TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74VHCT240AF, TC74VHCT240AFW, TC74VHCT240AFT
TC74VHCT244AF, TC74VHCT244AFW, TC74VHCT244AFT

OCTAL BUS BUFFER

TC74VHCT240AF / AFW / AFT INVERTED, 3 - STATE OUTPUTS

TC74VHCT244AF / AFW / AFT NON - INVERTED, 3 - STATE OUTPUTS

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

The TC74VHCT240A and 244A are advanced high speed CMOS OCTAL BUS BUFFFERs fabricated with silicon gate C^2MOS technology. They achieve the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The TC74VHCT240A is an inverting 3 - state buffer having two active - low output enables. The TC74VHCT244A is a non - inverting 3 - state buffer, and has two active - low output enables.

These devices are designed to be used with 3 - state memory address drivers, etc.

The input voltage are compatible with TTL output voltage.

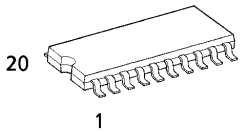
These devices may be used as a level converter for interfacing 3.3V to 5V system.

Input protection and output circuit ensure that 0 to 5.5V can be applied to the input and output*1 pins without regard to the supply voltage. These structure prevents device destruction due to mismatched supply and input / output voltages such as battery back up, hot board insertion, etc.

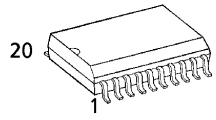
*1: output in off-state

FEATURES:

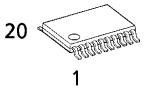
- High Speed ..... t_{pd} = 5.6ns(typ.) at V_{CC} = 5V
- Low Power Dissipation ..... I_{CC} = 4μA(Max.) at Ta = 25°C
- Compatible with TTL outputs ... V_{IL} = 0.8 V (Max.)
  V_{IH} = 2.0 V (Min.)
- Power Down Protection is provided on all inputs and outputs
- Balanced Propagation Delays ..... $t_{pLH} \simeq t_{pHL}$
- Low Noise ..... V_{OLP} = 1.1V (Max.)
- Pin and Function Compatible with the 74 series (74AC / HC / F / ALS / LS etc.) 240 / 244 type.



F (SOP20-P-300-1.27)
Weight : 0.22g (Typ.)



FW (SOL20-P-300-1.27)
Weight : 0.46g (Typ.)



FT (TSSOP20-P-0044-0.65)
Weight : 0.08g (Typ.)

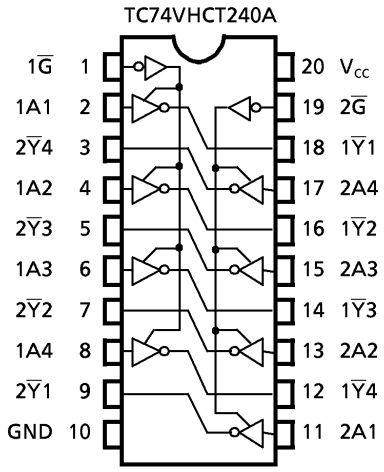
TRUTH TABLE

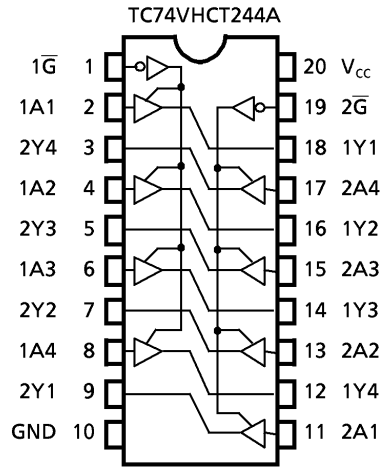
INPUTS		OUTPUTS	
$\overline{G}$	A_n	Y_n	$\overline{Y}_n$
L	L	L	H
L	H	H	L
H	X	Z	Z

X : Don't Care
Z : High Impedance
Y_n : TC74VHCT244A
$\overline{Y}_n$: TC74VHCT240A

