

## Features

- Power voltage range : 2.0 ~ 6.0V
- Operation temp. range : -40 ~ +85°C
- $|I_{OH}| = I_{OL} = 2\text{mA}$  (min)
- ESD Protection Exceeds ESD 22
  - 2000-V Human-Body Model (A114-A)
  - 1000-V Charged-Device Model (C101)
- SOT23-5 Package Available

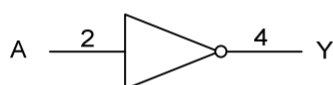
## General Description

TC7S08F are CMOS 2-input AND gate ICs. They realize a high speed operation similar to LS-TTL with a lower power consumption by CMOS features. An inner circuit structure of 3-stages logic gates obtains wider noise immunity and constant output.

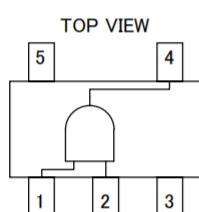
## Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
  - PCs, Networking, Notebooks, Netbooks, PDAs
  - Tablet Computers, E-readers
  - Computer Peripherals, Hard Drives, CD/DVD ROM
  - TV, DVD, DVR, Set-Top Box
  - Cell Phones, Personal Navigation / GPS
  - MP3 Players, Cameras, Video Recorders

## Logic Diagram



## Pin Configuration



SOT23-5

Marking : E2

## Function Table

| Pin No. | Pin Name |
|---------|----------|
| 1       | INB      |
| 2       | INA      |
| 3       | GND      |
| 4       | OUTX     |
| 5       | VCC      |

| Input |      | Output |
|-------|------|--------|
| INA   | INB  | OUTX   |
| Low   | Low  | Low    |
| Low   | High | Low    |
| High  | Low  | Low    |
| High  | High | High   |

## Maximum Absolute Ratings

| Parameter                      | Symbol    | Value        | Units |
|--------------------------------|-----------|--------------|-------|
| Power Voltage                  | VCC       | -0.5~+7.0    | V     |
| Input Voltage                  | VIN       | -0.5~VCC+0.5 | V     |
| Output Voltage                 | VOUT      | -0.5~VCC+0.5 | V     |
| Input Protection Diode Current | IIK       | ±20          | mA    |
| Output Parasitic Diode Current | IOK       | ±20          | mA    |
| Output Current                 | IOUT      | ±25          | mA    |
| VCC/GND Current                | ICC, IGND | ±25          | mA    |
| Power Dissipation              | Pd        | 200          | mW    |
| Storage Temp.                  | Tstg      | -65~+150     | °C    |

## Suggested Operating Condition

| Parameter                | Symbol           | Value                                                     | Units |
|--------------------------|------------------|-----------------------------------------------------------|-------|
| Power Voltage            | VCC              | 2.0~6.0                                                   | V     |
| Input Voltage            | VIN              | 0~VCC                                                     | V     |
| Output Voltage           | VOU <sub>T</sub> | 0~VCC                                                     | V     |
| Operating Temp.          | Top              | -40~+85                                                   | °C    |
| High-input,<br>Down-time | tr,tf            | 0~1000 (VCC=2.0V)<br>0~500 (VCC=4.5V)<br>0~400 (VCC=6.0V) | ns    |

## DC Electrical Characteristics

| Parameter      | Sym.           | VCC | Top = 25°C |      |      | Top = -40~+85°C |      | Units | Conditions      |                  |  |
|----------------|----------------|-----|------------|------|------|-----------------|------|-------|-----------------|------------------|--|
|                |                |     | Min.       | Typ. | Max. | Min.            | Max. |       |                 |                  |  |
| Input Voltage  | VIH            | 2.0 | 1.5        | -    | -    | 1.5             | -    | V     |                 |                  |  |
|                |                | 4.5 | 3.15       | -    | -    | 3.15            | -    |       |                 |                  |  |
|                |                | 6.0 | 4.2        | -    | -    | 4.2             | -    |       |                 |                  |  |
|                | VIL            | 2.0 | -          | -    | 0.5  | -               | 0.5  | V     |                 |                  |  |
|                |                | 4.5 | -          | -    | 1.35 | -               | 1.35 |       |                 |                  |  |
|                |                | 6.0 | -          | -    | 1.8  | -               | 1.8  |       |                 |                  |  |
| Output Voltage | VOH            | 2.0 | 1.9        | 2.0  | -    | 1.9             | -    | V     | VIN= VIH        | IOH = -20 μA     |  |
|                |                | 4.5 | 4.4        | 4.5  | -    | 4.4             | -    |       |                 |                  |  |
|                |                | 6.0 | 5.9        | 6.0  | -    | 5.9             | -    |       |                 |                  |  |
|                |                | 4.5 | 4.18       | 4.36 | -    | 4.13            | -    |       |                 |                  |  |
|                |                | 6.0 | 5.68       | 5.83 | -    | 5.63            | -    |       |                 |                  |  |
|                | VOL            | 2.0 | -          | 0.0  | 0.1  | -               | 0.1  | V     | VIN= VIH or VIL | IOL = 20 μA      |  |
|                |                | 4.5 | -          | 0.0  | 0.1  | -               | 0.1  |       |                 |                  |  |
|                |                | 6.0 | -          | 0.0  | 0.1  | -               | 0.1  |       |                 |                  |  |
|                |                | 4.5 | -          | 0.12 | 0.26 | -               | 0.33 |       |                 |                  |  |
|                |                | 6.0 | -          | 0.13 | 0.26 | -               | 0.33 |       |                 |                  |  |
|                | Input Current  | IIN | 6.0        | -0.1 | -    | 0.1             | -1.0 | 1.0   | μA              | VIN = VCC or GND |  |
|                | Static Current | ICC | 6.0        | -    | -    | 1.0             | -    | 10.0  | μA              | VIN = VCC or GND |  |

