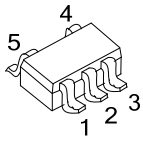
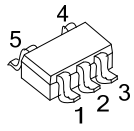
# U74LVC1G86

**CMOS IC**

## SINGLE 2-INPUT EXCLUSIVE-OR GATE




SOT-23-5
(JEDEC TO-236)




SOT-353


DFN1010-6

### ■ DESCRIPTION

The **U74LVC1G86** is a single 2-input EXCLUSIVE-OR gate which provides the Function $Y = A \oplus B$ or $Y = \overline{A}B + A\overline{B}$ in positive logic. Inputs can be driven from either 3.3V or 5V devices. These features allow the use of these devices in a mixed 3.3V and 5V environment.

This device is fully specified for partial Power-down applications using $I_{OFF}$. The $I_{OFF}$ circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

### ■ FEATURES

* Operate from 1.65V to 5.5V
* Inputs accept voltages to 5.5V
* $I_{OFF}$ supports partial-power-down mode
* Low power dissipation
* Max $t_{PD}$ of 4 ns at 3.3V

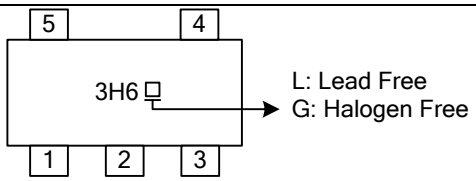
### ■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| U74LVC1G86L-AE5-R | U74LVC1G86G-AE5-R | SOT-23-5 | Tape Reel |
| U74LVC1G86L-AL5-R | U74LVC1G86G-AL5-R | SOT-353 | Tape Reel |
| U74LVC1G86L-K06-1010-R | U74LVC1G86G-K06-1010-R | DFN1010-6 | Tape Reel |

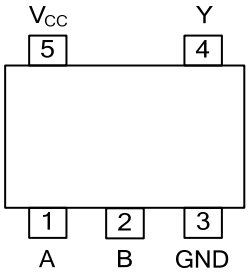
U74LVC1G86G-AE5-R
(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel
(2) AE5: SOT-23-5, AL5: SOT-353,
K06-1010: DFN1010-6
(3) G: Halogen Free and Lead Free, L: Lead Free

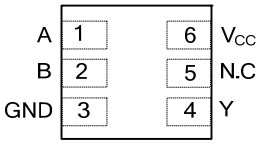
### ■ MARKING

| SOT-23-5 / SOT-353 | DFN1010-6 |
|---|---|
|  |  |

## ■ PIN CONFIGURATION




SOT-23-5 / SOT-353




DFN1010-6
(TOP VIEW)

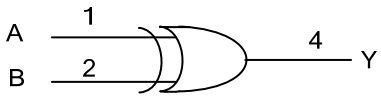
## ■ FUNCTION TABLE

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

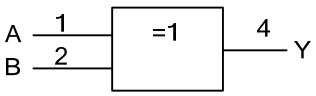
Note: H: HIGH voltage level; L: LOW voltage level

## ■ LOGIC DIAGRAM (positive logic)

For SOT-23-5/SOT-353

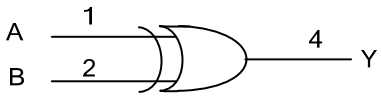



Logic symbol

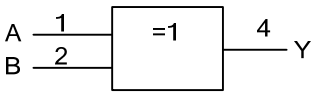



IEC logic symbol

For DFN1010-6




Logic symbol




IEC logic symbol

## ■ ABSOLUTE MAXIMUM RATING

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Supply Voltage | | $V_{CC}$ | -0.5 ~ +6.5 | V |
| Input Voltage | | $V_{IN}$ | -0.5 ~ +6.5 | V |
| Output Voltage | Output in the high or low state | $V_{OUT}$ | -0.5 ~ $V_{CC}$+0.5 | V |
| | Output in the high-impedance or power-off state | | -0.5 ~ +6.5 | V |
| Continuous $V_{CC}$ or GND Current | | $I_{CC}$ | ±100 | mA |
| Continuous Output Current ($V_{OUT}$=0 to $V_{CC}$) | | $I_{OUT}$ | ±50 | mA |
| Input Clamp Current ($V_{IN}$<0) | | $I_{IK}$ | -50 | mA |
| Output Clamp Current ($V_{OUT}$<0) | | $I_{OK}$ | -50 | mA |
| Storage Temperature Range | | $T_{STG}$ | -65 ~ +150 | °C |