PIN ASSIGNMENT

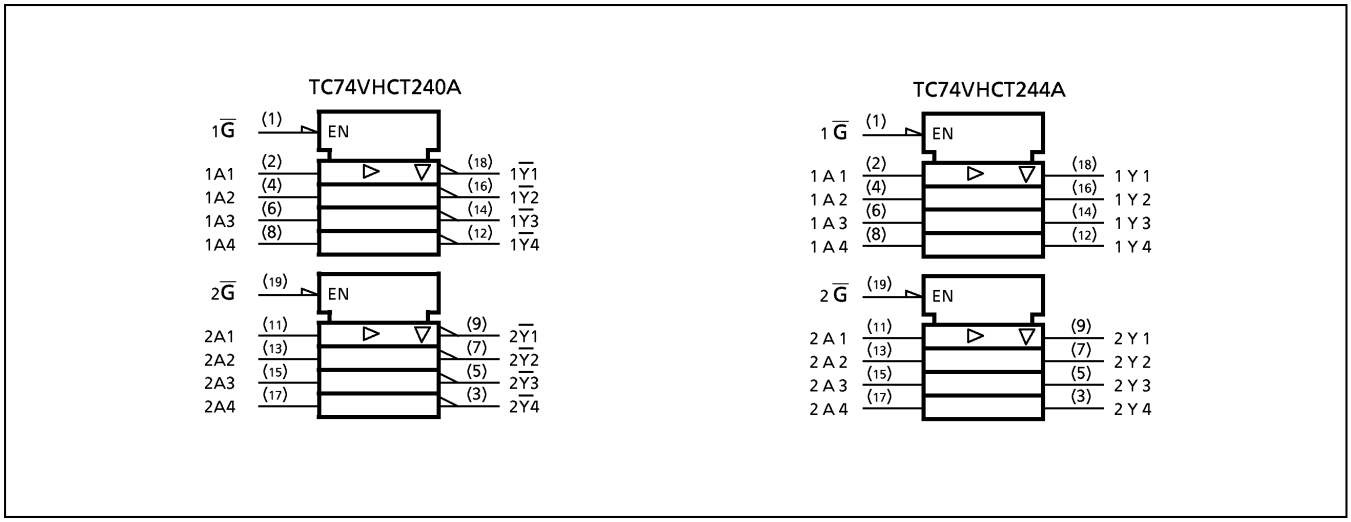
(TOP VIEW)





961001EBA2

IEC LOGIC SYMBOL



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	−0.5~7.0	V
DC Input Voltage	V_{IN}	−0.5~7.0	V
DC Output Voltage	V_{OUT}	−0.5~7.0 (Note 1)	V
		−0.5~VCC + 0.5 (Note 2)	
Input Diode Current	I_{IK}	−20	mA
Output Diode Current	I_{OK}	±20 (Note 3)	mA
DC Output Current	I_{OUT}	±25	mA
DC Vcc/Ground Current	I_{CC}	±75	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	−65~150	°C

(Note 1) Output in Off-State
(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.
(Note 3) $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	4.5~5.5	V
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~5.5 (Note 4)	V
		0~VCC (Note 5)	
Operating Temperature	T_{opr}	−40~85	°C
Input Rise and Fall Time	dt / dV	0~20	ns / V

(Note 4) Output in Off-State
(Note 5) High or Low State

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITON		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V_{IH}			4.5~5.5	2.0	—	—	2.0	—	V
Low - Level Input Voltage	V_{IL}			4.5~5.5	—	—	0.8	—	0.8	V
High - Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50μA	4.5	4.40	4.50	—	4.40	—	V
			I_{OH} = −8mA	4.5	3.94	—	—	3.80	—	
Low - Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50μA	4.5	—	0.0	0.10	—	0.10	V
			I_{OL} = 8mA	4.5	—	—	0.36	—	0.44	
3 - State Output Off - State Current	I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND		5.5	—	—	±0.25	—	±2.50	μA
Input Leakage Current	I_{IN}	V_{IN} = 5.5V or GND		0~5.5	—	—	±0.1	—	±1.0	
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	4.0	—	40.0	
	I_{CCT}	PER INPUT : VIN = 3.4V OTHER INPUT : VCC or GND		5.5	—	—	1.35	—	1.50	mA
Output Leakage Current	I_{OPD}	V_{OUT} = 5.5V		0	—	—	+0.5	—	+5.0	μA

