## General Description

This single 2-input exclusive-OR gate is designed for 1.65V to 5.5V Vcc operation.

The SN74LVC1G86 performs the Boolean function $Y=A \oplus B$ or $Y = A\bar{B} + \bar{A}B$ in positive logic. A common application is as a true/complement element. If the input is low, the other input is reproduced in true fom at the output. If the input is high the signal on the other input is reproduced inverted at the output. This device is fully specified for partial-power-down applications using lof. The loff circuitry disables the outputs, preventing damaging current back flow through the device when it is powered down.

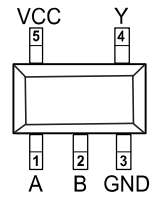
## Features

- Operate from 1.65 Vto 5.5V
- Specified from -40℃ to 85℃
- Inputs accept voltages to 5.5V
- Maxtpa of 3.7ns at 3.3V
- Low powerconsumption, 10μA max Icc
- ±24mA output drive at 3.3V
- loffs Supports partial-power-down mode

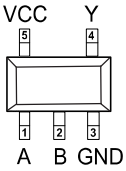
## Applications

- Wireless headsets
- Motor drives andcontrols
- TVs
- Set-top boxes
- Audio

## Pinning and Marking

| Pin Configurations | Marking |
|---|---|
|   |   |

SOT-23-5

| Pin Configurations | Marking |
|---|---|
|   |   |

SC70-5

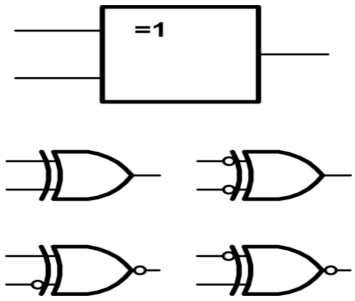
## Pin Functions

| Pin | | Type | Description |
|---|---|---|---|
| Name | SOT23-5/SC70-5 | | |
| A | 1 | I | Input A |
| B | 2 | I | Input B |
| Y | 4 | O | Output Y |
| VCC | 5 | - | Positive Supply |
| GND | 3 | - | Ground |

## Order information

| Orderable Device | Package | Packing Option |
|---|---|---|
| SN74LVC1G86DBVR | SOT23-5 | 3000PCS |
| SN74LVC1G86DCKR | SC70-5 | 3000PCS |

## Circuit Diagram




## Absolute Maximum Ratings

| Parameters | | | Min | Max. | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage range | | -0.5 | 6.5 | V |
| $V_I$ | Input voltage range | | -0.5 | 6.5 | V |
| $V_O$ | Voltage range applied to any output in the high-impedance or power-off state | | -0.5 | 6.5 | V |
| $V_O$ | Voltage range applied to any output in the high or low state | | -0.5 | $V_{CC}$+0.5 | V |
| $I_{IK}$ | Input clamp current | $V_I$<0 | | -50 | mA |
| $I_{OK}$ | Output clamp current | $V_O$<0 | | -50 | mA |
| $I_O$ | Continuous output current | | | ±50 | mA |
| Continuous current through $V_{CC}$ or GND | | | | ±100 | mA |
| $T_J$ | Junction temperature under bias | | | 150 | ˚C |
| $T_{stg}$ | Storage temperature range | | -65 | 150 | ˚C |

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

## ESD Ratings

| ESD | | | Value | Unit |
|---|---|---|---|---|
| V(ESD) | Electrostatic discharge | Human-body model (HBM) | 8 K | V |
| | | Charged-device model (CDM) | 1.25 K | V |