Note: 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 | 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 |
| High-level Output Current | $I_{OH}$ | $V_{CC}$=1.65V | | | -4 | mA |
| | | $V_{CC}$=2.3V | | | -8 | mA |
| | | $V_{CC}$=3V | | | -16 | mA |
| | | $V_{CC}$=3V | | | -24 | mA |
| | | $V_{CC}$=4.5V | | | -32 | mA |
| Low-level Output Current | $I_{OL}$ | $V_{CC}$=1.65V | | | 4 | mA |
| | | $V_{CC}$=2.3V | | | 8 | mA |
| | | $V_{CC}$=3V | | | 16 | mA |
| | | $V_{CC}$=3V | | | 24 | mA |
| | | $V_{CC}$=4.5V | | | 32 | mA |
| Operating Temperature | $T_A$ | | -40 | | 125 | °C |
| Input Transition Rise or Fall Rate | Δt/Δv | $V_{CC}$=1.8V±0.15V, 2.5V±0.2V | | | 20 | ns/V |
| | | $V_{CC}$=3.3V±0.3V | | | 10 | ns/V |
| | | $V_{CC}$=5V±0.5V | | | 5 | ns/V |

## ■ ELECTRICAL CHARACTERISTICS ($T_A$ =25°C , unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| High-level Input Voltage | $V_{IH}$ | $V_{CC}$=1.65V to 1.95V | | 0.65×$V_{CC}$ | | | V |
| | | $V_{CC}$=2.3V to 2.7V | | 1.7 | | | V |
| | | $V_{CC}$=3V to 3.6V | | 2 | | | V |
| | | $V_{CC}$=4.5V to 5.5V | | 0.7×$V_{CC}$ | | | V |
| Low-level Input Voltage | $V_{IL}$ | $V_{CC}$=1.65V to 1.95V | | | | 0.35×$V_{CC}$ | V |
| | | $V_{CC}$=2.3V to 2.7V | | | | 0.7 | V |
| | | $V_{CC}$=3V to 3.6V | | | | 0.8 | V |
| | | $V_{CC}$=4.5V to 5.5V | | | | 0.3×$V_{CC}$ | V |
| High-Level Output Voltage | $V_{OH}$ | $V_{CC}$=1.65 ~ 5.5V, $I_{OH}$=-100μA | | $V_{CC}$-0.1 | | | V |
| | | $V_{CC}$=1.65V, $I_{OH}$=-4mA | | 1.2 | | | V |
| | | $V_{CC}$=2.3V, $I_{OH}$=-8mA | | 1.9 | | | V |
| | | $V_{CC}$=3.0V | $I_{OH}$=16mA | 2.4 | | | V |
| | | | $I_{OH}$=24mA | 2.3 | | | V |
| | | $V_{CC}$=4.5V, $I_{OH}$=-32mA | | 3.8 | | | V |
| Low-Level Output Voltage | $V_{OL}$ | $V_{CC}$=1.65 ~ 5.5V, $I_{OL}$=100μA | | | | 0.1 | V |
| | | $V_{CC}$=1.65V, $I_{OL}$=4mA | | | | 0.45 | V |
| | | $V_{CC}$=2.3V, $I_{OL}$=8mA | | | | 0.3 | V |
| | | $V_{CC}$=3.0V | $I_{OL}$=16mA | | | 0.4 | V |
| | | | $I_{OL}$=24mA | | | 0.55 | V |
| | | $V_{CC}$=4.5V, $I_{OL}$=32mA | | | | 0.55 | V |
| Input Leakage Current | $I_{I(LEAK)}$ | $V_{CC}$=0 ~ 5.5V, $V_{IN}$=5.5V or GND | | | | ±5 | μA |
| Power OFF Leakage Current | $I_{off}$ | $V_{CC}$=0V, $V_{IN}$ or $V_{OUT}$=5.5V | | | | ±10 | μA |
| Quiescent Supply Current | $I_{CC}$ | $V_{CC}$=1.65 ~ 5.5V, $V_{IN}$=$V_{CC}$ or GND, $I_{OUT}$=0 | | | | 10 | μA |
| Additional Quiescent Supply Current Per Input Pin | $\Delta I_{CC}$ | $V_{CC}$=3 ~ 5.5V, One input at $V_{CC}$-0.6V, Other inputs at $V_{CC}$ or GND | | | | 500 | μA |
| Input Capacitance | $C_I$ | $V_{CC}$=3.3V, $V_{IN}$=$V_{CC}$ or GND | | | 6 | | pF |