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f$ = 3ns)

PARAMETER	SYMBOL	TEST CONDITION			Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC} (V)	C_L (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (TC74VHCT240A)	t_{pLH} t_{pHL}		5.0 ± 0.5	15	—	5.6	7.8	1.0	9.0	ns
				50	—	6.1	8.8	1.0	10.0	
Propagation Delay Time (TC74VHCT244A)	t_{pLH} t_{pHL}		5.0 ± 0.5	15	—	5.4	7.4	1.0	8.5	
				50	—	5.9	8.4	1.0	9.5	
3-State Output Enable Time	t_{pZL} t_{pZH}	R_L = 1kΩ	5.0 ± 0.5	15	—	7.7	10.4	1.0	12.0	
				50	—	8.2	11.4	1.0	13.0	
3-State Output Disable Time	t_{pLZ} t_{pHZ}	R_L = 1kΩ	5.0 ± 0.5	50	—	8.8	11.4	1.0	13.0	
Output to Output Skew	t_{osLH} t_{osHL}	(Note 6)	5.0 ± 0.5	50	—	—	1.0	—	1.0	
Input Capacitance	C_{IN}				—	4	10	—	10	pF
Output Capacitance	C_{OUT}				—	9	—	—	—	
Power Dissipation Capacitance (Note 7)	C_{PD}	TC74VHCT240A			—	19	—	—	—	
		TC74VHCT244A			—	18	—	—	—	

(Note 6) Parameter guaranteed by design. $t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

(Note 7) 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:

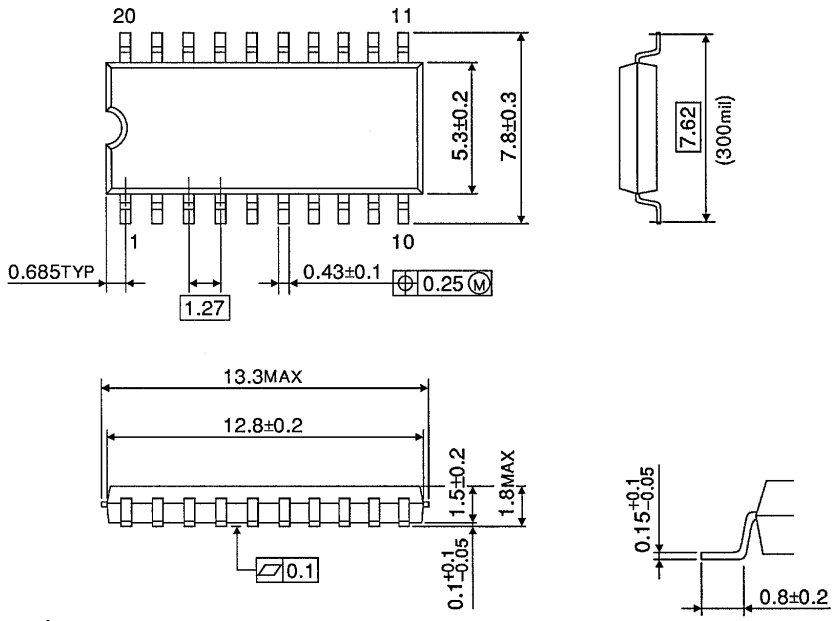
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per bit)}$$

NOISE CHARACTERISTICS (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C		UNIT
			V_{CC} (V)	TYP.	LIMIT	
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	$C_L = 50pF$	5.0	0.8 (0.9)	1.0 (1.1)	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}	$C_L = 50pF$	5.0	−0.8 (−0.9)	−1.0 (−1.1)	V
Minimum High Level Dynamic Input Voltage	V_{IHD}	$C_L = 50pF$	5.0	−	2.0	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}	$C_L = 50pF$	5.0	−	0.8	V

(Note) The value in ( ) only applies to JEDEC SOP (FW) devices.

