND	5.5		±0.1	±1.0	µA

AC CHARACTERISTICS over full operating conditions

Symbol	Parameter (C_L = 50 pF)	V_{CC} ±10% (V)	AC139					Unit
			T_A = +25°C			T_A = – 40°C to +85°C		
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay A_n to Y_n	3.3 5.0	4.0 3.0	8.0 6.5	11.5 8.5	3.5 2.5	13 9.5	ns
t_{PHL}		3.3 5.0	3.0 2.5	7.0 5.5	10 7.5	2.5 2.0	11 8.5	
t_{PLH}	Propagation Delay $\overline{E}_n$ to Y_n	3.3 5.0	4.5 3.5	9.5 7.0	12 8.5	3.5 3.0	13 10	ns
t_{PHL}		3.3 5.0	4.0 2.5	8.0 6.0	10 7.5	3.0 2.5	11 8.5	ns

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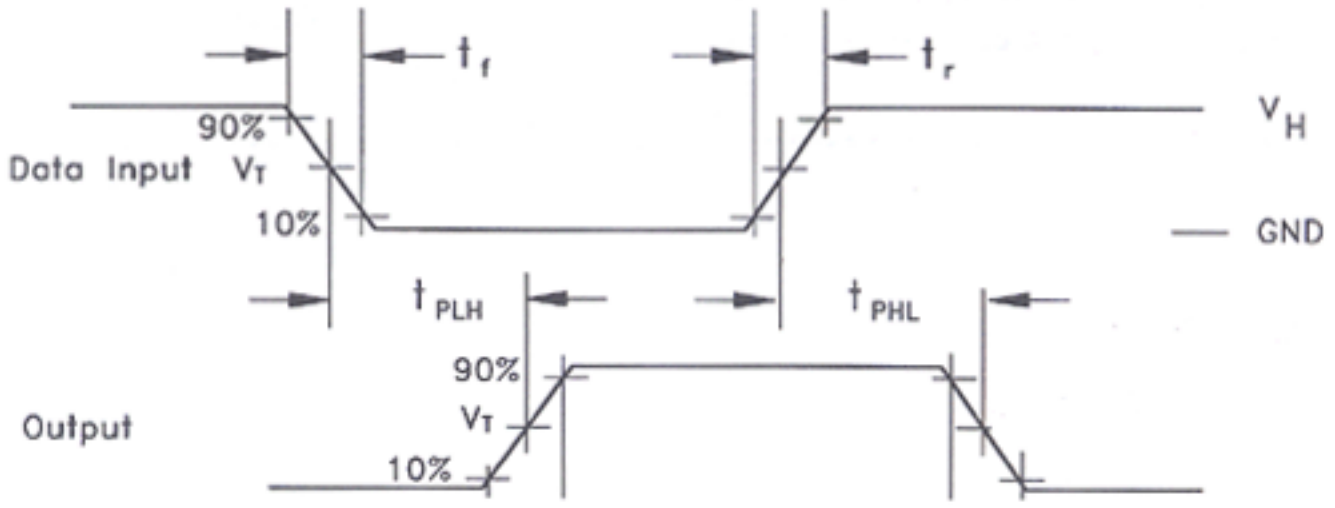
DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V_{CC} * (V)	ACT139			Unit
				T_A = +25°C		T_A = –40 to +85°C	
				Typ	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage	V_{OUT} = 0.1V or V_{CC} – 0.1 V	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V
V_{IL}	Maximum Low Level Input Voltage	V_{OUT} = 0.1V or V_{CC} – 0.1 V	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V
V_{OH}	Minimum High Level Output Voltage	I_{OUT} = –50 µA	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V
		V_{IN} = V_{IL} or V_{IH} I_{OH} –24mA –24 mA	4.5 5.5		3.86 4.86	3.76 4.76	V
V_{OL}	Maximum Low Level Output Voltage	I_{OUT} = 50 µA	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V
		V_{IN} = V_{IL} or V_{IH} I_{OL} 24mA 24 mA	4.5 5.5		0.36 0.36	0.44 0.44	V
I_{IN}	Maximum Input Leakage Current	V_{IN} = V_{CC} or GND	5.5		±0.1	±1.0	µA
ΔI_{CCT}	Additional Max I_{CC}/Input	V_{IN} = V_{CC} – 2.1 V	5.5	0.6		1.5	mA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND	5.5		8.0	80	µA

AC CHARACTERISTICS over full operating conditions

Symbol	Parameter (C_L = 50 pF)	Vcc ±10% (V)	ACT139					Unit
			T_A = +25°C			T_A = – 40°C to +85°C		
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay, A_n to $\overline{Y}_n$	5.0	1.5	6.0	8.5	1.5	9.5	ns
t_{PHL}	Propagation Delay, A_n to $\overline{Y}_n$	5.0	1.5	6.0	9.5	1.5	10.5	ns
t_{PLH}	Propagation Delay, $\overline{E}_n$ to $\overline{Y}_n$	5.0	2.5	7.0	10.0	2.0	11.0	ns
t_{PHL}	Propagation Delay, $\overline{E}_n$ to $\overline{Y}_n$	5.0	2.0	7.0	9.5	1.5	10.5	ns

SWITCHING WAVEFORMS



Input and output threshold voltage:
V_T = 50% Vcc for AC; 1.5V for ACT
V_H = V_{CC} for AC, 3V for ACT