

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7W04F, TC7W04FU, TC7W04FK

3 INVERTERS

The TC7W04 is high speed C²MOS BUFFER fabricated with silicon gate C²MOS technology.

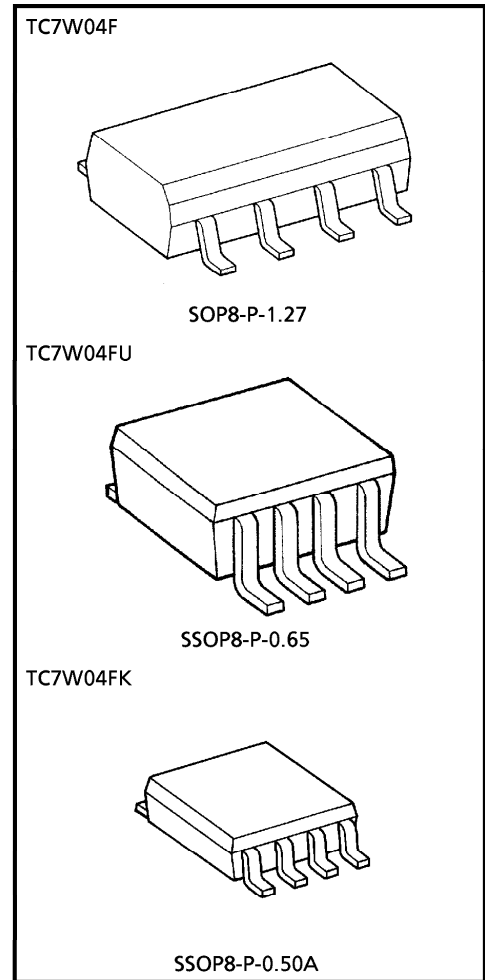
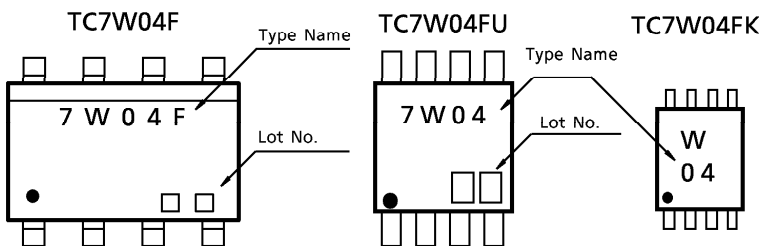
The internal circuit is composed of 3 stage including buffer output, which enable high noise immunity and stable output.

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

FEATURES

- High Speed $t_{pd} = 6ns$ (Typ.) at $V_{CC} = 5V$
- Low Power Dissipation $I_{CC} = 1\mu A$ (Max.) at $T_a = 25^\circ C$
- High Noise Immunity $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Output Drive Capability 10 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL} = 4mA$ (Min.)
- Balanced Propagation Delays $t_{pLH} \cong t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC} (opr) = 2\sim 6V$

MARKING



Weight	
SOP8-P-1.27	: 0.05g (Typ.)
SSOP8-P-0.65	: 0.02g (Typ.)
SSOP8-P-0.50A	: 0.01g (Typ.)

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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 (FM8, SM8)	mW
		200 (US8)	
Storage Temperature	T _{stg}	- 65~150	°C
Lead Temperature (10s)	T _L	260	°C

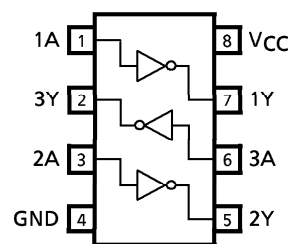
LOGIC DIAGRAM



TRUTH TABLE

A	Y
L	H
H	L

PIN ASSIGNMENT (TOP VIEW)



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	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

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	1.5	—	—	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} = -20μA	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	—	
				4.5	4.18	4.31	—	4.13	—	
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 20μA	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	
				4.5	—	0.17	0.26	—	0.33	
Input Leakage Current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	—	—	±0.1	—	±1.0	μA
				6.0	—	—	1.0	—	10.0	
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND		6.0	—	—	1.0	—	10.0	μA

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, V_{CC} = 5V, Ta = 25°C)

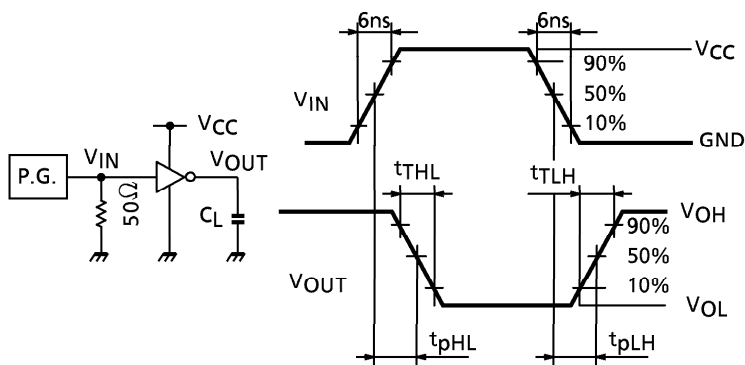
CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C			UNIT
			MIN.	TYP.	MAX.	
Output Transition Time	t _{TLH} t _{THL}	—	—	4	8	ns
Propagation Delay Time	t _{pLH} t _{pHL}	—	—	6	12	ns

AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input t_r = t_f = 6ns)

