

CMOS DIGITAL INTEGRATED CIRCUIT

## TC74HC131P/F

## TC74HC131P/F 3-TO-8 LINE DECODER/LATCH

The TC74HC131 is a high speed CMOS 3-TO-8 LINE DECODER with input register 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 a 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, determine which one of outputs will go low.

Enable input G1 is held "L" level or G2 is held "H" level, decoding function is inhibited and all the 8 outputs go high.

2 enable inputs are provided to ease cascade connection and application of address decoder for memory system.

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

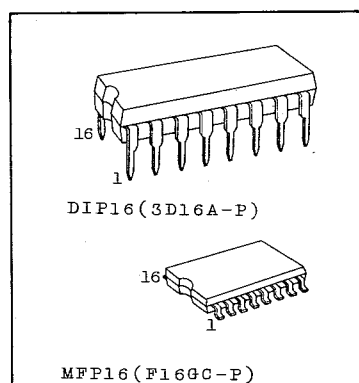
## FEATURES:

- High Speed .....  $t_{pd}=24ns$ (Typ.) at  $V_{CC}=5V$
- Low Power Dissipation .....  $I_{CC}=4\mu A$ (Max.) at  $T_a=25^\circ C$
- High Noise Immunity .....  $V_{NIH}=V_{NIL}=28\% V_{CC}$ (Min.)
- Output Drive Capability ..... 10 LSTTL Loads
- Symmetrical Output Impedance .....  $|I_{OH}|=I_{OL}=4mA$ (Min.)
- Balanced Propagation Delays .....  $t_{PLH}=t_{PHL}$
- Wide Operating Voltage Range .....  $V_{CC}$ (Opr.)= $2V \sim 6V$
- Pin and Function Compatible with 74LS131

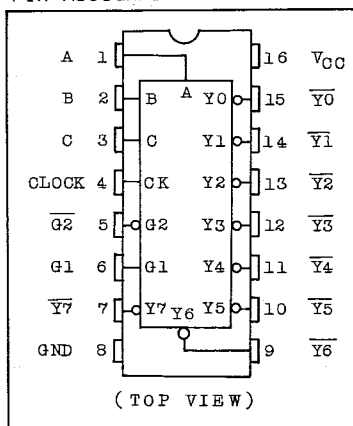
## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	$-0.5 \sim 7$	V
DC Input Voltage	$V_{IN}$	$-0.5 \sim V_{CC}+0.5$	V
DC Output Voltage	$V_{OUT}$	$-0.5 \sim V_{CC}+0.5$	V
Input Diode Current	$I_{IK}$	$\pm 20$	mA
Output Diode Current	$I_{OK}$	$\pm 20$	mA
DC Output Current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	$\pm 50$	mA
Power Dissipation	$P_D$	500(DIP)*/ 180(MFP)	mW
Storage Temperature	$T_{stg}$	$-65 \sim 150$	$^\circ C$
Lead Temperature 10sec	$T_L$	300	$^\circ C$

\* 500mW in the range of  $T_a=-40^\circ C \sim 65^\circ C$  and from  $T_a=65^\circ C$  up to  $85^\circ C$  derating factor of  $-10mW/^\circ C$  shall be applied until 300mW.



