



## U74LVC1G08

CMOS IC

### 2-INPUT AND GATE

#### DESCRIPTION

The **U74LVC1G08** is a 2-input AND gate which provides the Function  $Y=A \times B$ .

This device has power-down protective circuit to prevent device from destruction when it is powered down.

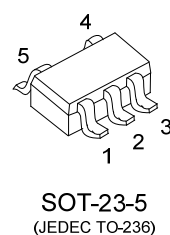
#### FEATURES

\* Operation Voltage Range: 1.65V ~ 5.5V

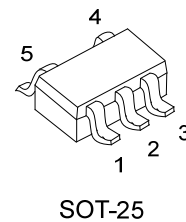
\* Low Power Current:  $I_{CC}=10\mu A$  (Max.)

\*  $\pm 24mA$  Output Drive ( $V_{CC}=3.0V$ )

\* Power Down Protection



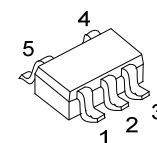
SOT-23-5  
(JEDEC TO-236)



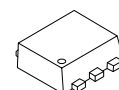
SOT-25



X2DFN1010-6



SOT-353

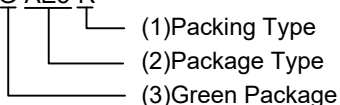


SOT-553

#### ORDERING INFORMATION

| Ordering Number          |                          | Package     | Packing   |
|--------------------------|--------------------------|-------------|-----------|
| Lead Free                | Halogen Free             |             |           |
| U74LVC1G08L-AE5-R        | U74LVC1G08G-AE5-R        | SOT-23-5    | Tape Reel |
| U74LVC1G08L-AF5-R        | U74LVC1G08G-AF5-R        | SOT-25      | Tape Reel |
| U74LVC1G08L-AL5-R        | U74LVC1G08G-AL5-R        | SOT-353     | Tape Reel |
| U74LVC1G08L-AN5-R        | U74LVC1G08G-AN5-R        | SOT-553     | Tape Reel |
| U74LVC1G08L-K06-1010X2-R | U74LVC1G08G-K06-1010X2-R | X2DFN1010-6 | Tape Reel |

U74LVC1G08G-AE5-R



(1) R: Tape Reel

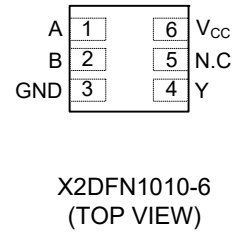
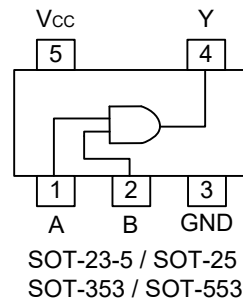
(2) AE5: SOT-23-5, AF5: SOT-25, AL5: SOT-353  
AN5: SOT-553, K06-1010X2: X2DFN1010-6

(3) G: Halogen Free and Lead Free, L: Lead Free

#### MARKING

| SOT-23-5 / SOT-25 / SOT-353 / SOT-553 | X2DFN1010-6 |
|---------------------------------------|-------------|
|                                       |             |

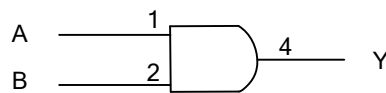
## PIN CONFIGURATION



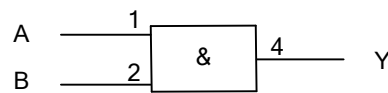
## FUNCTION TABLE (each gate)

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

## LOGIC DIAGRAM (positive logic)



Logic symbol



IEC logic symbol

■ ABSOLUTE MAXIMUM RATING ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified) (Note 2)

| PARAMETER                          | SYMBOL    | TEST CONDITIONS                 | RATINGS             | UNIT               |
|------------------------------------|-----------|---------------------------------|---------------------|--------------------|
| Supply Voltage                     | $V_{CC}$  |                                 | -0.5 ~ 6.5          | V                  |
| Input Voltage                      | $V_{IN}$  |                                 | -0.5 ~ 6.5          | V                  |
| Output Voltage                     | $V_{OUT}$ | Output in the high or low state | -0.5 ~ $V_{CC}+0.5$ | V                  |
|                                    |           | Output in the power-off state   | -0.5 ~ 6.5          | V                  |
| Continuous $V_{CC}$ or GND Current | $I_{CC}$  |                                 | $\pm 100$           | mA                 |
| Continuous Output Current          | $I_{OUT}$ |                                 | $\pm 50$            | mA                 |
| Input Clamp Current                | $I_{IK}$  | $V_{IN}<0$                      | -50                 | mA                 |
| Output Clamp Current               | $I_{OK}$  | $V_{OUT}<0$                     | -50                 | mA                 |
| Storage Temperature Range          | $T_{STG}$ |                                 | -65 ~ +150          | $^{\circ}\text{C}$ |

Notes: 1. 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.

