TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TC7SET08F, TC7SET08FU

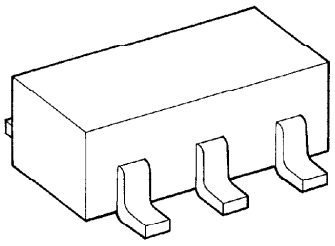
## 2-INPUT AND GATE

The TC7SET08 is an advanced high speed CMOS 2-INPUT AND 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 input threshold levels are compatible with TTL output voltage. This device can be used for level converter for interfacing 3V to 5V system.

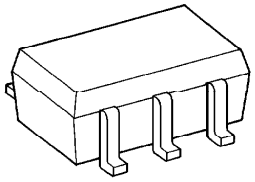
An input protection circuit ensures that 0V to 7V can be applied to the input pins without regard to the supply voltage.

TC7SET08F



SSOP5-P-0.95

TC7SET08FU



SSOP5-P-0.65A

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

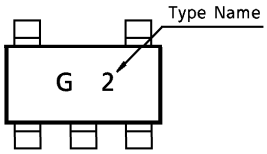
### FEATURES

- High Speed ····· $t_{pd}$ = 5.0ns (Typ.) at $V_{CC}$ = 5V
- Low Power Dissipation ····· $I_{CC}$ = 2$\mu$A (Max.) at Ta = 25°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 ····· $t_{pLH} \fallingdotseq t_{pHL}$

### MAXIMUM RATINGS (Ta = 25°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 | $I_{OK}$ | ±20 | mA |
| DC Output Current | $I_{OUT}$ | ±25 | mA |
| DC $V_{CC}$/Ground Current | $I_{CC}$ | ±50 | mA |
| Power Dissipation | $P_D$ | 200 | mW |
| Storage Temperature | $T_{stg}$ | −65~150 | °C |
| Lead Temperature (10 s) | $T_L$ | 260 | °C |

### MARKING



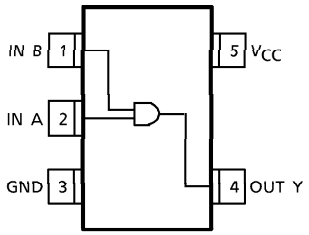

### TRUTH TABLE

| A | B | Y |
|---|---|---|
| L | L | L |
| L | H | L |
| H | L | L |
| H | H | H |

961001EBA2

## 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 | $V_{OUT}$ | 0~5.5 | 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) | Ta = 25°C MIN. | Ta = 25°C TYP. | Ta = 25°C MAX. | Ta = −40~85°C MIN. | Ta = −40~85°C MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | $V_{OH}$ | $V_{IN} = V_{IH}$ | $I_{OH} = -50\mu A$ | 4.5 | 4.4 | 4.5 | — | 4.4 | — | V |
| | | | $I_{OH} = -8mA$ | 4.5 | 3.94 | — | — | 3.80 | — | |
| Low-Level Output Voltage | $V_{OL}$ | $V_{IN} = V_{IH}$ or $V_{IL}$ | $I_{OL} = 50\mu A$ | 4.5 | — | 0.0 | 0.10 | — | 0.10 | V |
| | | | $I_{OL} = 8mA$ | 4.5 | — | — | 0.36 | — | 0.44 | |
| Input Leakage Current | $I_{IN}$ | $V_{IN} = 5.5V$ 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 |
| | $I_{CCT}$ | PER INPUT :$V_{IN} = 3.4V$<br>OTHER INPUT:$V_{CC}$ or GND | | 5.5 | — | — | 1.35 | — | 1.50 | mA |

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**AC ELECTRICAL CHARACTERISTICS** (Input $t_r = t_f = 3ns$)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | | | Ta = 25°C | | | Ta = −40~85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{CC}$ (V) | $C_L$ (pF) | MIN. | TYP. | MAX. | MIN. | MAX. | |
| Propagation Delay Time | $t_{PLH}$ | | 5.0 ± 0.5 | 15 | — | 5.0 | 6.9 | 1.0 | 8.0 | ns |
| | $t_{PHL}$ | | | 50 | — | 5.5 | 7.9 | 1.0 | 9.0 | |
| Input Capacitance | $C_{IN}$ | | | | — | 4 | 10 | — | 10 | pF |
| Power Dissipation Capacitance | $C_{PD}$ | (Note 1) | | | — | 17 | — | — | — | |

(Note 1) : $C_{PD}$ 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 :

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

**INPUT EQUIVALENT CIRCUIT**