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

## Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

| Symbol | Parameters | | Min. | Max. | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | | 1.65 | 5.5 | V |
| $V_{IH}$ | High-Level Input Voltage | $V_{CC}$=1.65V to1.95V | 0.65×$V_{CC}$ | | V |
| | | $V_{CC}$=2.3V to 2.7V | 1.7 | | |
| | | $V_{CC}$=3V to 3.6V | 2 | | |
| | | $V_{CC}$=4.5V to 5.5V | 0.7×$V_{CC}$ | | |
| $V_{IL}$ | Low-Level Input Voltage | $V_{CC}$=1.65V to1.95V | | 0.35×$V_{CC}$ | V |
| | | $V_{CC}$=2.3V to 2.7V | | 0.7 | |
| | | $V_{CC}$=3V to 3.6V | | 0.8 | |
| | | $V_{CC}$=4.5V to 5.5V | | 0.3×$V_{CC}$ | |
| $V_I$ | Input Voltage | | 0 | 5.5 | V |
| $V_O$ | Output Voltage | | 0 | $V_{CC}$ | V |
| $I_{OH}$ | High-Level Output Current | $V_{CC}$=1.65V | | -4 | mA |
| | | $V_{CC}$=2.3V | | -8 | |
| | | $V_{CC}$=3V | | -16 | |
| | | | | -24 | |
| | | $V_{CC}$=4.5V | | -32 | |
| $I_{OL}$ | Low-Level Output Current | $V_{CC}$=1.65V | | 4 | mA |
| | | $V_{CC}$=2.3V | | 8 | |
| | | $V_{CC}$=3V | | 16 | |
| | | | | 24 | |
| | | $V_{CC}$=4.5V | | 32 | |
| Δt/Δv | Input Transition Rise or Fall Rate | $V_{CC}$=1.8V±0.15V,2.5V±0.2V | | 20 | ns/V |
| | | $V_{CC}$=3.3V±0.3V | | 10 | |
| | | $V_{CC}$=5V±0.5V | | 5 | |
| TA | Operating Free-air Temperature | All Other Packages | 40 | 125 | °C |

(1) All unused digital inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation.

## Electrical Characteristics

FULL=–40°C to +125°C, Typical values are at TA=+25°C. (unless otherwise noted)

| Parameters | Symbol | Conditions | $V_{CC}$ | $T_A$ | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| Output | | | | | | | | |
| High-Level Output Voltage | $V_{OH}$ | $I_{OH}$=–100μA | 1.65V to 5.5V | FULL | $V_{CC}$-0.1 | | | V |
| | | $I_{OH}$=–4mA | 1.65 | | 1.2 | | | |
| | | $I_{OH}$=–8mA | 2.3 | | 1.9 | | | |
| | | $I_{OH}$=–16mA | 3 | | 2.4 | | | |
| | | $I_{OH}$=–24mA | | | 2.3 | | | |
| | | $I_{OH}$=–32mA | 4.5 | | 3.8 | | | |
| Low-Level Output Voltage | $V_{OL}$ | $I_{OL}$=100μA | 1.65V to 5.5V | FULL | | | 0.1 | V |
| | | $I_{OL}$=4mA | 1.65 | | | | 0.45 | |
| | | $I_{OL}$=8mA | 2.3 | | | | 0.3 | |
| | | $I_{OL}$=16mA | 3 | | | | 0.4 | |
| | | $I_{OL}$=24mA | | | | | 0.55 | |
| | | $I_{OL}$=32mA | 4.5 | | | | 0.55 | |
| Off-State Current | $I_{off}$ | $V_I$ or $V_O$=5.5V | 0V | FULL | | | ±10 | μA |
| Input | | | | | | | | |
| Input Leakage Current | $I_I$ | A or B input, $V_I$=5.5V or GND | 0V to 5.5V | FULL | | | ±5 | μA |
| Input Capacitance | $C_i$ | $V_I$=$V_{CC}$ or GND | 3.3V | FULL | | 6 | | pF |
| Power Supply | | | | | | | | |
| Power Supply Range | $V_{CC}$ | | 1.65V to 5.5V | FULL | 1.65 | | 5.5 | V |
| Supply Current | $I_{CC}$ | $V_I$=5.5 V or GND, $I_O$=0 | 1.65V to 5.5V | FULL | | | 10 | μA |
| Delta Power Current | $\Delta I_{CC}$ | One Input at $V_{CC}$ – 0.6 V, Other Inputs at $V_{CC}$ or GND | 3V to 5.5V | FULL | | | 500 | μA |

(1) All unused digital inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation.