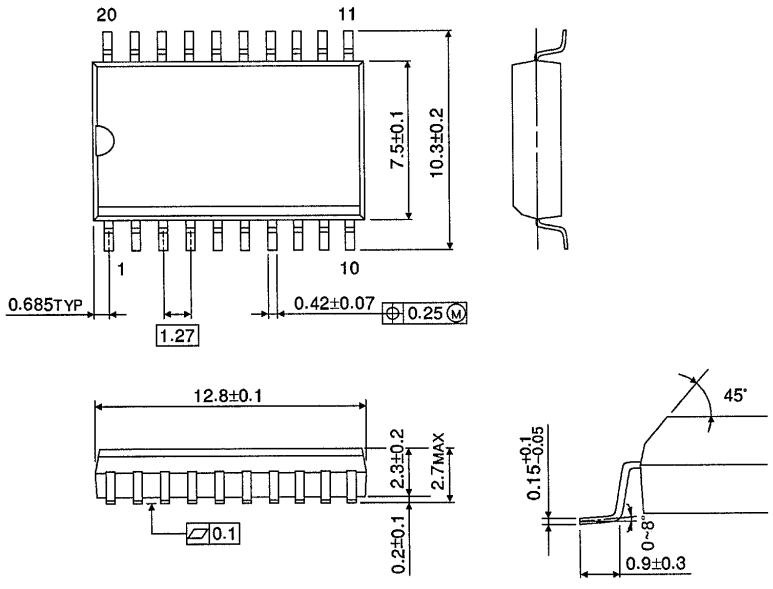
SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27) Unit in mm



Weight : 0.22g (Typ.)

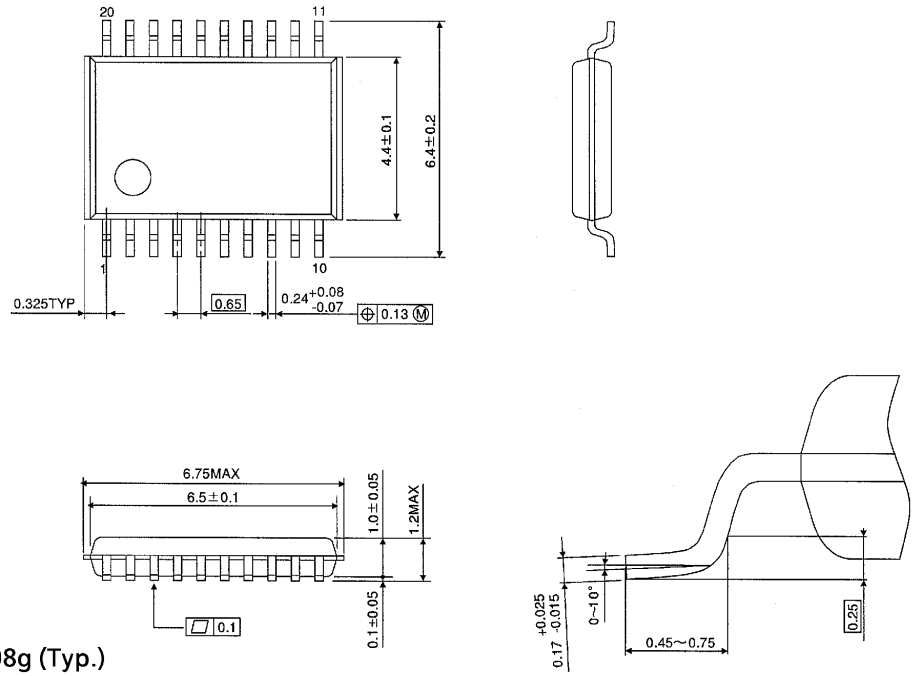
SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300-1.27) Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

TSSOP 20PIN OUTLINE DRAWING (TSSOP20-P-0044-0.65) Unit in mm



Weight : 0.08g (Typ.)