

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

The TC74VHCT240A and 244A are advanced high speed CMOS OCTAL BUS BUFFERS fabricated with silicon gate C²MOS 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.

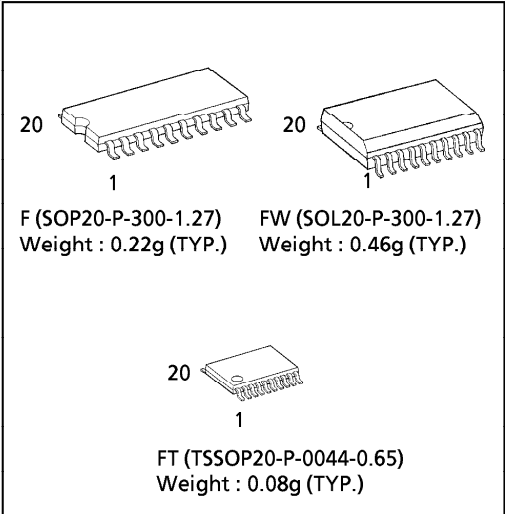
These devices are designed to be used with 3-state memory address drivers, etc.

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..... $I_{CC} = 4\mu A (Max.)$ at $T_a = 25^{\circ}C$
 - 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..... $t_{pLH} \approx t_{pHL}$
 - Low Noise $V_{OLP} = 1.1V (Max.)$
 - Pin and Function Compatible with the 74 series (74AC/HC / F/ALS/LS etc.) 240/244 type.

