

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74HC240AP, TC74HC240AF, TC74HC240AFW, TC74HC241AP  
TC74HC241AF, TC74HC244AP, TC74HC244AF, TC74HC244AFW**

**OCTAL BUS BUFFER**  
**TC74HC240AP/AF/AFW INVERTED, 3 – STATE OUTPUTS**  
**TC74HC241AP/AF NON – INVERTED, 3 – STATE OUTPUTS**  
**TC74HC244AP/AF/AFW NON – INVERTED, 3 – STATE OUTPUTS**

(Note) The JEDEC SOP (FW) is not available in Japan.

The TC74HC240A, 241A and 244A are high speed CMOS OCTAL BUS BUFFERS fabricated with silicon gate C<sup>2</sup>MOS technology.

They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

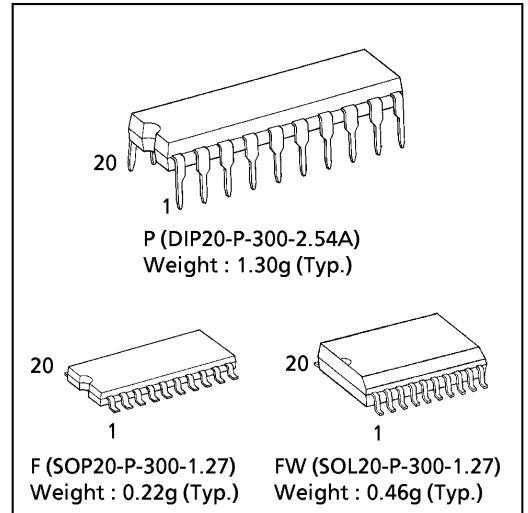
The 74HC240A is an inverting 3-state buffer having two active - low output enables. The TC74HC241A and TC74HC244A are non - inverting 3-state buffers that differ only in that the 241A has one active - high and one active - low output enable, and the 244A has two active - low output enables.

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..... $t_{pd} = 10ns( \text{typ.} )$  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...  $| I_{OH} | = I_{OL} = 6mA( \text{Min.} )$
- Balanced Propagation Delays.....  $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range...  $V_{CC} ( \text{opr.} ) = 2V \sim 6V$
- Pin and Function Compatible with 74LS 240 / 241 / 244

