

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

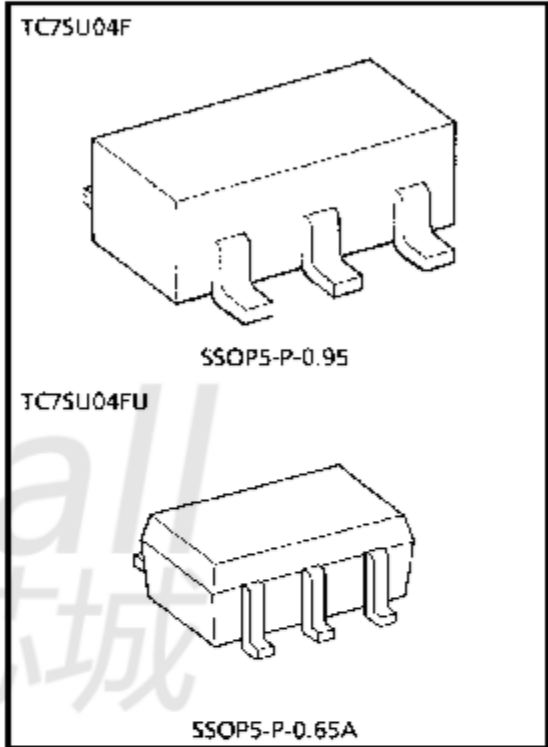
TC7SU04F, TC7SU04FU

INVERTER

The TC7SU04 is a high speed C²MOS INVERTER fabricated with silicon gate C²MOS technology. It achieves high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation. The internal circuit is composed of single stages inverter, it can be applied for crystal oscillation. The input is equipped with protection circuits against static discharge or transient excess voltage. Output currents are 1/2 compared to TC74HC series models.

FEATURES

- High Speed $t_{pd} = 7\text{ns}$ (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 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Output Drive Capability 5 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL} = 2\text{mA}$ (Min.)
- Balanced Propagation Delays $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC}(\text{opr}) = 2\sim 6\text{V}$

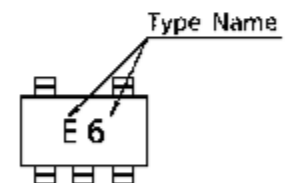


Weight SSOP5-P-0.95 : 0.016g (Typ.)
 SSOP5-P-0.65A : 0.006g (Typ.)

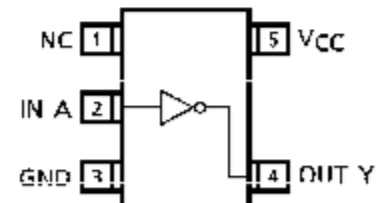
MAXIMUM RATINGS

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}	± 12.5	mA
DC V_{CC} /Ground Current	I_{CC}	± 25	mA
Power Dissipation	P_D	200	mW
Storage Temperature	T_{stg}	-65~150	$^\circ\text{C}$
Lead Temperature (10s)	T_L	260	$^\circ\text{C}$

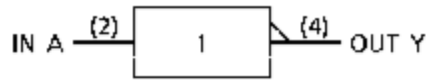
MARKING



PIN ASSIGNMENT (TOP VIEW)



LOGIC DIAGRAM



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	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		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}	$V_{IN} = V_{IL}$	$I_{OH} = -20\mu\text{A}$	2.0	1.8	2.0	—	1.8	—	V
			$I_{OH} = -2\text{mA}$	4.5	4.0	4.5	—	4.0	—	
			$I_{OH} = -2.6\text{mA}$	6.0	5.5	5.9	—	5.5	—	
Low-Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 20\mu\text{A}$	2.0	—	0.0	0.2	—	0.2	V
			$I_{OL} = 2\text{mA}$	4.5	—	0.0	0.2	—	0.5	
			$I_{OL} = 2.6\text{mA}$	6.0	—	0.0	0.5	—	0.5	
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		

Output currents are 1/2 compared to TC74HC series models.

