

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7WH240FU, TC7WH240FK

DUAL BUS BUFFER INVERTED, 3-STATE OUTPUTS

The TC7WH240 is an advanced high speed CMOS DUAL BUS BUFFERS fabricated with silicon gate CMOS technology.

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

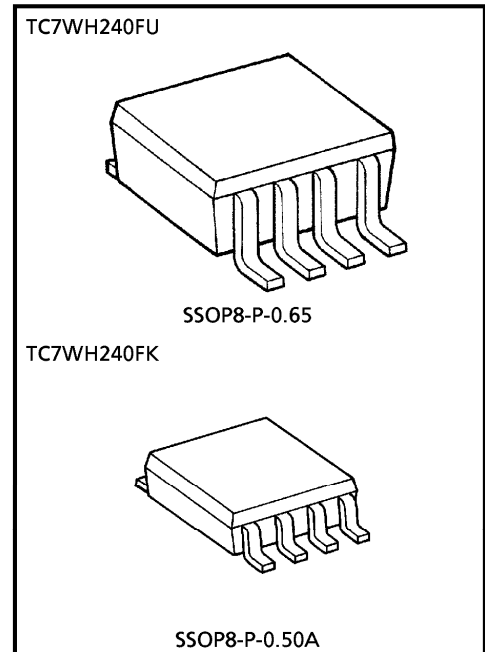
The 7WH240 is an inverting 3-state buffer having two active-low output enables.

This device is designed to be used with 3-state memory address drivers, etc.

An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V system and two supply system such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

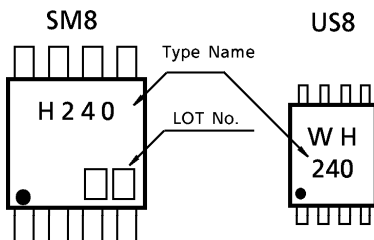
FEATURES

- High Speed $t_{pd} = 3.9ns$ (Typ.) at $V_{CC} = 5V$
- Low Power Dissipation $I_{CC} = 2\mu A$ (Max.) at $T_a = 25^\circ C$
- High Noise Immunity $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays $t_{pLH} \approx t_{pHL}$
- Wide Operation Voltage Range ... $V_{CC} (opr) = 2 \sim 5.5V$
- Low Noise $V_{OLP} = 0.8V$ (Max.)

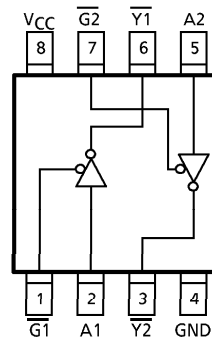


Weight
 SSOP8-P-0.65 : 0.02g (Typ.)
 SSOP8-P-0.50A : 0.01g (Typ.)

MARKING



PIN ASSIGNMENT (TOP VIEW)



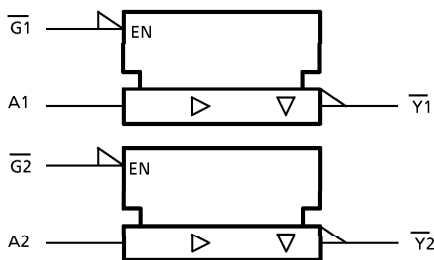
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MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	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~V _{CC} +0.5	V
Input Diode Current	I _{IK}	-20	mA
Output Diode Current	I _{OK}	±20	mA
DC Output Current	I _{OUT}	±25	mA
DC V _{CC} /Ground Current	I _{CC}	±50	mA
Power Dissipation	P _D	300 (SM8)	mW
		200 (US8)	
Storage Temperature	T _{stg}	-65~150	°C
Lead Temperature (10 s)	T _L	260	°C

LOGIC DIAGRAM



TRUTH TABLE

INPUTS		OUTPUTS
G	A	Y
L	L	H
L	H	L
H	x	Z

x : Don't Care
Z : High Impedance

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	2~5.5	V
Input Voltage	V _{IN}	0~5.5	V
Output Voltage	V _{OUT}	0~V _{CC}	V
Operating Temperature	T _{opr}	-40~85	°C
Input Rise and Fall Time	dt / dv	0~100 (V _{CC} = 3.3 ± 0.3V)	ns / V
		0~20 (V _{CC} = 5 ± 0.5V)	

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DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Input Voltage	V _{IH}	—	2.0	1.5	—	—	1.5	—	V	
			3.0~5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—		
Low-Level Input Voltage	V _{IL}	—	2.0	—	—	0.5	—	0.5	V	
			3.0~5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3		
High-Level Output Voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 μA	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
			I _{OH} = -4mA	3.0	2.58	—	—	2.48	—	
4.5	3.94	—		—	3.8	—				
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IL}	I _{OL} = 50 μA	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			I _{OL} = 4mA	3.0	—	—	0.36	—	0.44	
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	—	±2.5	μA	
Input Leakage Current	I _{IN}	V _{IN} = V _{CC} or GND	0~5.5	—	—	±0.1	—	±1.0	μA	
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND	5.5	—	—	2.0	—	20.0	μA	

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3\text{ns}$)