## PIN ASSIGNMENT



# TC74HC131P/F

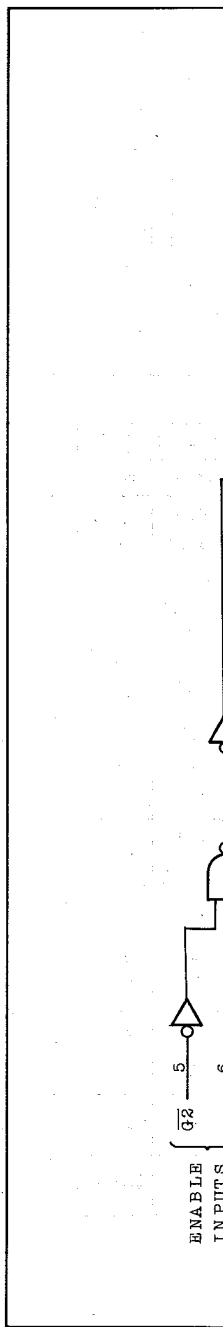
## TRUTH TABLE

ENABLE		CLOCK	SELECT			OUTPUTS							
G1	G2		C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
L	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
H	L		L	L	L	L	H	H	H	H	H	H	H
H	L		L	L	H	H	L	H	H	H	H	H	H
H	L		L	H	L	H	H	L	H	H	H	H	H
H	L		L	H	H	H	H	H	L	H	H	H	H
H	L		H	L	L	H	H	H	H	L	H	H	H
H	L		H	L	H	H	H	H	H	H	L	H	H
H	L		H	H	L	H	H	H	H	H	H	L	H
H	L		H	H	H	H	H	H	H	H	H	H	L