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, Input t_r = t_f = 6ns, V_{CC} = 5V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C			UNIT
			MIN.	TYP.	MAX.	
Output Transition Time	t _{TLH} t _{THL}	—	—	5	10	ns
Propagation Delay Time	t _{pLH} t _{pHL}	—	—	7	15	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	—	50	125	—	155	ns
			4.5	—	14	25	—	31	
			6.0	—	12	21	—	26	
Propagation Delay Time	t _{pLH} t _{pHL}	—	2.0	—	48	100	—	125	ns
			4.5	—	12	20	—	25	
			6.0	—	9	17	—	21	
Input Capacitance	C _{IN}	—	—	5	10	—	10	pF	
Power Dissipation Capacitance	C _{PD}	(Note 1)	—	10	—	—	—		

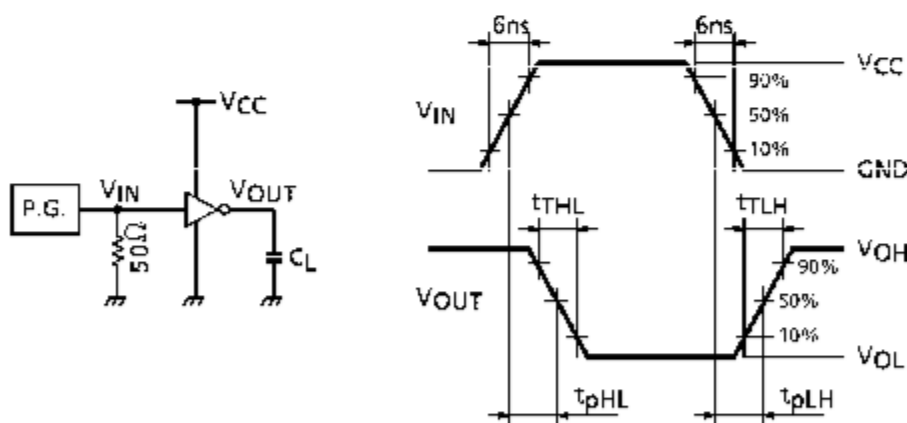
Note 1 : C_{PD} defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).

Average operating current can be obtained by the equation hereunder.

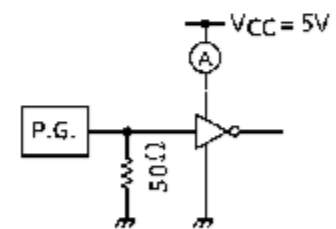
$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

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SWITCHING CHARACTERISTICS TEST CIRCUIT