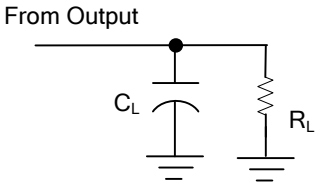
## ■ SWITCHING CHARACTERISTICS ($T_A$ =25°C , unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Propagation delay from input to output | $t_{PLH}$ $t_{PHL}$ | $V_{CC}$=1.8±0.15V,$C_L$=15pF, $R_L$=1MΩ | 2.1 | | 9.1 | ns |
| | | $V_{CC}$=2.5±0.2V,$C_L$=15pF, $R_L$=1MΩ | 1 | | 4.5 | ns |
| | | $V_{CC}$=3.3±0.3V,$C_L$=15pF, $R_L$=1MΩ | 0.6 | | 4 | ns |
| | | $V_{CC}$=5±0.5V,$C_L$=15pF, $R_L$=1MΩ | 0.8 | | 3.3 | ns |
| Propagation delay from input to output | $t_{PLH}$ $t_{PHL}$ | $V_{CC}$=1.8±0.15V,$C_L$=30pF, $R_L$=1KΩ | 3.5 | | 9.9 | ns |
| | | $V_{CC}$=2.5±0.2V,$C_L$=30pF, $R_L$=500Ω | 1.8 | | 5.5 | ns |
| | | $V_{CC}$=3.3±0.3V,$C_L$=50pF, $R_L$=500Ω | 1.3 | | 5 | ns |
| | | $V_{CC}$=5±0.5V,$C_L$=50pF, $R_L$=500Ω | 1 | | 4 | ns |

## ■ OPERATING CHARACTERISTICS (f=10MHz, $T_A$ =25°C , unless otherwise specified)

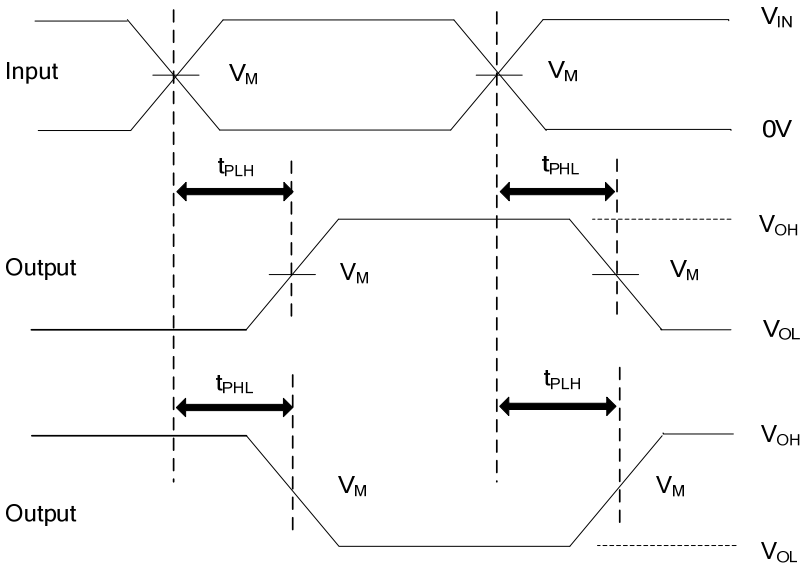
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Power Dissipation Capacitance | $C_{PD}$ | $V_{CC}$=1.8V | | 22 | | pF |
| | | $V_{CC}$=2.5V | | 22 | | pF |
| | | $V_{CC}$=3.3V | | 22 | | pF |
| | | $V_{CC}$=5V | | 24 | | pF |

## ■ TEST CIRCUIT AND WAVEFORMS




TEST CIRCUIT

| $V_{CC}$ | Inputs | | $V_M$ | $C_L$ | $R_L$ |
|---|---|---|---|---|---|
| | $V_{IN}$ | $t_R$, $t_F$ | | | |
| 1.8V±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 15pF | 1MΩ |
| | | | | 30pF | 1KΩ |
| 2.5V±0.2V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 15pF | 1MΩ |
| | | | | 30pF | 500Ω |
| 3.3V±0.3V | 3V | ≤2.5ns | 1.5V | 15pF | 1MΩ |
| | | | | 50pF | 500Ω |
| 5V±0.5V | $V_{CC}$ | ≤2.5ns | $V_{CC}/2$ | 15pF | 1MΩ |
| | | | | 50pF | 500Ω |




PROPAGATION DELAY TIMES

Notes: 1. $C_L$ includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR ≤10MHz, $Z_O$ = 50Ω.