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

■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER                          | SYMBOL      | TEST CONDITIONS        | MIN  | TYP | MAX      | UNIT               |
|------------------------------------|-------------|------------------------|------|-----|----------|--------------------|
| Supply Voltage                     | $V_{CC}$    | Operating              | 1.65 |     | 5.5      | V                  |
|                                    |             | Data retention only    | 1.5  |     |          | V                  |
| Input Voltage                      | $V_{IN}$    |                        | 0    |     | 5.5      | V                  |
| Output Voltage                     | $V_{OUT}$   | High or low state      | 0    |     | $V_{CC}$ | V                  |
| Input Transition Rise or Fall Rate | $t_R / t_F$ | $V_{CC}=1.8V\pm 0.15V$ |      |     | 20       | ns/V               |
|                                    |             | $V_{CC}=2.5V\pm 0.2V$  |      |     |          |                    |
|                                    |             | $V_{CC}=3.3V\pm 0.3V$  |      |     | 10       | ns/V               |
|                                    |             | $V_{CC}=5V\pm 0.5V$    |      |     | 5        | ns/V               |
| Operating Temperature              | $T_A$       |                        | -40  |     | +125     | $^{\circ}\text{C}$ |

■ THERMAL DATA

| PARAMETER           |             | SYMBOL        | RATINGS | UNIT                 |
|---------------------|-------------|---------------|---------|----------------------|
| Junction to Ambient | SOT-23-5    | $\theta_{JA}$ | 280     | $^{\circ}\text{C/W}$ |
|                     | SOT-25      |               | 230     | $^{\circ}\text{C/W}$ |
|                     | SOT-353     |               | 350     | $^{\circ}\text{C/W}$ |
|                     | SOT-553     |               | 370     | $^{\circ}\text{C/W}$ |
|                     | X2DFN1010-6 |               | 420     | $^{\circ}\text{C/W}$ |

■ STATIC CHARACTERISTICS (unless otherwise specified)

| PARAMETER                | SYMBOL   | TEST CONDITIONS          | $T_A=25^{\circ}\text{C}$ |     |                     | $T_A=-40^{\circ}\text{C}\sim +125^{\circ}\text{C}$ |     |                     | UNIT |
|--------------------------|----------|--------------------------|--------------------------|-----|---------------------|----------------------------------------------------|-----|---------------------|------|
|                          |          |                          | MIN                      | TYP | MAX                 | MIN                                                | TYP | MAX                 |      |
| High-Level Input Voltage | $V_{IH}$ | $V_{CC}=1.65V\sim 1.95V$ | $0.65\times V_{CC}$      |     |                     | $0.65\times V_{CC}$                                |     |                     | V    |
|                          |          | $V_{CC}=2.3V\sim 2.7V$   | 1.7                      |     |                     | 1.7                                                |     |                     |      |
|                          |          | $V_{CC}=3.0V\sim 3.6V$   | 2                        |     |                     | 2                                                  |     |                     |      |
|                          |          | $V_{CC}=4.5V\sim 5.5V$   | $0.7\times V_{CC}$       |     |                     | $0.7\times V_{CC}$                                 |     |                     |      |
| Low-Level Input Voltage  | $V_{IL}$ | $V_{CC}=1.65V\sim 1.95V$ |                          |     | $0.35\times V_{CC}$ |                                                    |     | $0.35\times V_{CC}$ | V    |
|                          |          | $V_{CC}=2.3V\sim 2.7V$   |                          |     | 0.7                 |                                                    |     | 0.7                 |      |
|                          |          | $V_{CC}=3.0V\sim 3.6V$   |                          |     | 0.8                 |                                                    |     | 0.8                 |      |
|                          |          | $V_{CC}=4.5V\sim 5.5V$   |                          |     | $0.3\times V_{CC}$  |                                                    |     | $0.3\times V_{CC}$  |      |