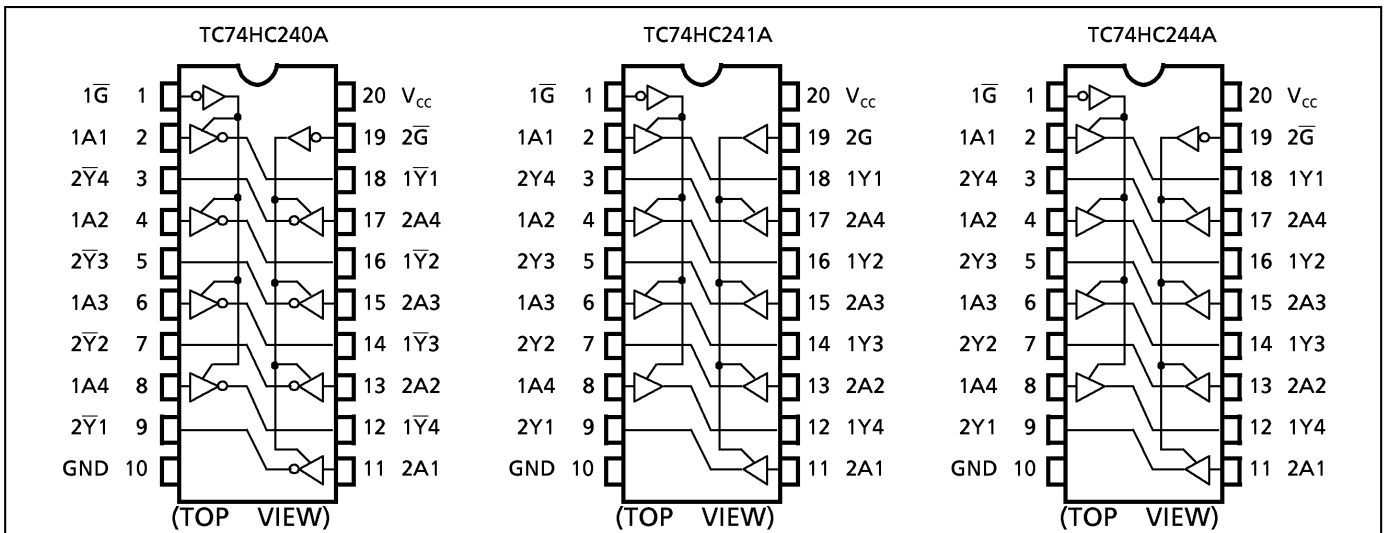


**TRUTH TABLE**

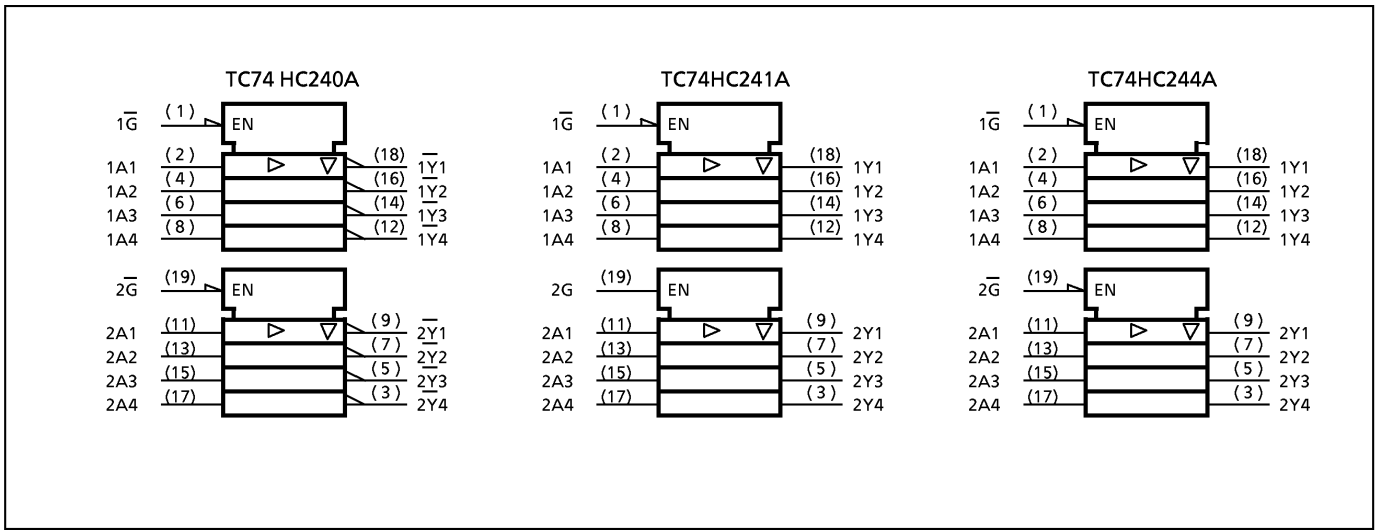
INPUTS			OUTPUTS	
$\bar{G}$	$G^\Delta$	$A_n$	$Y_n$	$\bar{Y}_n^{\Delta\Delta}$
L	H	L	L	H
L	H	H	H	L
H	L	X	Z	Z

$\Delta$  : for TC74HC241A only  
 $\Delta\Delta$  : for TC74HC240A only  
 X : Don't Care  
 Z : High Impedance

**PIN ASSIGNMENT**



**IEC LOGIC SYMBOL**



**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7	V
DC Input Voltage	$V_{IN}$	-0.5~ $V_{CC} + 0.5$	V
DC Output Voltage	$V_{OUT}$	-0.5~ $V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	±20	mA
Output Diode Current	$I_{OK}$	±20	mA
DC Output Current	$I_{OUT}$	±35	mA
DC $V_{CC}$ / Ground Current	$I_{CC}$	±75	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°C

\*500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ . From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  $-10\text{mW}/^{\circ}\text{C}$  shall be applied until 300mW.

**RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2~6	V
Input Voltage	$V_{IN}$	0~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise and Fall Time	$t_r, t_f$	0~1000 ( $V_{CC} = 2.0\text{V}$ ) 0~500 ( $V_{CC} = 4.5\text{V}$ ) 0~400 ( $V_{CC} = 6.0\text{V}$ )	ns