## AC Electrical Characteristics

(CL=15pF, tr=tf=6ns, VCC=5V)

| Parameter                 | Sym. | Top = 25°C |      |      | Units | Conditions                         |
|---------------------------|------|------------|------|------|-------|------------------------------------|
|                           |      | Min.       | Typ. | Max. |       |                                    |
| High Output<br>Down-time  | tTLH | -          | 4    | 10   | ns    | Refer to following<br>test circuit |
|                           | tTHL | -          | 3    | 10   |       |                                    |
| Propagation<br>Delay-time | tPLH | -          | 4    | 15   | ns    | Refer to following<br>test circuit |
|                           | tPHL | -          | 5    | 15   |       |                                    |

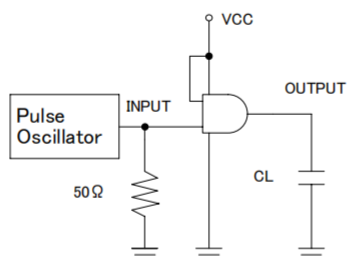
(CL=50pF, tr=tf=6ns)

| Parameter                 | Sym. | VCC | Top = 25°C |      |      | Top = -40~+85°C |      | Units | Conditions               |
|---------------------------|------|-----|------------|------|------|-----------------|------|-------|--------------------------|
|                           |      |     | Min.       | Typ. | Max. | Min.            | Max. |       |                          |
| High-Output<br>Down-time  | tTLH | 2.0 | -          | 21   | 125  | -               | 155  | ns    | Refer to<br>test circuit |
|                           |      | 4.5 | -          | 7    | 25   | -               | 31   |       |                          |
|                           |      | 6.0 | -          | 6    | 21   | -               | 26   |       |                          |
|                           | tTHL | 2.0 | -          | 18   | 125  | -               | 155  | ns    |                          |
|                           |      | 4.5 | -          | 6    | 25   | -               | 31   |       |                          |
|                           |      | 6.0 | -          | 6    | 21   | -               | 26   |       |                          |
| Propagation<br>Delay-time | tPLH | 2.0 | -          | 16   | 100  | -               | 125  | ns    | Refer to<br>test circuit |
|                           |      | 4.5 | -          | 6    | 20   | -               | 25   |       |                          |
|                           |      | 6.0 | -          | 5    | 17   | -               | 21   |       |                          |
|                           | tPHL | 2.0 | -          | 17   | 100  | -               | 125  | ns    |                          |
|                           |      | 4.5 | -          | 8    | 20   | -               | 25   |       |                          |
|                           |      | 6.0 | -          | 7    | 17   | -               | 21   |       |                          |
| Input Capacity            | CIN  | -   | -          | 5    | 10   | -               | 10   | pF    |                          |
| Equivalent Inner Capacity | CPD  | -   | -          | 10   | -    | -               | -    | pF    |                          |

\* CPD is IC's inner equivalent capacity which is calculated from non-loaded operating current consumption referred to following test circuit. Averaged operating current consumption at non-load is calculated as following formula;

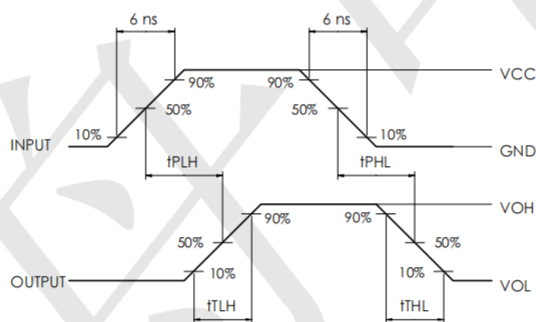
$$ICC (opr) = CPD \cdot VCC \cdot f_{IN} + ICC$$

## Test Circuit And Waveforms



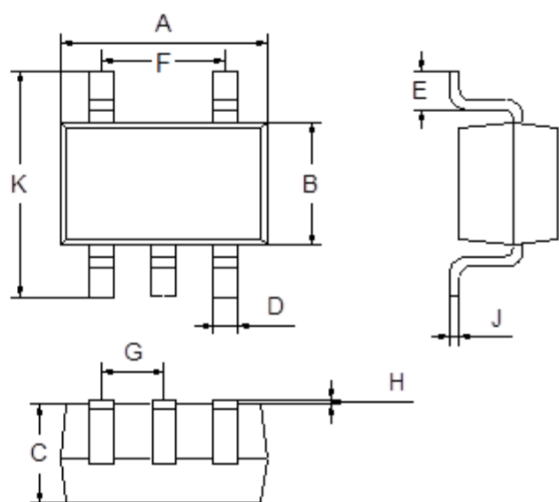
\* Output should be opened when measuring current consumption.

## Measured Wave Pattern



**Package Outline Dimensions** (Unit: mm)

SOT23-5



| Dimension | Min. | Max. |
|-----------|------|------|
| A         | 2.80 | 3.00 |
| B         | 1.50 | 1.70 |
| C         | 1.00 | 1.20 |
| D         | 0.35 | 0.45 |
| E         | 0.35 | 0.55 |
| F         | 1.80 | 2.00 |
| G         | 0.90 | 1.00 |
| H         | 0.02 | 0.10 |
| J         | 0.10 | 0.20 |
| K         | 2.60 | 3.00 |

**Mounting Pad Layout** (Unit: mm)

