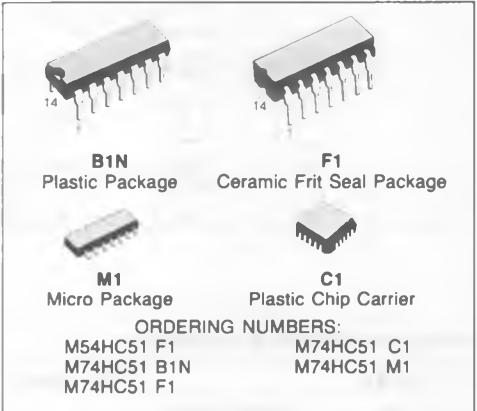
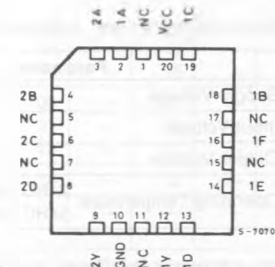
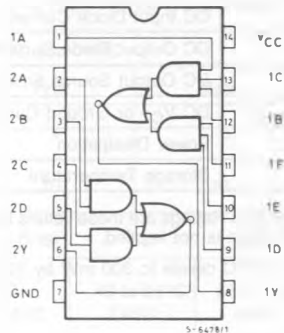


DUAL 2 WIDE-2 INPUT AND/OR INVERT GATE

- **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) = 2V to 6V
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS51



PIN CONNECTIONS (top view)

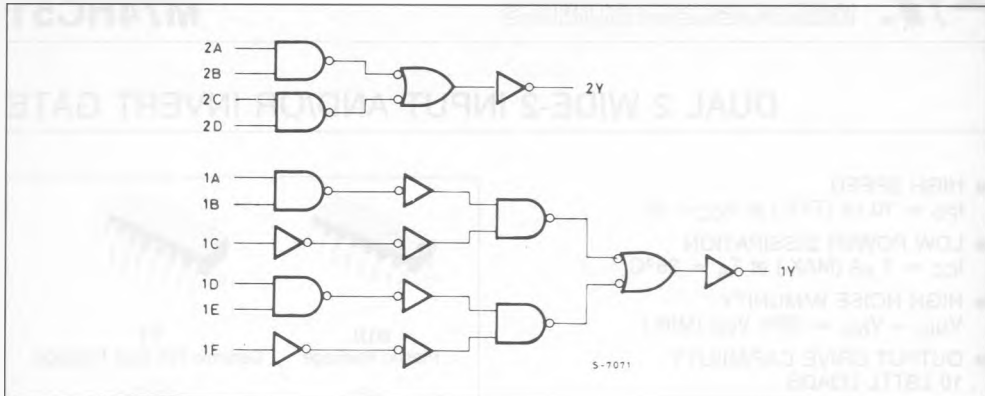


NC =
No Internal
Connection

DESCRIPTION

The M54/74HC51 is a high speed CMOS DUAL 2 WIDE-2 INPUT AND/OR INVERT GATE fabricated in silicon gate CMOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption. 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 buffered output, which gives high noise immunity and a stable output. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to 7	V
V_I	DC Input Voltage	-0.5 to $V_{CC} + 0.5$	V
V_O	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	-65 to 150	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

(*) 500 mW: $\cong 65^{\circ}C$ derate to 300 mW by 10 mW/ $^{\circ}C$: $65^{\circ}C$ to $85^{\circ}C$

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit	
V_{CC}	Supply Voltage	2 to 6	V	
V_I	Input Voltage	0 to V_{CC}	V	
V_O	Output Voltage	0 to V_{CC}	V	
T_A	Operating Temperature	74HC Series 54HC Series	$^{\circ}C$	
t_r, t_f	Input Rise and Fall Time	V_{CC} { 2 V 4.5V 6 V	0 to 1000 0 to 500 0 to 400	ns

