M54HC540/541
M74HC540/541

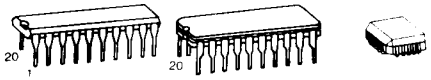
PRELIMINARY DATA

HC540 OCTAL BUS BUFFER (INVERTING) (3-STATE)

HC541 OCTAL BUS BUFFER (3-STATE)

DESCRIPTION

The M54/74HC540/541 are high speed CMOS OCTAL BUS BUFFERS (3-STATE) fabricated in silicon gate C²MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. The M54/74HC540 is an inverting buffer and the M54/74HC541 is a non-inverting buffer. The 3-STATE control gate operates as a two-input AND such that if either $\overline{G1}$ or $\overline{G2}$ are high, all eight outputs are in the high-impedance state.
In order to enhance PC board layout, the 'HC540 and 'HC541 offers a pinout having inputs and outputs on opposite sides of the package.
All inputs are equipped with protection circuits against static discharge or transient excess voltage.



B1 Plastic Package | **F1** Ceramic Package | **C1** Chip Carrier

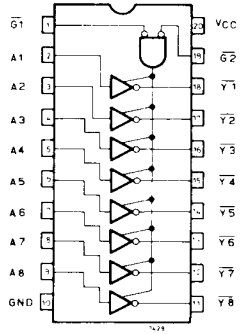
ORDERING NUMBERS: M54HCXXX F1
M74HCXXX B1
M74HCXXX F1
M74HCXXX C1

FEATURES

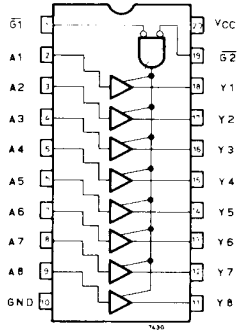
- High Speed
  t_{PD} = 13 ns (Typ.) at V_{CC} = 5V
- Low Power Dissipation
  I_{CC} = 4 μA (Max.) at T_A = 25°C
- High Noise Immunity
  $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Output Drive Capability
  15 LSTTL Loads
- Symmetrical Output Impedance
  $|I_{OH}| = I_{OL}$ = 6 mA (Min.)
- Balanced Propagation Delays
  $t_{PLH} = t_{PHL}$
- Wide Operating Voltage Range
  V_{CC} (opr) = 2V to 6V
- Pin and Function compatible with 54/74LS540/541

PIN CONNECTIONS
(top view)

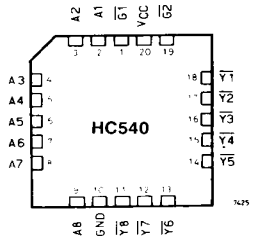
HC540

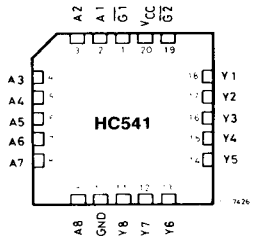


HC541



CHIP CARRIER





TRUTH TABLE HC540

OUTPUT INPUTS		
$\overline{G}$	A	$\overline{Y}$
H	*	Z
L	L	H
L	H	L

Z: High impedance
*: Don't care

TRUTH TABLE HC541

OUTPUT INPUTS		
$\overline{G}$	A	Y
H	*	Z
L	L	L
L	H	H

Z: High impedance
*: Don't care

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	± 35	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 70	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	−65 to 150	°C

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

(*) 500 mW: ≅ 65°C derate to 300 mW by 10 mW/°C: 65°C to 85°C.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Limit	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	− 40 to 85 −55 to 125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} 2 V: 0 to 1000 V_{CC} 4.5V: 0 to 500 V_{CC} 6 V: 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	V_{IH} or V_{IL}	−20 μA	4.4	4.5	—	4.4	—	4.4		
		6.0			5.9	6.0	—	5.9	—	5.9		
		4.5		−6.0 mA	4.18	4.31	—	4.13	—	4.10		
		6.0		−7.8 mA	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		6.0 mA	—	0.17	0.26	—	0.33		0.40	
		6.0		7.8 mA	—	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_{OZ}	3-State Output Off-State Current	6.0	V_I = V_{IH} or V_{IL} V_O = V_{CC} or GND		—	—	±0.5	—	±5.0		±10	μA
I_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND I_O = 0		—	—	4	—	40		80	μA

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

Symbol	Parameter	CL (pF)	54HC and 74HC			Unit
			MIN.	TYP.	MAX.	
t_{TLH} t_{THL}	Output Transition Time	50		7	11	ns
t_{PLH} t_{PHL}	Propagation Delay Time	50		12	20	ns
t_{PZL} t_{PZH}	3-State Output Enable Time	50		17	27	ns
t_{PLH} t_{PLZ}	3-State Output Disable Time	50		16	26	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		—	22	60	—	75			ns
		4.5		—	8	12	—	15			
		6.0		—	7	10	—	13			
t_{PLH} t_{PHL}	Propagation Delay Time	2.0		—	60	105	—	130			ns
		4.5		—	13	21	—	26			
		6.0		—	11	18	—	22			
t_{PZL} t_{PZH}	3-State Output Enable	2.0	R_L = 1KΩ	—	65	145	—	175			ns
		4.5		—	18	29	—	35			
		6.0		—	16	25	—	130			
t_{PLZ} t_{PHZ}	3-State Output Disable Time	2.0	R_L = 1KΩ	—	49	136	—	166			ns
		4.5		—	22	32	—	38			
		6.0		—	20	28	—	34			
C_{IN}	Input Capacitance			—	5	10	—	10			pF
C_{PD} (*)	Power Dissipation Capacitance										pF

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

Average operating current can be obtained by the following equation.
$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8$ (per Circuit).