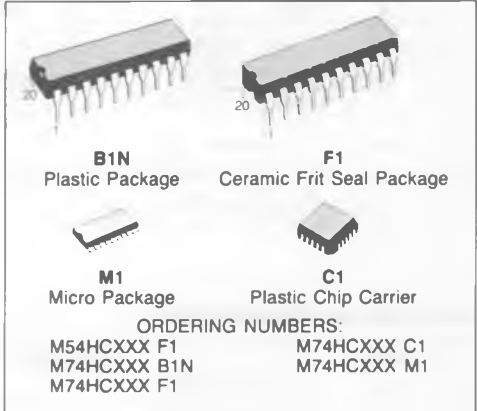


**HC240 OCTAL BUS BUFFER WITH INVERTED 3-STATE OUTPUTS**  
**HC241/244 OCTAL BUS BUFFER WITH NON INVERTED 3-STATE OUTPUTS**

PRELIMINARY DATA

- **HIGH SPEED**  
 $t_{PD} = 12 \text{ ns (TYP.) at } V_{CC} = 5\text{V}$
- **LOW POWER DISSIPATION**  
 $I_{CC} = 4 \mu\text{A (MAX.) at } T_A = 25^\circ\text{C}$
- **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**  
 $V_{CC} \text{ (OPR)} = 2\text{V to } 6\text{V}$
- **PIN AND FUNCTION COMPATIBLE**  
 WITH 54/74LS240/244


**DESCRIPTION**

The M54/74HC240, M54/74HC241 and M54HC244 are high speed CMOS OCTAL BUS BUFFER's fabricated in silicon gate C<sup>2</sup>MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. The designer has a choice of selected combinations of inverting and non-inverting outputs, symmetrical  $\bar{G}$  (active-low output control) inputs, and complementary G and  $\bar{G}$  inputs. Each control input governs four BUS BUFFERS.

These devices are designed to be used with 3-state memory address drivers, etc. All inputs are equipped with protection circuits against static discharge

and transient excess voltage.

**TRUTH TABLE**

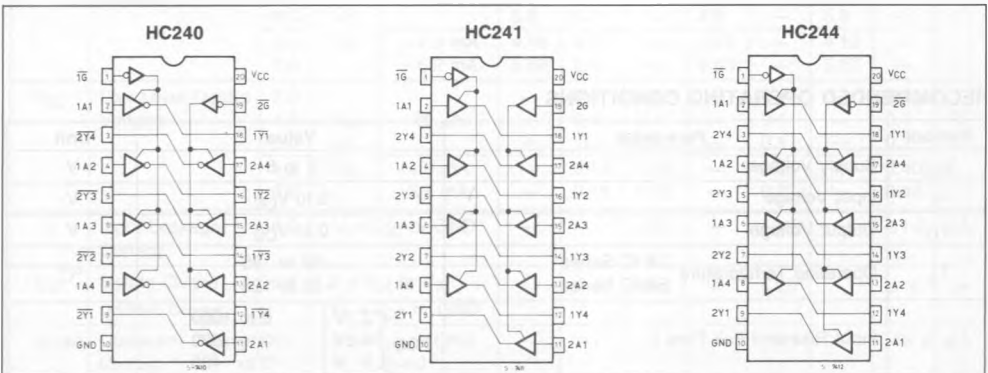
INPUTS			OUTPUTS	
$\bar{G}$	$G^{\Delta}$	$A_n$	$Y_n$	$\bar{Y}_n^{\Delta\Delta}$
L	H	L	L	H
L	H	H	H	H
H	L	X	Z	Z

