



## U7SH02

CMOS IC

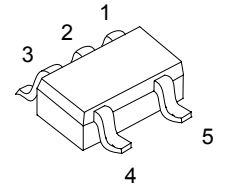
### 2-INPUT NOR GATE

#### DESCRIPTION

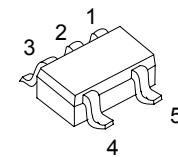
The U7SH02 is a 2-input NOR gate, it provides the function  $Y = \overline{A+B}$   
This device has power-down protective circuit, preventing device destruction when it is powered down.

#### FEATURES

- \* Operation voltage range: 2~5.5V
- \* Low power dissipation:  $I_{CC}=2\mu A(\text{Max})$
- \* High speed:  $t_{pd}=3.8ns(\text{Typ})$
- \* High noise immunity
- \* Power down protection



SOT-25



SOT-353

\*Pb-free plating product number: U7SH02L

#### ORDERING INFORMATION

| Order Number |                   | Package | Packing   |
|--------------|-------------------|---------|-----------|
| Normal       | Lead Free Plating |         |           |
| U7SH02-AF5-R | U7SH02L-AF5-R     | SOT-25  | Tape Reel |
| U7SH02-AL5-R | U7SH02L-AL5-R     | SOT-353 | Tape Reel |

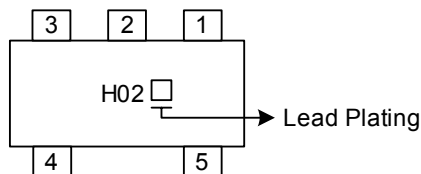
U7SH02L-AF5-R



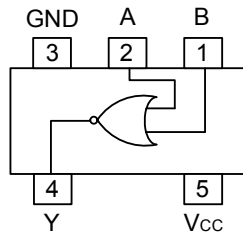
- (1)Packing Type
- (2)Package Type
- (3)Lead Plating

- (1) R: Tape Reel
- (2) AF5: SOT-25, AL5: SOT-353
- (3) L: Lead Free Plating, Blank: Pb/Sn

#### MARKING



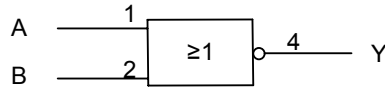
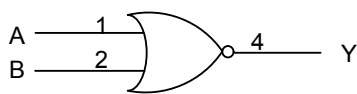
## ■ PIN CONFIGURATION



## ■ FUNCTION TABLE (each gate)

| INPUT |   | OUTPUT |
|-------|---|--------|
| A     | B | Y      |
| L     | L | H      |
| L     | H | L      |
| H     | L | L      |
| H     | H | L      |

## ■ LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATINGS (unless otherwise specified)(Note 1)

| PARAMETER               | SYMBOL    | RATINGS            | UNIT |
|-------------------------|-----------|--------------------|------|
| Supply Voltage          | $V_{CC}$  | -0.5~7             | V    |
| Input Voltage           | $V_{IN}$  | -0.5~7             | V    |
| Output Voltage          | $V_{OUT}$ | -0.5~ $V_{CC}+0.5$ | V    |
| Input Clamp Current     | $I_{IK}$  | -20                | mA   |
| Output Clamp Current    | $I_{OK}$  | ±20                | mA   |
| Output Current          | $I_{OUT}$ | ±25                | mA   |
| $V_{CC}$ or GND Current | $I_{CC}$  | ±50                | mA   |
| Power Dissipation       | $P_D$     | 200                | mW   |
| Storage Temperature     | $T_{STG}$ | -65 ~ +150         | °C   |

Note 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER                          | SYMBOL              | CONDITIONS        | MIN | TYP | MAX      | UNIT |
|------------------------------------|---------------------|-------------------|-----|-----|----------|------|
| Supply Voltage                     | $V_{CC}$            |                   | 2   |     | 5.5      | V    |
| Input Voltage                      | $V_{IN}$            |                   | 0   |     | 5.5      | V    |
| Output Voltage                     | $V_{OUT}$           |                   | 0   |     | $V_{CC}$ | V    |
| Input Transition Rise or Fall Rate | $\Delta t/\Delta v$ | $V_{CC}=3.3+0.3V$ |     |     | 100      | ns/V |
|                                    |                     | $V_{CC}=5.0+0.5V$ |     |     | 20       |      |
| Operating Temperature              | $T_A$               |                   | -40 |     | 85       | °C   |

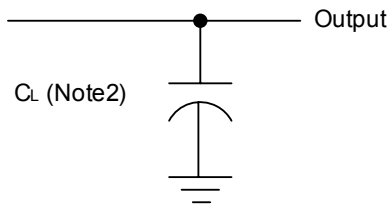
■ STATIC CHARACTERISTICS ( $T_a=25\text{ }^{\circ}\text{C}$ )

