

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 C²MOS technology.

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

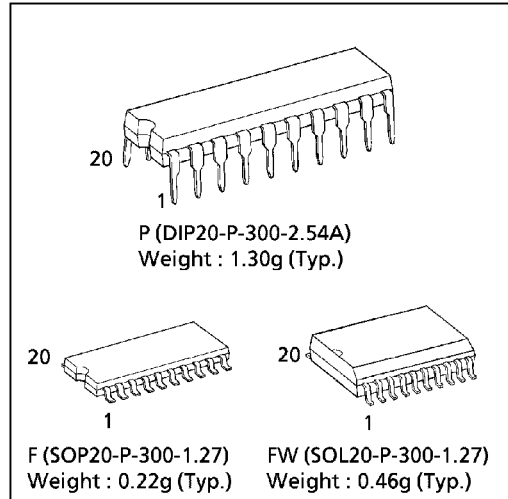
The 74HC240A is an inverting 3 - state buffer having two active - low output enables. The TC74HC241A and TC74HC244A are non - inverting 3 - state buffers that differ only in that the 241A has one active - high and one active - low output enable, and the 244A has two active - low output enables.

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

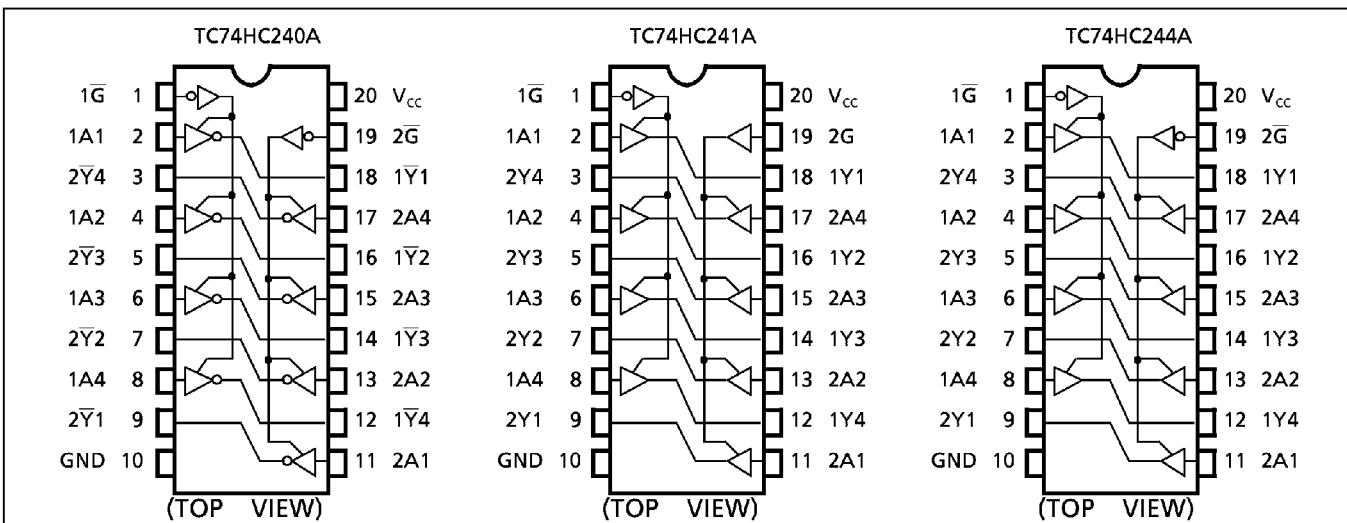


TRUTH TABLE

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

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

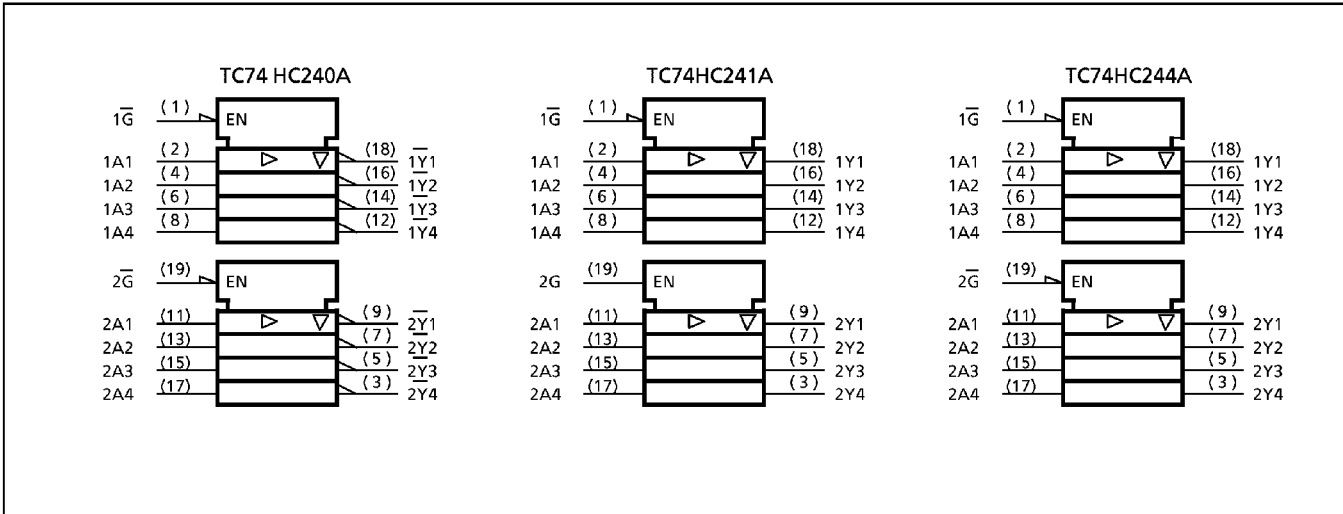
PIN ASSIGNMENT



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IEC LOGIC SYMBOL



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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°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 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	— — —	V	