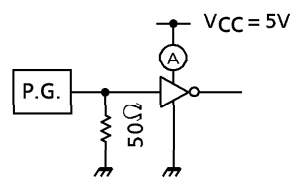
CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{CC}	Ta = 25°C			Ta = -40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t _{TLH} t _{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation Delay Time	t _{pLH} t _{pHL}	—	2.0	—	27	75	—	95	ns
			4.5	—	9	15	—	19	
			6.0	—	8	13	—	16	
Input Capacitance	C _{IN}	—	—	5	10	—	10	pF	
Power Dissipation Capacitance	C _{PD}	(Note 1)	—	20	—	—	—		

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

SWITCHING CHARACTERISTICS TEST CIRCUIT



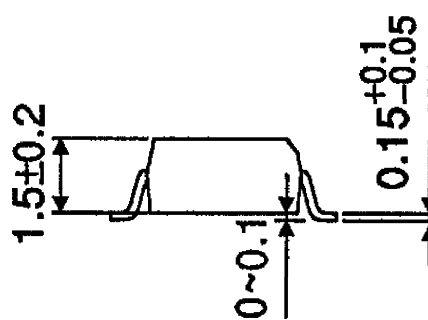
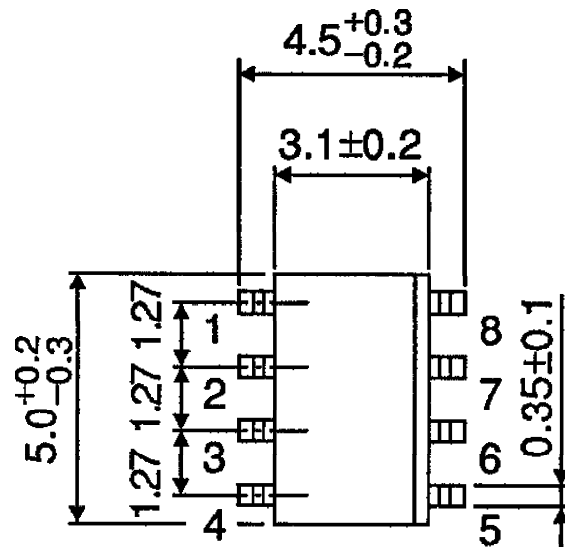
OPERATING CURRENT CONSUMPTION TEST CIRCUIT



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

OUTLINE DRAWING
SOP8-P-1.27

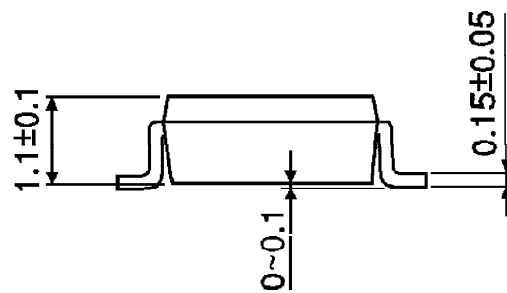
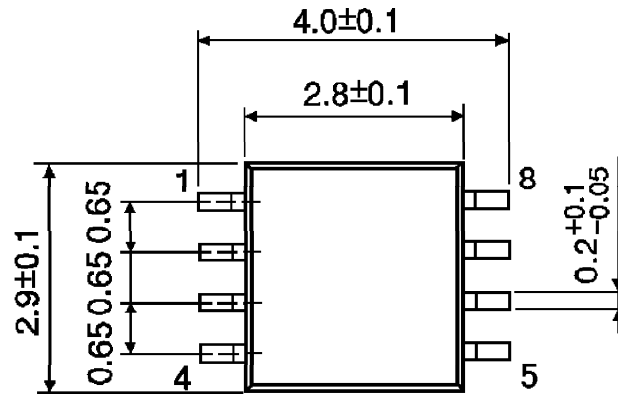
Unit : mm



Weight : 0.05g (Typ.)

OUTLINE DRAWING
SSOP8-P-0.65

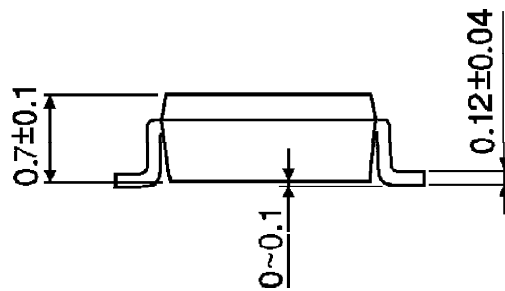
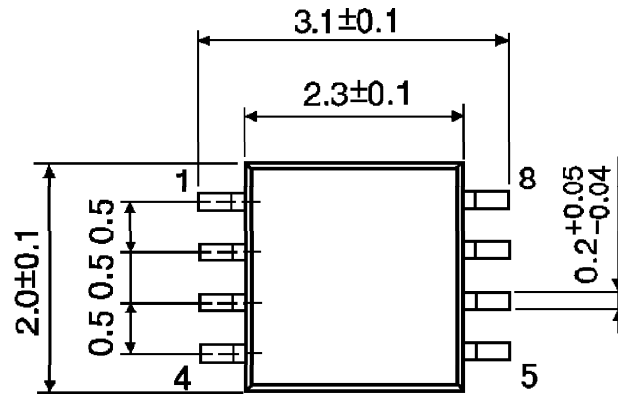
Unit : mm



Weight : 0.02g (Typ.)

OUTLINE DRAWING
SSOP8-P-0.50A

Unit : mm



Weight : 0.01g (Typ.)