DC SPECIFICATIONS

Symbol	Parameter	V _{CC}	Test Condition		T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.			
V _{IH}	High Level Input Voltage	2.0			1.5	—	—	1.5	—	1.5	—	V		
		4.5			3.15	—	—	3.15	—	3.15	—			
		6.0			4.2	—	—	4.2	—	4.2	—			
V _{IL}	Low Level Input Voltage	2.0			—	—	0.5	—	0.5	—	0.5	V		
		4.5			—	—	1.35	—	1.35	—	1.35			
		6.0			—	—	1.8	—	1.8	—	1.8			
V _{OH}	High Level Output Voltage	2.0		V _I	I _O	1.9	2.0	—	1.9	—	1.9	—	V	
		4.5				- 20 μA	4.4	4.5	—	4.4	—	4.4		—
		6.0					5.9	6.0	—	5.9	—	5.9		—
		4.5				- 4.0 mA - 5.2 mA	4.18	4.31	—	4.13	—	4.10		—
6.0	5.68	5.8	—	5.63	—		5.60	—						
V _{OL}	Low Level Output Voltage	2.0		V _{IH} or V _{IL}	20 μA	—	0	0.1	—	0.1	—	0.1	V	
		4.5				—	0	0.1	—	0.1	—	0.1		
		6.0				—	0	0.1	—	0.1	—	0.1		
		4.5				4.0 mA 5.2 mA	—	0.17	0.26	—	0.33	—		0.40
6.0	—	0.18	0.26	—	0.33		—	0.40						
I _I	Input Leakage Current	6.0		V _I = V _{CC} or GND	—	—	± 0.1	—	± 1	—	± 1	μA		
I _{CC}	Quiescent Supply Current	6.0		V _I = V _{CC} or GND	—	—	1	—	10	—	20	μA		

AC ELECTRICAL CHARACTERISTICS (V_{CC} = 5V, T_A = 25°C, C_L = 15pF, Input t_r = t_f = 6ns)

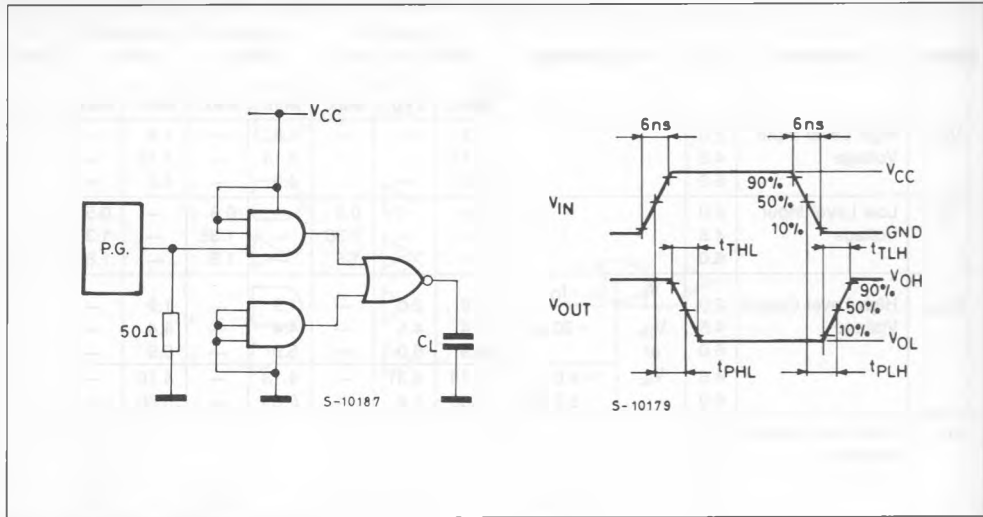
Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t _{TLH} t _{THL}	Output Transition Time		4	8	ns
t _{PLH} t _{PHL}	Propagation Delay Time		10	18	ns

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input t_r = t_f = 6ns)

Symbol	Parameter	V _{CC}	Test Condition		T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t _{TLH} t _{THL}	Output Transition Time	2.0			—	30	75	—	95	—	110	ns
		4.5			—	8	15	—	19	—	22	
		6.0			—	7	13	—	16	—	19	
t _{PLH} t _{PHL}	Propagation Delay Time	2.0			—	52	105	—	130	—	155	ns
		4.5			—	13	21	—	26	—	33	
		6.0			—	11	18	—	22	—	28	
C _{IN}	Input Capacitance				—	5	10	—	10	—	10	pF
C _{PD} (*)	Power Dissipation Capacitance				—	33	—	—	—	—	—	pF

Note (*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit)

SWITCHING CHARACTERISTICS TEST CIRCUIT



TEST CIRCUIT I_{CC} (Opr.)

