

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC7SET04F, TC7SET04FU

## INVERTER

The TC7SET04 is an advanced high speed CMOS INVERTER 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 input threshold levels are compatible with TTL output voltage. This device can be used for level converter for interfacing 3V to 5V system.

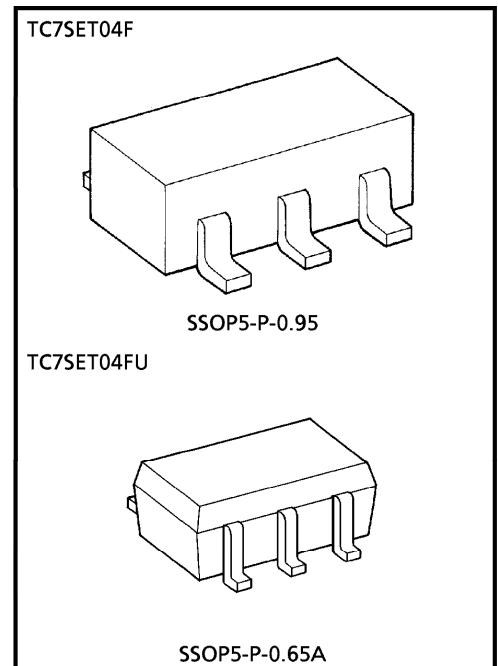
An input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage.

### FEATURES

- High Speed .....  $t_{pd} = 5.0ns$  (Typ.)  
at  $V_{CC} = 5V$
- Low Power Dissipation .....  $I_{CC} = 2\mu A$  (Max.)  
at  $T_a = 25^\circ C$
- Compatible with TTL outputs .....  $V_{IL} = 0.8V$  (Max.)  
 $V_{IH} = 2.0V$  (Min.)
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays .....  $t_{pLH} = t_{pHL}$

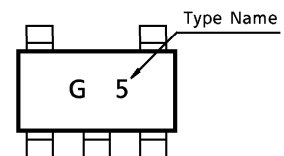
### MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

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	$I_{OK}$	$\pm 20$	mA
DC Output Current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	$\pm 50$	mA
Power Dissipation	$P_D$	200	mW
Storage Temperature	$T_{stg}$	-65~150	$^\circ C$
Lead Temperature (10 s)	$T_L$	260	$^\circ C$



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

### MARKING



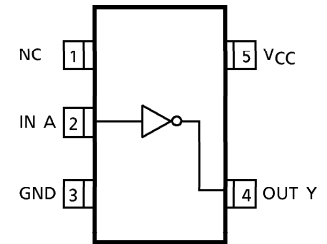
### TRUTH TABLE

A	Y
L	H
H	L

**LOGIC DIAGRAM**



**PIN ASSIGNMENT (TOP VIEW)**



**RECOMMENDED OPERATING CONDITIONS**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	$V_{CC}$	4.5~5.5	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	0~20	ns/V

**DC ELECTRICAL CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40\sim 85^\circ\text{C}$		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Input Voltage	$V_{IH}$		4.5~5.5	2.0	—	—	2.0	—	V	
Low-Level Input Voltage	$V_{IL}$		4.5~5.5	—	—	0.8	—	0.8	V	
High-Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IL}$	$I_{OH} = -50\mu\text{A}$	4.5	4.4	4.5	—	4.4	—	V
			$I_{OH} = -8\text{mA}$	4.5	3.94	—	—	3.80	—	
Low-Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$	$I_{OL} = 50\mu\text{A}$	4.5	—	0.0	0.10	—	0.10	V
			$I_{OL} = 8\text{mA}$	4.5	—	—	0.36	—	0.44	
Input Leakage Current	$I_{IN}$	$V_{IN} = 5.5\text{V}$ or GND	0~5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	2.0	—	20.0	$\mu\text{A}$	
	$I_{CCT}$	PER INPUT : $V_{IN} = 3.4\text{V}$ OTHER INPUT : $V_{CC}$ or GND	5.5	—	—	1.35	—	1.50	mA	

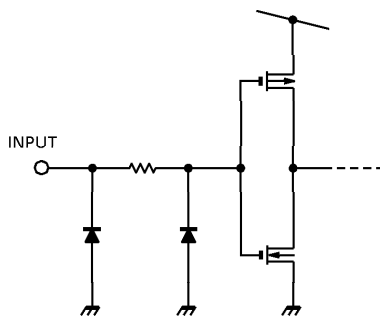
**AC ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 3\text{ns}$ )**

CHARACTERISTIC	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = -40~85°C		UNIT
		VCC (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	tPLH	5.0 ± 0.5	15	—	5.0	7.0	1.0	8.0	ns
	tPHL		50	—	8.0	10.5	1.0	12.0	
Input Capacitance	CIN			—	4	10	—	10	pF
Power Dissipation Capacitance	CpD	(Note 1)		—	17	—	—	—	

