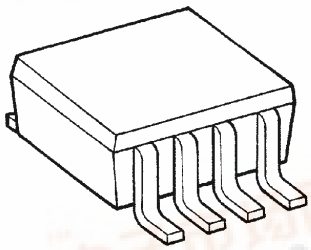
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7WH241FU, TC7WH241FK

DUAL BUS BUFFER
NON INVERTED, 3-STATE OUTPUTS

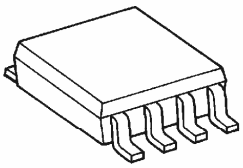
The TC7WH241 is an advanced high speed CMOS DUAL BUS BUFFERS fabricated with silicon gate CMOS technology.
They achieve the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.
The 7WH241 is an non-inverting 3-state buffer, and has two active-low 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.

TC7WH241FU



SSOP8-P-0.65

TC7WH241FK



SSOP8-P-0.50A

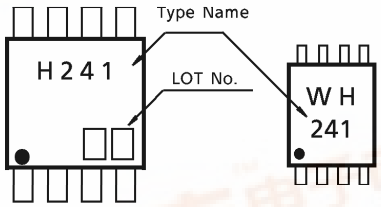
Weight
SSOP8-P-0.65 : 0.02g (Typ.)
SSOP8-P-0.50A : 0.01g (Typ.)

FEATURES

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

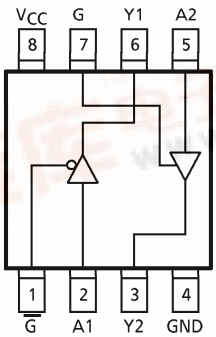
MARKING

SM8



US8

PIN ASSIGNMENT (TOP VIEW)

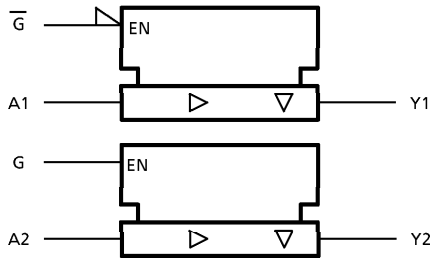


980508EBA2

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
$\overline{G}$	G	A	Y
L	H	L	L
L	H	H	H
H	L	×	Z

× : 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)	

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} = −50μA	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	—	
			I_{OH} = −8mA	4.5	3.94	—	—	3.8	—	
Low-Level Output Voltage	V_{OL}	V_{IN} = V_{IL}	I_{OL} = 50μA	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	
			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	—	±2.5	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 $t_r = t_f = 3ns$)

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} t_{pHL}		3.3 ± 0.3	15	—	5.3	7.5	1.0	9.0	ns
				50	—	7.8	11.0	1.0	12.5	
			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} t_{pZH}	$R_L = 1k\Omega$	3.3 ± 0.3	15	—	6.6	10.6	1.0	12.5	ns
				50	—	9.1	14.1	1.0	16.0	
			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} t_{pHZ}	$R_L = 1k\Omega$	3.3 ± 0.3	50	—	10.3	14.0	1.0	16.0	ns
			5.0 ± 0.5	50	—	6.7	9.2	1.0	10.5	
Output to Output Skew	t_{osLH} t_{osHL}	(Note 1)	3.3 ± 0.3	50	—	—	1.5	—	1.5	ns
			5.0 ± 0.5	50	—	—	1.0	—	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. $t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$

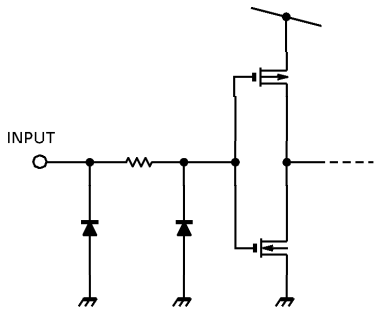
(Note 2) : C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation :

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

NOISE CHARACTERISTICS (Ta = 25°C, Input $t_r = t_f = 3ns$)

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

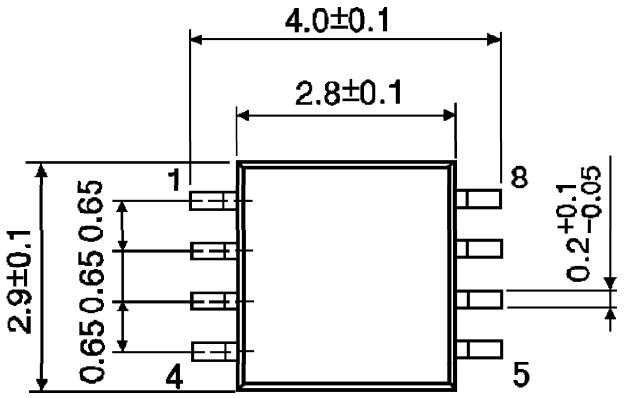
INPUT EQUIVALENT CIRCUIT

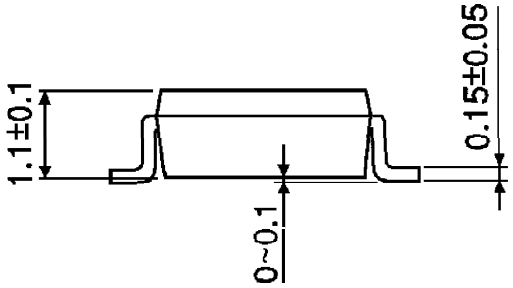


OUTLINE DRAWING

SSOP8-P-0.65

Unit : mm



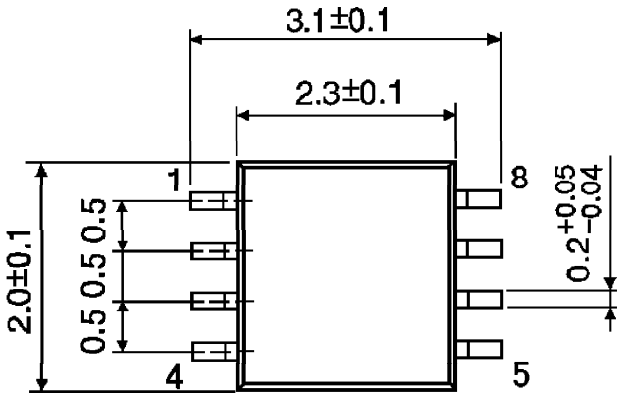


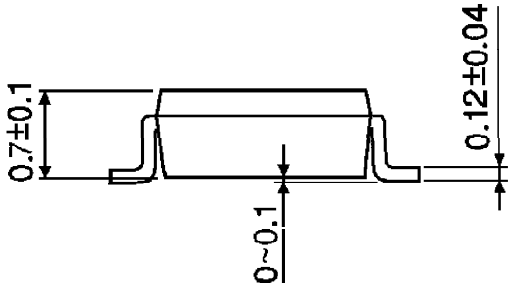
Weight : 0.02g (Typ.)

OUTLINE DRAWING

SSOP8-P-0.50A

Unit : mm





Weight : 0.01g (Typ.)