Outputs corresponding to stored address ..... L  
All others ..... H

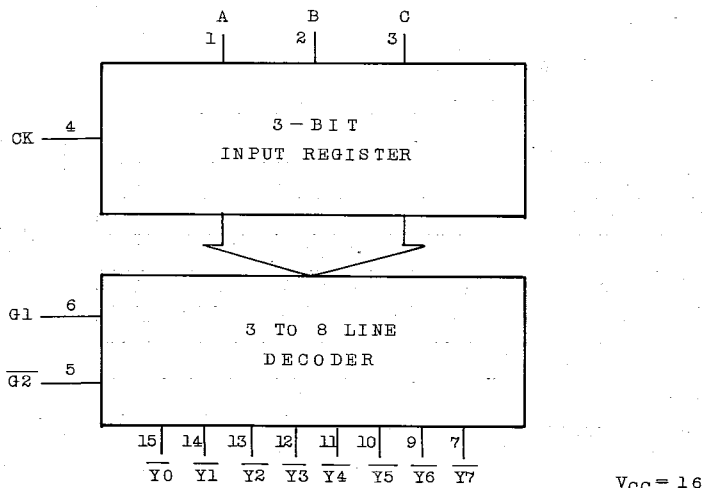
X: Don't care

## LOGIC DIAGRAM



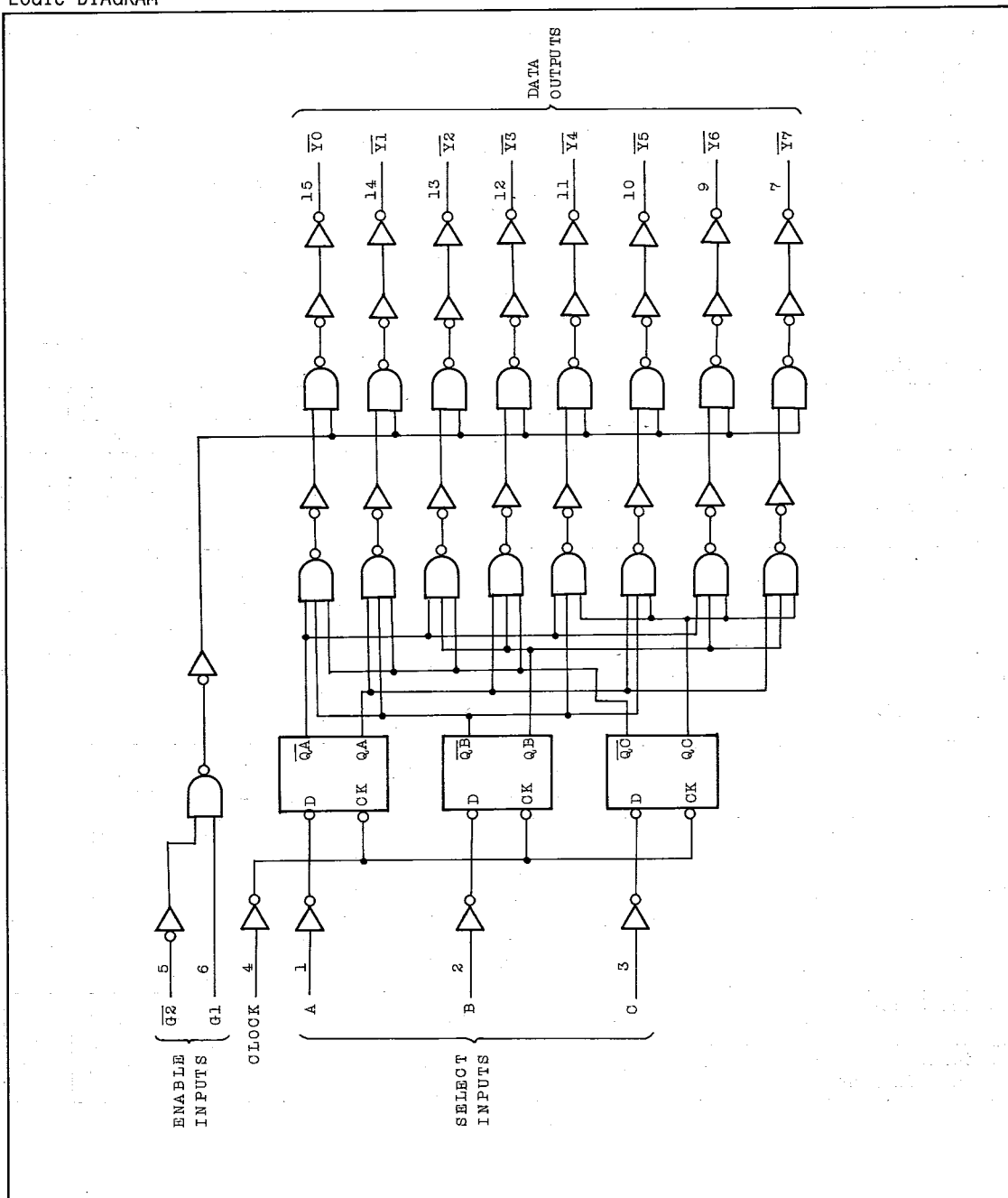
ENABLE  
INPUTS

## BLOCK DIAGRAM



## TC74HC131P/F

## LOGIC DIAGRAM

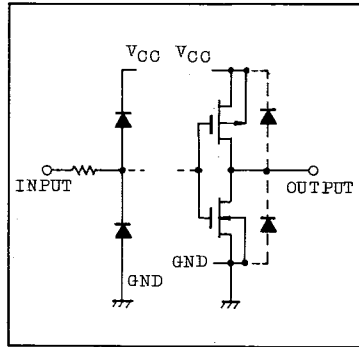


# TC74HC131P/F

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	LIMIT	UNIT
Supply Voltage	V <sub>CC</sub>	2 ~ 6	V
Input Voltage	V <sub>IN</sub>	0 ~ V <sub>CC</sub>	V
Output Voltage	V <sub>OUT</sub>	0 ~ V <sub>CC</sub>	V
Operating Temperature	T <sub>opr</sub>	-40 ~ 85	°C
Input Rise and Fall Time	t <sub>r</sub> , t <sub>f</sub>	0 ~ 1000 (V <sub>CC</sub> =2.0V) 0 ~ 500 (V <sub>CC</sub> =4.5V) 0 ~ 400 (V <sub>CC</sub> =6.0V)	ns

