

HC540 OCTAL BUS BUFFER INVERTING (3-STATE) HC541 OCTAL BUS BUFFER (3-STATE)

- **HIGH SPEED**
 $t_{PD} = 11 \text{ ns (TYP.) at } V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 4 \mu A \text{ (MAX.) at } T_A = 25^\circ C$
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- **OUTPUT DRIVE CAPABILITY**
 15 LSTTL LOADS
- **SYMMETRICAL OUTPUT IMPEDANCE**
 $|I_{OH}| = |I_{OL}| = 6 \text{ mA (MIN.)}$
- **BALANCED PROPAGATION DELAYS**
 $t_{PLH} = t_{PHL}$
- **WIDE OPERATING VOLTAGE RANGE**
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS540/541

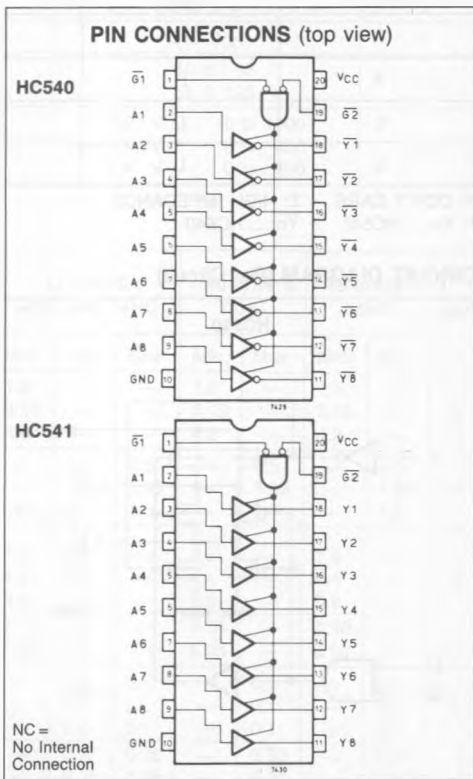
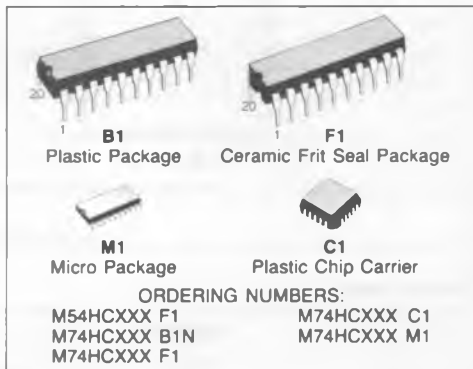
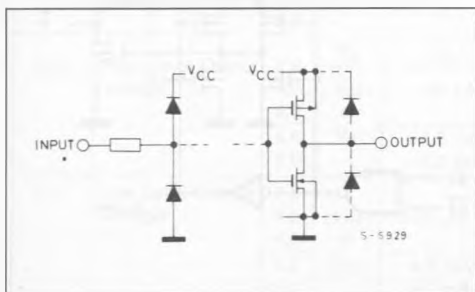
DESCRIPTION

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 G1 or 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 and transient excess voltage.

INPUT AND OUTPUT EQUIVALENT CIRCUIT



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	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	− 40 to 85 − 55 to 125	°C
t _r , t _f	Input Rise and Fall Time	V _{CC} { 2 V 0 to 1000 4.5V 0 to 500 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 4.5 6.0		1.5 3.15 4.2	— — —	— — —	1.5 3.15 4.2	— — —	1.5 3.15 4.2	— — —	V
V _{IL}	Low Level Input Voltage	2.0 4.5 6.0		— — —	— — —	0.5 1.35 1.8	— 1.35 1.8	— — —	— 1.35 1.8	0.5 — —	V
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}	− 20 μA	4.4	4.5	—	4.4	—	4.4	
		6.0	V _{IH} or V _{IL}	—	5.9	6.0	—	5.9	—	5.9	
V _{OL}	Low Level Output Voltage	4.5		− 4.0 mA	4.18	4.31	—	4.13	—	4.10	V
		6.0		− 5.2 mA	5.68	5.8	—	5.63	—	5.60	
		6.0	V _{IH} or V _{IL}	20 μA	—	0.0	0.1	—	0.1	—	
		4.5			—	0.0	0.1	—	0.1	—	V
		6.0			—	0.0	0.1	—	0.1	—	
		6.0			—	0.1	0.1	—	0.1	—	
		4.5		4.0 mA	—	0.17	0.26	—	0.33	—	V
		6.0		5.2 mA	—	0.18	0.26	—	0.33	—	
		6.0			—	0.18	0.26	—	0.33	—	

DC SPECIFICATIONS (Continued)

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.	
I _I	Input Leakage Current	6.0	V _I = V _{CC} or GND	—	—	± 0.1	—	± 1.0	—	± 1.0	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	—	—	4	—	40	—	80	μA