Low - Level Input Voltage	V_{IL}		2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	— — —	V
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	—	
				6.0	5.9	6.0	—	5.9	—	
			$I_{OH} = -6\text{ mA}$ $I_{OH} = -7.8\text{ mA}$	4.5	4.18	4.31	—	4.13	—	V
				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	
				6.0	—	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	V
				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	μA	
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 ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	CL (pF)	V _{CC} (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 = 1kΩ	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 = 1kΩ	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	—	—	—	—

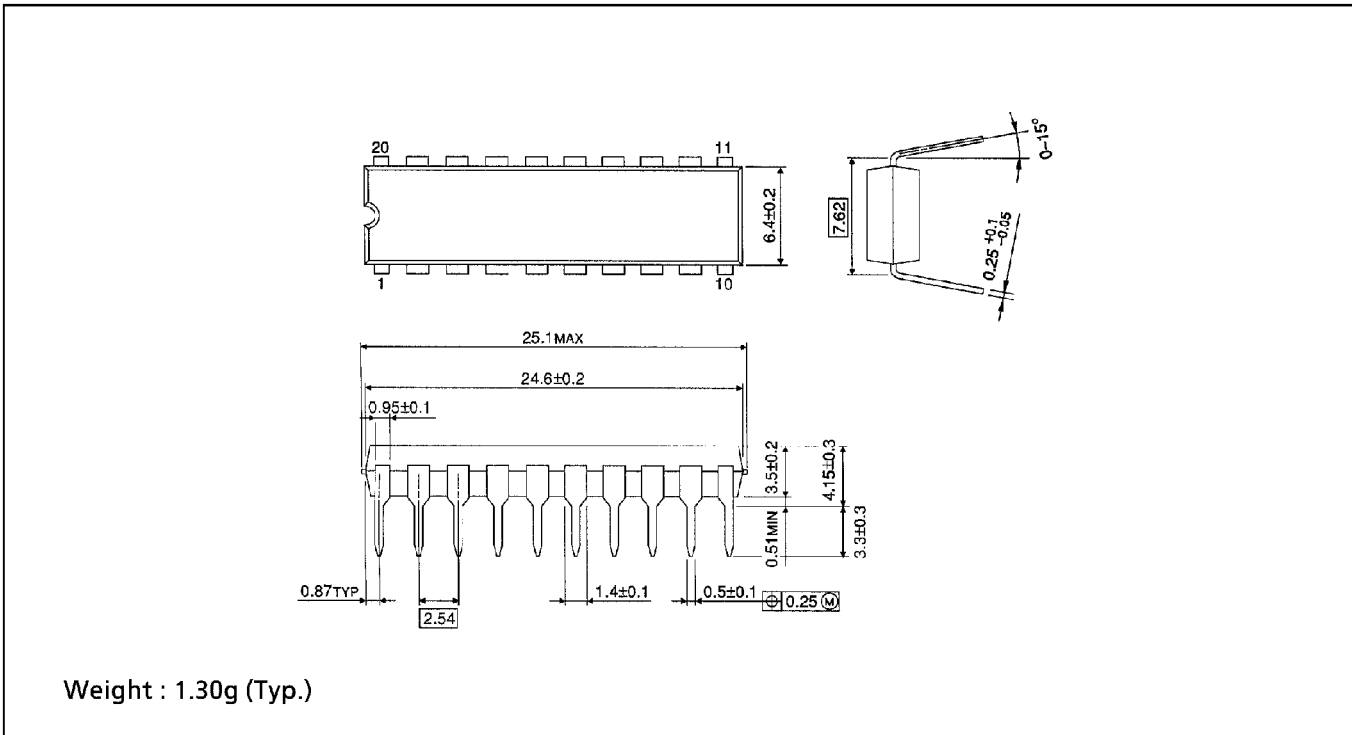
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