CHARACTERISTIC	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	t _{pLH}	3.3 ± 0.3	15	—	5.3	7.5	1.0	9.0	ns	
			50	—	7.8	11.0	1.0	12.5		
	t _{pHL}	5.0 ± 0.5	15	—	3.6	5.5	1.0	6.5		
			50	—	5.1	7.5	1.0	8.5		
3-State Output Enable Time	t _{pZL}	3.3 ± 0.3	15	—	6.6	10.6	1.0	12.5	ns	
			50	—	9.1	14.1	1.0	16.0		
	t _{pZH}	5.0 ± 0.5	15	—	4.7	7.3	1.0	8.5		
			50	—	6.2	9.3	1.0	10.5		
3-State Output Disable Time	t _{pLZ}	3.3 ± 0.3	50	—	10.3	14.0	1.0	16.0	ns	
			t _{pHZ}	5.0 ± 0.5	50	—	6.7	9.2		1.0
Output to Output Skew	t _{osLH}	(Note 1)	3.3 ± 0.3	50	—	—	1.5	—	1.5	ns
			t _{osHL}	5.0 ± 0.5	50	—	—	1.0	—	
Input Capacitance	C _{IN}			—	4	10	—	10	pF	
Output Capacitance	C _{OUT}			—	6	—	—	—	pF	
Power Dissipation Capacitance (Note 2)	C _{PD}			—	17	—	—	—	pF	

(Note 1) : Parameter guaranteed by design. $t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

(Note 2) : C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

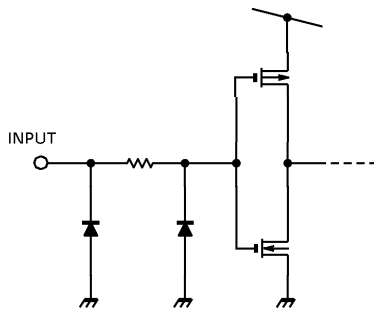
Average operating current can be obtained by the equation :

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 2 \text{ (per bit)}$$

NOISE CHARACTERISTICS ($T_a = 25^\circ\text{C}$, Input $t_r = t_f = 3\text{ns}$)

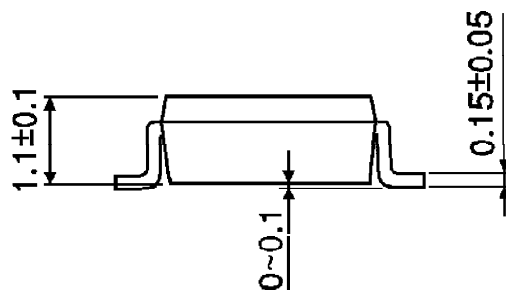
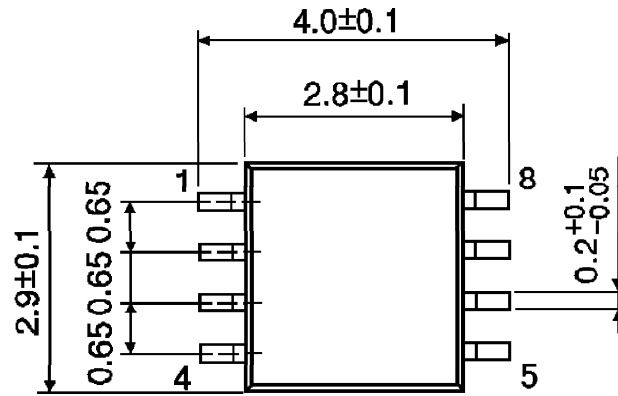
CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{CC} (V)	TYP.	LIMIT	UNIT
			5.0			
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	$C_L = 50\text{pF}$	5.0	0.5	0.8	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}	$C_L = 50\text{pF}$	5.0	-0.5	-0.8	V
Minimum High Level Dynamic Input Voltage	V_{IHD}	$C_L = 50\text{pF}$	5.0	—	3.5	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}	$C_L = 50\text{pF}$	5.0	—	1.5	V

INPUT EQUIVALENT CIRCUIT



OUTLINE DRAWING
SSOP8-P-0.65

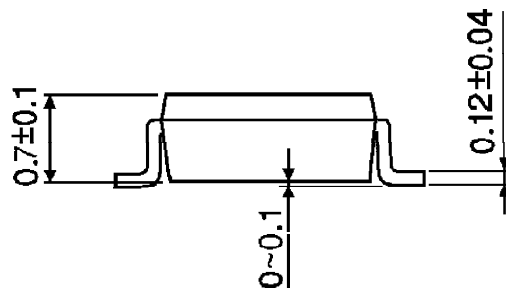
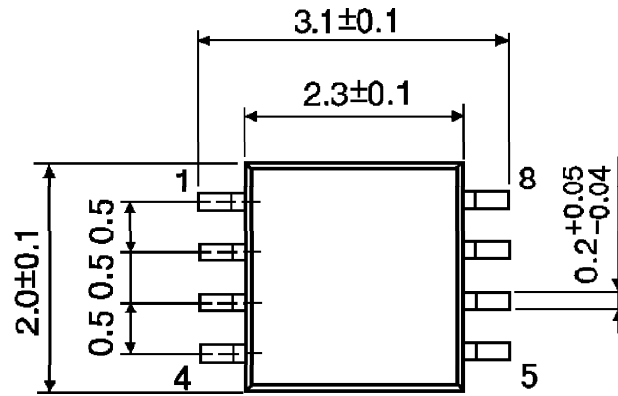
Unit : mm



Weight : 0.02g (Typ.)

OUTLINE DRAWING
SSOP8-P-0.50A

Unit : mm



Weight : 0.01g (Typ.)