## Switching Characteristics

Over recommended operating free-air temperature range,$C_L$=30pF or 50 pF (unless otherwise noted)

| Parameter | From(Input) | To(Output) | –40°C to +125°C | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{CC}$=1.8V±0.15V | | $V_{CC}$=2.5V±0.2V | | $V_{CC}$=3.3V±0.3V | | |
| | | | Min | Max | Min | Max | Min | Max | |
| $t_{pd}$ | A or B | Y | 2.1 | 10 | 1 | 4.9 | 0.6 | 3.7 | ns |

## Operating Characteristics

TA=–40°C to +125°C

| Parameter | | Test Conditions | $V_{CC}$=1.8V | $V_{CC}$=2.5V | $V_{CC}$=3.3V | Units |
|---|---|---|---|---|---|---|
| | | | Typ | Typ | Typ | |
| $C_{pd}$ | Power Dissipation Capacitance | f=10Mhz | 20 | 20 | 20 | pF |

## Typical Characteristics

Typical values are at TA=+25°C (unless otherwise noted)

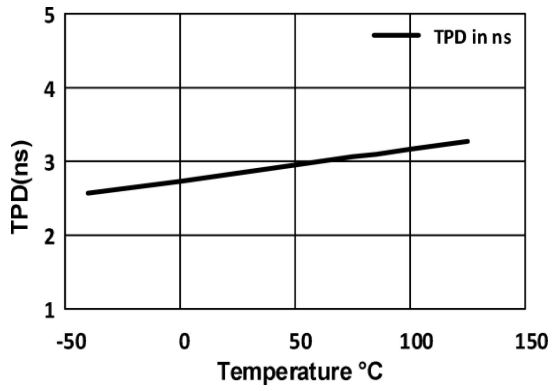



Fig.8-1. TPD Across Temperature at 3.6V $V_{CC}$

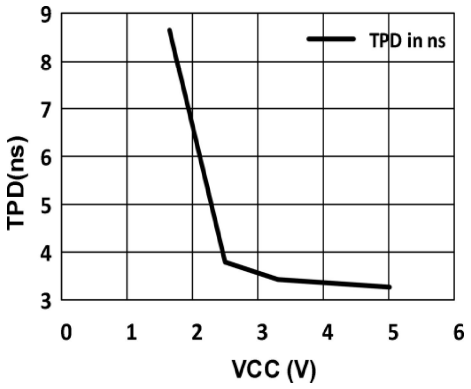
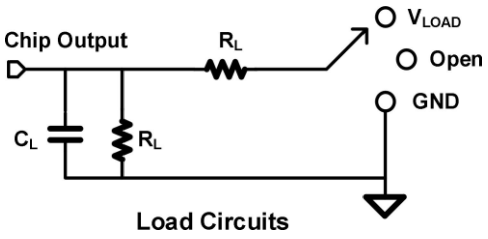



Fig.8-2. TPD Across $V_{CC}$ at 25℃

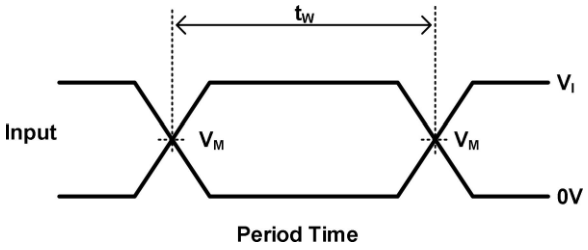
## Parameter Measurement Information



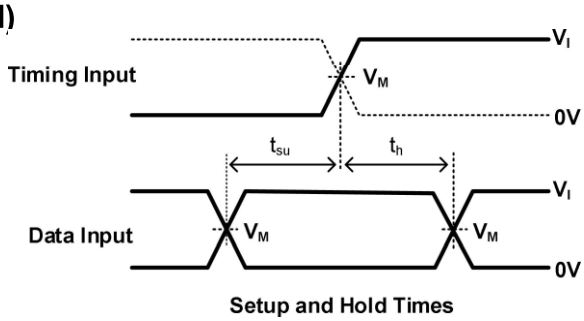

| TEST | S1 |
|---|---|
| $T_{PHL}/T_{PLH}$ | OPEN |
| $T_{PLZ}/T_{PZL}$ | $V_{LOAD}$ |
| $T_{PHZ}/T_{PZH}$ | GND |

| $V_{CC}$ | Inputs | | $V_M$ | $V_{LOAD}$ | $C_L$ | $R_L$ | $V_\Delta$ |
|---|---|---|---|---|---|---|---|
| | $V_I$ | $T_r/T_f$ | | | | | |
| 1.8V±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | $2\times V_{CC}$ | 15pF | 1MΩ | 0.15V |
| 2.5V±0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | $2\times V_{CC}$ | 15pF | 1MΩ | 0.15V |
| 3.3V±0.15V | 3V | ≤2.5ns | 1.5V | 6V | 15pF | 1MΩ | 0.3V |
| 5V±0.15V | $V_{CC}$ | ≤2.5ns | $V_{CC}/2$ | $2\times V_{CC}$ | 15pF | 1NΩ | 0.3V |