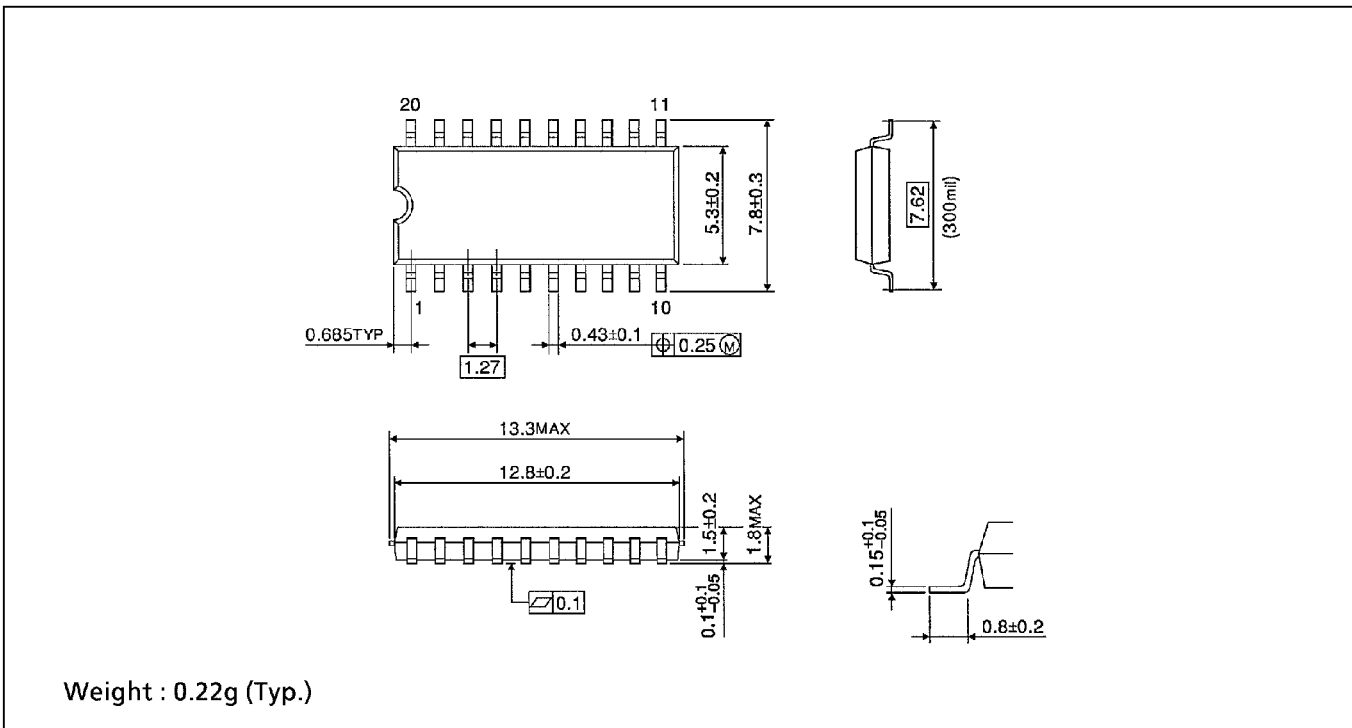
DIP 20PIN OUTLINE DRAWING (DIP20-P-300-2.54A)

Unit in mm



SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27)

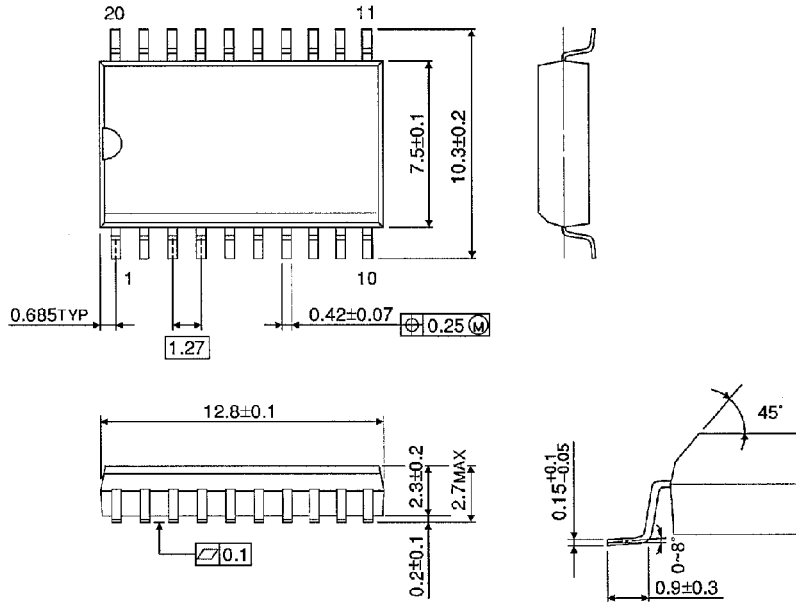
Unit in mm



SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300-1.27)

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)