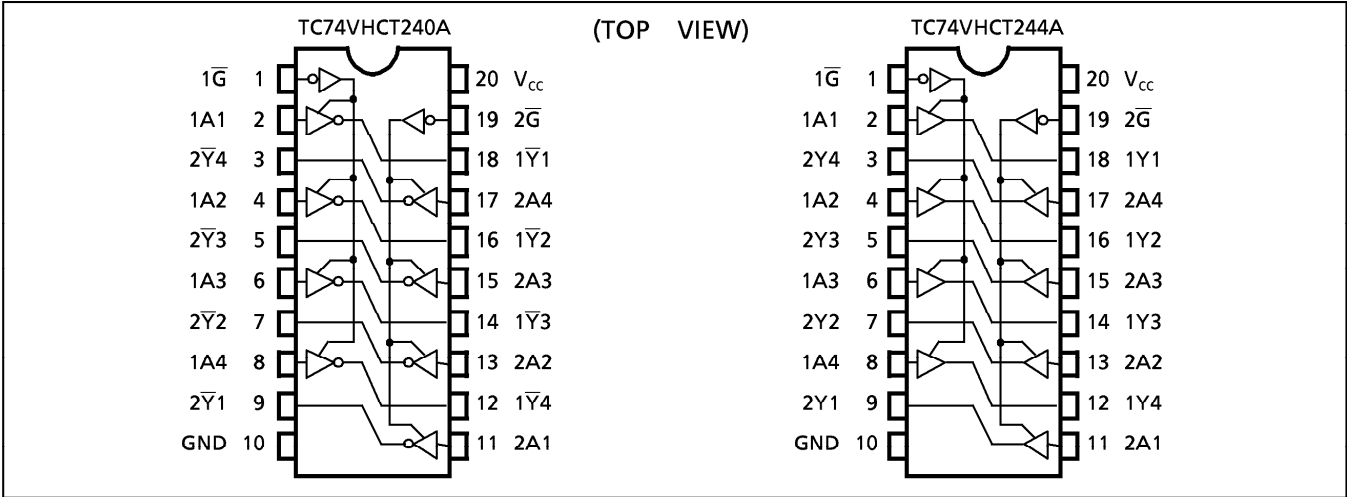


TRUTH TABLE

INPUTS		OUTPUTS	
G	A _n	Y _n	Ȳ _n
L	L	L	H
L	H	H	L
H	X	Z	Z

X : Don't Care
Z : High Impedance
Y_n : TC74VHCT244A
Ȳ_n : TC74VHCT240A

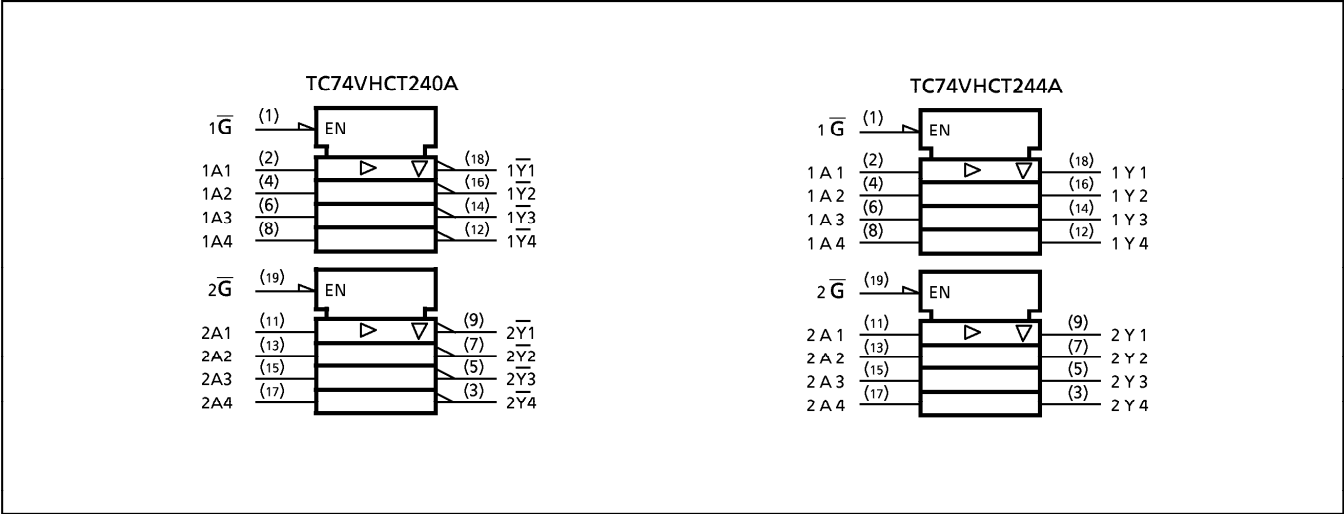
PIN ASSIGNMENT



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IEC LOGIC SYMBOL



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim 7.0$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim 7.0$ (Note 1)	V
		$-0.5 \sim V_{CC} + 0.5$ (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}	$-65 \sim 150$	$^{\circ}C$

- (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~ V_{CC} (Note 5)	
Operating Temperature	T_{opr}	$-40 \sim 85$	$^{\circ}C$
Input Rise and Fall Time	dt/dV	0~20	ns/V

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

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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	mA
	I _{CCT}	PER INPUT : V _{IN} = 3.4V OTHER INPUT : V _{CC} or GND		5.5	—	—	1.35	—	1.50	
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 :

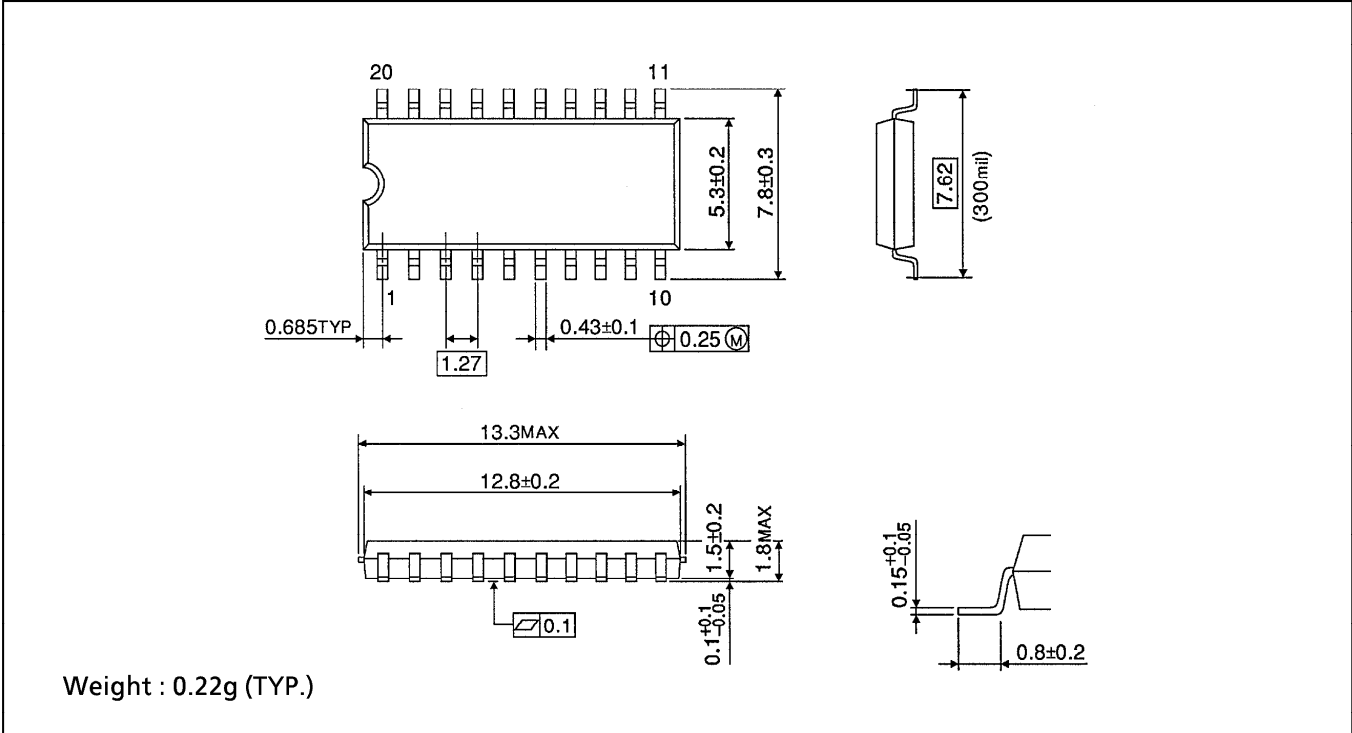
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8 \text{ (per bit)}$$