(Note 1) : CpD 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 :  

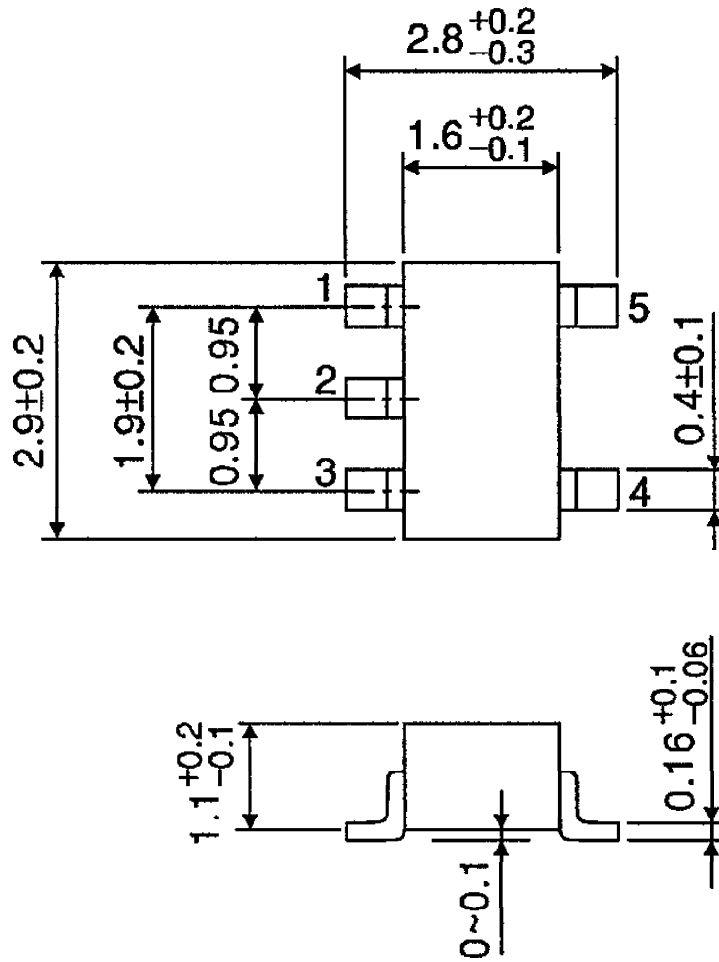
$$I_{CC (opr)} = C_{pD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

**INPUT EQUIVALENT CIRCUIT**



**PACKAGE DIMENSIONS**  
SSOP5-P-0.95

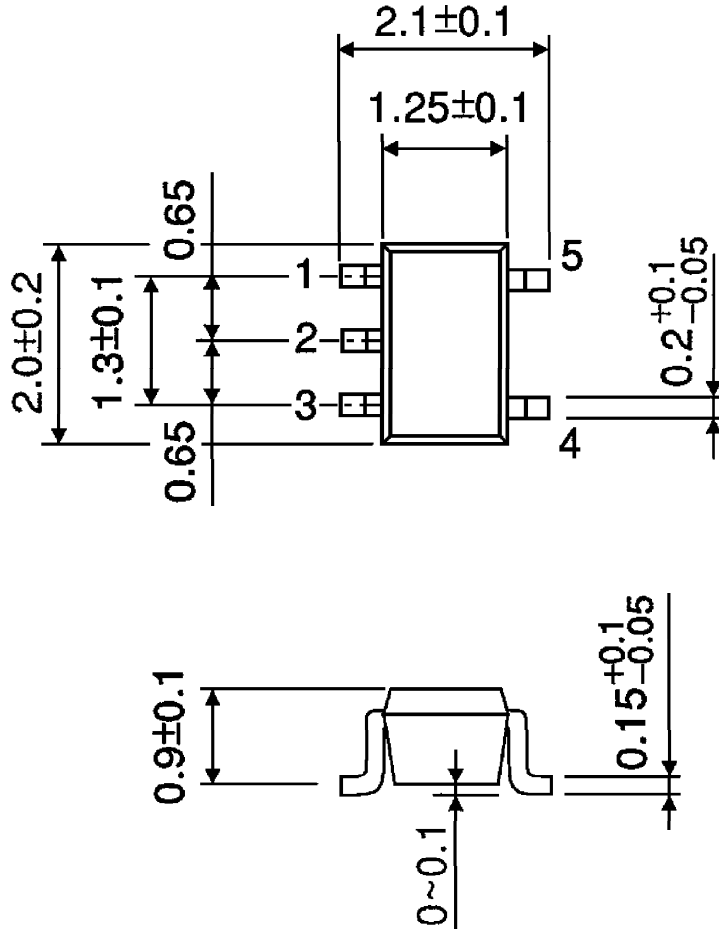
Unit : mm



Weight : 0.016g (Typ.)

PACKAGE DIMENSIONS  
SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)

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