| PARAMETER                 | SYMBOL        | TEST CONDITIONS                                  | MIN  | TYP | MAX  | UNIT |
|---------------------------|---------------|--------------------------------------------------|------|-----|------|------|
| High-Level Input Voltage  | $V_{IH}$      | $V_{CC}=2.0V$                                    | 1.5  |     |      | V    |
|                           |               | $V_{CC}=3.0V$                                    | 2.1  |     |      |      |
|                           |               | $V_{CC}=5.5V$                                    | 3.85 |     |      |      |
| Low-Level Input Voltage   | $V_{IL}$      | $V_{CC}=2.0V$                                    |      |     | 0.5  | V    |
|                           |               | $V_{CC}=3.0V$                                    |      |     | 0.9  |      |
|                           |               | $V_{CC}=5.5V$                                    |      |     | 1.65 |      |
| High-Level Output Voltage | $V_{OH}$      | $V_{CC}=2.0V, I_{OH}=-50\mu A$                   | 1.9  | 2.0 |      | V    |
|                           |               | $V_{CC}=3.0V, I_{OH}=-50\mu A$                   | 2.9  | 3.0 |      |      |
|                           |               | $V_{CC}=4.5V, I_{OH}=-50\mu A$                   | 4.4  | 4.5 |      |      |
|                           |               | $V_{CC}=3.0V, I_{OH}=-4mA$                       | 2.58 |     |      |      |
|                           |               | $V_{CC}=4.5V, I_{OH}=-8mA$                       | 3.94 |     |      |      |
| Low-Level Output Voltage  | $V_{OL}$      | $V_{CC}=2.0V, I_{OL}=50\mu A$                    |      |     | 0.1  | V    |
|                           |               | $V_{CC}=3.0V, I_{OL}=50\mu A$                    |      |     | 0.1  |      |
|                           |               | $V_{CC}=4.5V, I_{OL}=50\mu A$                    |      |     | 0.1  |      |
|                           |               | $V_{CC}=3.0V, I_{OH}=4mA$                        |      |     | 0.36 |      |
|                           |               | $V_{CC}=4.5V, I_{OH}=8mA$                        |      |     | 0.36 |      |
| Input Leakage Current     | $I_{I(LEAK)}$ | $V_{CC}=0V\sim 5.5V, V_{IN}=V_{CC}$ or GND       |      |     | ±0.1 | μA   |
| Quiescent Supply Current  | $I_Q$         | $V_{CC}=5.5V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$ |      |     | 2    | μA   |
| Input Capacitance         | $C_{IN}$      | $V_{CC}=5V, V_{IN}=V_{CC}$ or GND                |      | 4   | 10   | pF   |

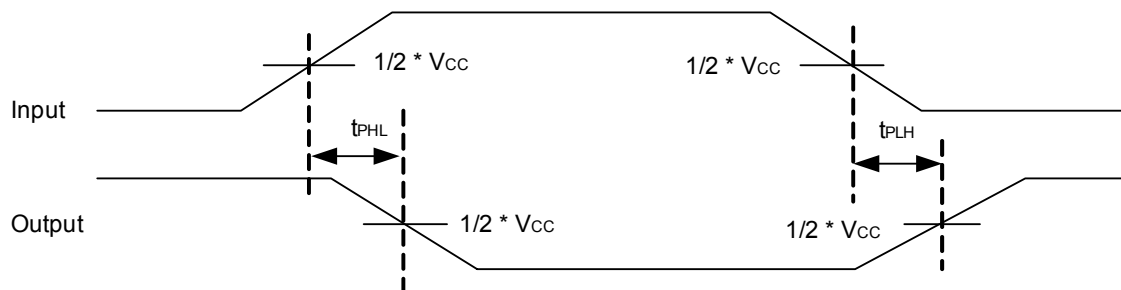
■ DYNAMIC CHARACTERISTICS (Ta=25 °C, Input: t<sub>R</sub>, t<sub>F</sub>=3ns)

| PARAMETER                                          | SYMBOL           | TEST CONDITIONS                                   | MIN | TYP | MAX  | UNIT |
|----------------------------------------------------|------------------|---------------------------------------------------|-----|-----|------|------|
| Propagation delay from input (A or B) to output(Y) | t <sub>PLH</sub> | V <sub>CC</sub> =3.3V±0.3V, C <sub>L</sub> =15 pF |     | 5.5 | 7.9  | ns   |
|                                                    | t <sub>PHL</sub> |                                                   |     | 5.5 | 7.9  |      |
|                                                    | t <sub>PLH</sub> | V <sub>CC</sub> =3.3V±0.3V, C <sub>L</sub> =50 pF |     | 8.0 | 11.4 |      |
|                                                    | t <sub>PHL</sub> |                                                   |     | 8.0 | 11.4 |      |
| Propagation delay from input (A or B) to output(Y) | t <sub>PLH</sub> | V <sub>CC</sub> = 5V±0.5V, C <sub>L</sub> =15 pF  |     | 3.8 | 5.5  | ns   |
|                                                    | t <sub>PHL</sub> |                                                   |     | 3.8 | 5.5  |      |
|                                                    | t <sub>PLH</sub> | V <sub>CC</sub> = 5V±0.5V, C <sub>L</sub> =50 pF  |     | 5.3 | 10   |      |
|                                                    | t <sub>PHL</sub> |                                                   |     | 5.3 | 10   |      |
| OPERATING CHARACTERISTICS                          |                  |                                                   |     |     |      |      |
| Power Dissipation Capacitance                      | Cpd              | No load                                           |     | 15  |      | pF   |

## ■ TEST CIRCUIT AND WAVEFORM



Note 2:  $C_L$  includes probe and jig capacitance.



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