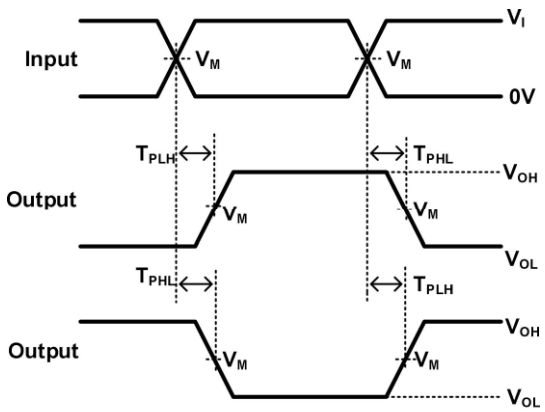
## Parameter Measurement Information(Continued)



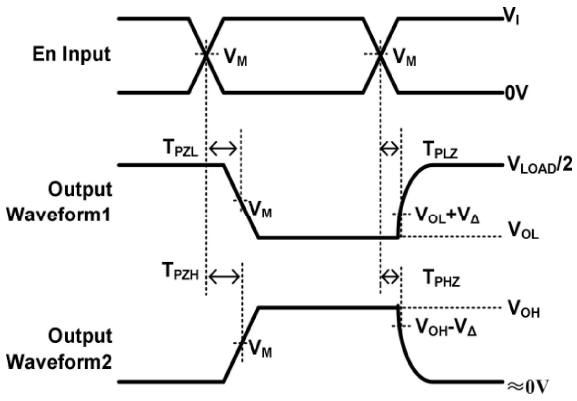

Period Time




Setup and Hold Times




Propagation Delay
for Output and Inverted Output




Enable and Disable Times
Low-And High-Level Enabling

Notes: A. $C_L$ includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR 10 MHz, Z =50.
D. The outputs are measured one at a time, with one transition per measurement.
E. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.
F. $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$.
G. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.
H. All parameters and waveforms are not applicable to all device.

## Feature Description

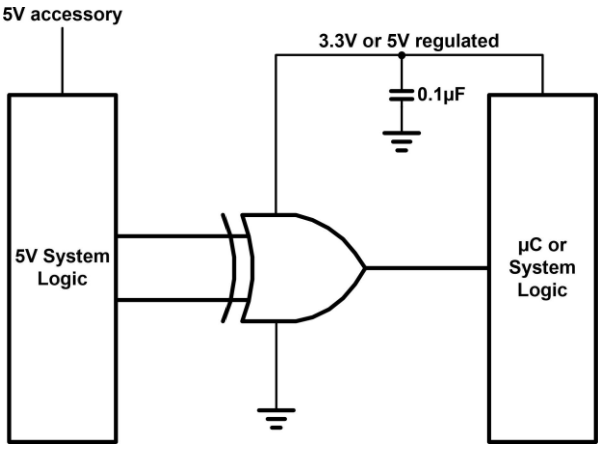
The SN74LVC1G86 device performs the Boolean function $Y = \overline{A}B + A\overline{B}$ in positive logic. This single 2-input exclusive-OR gate is designed for 1.65V to 5.5V $V_{CC}$ operation. A common application is as a true and complement element. If the input is low, the other input is reproduced in true form at the output. If the input is high, the signal on the other input is reproduced inverted at the output. This device is fully specified for partial-power-down applications using $I_{off}$. The $I_{off}$ circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

## Device Functional Modes

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

## Application Information

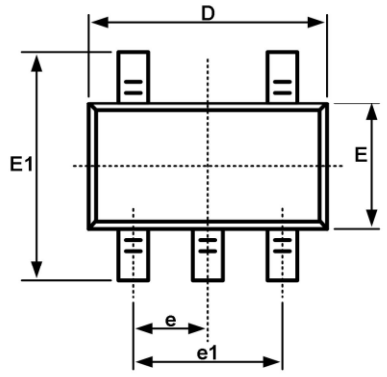
The SN74LVC1G86 device can accept input voltages up to 5.5 V at any valid Vcc which makes the device suitable for down translation. This feature of the SN74LVC1G86 makes it ideal for various bus interface applications.