## INPUT and OUTPUT EQUIVALENT CIRCUIT



## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub>	T <sub>a</sub> =25°C			T <sub>a</sub> =-40~85°C		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Input Voltage	V <sub>IH</sub>		2.0	1.5	-	-	1.5	-	V	
			4.5	3.15	-	-	3.15	-		
			6.0	4.2	-	-	4.2	-		
Low-Level Input Voltage	V <sub>IL</sub>		2.0	-	-	0.5	-	0.5	V	
			4.5	-	-	1.35	-	1.35		
			6.0	-	-	1.8	-	1.8		
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> =-20μA	2.0	1.9	2.0	-	1.9	-	V
				4.5	4.4	4.5	-	4.4	-	
				6.0	5.9	6.0	-	5.9	-	
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> =20μA	2.0	-	0.0	0.1	-	0.1	V
				4.5	-	0.0	0.1	-	0.1	
				6.0	-	0.0	0.1	-	0.1	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> =-4mA	4.5	4.18	4.31	-	4.13	-	V
				6.0	5.68	5.80	-	5.63	-	
				Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> =4mA	4.5	-	
6.0	-	0.18	0.26					-	0.33	
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> =5.2mA					4.5	-	0.17
				6.0	-	0.18	0.26	-	0.33	
				Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> =V <sub>CC</sub> or GND	6.0	-	-	±0.1
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> =V <sub>CC</sub> or GND	6.0				-	-	4.0	-

## AC ELECTRICAL CHARACTERISTICS

PARAMETER
Output Transition Time (CLOCK)
Propagation Delay Time (G1, G2)
Minimum Propagation Delay Time (CLOCK)
Minimum Setup Time (A, B, C)
Minimum Hold Time (A, B, C)
Input Capacitance
Power Dissipation Capacitance

Note 1: C, c, C, A

## TC74HC131P/F

AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub>=50pF, Input t<sub>r</sub>=t<sub>f</sub>=6ns)

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 <sub>TLH</sub>		2.0	-	30	75	-	95	ns
	t <sub>THL</sub>		4.5	-	8	15	-	19	
			6.0	-	7	13	-	16	
Propagation Delay Time (CLOCK - $\bar{Y}_n$ )	t <sub>pLH</sub>		2.0	-	112	210	-	265	
	t <sub>pHL</sub>		4.5	-	27	42	-	53	
			6.0	-	23	36	-	45	
Propagation Delay Time (G1, $\bar{G}2$ - $\bar{Y}_n$ )	t <sub>pLH</sub>		2.0	-	72	140	-	175	
	t <sub>pHL</sub>		4.5	-	18	28	-	35	
			6.0	-	16	24	-	30	
Minimum Pulse Width (CLOCK)	t <sub>w(L)</sub>		2.0	-	30	75	-	95	
	t <sub>w(H)</sub>		4.5	-	8	15	-	19	
			6.0	-	7	13	-	16	
Minimum Set-up Time (A, B, C)	t <sub>s</sub>		2.0	-	12	50	-	65	
			4.5	-	3	10	-	13	
			6.0	-	2	9	-	11	
Minimum Hold Time (A, B, C)	t <sub>h</sub>		2.0	-	-	5	-	5	
			4.5	-	-	5	-	5	
			6.0	-	-	5	-	5	
Input Capacitance	C <sub>IN</sub>		-	5	10	-	10	pF	
Power Dissipation Capacitance	C <sub>PD</sub> <sup>(1)</sup>		-	89	-	-	-		