X: DON'T CARE

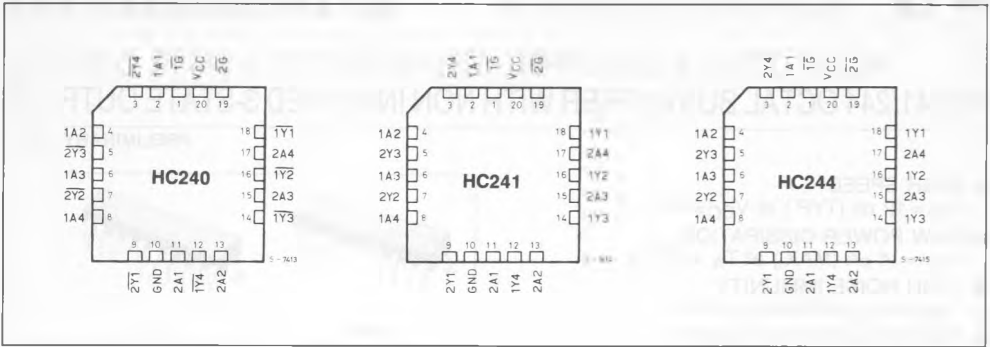
Z: HIGH IMPEDANCE

 $\Delta$  : APPLIED only for M54/74HC241

 $\Delta\Delta$  : APPLIED only for M54/74HC240

**PIN CONNECTION (top view)**


CHIP CARRIER



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	- 0.5 to 7	V
V <sub>I</sub>	DC Input Voltage	- 0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	- 0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Source Sink Current Per Output Pin	± 35	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 70	mA
P <sub>D</sub>	Power Dissipation	500 (*)	mW
T <sub>stg</sub>	Storage Temperature	- 65 to 150	°C

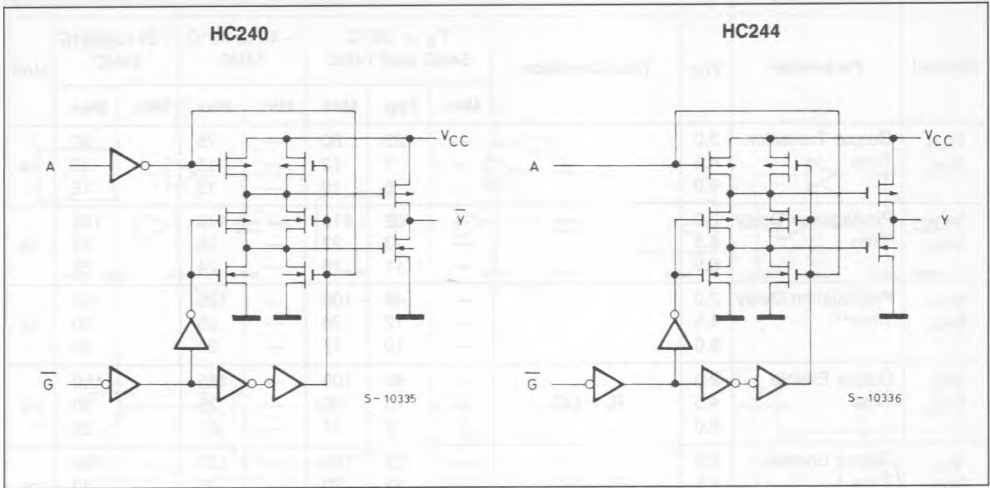
Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(\*) 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 <sub>CC</sub>	Supply Voltage	2 to 6	V
V <sub>I</sub>	Input Voltage	0 to V <sub>CC</sub>	V
V <sub>O</sub>	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature 74HC Series 54HC Series	- 40 to 85 - 55 to 125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time	V <sub>CC</sub> { 2 V: 0 to 1000 4.5V: 0 to 500 6 V: 0 to 400	ns

## CIRCUIT SCHEMATIC (1/8 PACKAGE)



## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	$V_{CC}$	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			$-40$ to $85^\circ\text{C}$ 74HC		$-55$ to $125^\circ\text{C}$ 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	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	V	
$V_{OH}$	High Level Output Voltage	2.0	$V_I$	$I_O$ $-20\ \mu\text{A}$ $-4.0\ \text{mA}$ $-5.2\ \text{mA}$	1.9	2.0	—	1.9	—	1.9	—	V
		4.5	$V_{IH}$ or $V_{IL}$		4.4	4.5	—	4.4	—	4.4	—	
		6.0			5.9	6.0	—	5.9	—	5.9	—	
$V_{OL}$	Low Level Output Voltage	2.0	$V_I$	$I_O$ $20\ \mu\text{A}$ $4.0\ \text{mA}$ $5.2\ \text{mA}$	—	0.0	0.1	—	0.1	—	0.1	V
		4.5	$V_{IH}$ or $V_{IL}$		—	0.0	0.1	—	0.1	—	0.1	
		6.0			—	0.0	0.1	—	0.1	—	0.1	
$I_I$	Input Leakage Current	4.5	$V_I = V_{CC}$ or GND	—	—	$\pm 0.1$	—	$\pm 1.0$	—	$\pm 1.0$	$\mu\text{A}$	
		6.0										
$I_{OZ}$	3-state Output Off-State Current	6.0	$V_I = V_{IH}$ or $V_{IL}$ $V_O = V_{CC}$ or GND	—	—	$\pm 0.5$	—	$\pm 5.0$	—	$\pm 10$	$\mu\text{A}$	
$I_{CC}$	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND $I_O = 0$	—	—	4	—	40	—	80	$\mu\text{A}$	

