

### 3-to-8 Line Decoder/Latch

The TC74HC131A is a high speed CMOS 3-TO-8 LINE DECODER fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

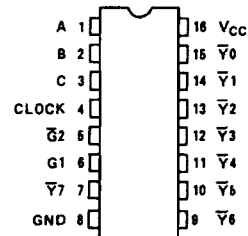
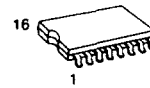
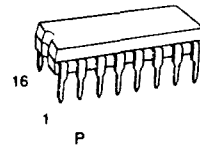
It is composed of 3-bit input register with a common CLOCK input and 3-to-8 line decoder with enable inputs G1 and G2. The 3-bit binary data is stored into input register on the positive going transition of the clock pulse. The value of the binary data determines which one of outputs will go to low.

When enable input G1 held low or G2 is held high, the decoding function is inhibited and all outputs go high. These enable inputs are provided for cascade connection and for use as an address decoder for memory systems.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

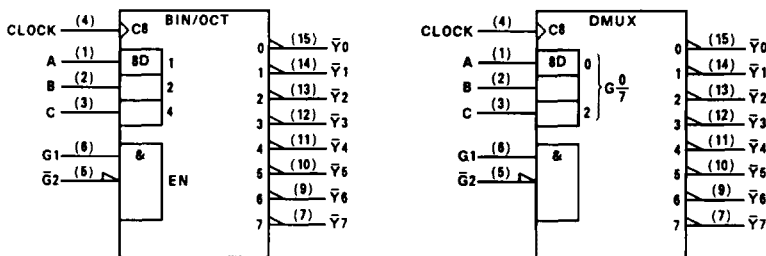
### Features

- High Speed:  $t_{pd} = 22\text{ns}(\text{Typ.})$  at  $V_{CC} = 5\text{V}$
- Low Power Dissipation:  $I_{CC} = 4\mu\text{A}(\text{Max.})$  at  $T_a = 25^\circ\text{C}$
- High Noise Immunity:  $V_{NIH} = V_{NIL} = 28\%V_{CC}(\text{Min.})$
- Output Drive Capability: 10 LSTTL Loads
- Symmetrical Output Impedance:  $|I_{OH}| = I_{OL} = 4\text{mA}(\text{Min.})$
- Balanced Propagation Delays:  $t_{PLH} = t_{PHL}$
- Wide Operating Voltage Range:  $V_{CC}(\text{opr}) = 2\text{V} \sim 6\text{V}$



(TOP VIEW)

