

HS-C²MOS™ INTEGRATED CIRCUITS

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040647(241)
040648(244)

M54/74HC240
M54/74HC241
M54/74HC244

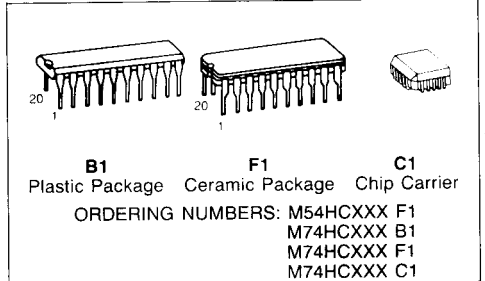
PRELIMINARY DATA

- HC240 OCTAL BUS BUFFER WITH
INVERTED 3-STATE OUTPUTS
- HC241 OCTAL BUS BUFFER WITH
NON INVERTED 3-STATE OUTPUTS
- HC244 OCTAL BUS BUFFER WITH
NON INVERTED 3-STATE OUTPUTS

DESCRIPTION

The M54/74HC240, M54/74HC241 and M54HC244 are high speed CMOS OCTAL BUS BUFFER's fabricated in silicon gate C²MOS 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 noninverting 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 or transient excess voltage.



FEATURES

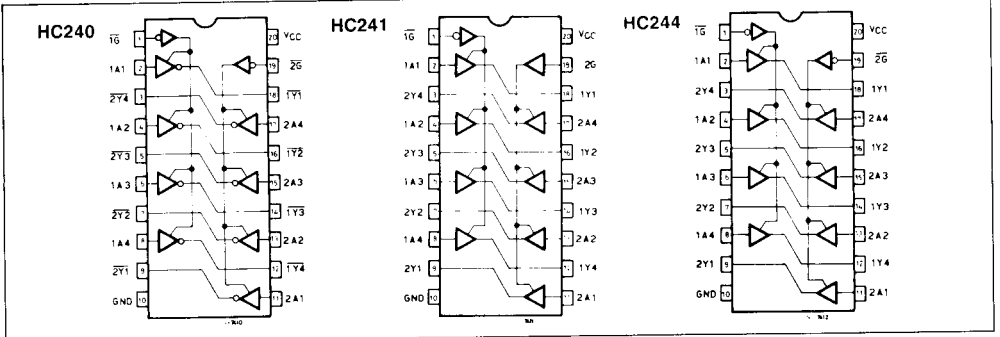
- High Speed
 $t_{PD} = 12 \text{ ns (Typ.) at } V_{CC} = 5V$
- Low Power Dissipation
 $I_{CC} = 4 \mu A \text{ (Max.) at } T_A = 25^\circ C$
- High Noise Immunity
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (Min.)}$
- Output Drive Capability
15 LSTTL Loads
- Symmetrical Output Impedance
 $|I_{OH}| = I_{OL} = 6 \text{ mA (Min.)}$
- Balanced Propagation Delays
 $t_{PLH} = t_{PHL}$
- Wide Operating Voltage Range
 $V_{CC} \text{ (opr)} = 2V \text{ to } 6V$
- Pin and Function compatible
with 54/74LS240/241/244

TRUTH TABLE

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

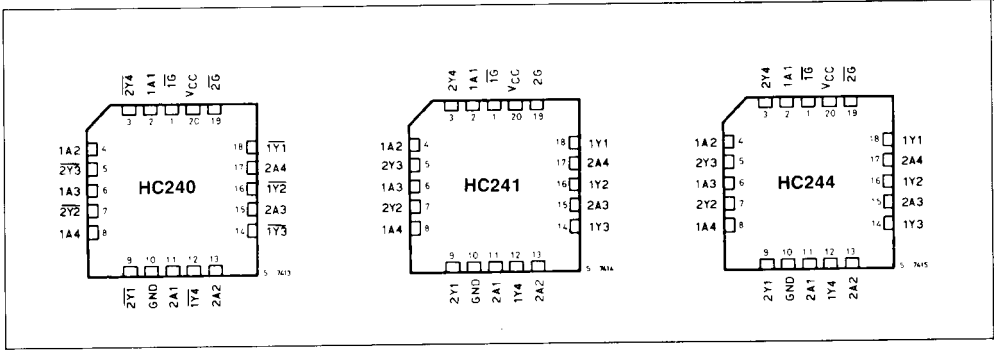
Δ : Applied only for M54/74HC241
 $\Delta \Delta$: Applied only for M54/74HC240
 * : Don't Care
 Z : High Impedance

PIN CONNECTIONS (top view)



M54/74HC240
M54/74HC241
M54/74HC244

CHIP CARRIER



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 conditions 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: - 40 to 85 54HC Series: - 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		0.5 1.35 1.8	V	
V _{OH}	High Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V _I	I _O - 20 μA - 6.0 mA - 7.8 mA	1.9	2.0	—	1.9	—	1.9		V
			V _{IH} or V _{IL}		4.4	4.5	—	4.4	—	4.4		
					5.9	6.0	—	5.9	—	5.9		
V _{OL}	Low Level Output Voltage	2.0 4.5 6.0 4.5 6.0	V _{IH} or V _{IL}	20 μA 6.0 mA 7.8 mA	—	0	0.1	—	0.1		0.1 0.1 0.1	V
					—	0	0.1	—	0.1			
					—	0.17	0.26	—	0.33		0.40 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		13	21	ns
t _{PZH} t _{PZL}	3-State Output Enable Time	50		11	18	ns
t _{PLH} t _{PLZ}	3-State Output Disable Time	50		16	26	ns

M54/74HC240
M54/74HC241
M54/74HC244

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 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		—	25	60	—	75			ns
		4.5		—	8	12	—	15			
		6.0		—	6	10	—	13			
t_{PLH} t_{PHL}	Propagation Delay Time	2.0		—	50	110	—	135			ns
		4.5		—	14	22	—	27			
		6.0		—	12	19	—	23			
t_{PZL} t_{PHL}	Output Enable Time	2.0	$R_L = 1\text{k}\Omega$	—	45	100	—	120			ns
		4.5		—	12	20	—	24			
		6.0		—	10	17	—	21			
t_{PZL} t_{PZH}	Output Disable Time	2.0	$R_L = 1\text{k}\Omega$	—	43	165	—	200			ns
		4.5		—	22	33	—	40			
		6.0		—	20	30	—	36			
C_{IN}	Input Capacitance			—	5	10	—	10			pF
C_{OUT}	Output Capacitance			—	10	—	—	—			pF
$C_{PD} (*)$	Power Dissipation Capacitance			—	40	—	—	—			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.

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