## ■ STATIC CHARACTERISTICS (Cont.)

| PARAMETER                           | SYMBOL               | TEST CONDITIONS                                                                                      | T <sub>A</sub> =25°C |     |      | T <sub>A</sub> =-40°C~+125°C |     |      | UNIT |
|-------------------------------------|----------------------|------------------------------------------------------------------------------------------------------|----------------------|-----|------|------------------------------|-----|------|------|
|                                     |                      |                                                                                                      | MIN                  | TYP | MAX  | MIN                          | TYP | MAX  |      |
| High-Level Output Voltage           | V <sub>OH</sub>      | V <sub>CC</sub> =1.65V ~ 5.5V,<br>I <sub>OH</sub> =-100μA                                            | V <sub>CC</sub> -0.1 |     |      | V <sub>CC</sub> -0.1         |     |      | V    |
|                                     |                      | V <sub>CC</sub> =1.65V, I <sub>OH</sub> =-4mA                                                        | 1.2                  |     |      | 0.95                         |     |      |      |
|                                     |                      | V <sub>CC</sub> =2.3V, I <sub>OH</sub> =-8mA                                                         | 1.9                  |     |      | 1.7                          |     |      |      |
|                                     |                      | V <sub>CC</sub> =3.0V    I <sub>OH</sub> =-16mA                                                      | 2.4                  |     |      | 2.1                          |     |      |      |
|                                     |                      | I <sub>OH</sub> =-24mA                                                                               | 2.3                  |     |      | 2                            |     |      |      |
|                                     |                      | V <sub>CC</sub> =4.5V, I <sub>OH</sub> =-32mA                                                        | 3.8                  |     |      | 3.4                          |     |      |      |
| Low-Level Output Voltage            | V <sub>OL</sub>      | V <sub>CC</sub> =1.65V ~ 5.5V,<br>I <sub>OL</sub> =100μA                                             |                      |     | 0.1  |                              |     | 0.1  | V    |
|                                     |                      | V <sub>CC</sub> =1.65V, I <sub>OL</sub> =4mA                                                         |                      |     | 0.45 |                              |     | 0.7  |      |
|                                     |                      | V <sub>CC</sub> =2.3V, I <sub>OL</sub> =8mA                                                          |                      |     | 0.3  |                              |     | 0.45 |      |
|                                     |                      | V <sub>CC</sub> =3.0V    I <sub>OL</sub> =16mA                                                       |                      |     | 0.4  |                              |     | 0.6  |      |
|                                     |                      | I <sub>OL</sub> =24mA                                                                                |                      |     | 0.55 |                              |     | 0.8  |      |
|                                     |                      | V <sub>CC</sub> =4.5V, I <sub>OL</sub> =32mA                                                         |                      |     | 0.55 |                              |     | 0.8  |      |
| Input Leakage Current               | I <sub>I(LEAK)</sub> | V <sub>CC</sub> =0V ~ 5.5V, V <sub>IN</sub> =5.5V or GND                                             |                      |     | ±5   |                              |     | ±5   | μA   |
| Power OFF Leakage Current           | I <sub>OFF</sub>     | V <sub>CC</sub> =0V, V <sub>IN</sub> or V <sub>OUT</sub> =5.5V                                       |                      |     | ±10  |                              |     | ±10  | μA   |
| Quiescent Supply Current            | I <sub>Q</sub>       | V <sub>CC</sub> =1.65V~5.5V, V <sub>IN</sub> =5.5V or GND    I <sub>OUT</sub> =0                     |                      |     | 10   |                              |     | 10   | μA   |
| Additional Quiescent Supply Current | ΔI <sub>Q</sub>      | V <sub>CC</sub> =3V~5.5V, One input at V <sub>CC</sub> -0.6V, other inputs at V <sub>CC</sub> or GND |                      |     | 500  |                              |     | 500  | μA   |

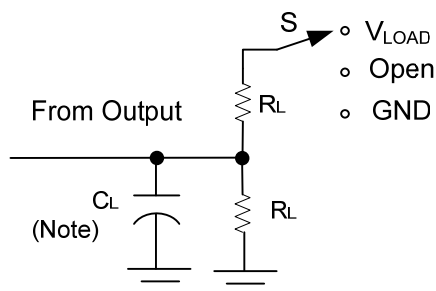
## ■ DYNAMIC CHARACTERISTICS (unless otherwise specified)