Pin Assignment

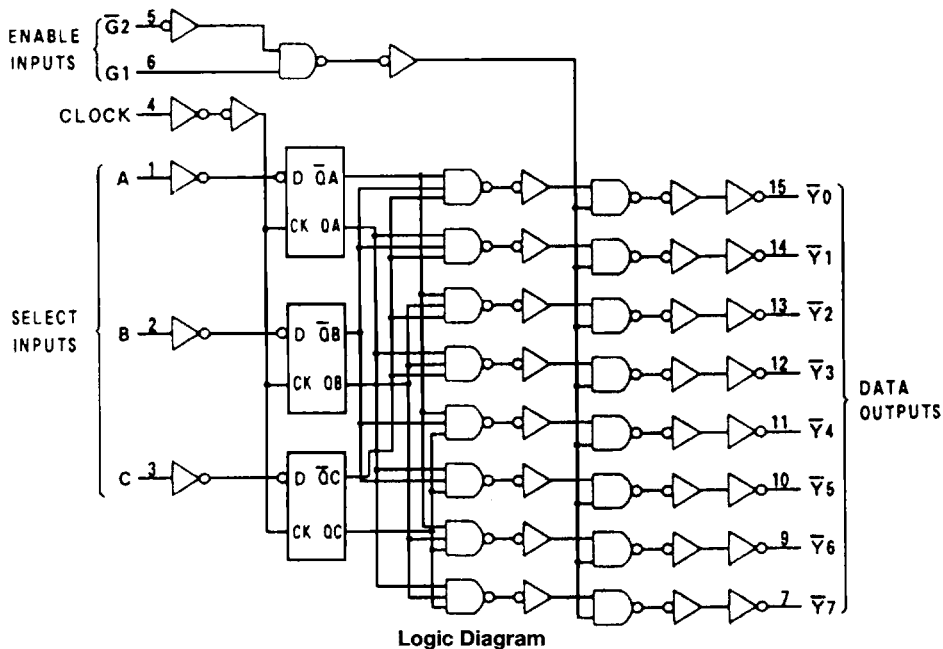


IEC Logic Symbol

Truth Table

Input														Selected Output
Enable		Clock	Select			Y <sub>0</sub>	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	Y <sub>7</sub>	
G1	G <sub>2</sub>		C	B	A									
L	X	X	X	X	X	H	H	H	H	H	H	H	H	NONE
X	H	X	X	X	X	H	H	H	H	H	H	H	H	NONE
H	L	⌋	L	L	L	L	H	H	H	H	H	H	H	Y <sub>0</sub>
H	L	⌋	L	L	H	H	L	H	H	H	H	H	H	Y <sub>1</sub>
H	L	⌋	L	H	L	H	H	L	H	H	H	H	H	Y <sub>2</sub>
H	L	⌋	L	H	H	H	H	H	L	H	H	H	H	Y <sub>3</sub>
H	L	⌋	H	L	L	H	H	H	H	L	H	H	H	Y <sub>4</sub>
H	L	⌋	H	L	H	H	H	H	H	H	L	H	H	Y <sub>5</sub>
H	L	⌋	H	H	L	H	H	H	H	H	H	L	H	Y <sub>6</sub>
H	L	⌋	H	H	H	H	H	H	H	H	H	H	L	Y <sub>7</sub>
H	L	⌋	X	X	X	NO CHANGE								

X: Don't Care



## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage Range	$V_{CC}$	-0.5 ~ 7	V
DC Input Voltage	$V_{IN}$	-0.5 ~ $V_{CC} + 0.5$	V
DC Output Voltage	$V_{OUT}$	-0.5 ~ $V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	±20	mA
Output Diode Current	$I_{OK}$	±20	mA
DC Output Current	$I_{OUT}$	±25	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	±50	mA
Power Dissipation	$P_D$	500(DiP)*180(MFP)	mW
Storage Temperature	$T_{stg}$	-65 ~ 150	°C
Lead Temperature 10sec	$T_L$	300	°C

\*500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ . From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  $-10\text{mW}/^{\circ}\text{C}$  shall be applied until 300mW.

## Recommended Operating Conditions

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	2 ~ 6	V
Input Voltage	$V_{IN}$	0 ~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0 ~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40 ~ 85	°C
Input Rise and Fall Time	$t_r, t_f$	0 ~ 1000( $V_{CC} = 2.0\text{V}$ ) 0 ~ 500( $V_{CC} = 4.5\text{V}$ ) 0 ~ 400( $V_{CC} = 6.0\text{V}$ )	ns

## DC Electrical Characteristics

Parameter	Symbol	Test Condition	$T_a = 25^{\circ}\text{C}$			$T_a = -40 \sim 85^{\circ}\text{C}$		Unit		
			$V_{CC}$	Min	Typ.	Max.	Min.		Max.	
High-Level Input Voltage	$V_{IH}$	-	2.0	1.5	-	-	1.5	-	V	
			4.5	3.15	-	-	3.15	-		
			6.0	4.2	-	-	4.2	-		
Low-Level Input Voltage	$V_{IL}$	-	2.0	-	-	0.5	-	0.5	V	
			4.5	-	-	1.35	-	1.35		
			6.0	-	-	1.8	-	1.8		
High-Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -20\mu\text{A}$	2.0	1.9	2.0	-	1.9	-	V
				4.5	4.4	4.5	-	4.4	-	
			$I_{OH} = -4 \text{ mA}$	4.5	4.18	4.31	-	4.13	-	
				6.0	5.68	5.80	-	5.63	-	
			$I_{OH} = -5.2 \text{ mA}$	4.5	-	-	-	-	-	
				6.0	-	-	-	-	-	
Low-Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 20\mu\text{A}$	2.0	-	0.0	0.1	-	0.1	V
				4.5	-	0.0	0.1	-	0.1	
			$I_{OL} = 4 \text{ mA}$	4.5	-	0.17	0.26	-	0.33	
				6.0	-	0.18	0.26	-	0.33	
			$I_{OL} = 5.2 \text{ mA}$	4.5	-	-	-	-	-	
				6.0	-	-	-	-	-	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC} \text{ or } \text{GND}$	6.0	-	-	±0.1	-	±1.0	μA	
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC} \text{ or } \text{GND}$	6.0	-	-	4.0	-	40.0		

Timing Requirements (Input  $t_r = t_f = 6\text{ns}$ )

