

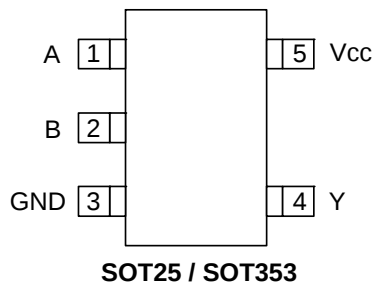
### Description

The 74AHC1G86 is a single 2-input positive exclusive-OR gate with a standard push-pull output. The device is designed for operation with a power supply range of 2.0V to 5.5V. The gate performs the positive Boolean function:

$$Y = A \oplus B \text{ or } Y = \overline{A}B + A\overline{B}$$

### Pin Assignments

(Top View)



### Features

- Supply Voltage Range from 2.0V to 5.5V
- $\pm 8$  mA Output Drive at 5.0V
- CMOS low power consumption
- Schmitt Trigger Action at All Inputs Make the Circuit Tolerant for Slower Input Rise and Fall Time.
- ESD Protection per JESD 22
  - Exceeds 200-V Machine Model (A115-A)
  - Exceeds 2000-V Human Body Model (A114-A)
  - Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- SOT25 and SOT353: Assembled with "Green" Molding Compound (no Br, Sb)
- Lead Free Finish / RoHS Compliant (Note 1)

### Applications

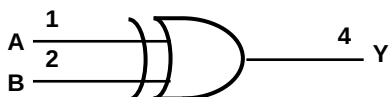
- General Purpose Logic
- Wide array of products such as:
  - PCs, networking, notebooks, netbooks, PDAs
  - Computer peripherals, hard drives, CD/DVD ROM
  - TV, DVD, DVR, set top box
  - Personal Navigation / GPS
  - MP3 players, Cameras, Video Recorders

Notes: 1. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html).

## Pin Descriptions

| Pin Name        | Pin NO. | Description    |
|-----------------|---------|----------------|
| A               | 1       | Data Input     |
| B               | 2       | Data Input     |
| GND             | 3       | Ground         |
| Y               | 4       | Data Output    |
| V <sub>CC</sub> | 5       | Supply Voltage |

## Logic Diagram



## Function Table

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| H      | H | L      |
| L      | H | H      |
| H      | L | H      |
| L      | L | L      |

### Absolute Maximum Ratings (Note 2)

| Symbol           | Description                                                                    | Rating                       | Unit |
|------------------|--------------------------------------------------------------------------------|------------------------------|------|
| ESD HBM          | Human Body Model ESD Protection                                                | 2                            | KV   |
| ESD CDM          | Charged Device Model ESD Protection                                            | 1                            | KV   |
| ESD MM           | Machine Model ESD Protection                                                   | 200                          | V    |
| V <sub>CC</sub>  | Supply Voltage Range                                                           | -0.5 to 6.5                  | V    |
| V <sub>I</sub>   | Input Voltage Range                                                            | -0.5 to 6.5                  | V    |
| V <sub>O</sub>   | Voltage applied to output in high or low state                                 | -0.5 to V <sub>CC</sub> +0.5 | V    |
| I <sub>IK</sub>  | Input Clamp Current V <sub>I</sub> < 0                                         | -20                          | mA   |
| I <sub>OK</sub>  | Output Clamp Current (V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> ) | ±20                          | mA   |
| I <sub>O</sub>   | Continuous output current (V <sub>O</sub> = 0 to V <sub>CC</sub> )             | ±25                          | mA   |
| I <sub>CC</sub>  | Continuous current through V <sub>CC</sub>                                     | 50                           | mA   |
| I <sub>GND</sub> | Continuous current through GND                                                 | -50                          | mA   |
| T <sub>J</sub>   | Operating Junction Temperature                                                 | -40 to 150                   | °C   |
| T <sub>STG</sub> | Storage Temperature                                                            | -65 to 150                   | °C   |

