

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7WU04F, TC7WU04FU

3 INVERTER

The TC7WU04 is a high speed C²MOS INVERTER fabricated with silicon gate C²MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation.

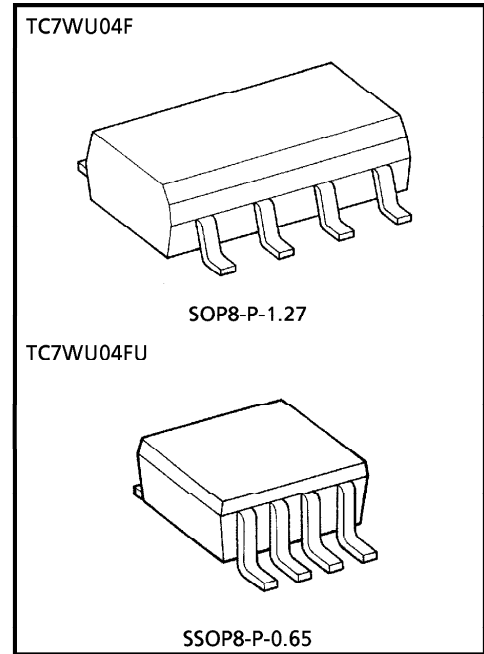
As the internal circuit is composed of single stage inverter, it can be applied for crystal oscillation. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES

- High Speed $t_{pd} = 6\text{ns}$ (Typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation $I_{CC} = 1\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- High Noise Immunity $V_{NIH} = V_{NIL} = 10\% V_{CC}$ (Min.)
- Output Drive Capability 10 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL} = 4\text{mA}$ (Min.)
- Balanced Propagation Delays $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC}(\text{opr}) = 2\sim 6\text{V}$

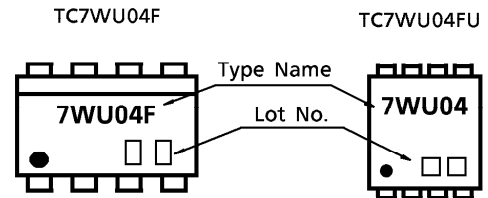
MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	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}	±20	mA
Output Diode Current	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±25	mA
DC V_{CC} /Ground Current	I_{CC}	±25	mA
Power Dissipation	P_D	300	mW
Storage Temperature	T_{stg}	-65~150	°C
Lead Temperature (10s)	T_L	260	°C



Weight SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)

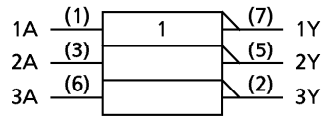
MARKING



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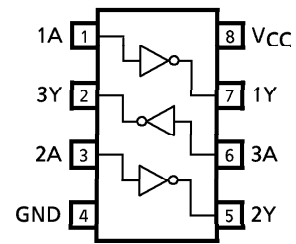
LOGIC DIAGRAM



TRUTH TABLE

A	Y
L	H
H	L

PIN ASSIGNMENT (TOP VIEW)



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	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

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	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	1.7	—	—	1.7	—	V	
			4.5	3.6	—	—	3.6	—		
			6.0	4.8	—	—	4.8	—		
Low-Level Input Voltage	V _{IL}	—	2.0	—	—	0.3	—	0.3	V	
			4.5	—	—	0.9	—	0.9		
			6.0	—	—	1.2	—	1.2		
High-Level Output Voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = -20μA	2.0	1.8	2.0	—	1.8	V	
				4.5	4.0	4.5	—	4.0		—
		V _{IN} = GND	I _{OH} = -4mA I _{OH} = -5.2mA	4.5	4.18	4.31	—	4.13		—
				6.0	5.68	5.80	—	5.63		—
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 20μA	2.0	—	0.0	0.2	—	V	
				4.5	—	0.0	0.5	—		0.5
		V _{IN} = V _{CC}	I _{OL} = 4mA I _{OL} = 5.2mA	4.5	—	0.17	0.26	—		0.33
				6.0	—	0.18	0.26	—		0.33
Input Leakage Current	I _{IN}	V _{IN} = V _{CC} or GND	6.0	—	—	±0.1	—	±1.0	μA	
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND	6.0	—	—	1.0	—	10.0		

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AC ELECTRICAL CHARACTERISTICS ($C_L = 15\text{pF}$, $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C			UNIT
			MIN.	TYP.	MAX.	
Output Transition Time	t_{TLH}	—	—	4	8	ns
	t_{THL}					
Propagation Delay Time	t_{pLH}	—	—	4	8	ns
	t_{pHL}					

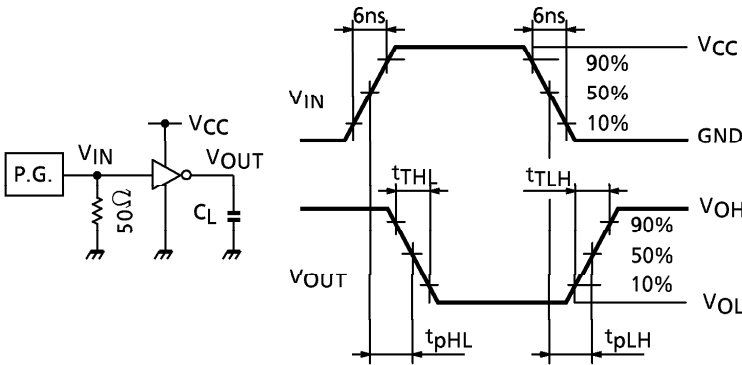
AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT	
			V _{CC}	MIN.	TYP.	MAX.	MIN.		MAX.
Output Transition Time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation Delay Time	t_{pLH} t_{pHL}	—	2.0	—	18	60	—	75	ns
			4.5	—	6	12	—	15	
			6.0	—	5	10	—	13	
Input Capacitance	C_{IN}	—	—	9	15	—	15	pF	
Power Dissipation Capacitance	C_{PD}	(Note 1)	—	13	—	—	—		

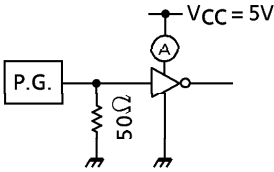
Note 1 : C_{PD} is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit). Average operating current can be obtained by the equation hereunder.

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 3 \text{ (per gate)}$$

**SWITCHING CHARACTERISTICS
TEST CIRCUIT**



**OPERATING CURRENT CONSUMPTION
TEST CIRCUIT**



This input waveform is equal to SWITCHING CHARACTERISTICS TEST CIRCUIT input waveform.