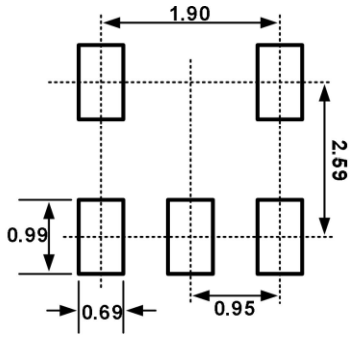



This device uses CMOS technology and has balanced output drive. Take care to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

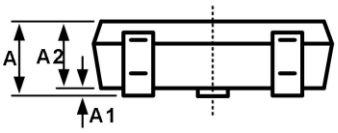
## Package Outline

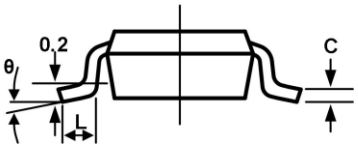
**SOT23-5**



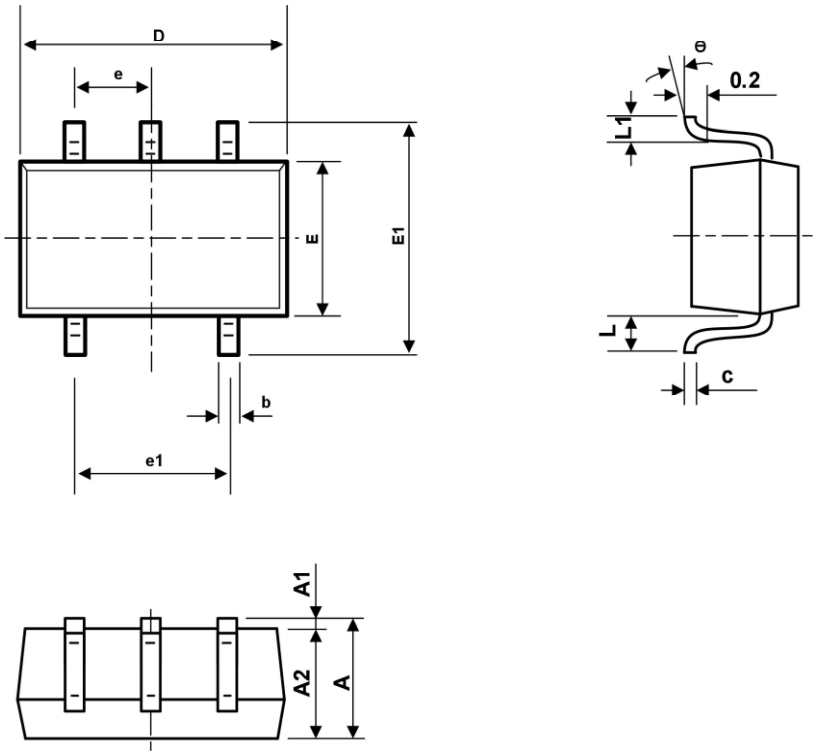

Recommended Land Pattern (Unit: mm)




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950BSC | | 0.037BSC | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| L1 | 0.600REF | | 0.024REF | |
| θ | 0° | 8° | 0° | 8° |

## Package Outline
## SC70-5




| symbol | Dimension In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.900 | 1.100 | 0.035 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.000 | 0.035 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| c | 0.110 | 0.175 | 0.004 | 0.007 |
| D | 2.000 | 2.200 | 0.079 | 0.087 |
| E | 1.150 | 1.350 | 0.045 | 0.053 |
| E1 | 2.150 | 2.450 | 0.085 | 0.096 |
| e | 0.650TYP | | 0.026TYP | |
| e1 | 1.200 | 1.400 | 0.047 | 0.055 |
| L | 0.525REF | | 0.021REF | |
| L1 | 0.260 | 0.460 | 0.010 | 0.018 |
| θ | 0° | 8° | 0° | 8° |