

TC7WH32FU, TC7WH32FK

Dual 2-Input OR Gate

The TC7WH32 is an advanced high speed CMOS 2-Input OR Gate fabricated with silicon gate CMOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. The internal circuit is composed of 4 stages including buffer output, which provide high noise immunity and stable output. An input protection circuit ensures that 0 to 7 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

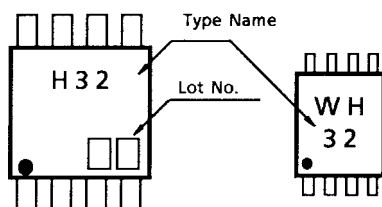
Features

- High speed: $t_{pd} = 3.8 \text{ ns}$ (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)
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2 \sim 5.5 \text{ V}$

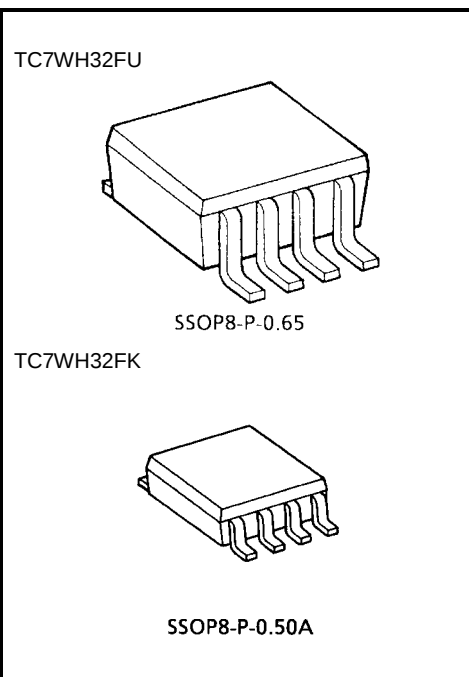
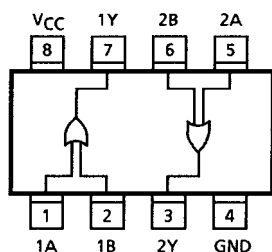
Marking

SM8

US8



Pin Assignment (top view)

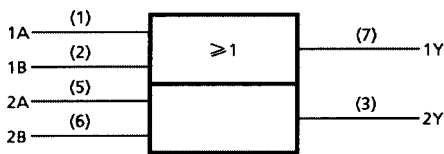


Weight

SSOP8-P-0.65: 0.02 g (typ.)

SSOP8-P-0.50A: 0.01 g (typ.)

Logic Diagram



Truth Table

A	B	Y
H	H	H
L	H	H
H	L	H
L	L	L

Maximum Ratings (Ta = 25°C)

Characteristics	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

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	2.0~5.5	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 ± 0.3 V)	ns/V
		0~20 (V _{CC} = 5 ± 0.5 V)	

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C				Ta = -40~85°C		Unit
				V _{CC} (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V _{IH}	—		2.0	1.50	—	—	1.50	—	V
				3.0~5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—	
Low-level input voltage	V _{IL}	—		2.0	—	—	0.50	—	0.50	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} = -4 mA	3.0	2.58	—	—	2.48	—	
			I _{OH} = -8 mA	4.5	3.94	—	—	3.80	—	
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} = 4 mA	3.0	—	—	0.36	—	0.44	
			I _{OL} = 8 mA	4.5	—	—	0.36	—	0.44	
Input leakage current	I _{IN}	V _{IN} = 5.5 V 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 Characteristics (input: t_r = t_f = 3 ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = −40~85°C		Unit
			VCC (V)	CL (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t _{pLH} t _{pHL}	—	3.3 ± 0.3	15	—	5.5	7.9	1.0	9.5	ns
				50	—	8.0	11.4	1.0	13.0	
			5.0 ± 0.5	15	—	3.8	5.5	1.0	6.5	
				50	—	5.3	7.5	1.0	8.5	
Input capacitance	C _{IN}	—			—	4	10	—	10	pF
Power dissipation capacitance	C _{PD}	(Note)			—	14	—	—	—	pF

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

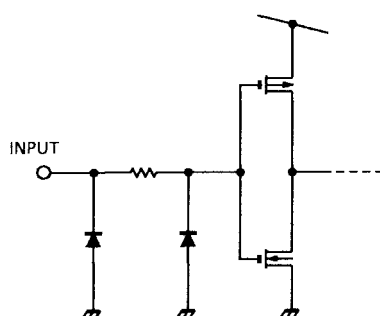
Average operating current can be obtained by the equation:

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

Noise Characteristics (Ta = 25°C, input: tr = tf = 3 ns)

Characteristics	Symbol	Test Condition	V _{CC} (V)	Typ.	Limit	Unit
Quiet output maximum dynamic V _{OL}	V _{OLP}	C _L = 50 pF	5.0	0.3	0.8	V
Quiet output minimum dynamic V _{OL}	V _{OLV}	C _L = 50 pF	5.0	-0.3	-0.8	V
Minimum high level dynamic input voltage	V _{IHD}	C _L = 50 pF	5.0	—	3.5	V
Maximum low level dynamic input voltage	V _{ILD}	C _L = 50 pF	5.0	—	1.5	V

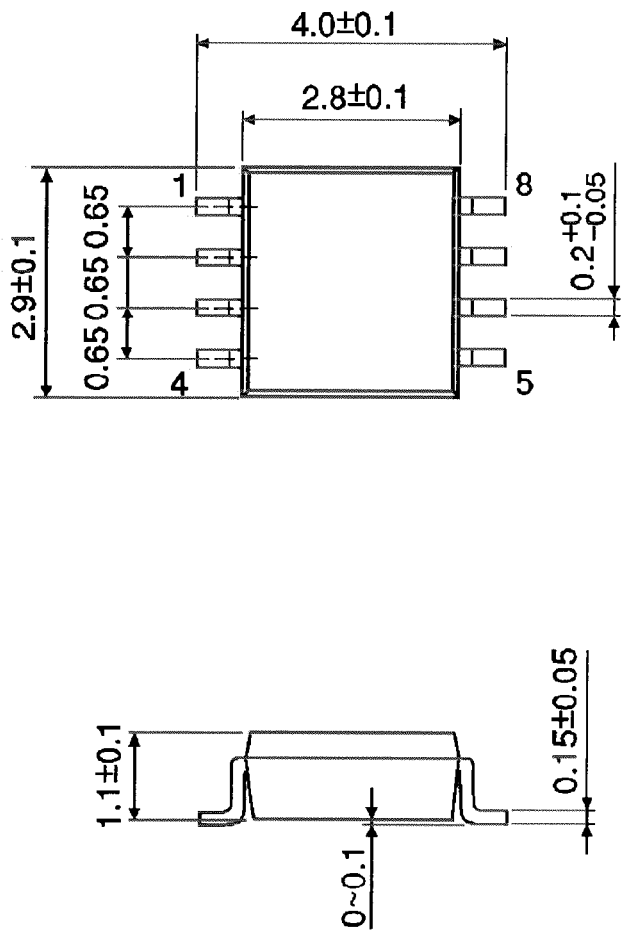
Input Equivalent Circuit



Package Dimensions

SSOP8-P-0.65

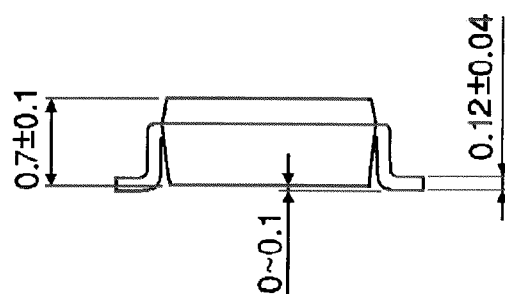
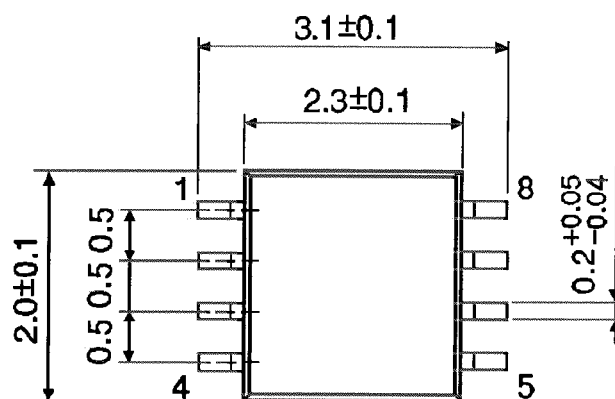
Unit : mm



Weight: 0.02 g (typ.)

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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