

Dual 2 Wide-2 Input and/or Invert Gate

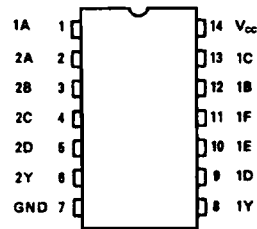
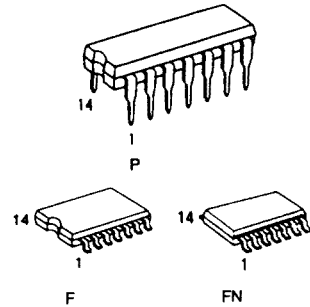
The TC74HC51A is a high speed CMOS 2-WIDE 2-INPUT/ 3-INPUT AND/OR/INVERT GATE fabricated with silicon gate C²MOS technology.

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

It contains a 2-WIDE 2-INPUT AND/OR/INVERT GATE and a 2-WIDE 3-INPUT AND/OR/INVERT GATE.

The internal circuit is composed of 3 stages (2-INPUT) or 5 stages (3-INPUT) including buffer output, which provide high noise immunity and stable output.

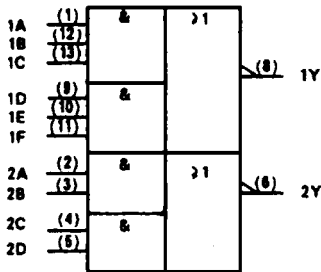
All inputs are equipped with protection circuits against static discharge or transient excess voltage.



(TOP VIEW)
Pin Assignment

Features

- High Speed: $t_{pd} = 10\text{ns}$ (Typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation: $I_{CC} = 1\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- High Noise Immunity: $V_{NIH} = V_{NIL} = 28\%V_{CC}$ (Min.)
- Output Drive Capability: 10 LSTTL Loads
- Symmetrical Output Impedance: $I_{OH} = I_{OL} = 4\text{mA}$ (Min.)
- Balanced Propagation Delays: $t_{pLH} = t_{pHL}$
- Wide Operating Voltage Range: $V_{CC(opr)} = 2\text{V} \sim 6\text{V}$
- Pin and Function Compatible with 74LS51



IEC Logic Symbol

Truth Table

Inputs						Output
1A	1B	1C	1D	1E	1F	1Y
H	H	H	X	X	X	L
X	X	X	H	H	H	L
All other combinations						H

Inputs				Output
2A	2B	2C	2D	1Y
H	H	X	X	L
X	X	H	H	L
All other combinations				H

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°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}	$V_{IN} = V_{IH}$ 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	-	
			$I_{OH} = -4\text{mA}$ $I_{OH} = -5.2\text{mA}$	4.5	4.18	4.31	-	4.13	-	
				6.0	5.68	5.80	-	5.63	-	
Low-Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ 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	
			$I_{OL} = 4\text{mA}$ $I_{OL} = 5.2\text{mA}$	4.5	-	0.17	0.26	-	0.33	
				6.0	-	0.18	0.26	-	0.33	
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC}$ or GND	6.0	-	-	±0.1	-	±1.0	μA	
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND	6.0	-	-	1.0	-	10.0		

AC Electrical Characteristics (C_L = 15pF, V_{CC} = 5V, Ta = 25°C, Input t_r = t_f = 6ns)

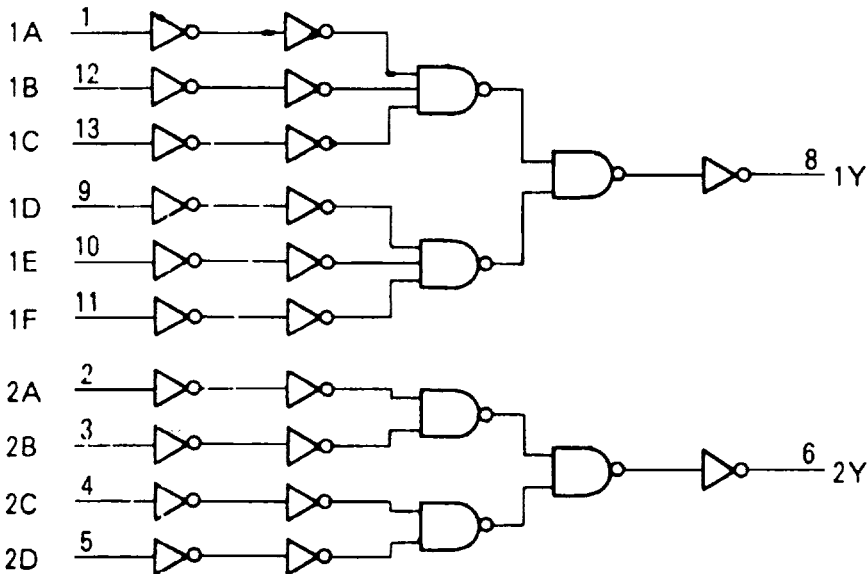
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Transition Time	t _{TLH} t _{THL}	-	-	4	8	ns
Propagation Delay Time	t _{pLH} t _{pHL}	-	-	10	17	

AC Electrical Characteristics (C_L = 50pF, Input t_r = t_f = 6ns)

Parameter	Symbol	Test Condition	Ta = 25°C			Ta = -40 ~ 85°C		Unit	
			V _{CC}	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	t _{pLH} t _{pHL}	-	2.0	-	39	100	-	125	ns
			4.5	-	13	20	-	25	
			6.0	-	11	17	-	21	
Input Capacitance	C _{IN}	-	-	5	10	-	10	pF	
Power Dissipation Capacitance	C _{PD(1)}	-	-	35	-	-	-		

Note (1) C_{PD} 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:

$$I_{CC(OP)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2(\text{per Gate})$$



Logic Diagram

Notes