

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

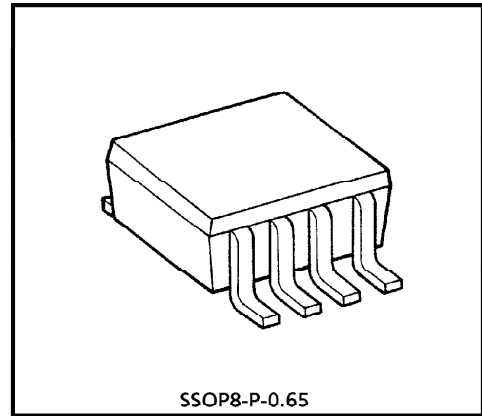
# TC7W240FU

## INVERTED, 3-STATE OUTPUTS

The TC7W240FU is a high speed C<sup>2</sup>MOS DUAL BUS BUFFERS fabricated with silicon gate C<sup>2</sup>MOS technology. It achieve the high speed operation similar to equivalent LSTTL while maintaining the C<sup>2</sup>MOS low power dissipation.

It is an inverting 3-state buffer having two active-low output enables.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.



Weight : 0.02g (Typ.)

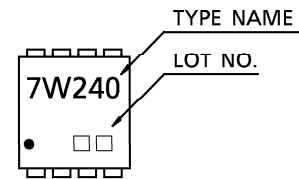
### FEATURES

- High Speed.....  $t_{pd} = 10\text{ns}$  (Typ.) at  $V_{CC} = 5\text{V}$
- Low Power Dissipation .....  $I_{CC} = 2\mu\text{A}$  (Max.) at  $T_a = 25^\circ\text{C}$
- High Noise Immunity .....  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (Min.)
- Output Drive Capability..... 15 LSTTL Loads
- Symmetrical Output Impedance .....  $|I_{OH}| = I_{OL} = 6\text{mA}$  (Min.)
- Balanced Propagation Delays.....  $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range.....  $V_{CC}(\text{opr}) = 2\sim 6\text{V}$

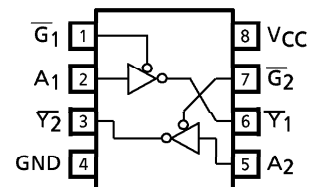
### MAXIMUM RATINGS

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	$I_{IK}$	$\pm 20$	mA
Output Diode Current	$I_{OK}$	$\pm 20$	mA
DC Output Current	$I_{OUT}$	$\pm 35$	mA
DC $V_{CC}$ / Ground Current	$I_{CC}$	$\pm 37.5$	mA
Power Dissipation	$P_D$	300	mW
Storage Temperature	$T_{stg}$	-65~150	$^\circ\text{C}$
Lead Temperature (10s)	$T_L$	260	$^\circ\text{C}$

### MARKING



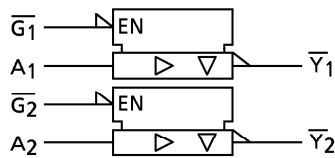
### PIN ASSIGNMENT (TOP VIEW)



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LOGIC DIAGRAM



TRUTH TABLE

INPUT		OUTPUT
$\bar{G}$	A	$\bar{Y}$
L	L	H
L	H	L
H	X	Z

X : Don't Care  
Z : High Impedance

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 ( $V_{CC} = 2.0V$ )	ns
		0~500 ( $V_{CC} = 4.5V$ )	
		0~400 ( $V_{CC} = 6.0V$ )	

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CIRCUIT	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT						
				$V_{CC}$	MIN.	TYP.	MAX.	MIN.		MAX.					
High-Level Input Voltage	$V_{IH}$	—	—	2.0	1.5	—	—	1.5	—	V					
				4.5	3.15	—	—	3.15	—						
				6.0	4.2	—	—	4.2	—						
Low-Level Input Voltage	$V_{IL}$	—	—	2.0	—	—	0.5	—	0.5	V					
				4.5	—	—	1.35	—	1.35						
				6.0	—	—	1.8	—	1.8						
High-Level Output Voltage	$V_{OH}$	—	$V_{IN} = V_{IL}$	$I_{OH} = -20\mu A$	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	—					
Low-Level Output Voltage	$V_{OL}$	—	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\mu A$	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					
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

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AC ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 6ns$ )

PARAMETER	SYMBOL	TEST CIRCUIT	TEST CONDITION			Ta = 25°C			Ta = -40~85°C		UNIT
				C <sub>L</sub>	V <sub>CC</sub>	MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t <sub>TLH</sub> t <sub>THL</sub>	—	—	50	2.0	—	25	60	—	75	ns
					4.5	—	7	12	—	15	
					6.0	—	6	10	—	13	
Propagation Delay Time	t <sub>PLH</sub> t <sub>pHL</sub>	—	—	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 <sub>pZL</sub> t <sub>pZH</sub>	—	R <sub>L</sub> = 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 <sub>pLZ</sub> t <sub>pHZ</sub>	—	R <sub>L</sub> = 1kΩ	50	2.0	—	32	125	—	155	
					4.5	—	15	25	—	31	
					6.0	—	14	21	—	26	
Input Capacitance	C <sub>IN</sub>	—	—	—	—	—	5	10	—	10	pF
Output Capacitance	C <sub>OUT</sub>	—	—	—	—	—	10	—	—	—	
Power Dissipation Capacitance	C <sub>PD</sub>	—	Note (1)	—	—	—	31	—	—	—	

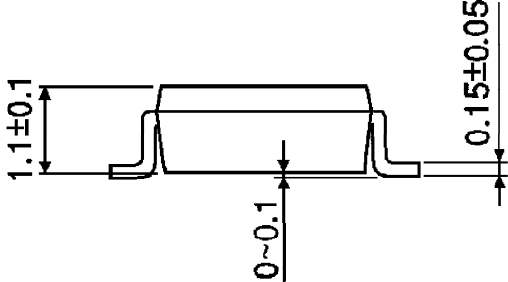
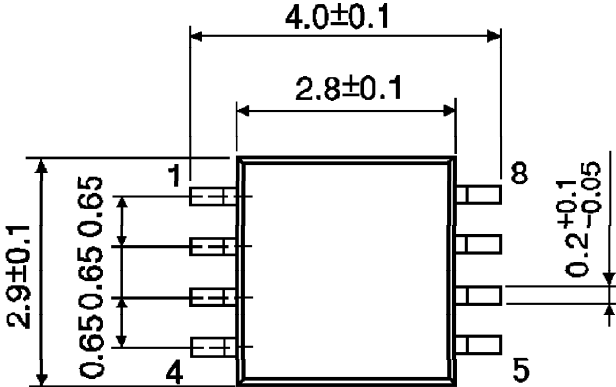
Note (1) : C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

OUTLINE DRAWING  
SSOP8-P-0.65

Unit : mm



Weight : 0.02g (Typ.)