Parameter	Symbol	Test Condition	Ta = 25°C			Ta = -40 ~ 85°C		Unit
			V <sub>CC</sub>	Typ.	Limit	Limit		
Minimum Pulse Width (CLOCK)	$t_{W(L)}$ $t_{W(H)}$	-	2.0	-	75	95		ns
			4.5	-	15	19		
			6.0	-	13	16		
Minimum Setup Time (A, B, C)	$t_s$	-	2.0	-	50	65		
			4.5	-	10	13		
			6.0	-	9	11		
Minimum Hold Time (A, B, C)	$t_h$	-	2.0	-	0	0		
			4.5	-	0	0		
			6.0	-	0	0		

AC Electrical Characteristics (C<sub>L</sub> = 15pF, V<sub>CC</sub> = 5V, Ta = 25°C)

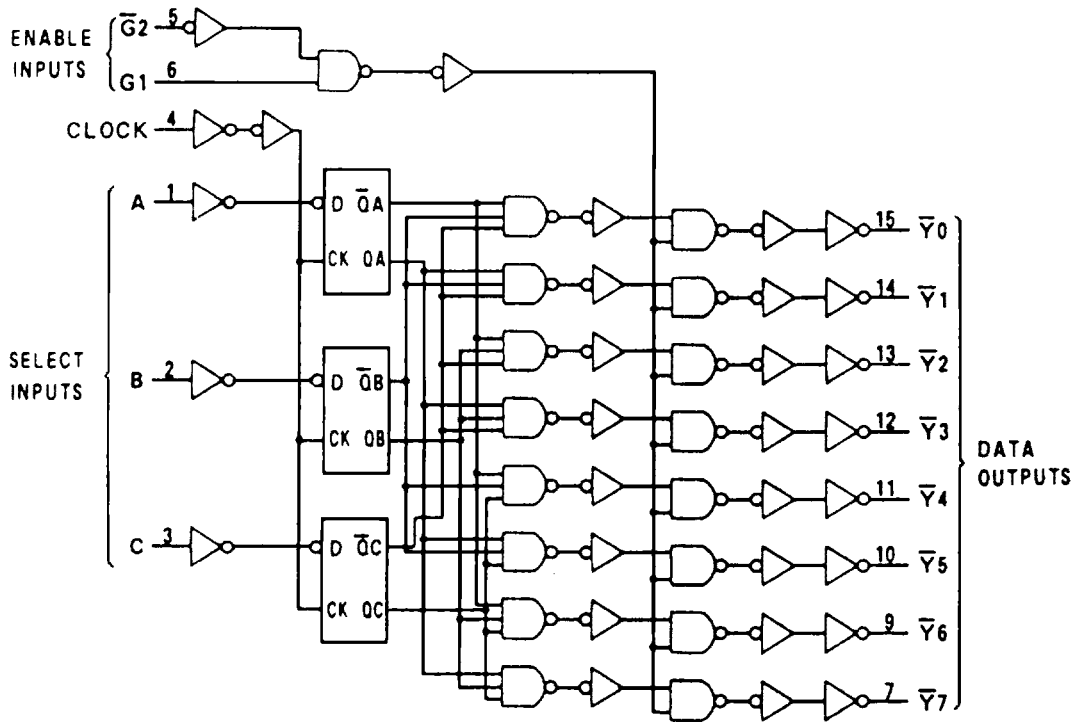
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Transition Time	$t_{TLH}$ $t_{THL}$	-	-	4	8	ns
			-	22	35	
Propagation Delay Time (CLOCK - Y)	$t_{PLH}$ $t_{PHL}$	-	-	12	24	

AC Electrical Characteristics (C<sub>L</sub> = 50pF, Input  $t_r = t_f = 6\text{ns}$ )

Parameter	Symbol	Test Condition	Ta = 25°C			Ta = -40 ~ 85°C		Unit	
			V <sub>CC</sub>	Min	Typ.	Max.	Min.		Max.
Output Transition Time	$t_{TLH}$ $t_{THL}$	-	2.0	-	30	75	-	95	ns
			4.5	-	8	15	-	19	
			6.0	-	7	13	-	16	
Propagation Delay Time (CLOCK - Q, $\bar{Q}$ )	$t_{PLH}$ $t_{PHL}$	-	2.0	-	78	200	-	240	
			4.5	-	26	40	-	48	
			6.0	-	22	34	-	41	
Propagation Delay Time (CLOCK - Q, $\bar{Q}$ )	$t_{PLH}$ $t_{PHL}$	-	2.0	-	60	140	-	175	
			4.5	-	15	28	-	35	
			6.0	-	13	24	-	30	
Input Capacitance	C <sub>IN</sub>	-	-	5	10	-	10	pF	
Power Dissipation Capacitance	C <sub>PD(1)</sub>	-	-	37	-	-	-		

Note (1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:

$$I_{CC(OPN)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$



Logic Diagram (1/2 package)

Notes