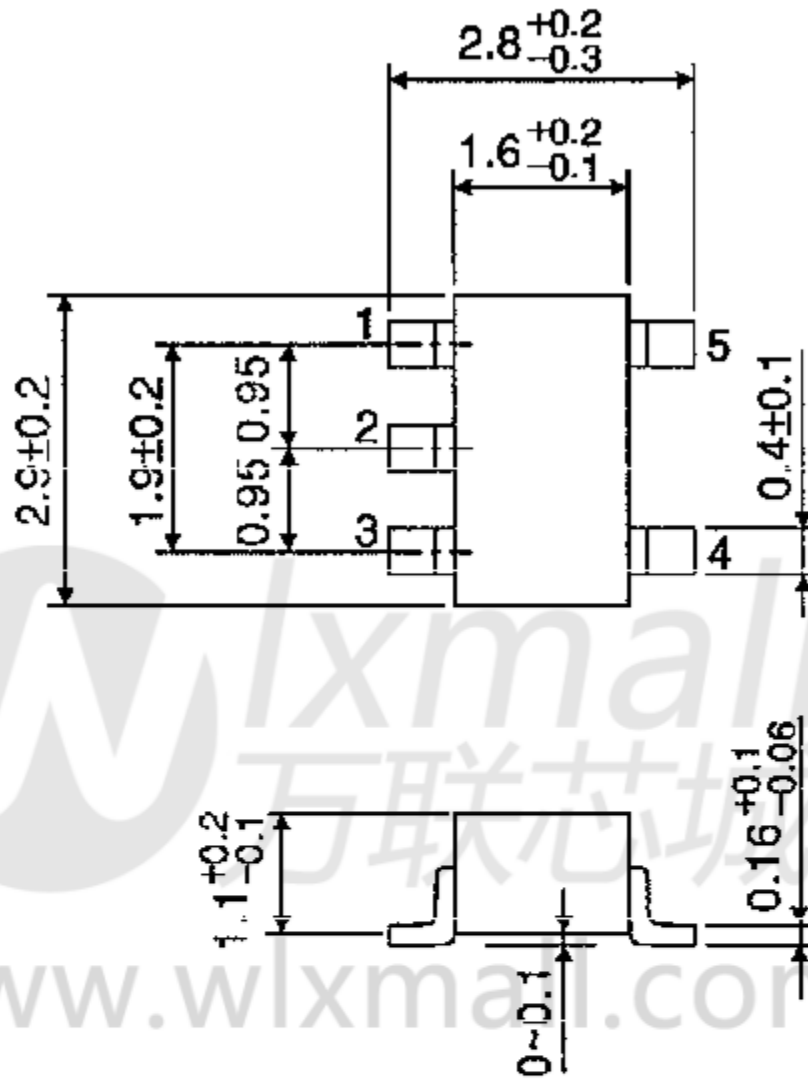
I_{CC(opr)} TEST CIRCUIT



Input waveform is the same as that in case of switching characteristics test.

PACKAGE DIMENSIONS
SSOP5-P-0.95

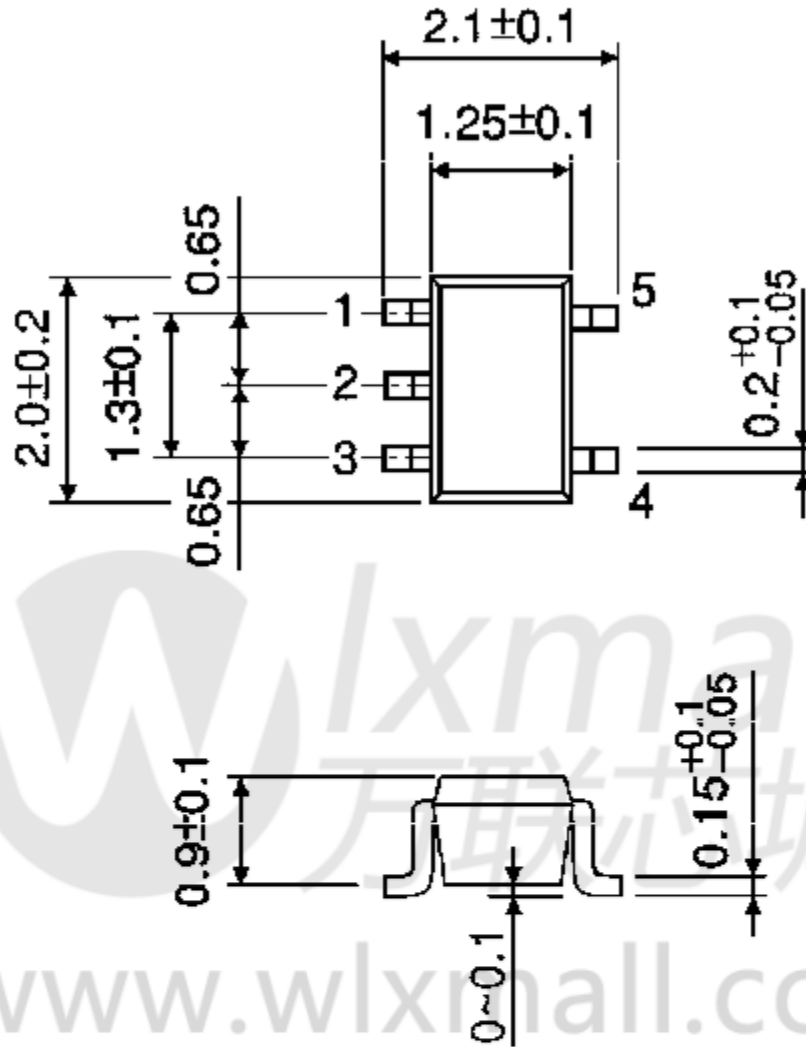
Unit : mm



Weight : 0.016g (Typ.)

PACKAGE DIMENSIONS
SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

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