| PARAMETER                                          | SYMBOL                             | TEST CONDITIONS            | T <sub>A</sub> =25°C        |     |     | T <sub>A</sub> =-40°C~+125°C |     |      | UNIT |
|----------------------------------------------------|------------------------------------|----------------------------|-----------------------------|-----|-----|------------------------------|-----|------|------|
|                                                    |                                    |                            | MIN                         | TYP | MAX | MIN                          | TYP | MAX  |      |
| Propagation delay from input (A or B) to output(Y) | t <sub>PLH</sub> /t <sub>PHL</sub> | C <sub>L</sub> =15pF       | V <sub>CC</sub> =1.8V±0.15V | 1.5 |     | 10                           |     | 12.5 | ns   |
|                                                    |                                    |                            | V <sub>CC</sub> =2.5V±0.2V  | 0.7 |     | 8                            |     | 10.5 | ns   |
|                                                    |                                    |                            | V <sub>CC</sub> =3.3V±0.3V  | 0.8 |     | 6                            |     | 8.5  | ns   |
|                                                    |                                    |                            | V <sub>CC</sub> =5V±0.5V    | 0.8 |     | 4.2                          |     | 6    | ns   |
|                                                    |                                    | C <sub>L</sub> =30 or 50pF | V <sub>CC</sub> =1.8V±0.15V | 2.4 |     | 11                           |     | 13.5 | ns   |
|                                                    |                                    |                            | V <sub>CC</sub> =2.5V±0.2V  | 1.1 |     | 9                            |     | 11.5 | ns   |
|                                                    |                                    |                            | V <sub>CC</sub> =3.3V±0.3V  | 1   |     | 8                            |     | 10.5 | ns   |
|                                                    |                                    |                            | V <sub>CC</sub> =5V±0.5V    | 1   |     | 7                            |     | 9.5  | ns   |

■ OPERATING CHARACTERISTICS (f=10MHz, T<sub>A</sub>=25°C, unless otherwise specified)

| PARAMETER                     | SYMBOL          | TEST CONDITIONS                                                | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------------|----------------------------------------------------------------|-----|-----|-----|------|
| Input Capacitance             | C <sub>IN</sub> | V <sub>CC</sub> =3.3V, V <sub>IN</sub> =V <sub>CC</sub> or GND |     | 4   |     | pF   |
| Power Dissipation Capacitance | C <sub>PD</sub> | V <sub>CC</sub> =1.8V                                          |     | 21  |     | pF   |
|                               |                 | V <sub>CC</sub> =2.5V                                          |     | 24  |     | pF   |
|                               |                 | V <sub>CC</sub> =3.3V                                          |     | 26  |     | pF   |
|                               |                 | V <sub>CC</sub> =5V                                            |     | 31  |     | pF   |

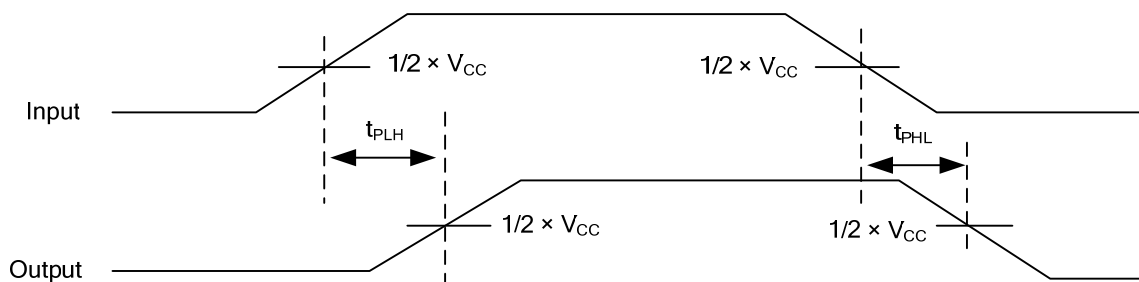
## ■ TEST CIRCUIT AND WAVEFORMS



| TEST              | S          |
|-------------------|------------|
| $t_{PLH}/t_{PHL}$ | Open       |
| $t_{PHZ}/t_{PZH}$ | GND        |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |

Note:  $C_L$  includes probe and jig capacitance.

| $V_{CC}$         | $V_{IN}$ | $t_R/t_F$    | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|------------------|----------|--------------|------------|-------------------|-------|--------------|--------------|
| $1.8V \pm 0.15V$ | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 15pF  | 1M $\Omega$  | 0.15V        |
| $2.5V \pm 0.2V$  | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 15pF  | 1M $\Omega$  | 0.15V        |
| $3.3V \pm 0.3V$  | 3 V      | $\leq 2.5ns$ | 1.5V       | 6V                | 15pF  | 1M $\Omega$  | 0.3V         |
| $5V \pm 0.5V$    | $V_{CC}$ | $\leq 2.5ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 15pF  | 1M $\Omega$  | 0.3V         |
| $1.8V \pm 0.15V$ | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2V_{CC}$         | 30pF  | 1K $\Omega$  | 0.15V        |
| $2.5V \pm 0.2V$  | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30pF  | 500 $\Omega$ | 0.15V        |
| $3.3V \pm 0.3V$  | 3 V      | $\leq 2.5ns$ | 1.5V       | 6V                | 50pF  | 500 $\Omega$ | 0.3V         |
| $5V \pm 0.5V$    | $V_{CC}$ | $\leq 2.5ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 50pF  | 500 $\Omega$ | 0.3V         |



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.