**DC ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	$T_a = 25^{\circ}\text{C}$			$T_a = -40 \sim 85^{\circ}\text{C}$		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	$V_{IH}$		2.0	1.50	—	—	1.50	—	V	
			4.5	3.15	—	—	3.15	—		
			6.0	4.20	—	—	4.20	—		
Low - Level Input Voltage	$V_{IL}$		2.0	—	—	0.50	—	0.50	V	
			4.5	—	—	1.35	—	1.35		
			6.0	—	—	1.80	—	1.80		
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
			$I_{OH} = -6\text{ mA}$ $I_{OH} = -7.8\text{ mA}$	4.5	4.18	4.31	—	4.13	—	
				6.0	5.68	5.80	—	5.63	—	
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
			$I_{OL} = 6\text{ mA}$ $I_{OL} = 7.8\text{ mA}$	4.5	—	0.17	0.26	—	0.33	
				6.0	—	0.18	0.26	—	0.33	
3 - State Output Off - State Current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$ or GND	6.0	—	—	±0.5	—	±5.0	$\mu\text{A}$	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	±0.1	—	±1.0		
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	4.0	—	40.0		

AC ELECTRICAL CHARACTERISTICS ( Input  $t_r = t_f = 6\text{ns}$  )

PARAMETER	SYMBOL	TEST CONDITION	CL (pF)	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	$t_{TLH}$ $t_{THL}$		50	2.0	—	25	60	—	75	ns
				4.5	—	7	12	—	15	
				6.0	—	6	10	—	13	
Propagation Delay Time	$t_{pLH}$ $t_{pHL}$		50	2.0	—	36	90	—	115	
				4.5	—	12	18	—	23	
				6.0	—	10	15	—	20	
			150	2.0	—	51	130	—	165	
				4.5	—	17	26	—	33	
				6.0	—	14	22	—	28	
Output Enable time	$t_{pZL}$ $t_{pZH}$	$R_L = 1\text{k}\Omega$	50	2.0	—	48	125	—	155	
				4.5	—	16	25	—	31	
				6.0	—	14	21	—	26	
			150	2.0	—	63	165	—	205	
				4.5	—	21	33	—	41	
				6.0	—	18	28	—	35	
Output Disable time	$t_{pLZ}$ $t_{pHZ}$	$R_L = 1\text{k}\Omega$	50	2.0	—	32	125	—	155	
				4.5	—	15	25	—	31	
				6.0	—	14	21	—	26	
Input Capacitance	$C_{IN}$				—	5	10	—	10	pF
Output Capacitance	$C_{OUT}$				—	10	—	—	—	
Power Dissipation Capacitance	$C_{PD}(1)$	TC74HC240A			—	31	—	—	—	
		TC74HC241A / 244A			—	33	—	—	—	

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

Average operating current can be obtained by the equation :

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

**DIP 20PIN PACKAGE DIMENSIONS (DIP20-P-300-2.54A)**

Unit in mm



**SOP 20PIN (200mil BODY) PACKAGE DIMENSIONS (SOP20-P-300-1.27)**

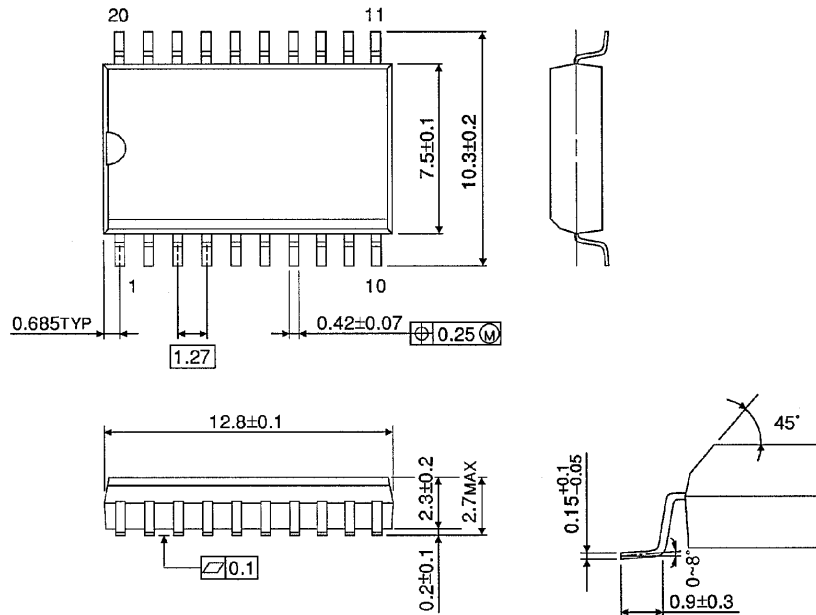
Unit in mm



**SOP 20PIN (300mil BODY) PACKAGE DIMENSIONS (SOL20-P-300-1.27)**

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

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