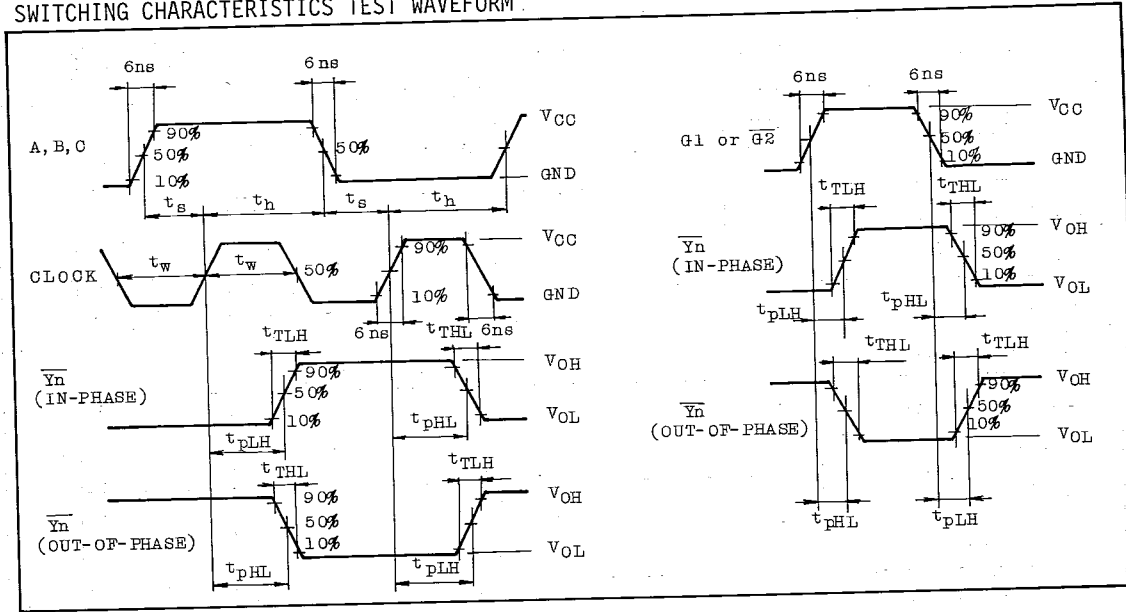
Note 1 C<sub>PD</sub> is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).

Average operating current can be obtained by the equation hereunder.

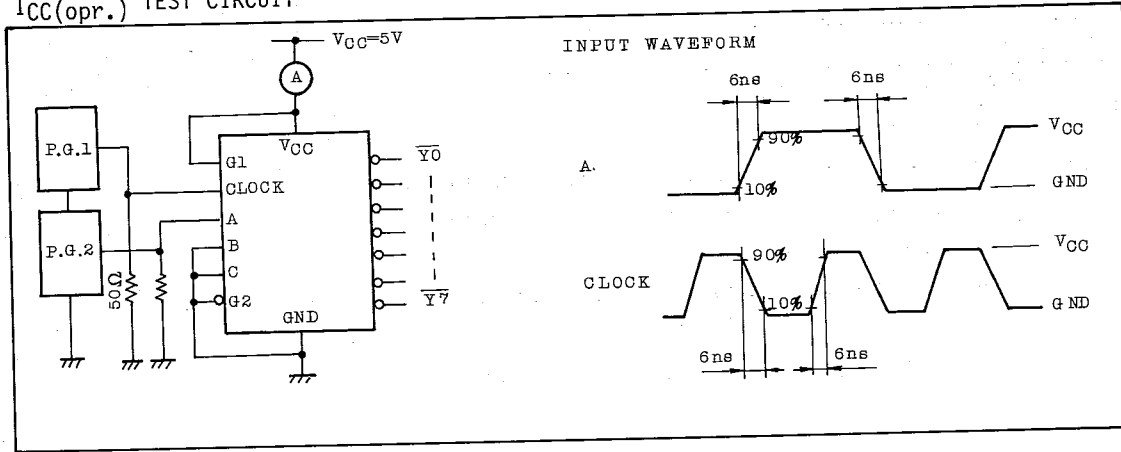
$$I_{CC(Opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

# TC74HC131P/F

## SWITCHING CHARACTERISTICS TEST WAVEFORM



## ICC(opr.) TEST CIRCUIT



TC74HC131

The TC74HC131 is a silicon gate CMOS low power Pin compatible hysteretic changing All input excess vo

### FEATURES:

- High Sp
- Low Pow
- High No
- Output
- Symmert
- Balance
- Wide Op
- Pin and

### LOGIC DIAGRAM