**AC ELECTRICAL CHARACTERISTICS** ( $C_L = 50\text{pF}$ , Input  $t_r = t_f = 6\text{ns}$ )

Symbol	Parameter	$V_{CC}$	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			$-40\text{ to }85^\circ\text{C}$ 74HC		$-55\text{ to }125^\circ\text{C}$ 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		— — —	52 13 11	110 22 19	— — —	140 28 24	— — —	165 33 28	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time**	2.0 4.5 6.0		— — —	48 12 10	100 20 17	— — —	125 25 21	— — —	150 30 26	ns
$t_{PZL}$ $t_{PHL}$	Output Enable Time	2.0 4.5 6.0	$R_L = 1\text{k}\Omega$	— — —	40 10 9	100 20 17	— — —	125 25 21	— — —	150 30 26	ns
$t_{PZL}$ $t_{PZH}$	Output Enable Time *	2.0 4.5 6.0	$R_L = 1\text{k}\Omega$	— — —	52 13 11	100 20 17	— — —	125 25 21	— — —	150 30 26	ns
$t_{PZL}$ $t_{PZH}$	Output Disable Time	2.0 4.5 6.0	$R_L = 1\text{k}\Omega$	— — —	44 21 18	150 30 26	— — —	190 38 33	— — —	225 45 38	ns
$C_{IN}$	Input Capacitance			—	5	10	—	10	—	10	pF
$C_{OUT}$	Output Capacitance			—	10	—	—	—	—	—	pF
$C_{PD}$ (1)	Power Dissipation Capacitance			—	40	—	—	—	—	—	pF

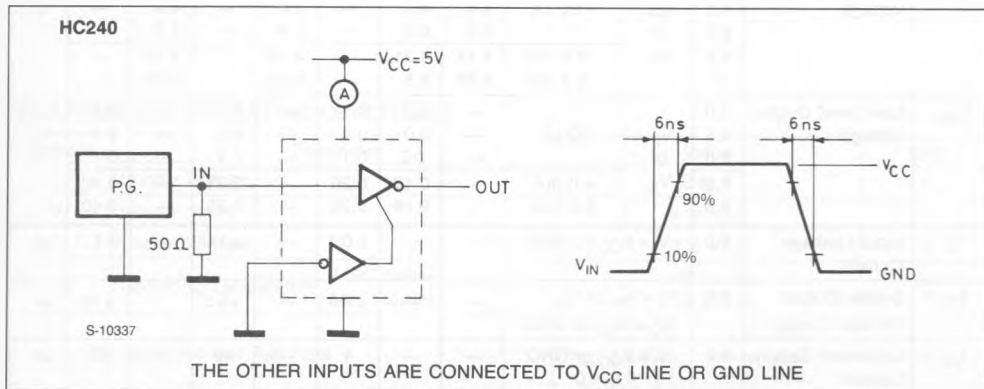
Note (1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit)

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 Gate)

\* for M54/74HC241 only

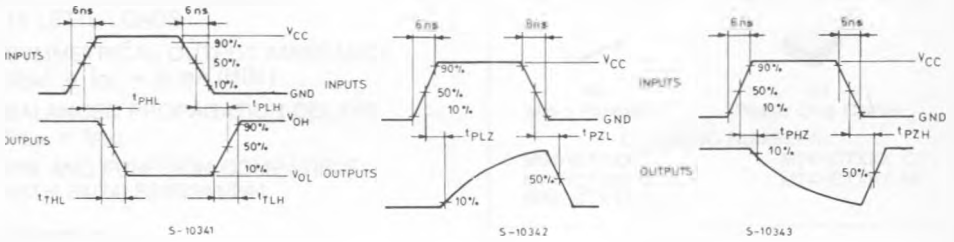
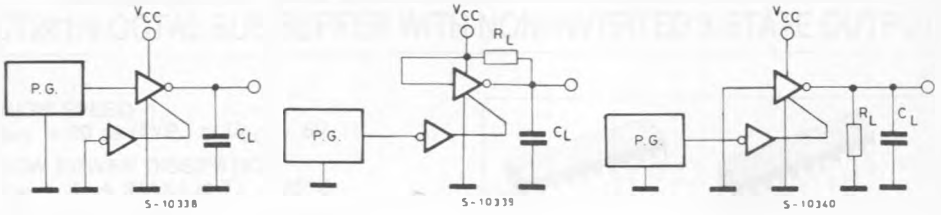
\*\* for M54/74HC240 only

**TEST CIRCUIT  $I_{CC}$  (Opr.)**



## SWITCHING CHARACTERISTICS TEST CIRCUIT

## HC240



## HC241/HC244