Notes: 2. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

### Recommended Operating Conditions (Note 3)

| Symbol          | Parameter                          | Min                            | Max             | Unit |
|-----------------|------------------------------------|--------------------------------|-----------------|------|
| V <sub>CC</sub> | Operating Voltage                  | 2                              | 5.5             | V    |
| V <sub>IH</sub> | High-level Input Voltage           | V <sub>CC</sub> = 2V           | 1.5             | V    |
|                 |                                    | V <sub>CC</sub> = 3V           | 2.1             |      |
|                 |                                    | V <sub>CC</sub> = 5.5V         | 3.85            |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 2V           | 0.5             | V    |
|                 |                                    | V <sub>CC</sub> = 3V           | 0.9             |      |
|                 |                                    | V <sub>CC</sub> = 5.5V         | 1.65            |      |
| V <sub>I</sub>  | Input Voltage                      | 0                              | 5.5             | V    |
| V <sub>O</sub>  | Output Voltage                     | 0                              | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 2V           | -50             | µA   |
|                 |                                    | V <sub>CC</sub> = 3.3 V ± 0.3V | -4              | mA   |
|                 |                                    | V <sub>CC</sub> = 5V ± 0.5V    | -8              |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 2V           | 50              | µA   |
|                 |                                    | V <sub>CC</sub> = 5V ± 0.5V    | 4               | mA   |
|                 |                                    | V <sub>CC</sub> = 3V           | 8               |      |
| Δt/ΔV           | Input transition rise or fall rate | V <sub>CC</sub> = 3.3V ± 0.3V  | 100             | ns/V |
|                 |                                    | V <sub>CC</sub> = 5V ± 0.5V    | 20              |      |
| T <sub>A</sub>  | Operating free-air temperature     | -40                            | 125             | °C   |

Notes: 3. Unused inputs should be held at V<sub>CC</sub> or Ground.

**Electrical Characteristics**

| Symbol          | Parameter                              | Test Conditions                                   | V <sub>CC</sub> | 25°C |      |       | -40°C to 85°C |      | -40°C to 125°C |      | Unit |
|-----------------|----------------------------------------|---------------------------------------------------|-----------------|------|------|-------|---------------|------|----------------|------|------|
|                 |                                        |                                                   |                 | Min  | Typ. | Max   | Min           | Max  | Min            | Max  |      |
| V <sub>OH</sub> | High Level Output Voltage              | I <sub>OH</sub> = -50µA                           | 2V              | 1.9  | 2    |       | 1.9           |      | 1.9            |      | V    |
|                 |                                        |                                                   | 3V              | 2.9  | 3    |       | 2.9           |      | 2.9            |      |      |
|                 |                                        |                                                   | 4.5V            | 4.4  | 4.5  |       | 4.4           |      | 4.4            |      |      |
|                 |                                        | I <sub>OH</sub> = -4mA                            | 3V              | 2.58 |      |       | 2.48          |      | 2.40           |      |      |
|                 |                                        | I <sub>OH</sub> = -8mA                            | 4.5V            | 3.94 |      |       | 3.8           |      | 3.70           |      |      |
| V <sub>OL</sub> | Low Level Output Voltage               | I <sub>OL</sub> = 50µA                            | 2V              |      |      | 0.1   |               | 0.1  |                | 0.1  | V    |
|                 |                                        |                                                   | 3V              |      |      | 0.1   |               | 0.1  |                | 0.1  |      |
|                 |                                        |                                                   | 4.5V            |      |      | 0.1   |               | 0.1  |                | 0.1  |      |
|                 |                                        | I <sub>OL</sub> = 4mA                             | 3V              |      |      | 0.36  |               | 0.44 |                | 0.55 |      |
|                 |                                        | I <sub>OL</sub> = 8mA                             | 4.5V            |      |      | 0.36  |               | 0.44 |                | 0.55 |      |
| I <sub>I</sub>  | Input Current                          | V <sub>I</sub> = 5.5 V or GND                     | 0 to 5.5V       |      |      | ± 0.1 |               | ± 1  |                | ± 2  | µA   |
| I <sub>CC</sub> | Supply Current                         | V <sub>I</sub> = 5.5V or GND<br>I <sub>O</sub> =0 | 5.5V            |      |      | 1     |               | 10   |                | 40   | µA   |
| C <sub>i</sub>  | Input Capacitance                      | V <sub>I</sub> = V <sub>CC</sub> – or GND         | 5.5V            |      | 2.0  | 10    |               | 10   |                | 10   | pF   |
| θ <sub>JA</sub> | Thermal Resistance Junction-to-Ambient | SOT25                                             | (Note 4)        |      | 195  |       |               |      |                |      | °C/W |
|                 |                                        | SOT353                                            |                 |      | 430  |       |               |      |                |      |      |
| θ <sub>JC</sub> | Thermal Resistance Junction-to-Case    | SOT25                                             | (Note 4)        |      | 58   |       |               |      |                |      | °C/W |
|                 |                                        | SOT353                                            |                 |      | 155  |       |               |      |                |      |      |

Note: 4. Test conditions for SOT25, and SOT353: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout

**Switching Characteristics**

 V<sub>CC</sub> = 3.3V ± 0.3 (see Figure 1)

| Parameter       | From (Input) | TO (OUTPUT) |                      | 25°C |      |      | -40°C to 85°C |      | -40°C to 125°C |      | Unit |
|-----------------|--------------|-------------|----------------------|------|------|------|---------------|------|----------------|------|------|
|                 |              |             |                      | Min  | Typ. | Max  | Min           | Max  | Min            | Max  |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> =15pF | 0.6  | 4.0  | 11.0 | 0.6           | 13.0 | 0.6            | 14.0 | ns   |
|                 |              |             | C <sub>L</sub> =50pF | 0.6  | 5.8  | 14.5 | 0.6           | 16.5 | 0.6            | 18.5 | ns   |