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	0.9	1.1	V
Quiet Output Minimum Dynamic V _{OL}	V _{OLV}	C _L = 50pF	5.0	— 0.9	— 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

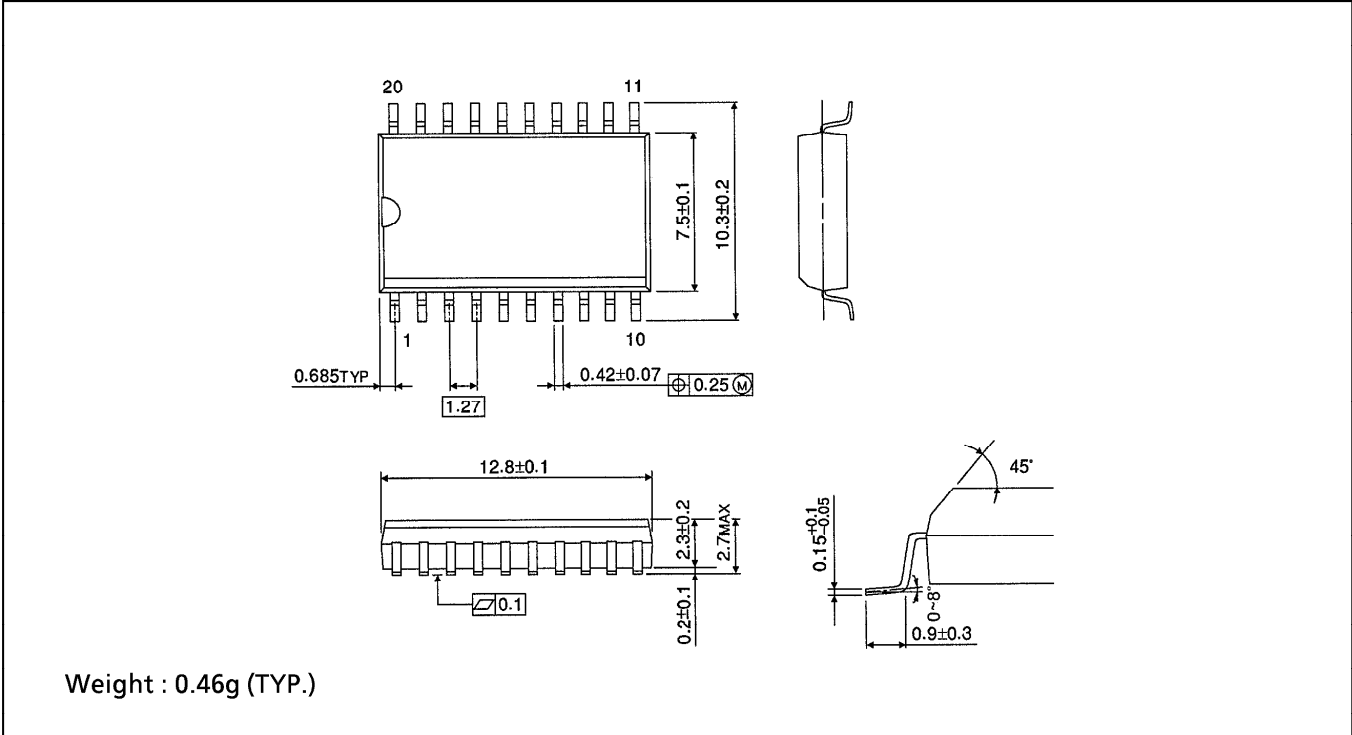
SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27)

Unit in mm



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

Unit in mm



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

Unit in mm