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 4.5 6.0		— — —	25 7 6	60 12 10	— — —	75 15 13		90 18 15	ns
t _{PLH} t _{PHL}	Propagation Delay Time	2.0 4.5 6.0	HC540	— — —	52 13 11	105 21 18	— — —	130 26 22		160 32 27	ns
t _{PLH} t _{PHL}	Propagation Delay Time	2.0 4.5 6.0	HC541		56 14 12	15 23 20	— — —	145 29 25	— — —	135 35 30	ns
t _{PLZ} t _{PHZ}	3-State Output Enable	2.0 4.5 6.0	R _L = 1KΩ	— — —	72 18 15	145 29 25	— — —	180 36 31	— — —	220 44 38	ns
t _{PLZ} t _{PHZ}	3-State Output Disable Time	2.0 4.5 6.0	R _L = 1KΩ	— — —	88 22 19	160 32 27	— — —	200 40 34	— — —	240 48 41	ns
C _{IN}	Input Capacitance			—	5	10	—	10		10	pF
C _{OUT}	Output Capacitance			—	10	—	—	—	—	—	pF
C _{PD} (1)	Power Dissipation Capacitance		HC540	—	33	—	—	—	—	—	pF
			HC541	—	36	—	—	—	—	—	

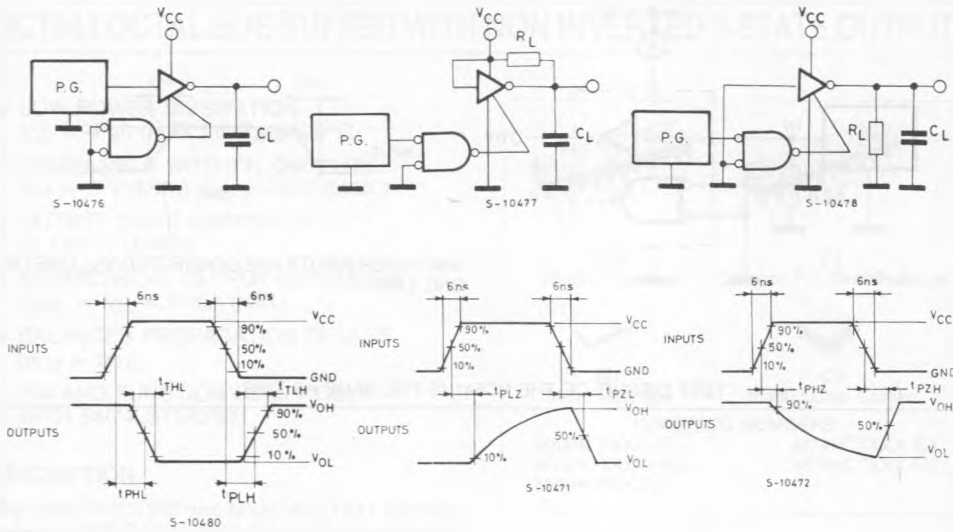
Note (1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the following equation.

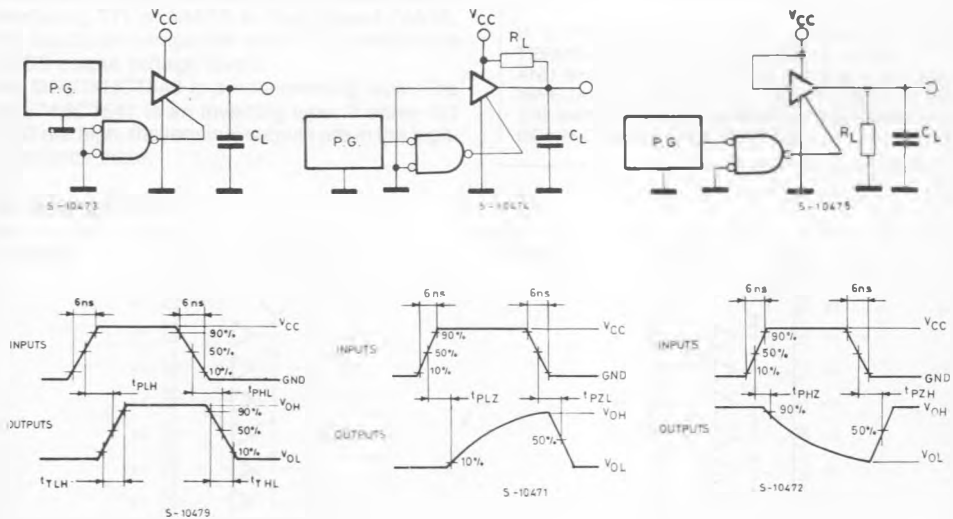
$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per Gate).}$$

SWITCHING CHARACTERISTICS TEST CIRCUIT AND WAVEFORM

HC540

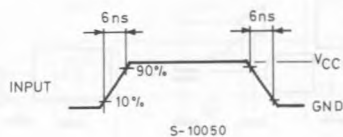
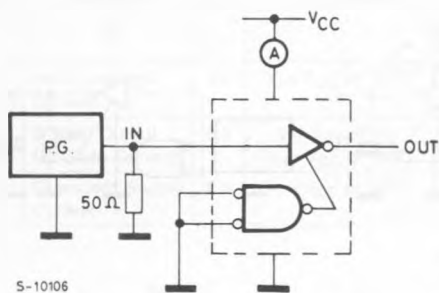


HC541



TEST CIRCUIT I_{CC} (Opr.)

HC540



THE OTHER INPUTS ARE CONNECTED V_{CC} LINE OR GND LINE.

TEST CIRCUIT OF THE HC541 IS THE SAME AS THIS