 V<sub>CC</sub> = 5V ± 0.5V (see Figure 1)

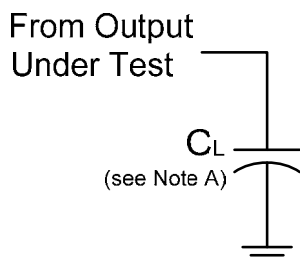
| Parameter       | From (Input) | TO (OUTPUT) |                      | 25°C |      |     | -40°C to 85°C |      | -40°C to 125°C |      | Unit |
|-----------------|--------------|-------------|----------------------|------|------|-----|---------------|------|----------------|------|------|
|                 |              |             |                      | Min  | Typ. | Max | Min           | Max  | Min            | Max  |      |
| t <sub>pd</sub> | A or B       | Y           | C <sub>L</sub> =15pF | 0.6  | 3.4  | 6.8 | 0.6           | 8.0  | 0.6            | 8.5  | ns   |
|                 |              |             | C <sub>L</sub> =50pF | 0.6  | 4.9  | 8.8 | 0.6           | 10.0 | 0.6            | 11.5 | ns   |

## Operating Characteristics

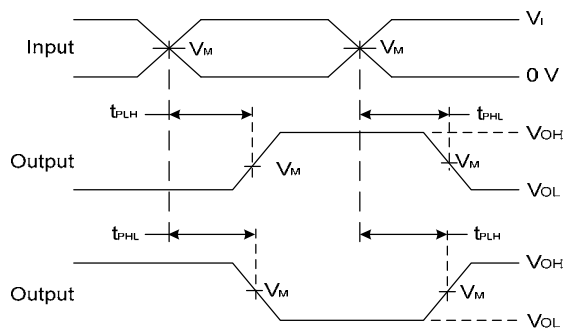
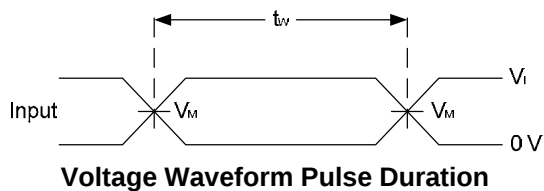
$T_A = 25\text{ }^\circ\text{C}$

| Parameter |                               | Test Conditions               | $V_{CC} = 5\text{ V}$ | Unit |
|-----------|-------------------------------|-------------------------------|-----------------------|------|
|           |                               |                               | Typ.                  |      |
| $C_{pd}$  | Power dissipation capacitance | $f = 1\text{ MHz}$<br>No Load | 12                    | pF   |

## Parameter Measurement Information



| $V_{CC}$                      | Inputs   |                   | $V_M$      | $C_L$ |
|-------------------------------|----------|-------------------|------------|-------|
|                               | $V_I$    | $t_r/t_f$         |            |       |
| $3.3\text{V} \pm 0.3\text{V}$ | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 15pF  |
| $5\text{V} \pm 0.5\text{V}$   | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 15pF  |
| $3.3\text{V} \pm 0.3\text{V}$ | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 50pF  |
| $5\text{V} \pm 0.5\text{V}$   | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 50pF  |

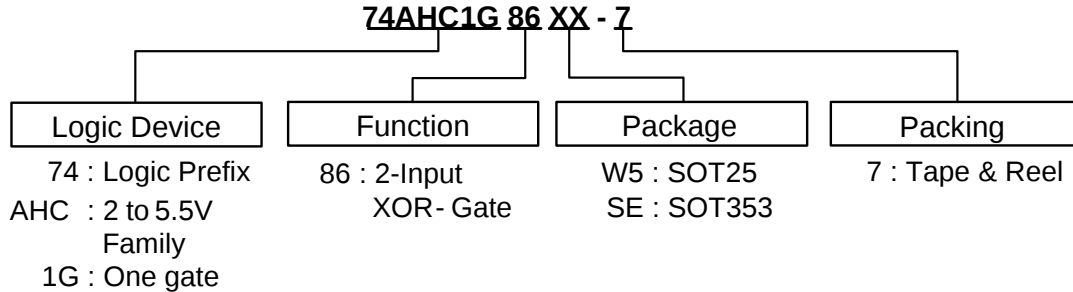


**Voltage Waveform Propagation Delay Times  
Inverting and Non Inverting Outputs**

**Figure 1. Load Circuit and Voltage Waveforms**

- Notes:
- A. Includes test lead and test apparatus capacitance.
  - B. All pulses are supplied at pulse repetition rate  $\leq 1\text{ MHz}$ .
  - C. Inputs are measured separately one transition per measurement.
  - D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .

## Ordering Information

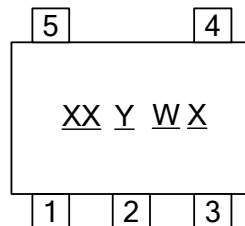


| Device        | Package Code | Packaging (Note 5) | 7" Tape and Reel |                    |
|---------------|--------------|--------------------|------------------|--------------------|
|               |              |                    | Quantity         | Part Number Suffix |
| 74AHC1G86W5-7 | W5           | SOT25              | 3000/Tape & Reel | -7                 |
| 74AHC1G86SE-7 | SE           | SOT353             | 3000/Tape & Reel | -7                 |

Notes: 5. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

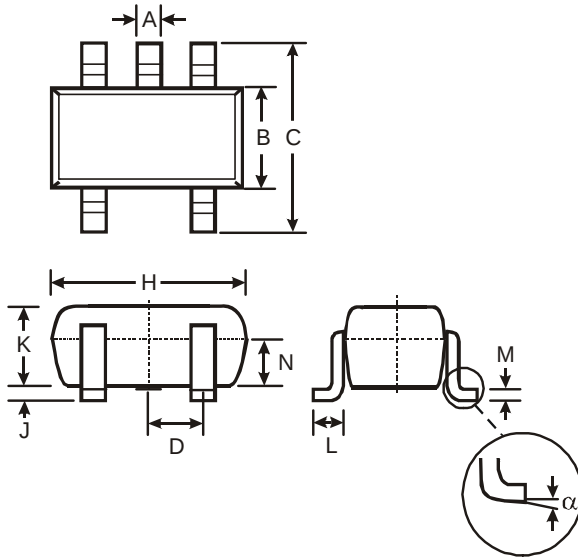
## Marking Information

(Top View)

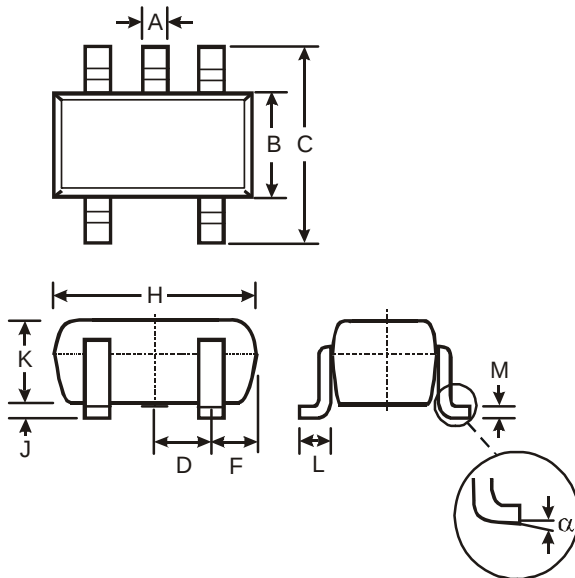


XX : Identification code  
Y : Year 0~9  
W : Week : A~Z : 1~26 week;  
           a~z : 27~52 week; z represents  
           52 and 53 week  
X : A~Z : Internal code

| Part Number | Package | Identification Code |
|-------------|---------|---------------------|
| 74AHC1G86W5 | SOT25   | YX                  |
| 74AHC1G86SE | SOT353  | YX                  |

**Package Outline Dimensions (All Dimensions in mm)**
**(1) Package Type: SOT25**


| SOT25                |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 0.35  | 0.50 | 0.38 |
| B                    | 1.50  | 1.70 | 1.60 |
| C                    | 2.70  | 3.00 | 2.80 |
| D                    | —     | —    | 0.95 |
| H                    | 2.90  | 3.10 | 3.00 |
| J                    | 0.013 | 0.10 | 0.05 |
| K                    | 1.00  | 1.30 | 1.10 |
| L                    | 0.35  | 0.55 | 0.40 |
| M                    | 0.10  | 0.20 | 0.15 |
| N                    | 0.70  | 0.80 | 0.75 |
| $\alpha$             | 0°    | 8°   | —    |
| All Dimensions in mm |       |      |      |

**(2) Package Type: SOT353**


| SOT353               |          |      |
|----------------------|----------|------|
| Dim                  | Min      | Max  |
| A                    | 0.10     | 0.30 |
| B                    | 1.15     | 1.35 |
| C                    | 2.00     | 2.20 |
| D                    | 0.65 Typ |      |
| F                    | 0.40     | 0.45 |
| H                    | 1.80     | 2.20 |
| J                    | 0        | 0.10 |
| K                    | 0.90     | 1.00 |
| L                    | 0.25     | 0.40 |
| M                    | 0.10     | 0.22 |
| $\alpha$             | 0°       | 8°   |
| All Dimensions in mm |          |      |

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