

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 $Y=\bar{A}B + A\bar{B}$ in positive logic. A common application is as a true/complement element. If the input is low, the other input is reproduced in true 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 Ioff. The Ioff circuitry disables the outputs, preventing damaging current back flow through the device when it is powered down.

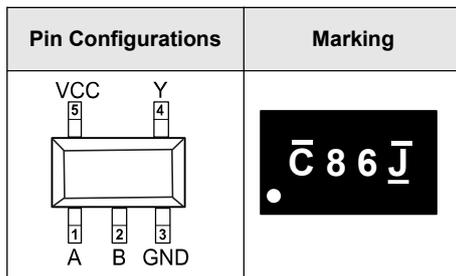
Features

- Operate from 1.65 V to 5.5V
- Specified from -40°C to 85°C
- Inputs accept voltages to 5.5V
- Max t_{pd} of 3.7ns at 3.3V
- Low power consumption, 10µA max I_{cc}
- ±24mA output drive at 3.3V
- Ioffs Supports partial-power-down mode

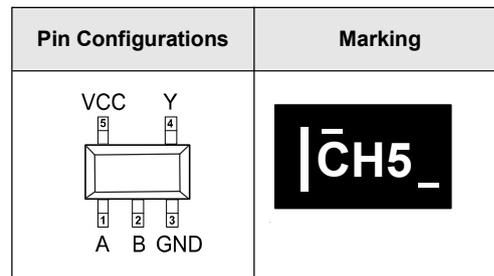
Applications

- Wireless headsets
- Motor drives and controls
- TVs
- Set-top boxes
- Audio

Pinning and Marking



SOT-23-5



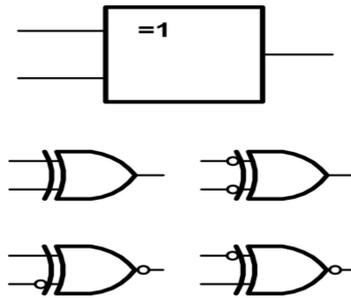
SC70-5

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		-50	mA
I_{OK}	Output clamp current		-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	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-65	150	$^{\circ}\text{C}$

(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.

ESDRatings

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	$V_{CC}=1.65V$ to $1.95V$	$0.65 \times V_{CC}$		V
		$V_{CC}=2.3V$ to $2.7V$	1.7		
		$V_{CC}=3V$ to $3.6V$	2		
		$V_{CC}=4.5V$ to $5.5V$	$0.7 \times V_{CC}$		
V_{IL}	Low-Level Input Voltage	$V_{CC}=1.65V$ to $1.95V$		$0.35 \times V_{CC}$	V
		$V_{CC}=2.3V$ to $2.7V$		0.7	
		$V_{CC}=3V$ to $3.6V$		0.8	
		$V_{CC}=4.5V$ to $5.5V$		$0.3 \times V_{CC}$	
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	
		$V_{CC}=4.5V$		-24	
I_{OL}	Low-Level Output Current	$V_{CC}=1.65V$		4	mA
		$V_{CC}=2.3V$		8	
		$V_{CC}=3V$		16	
		$V_{CC}=4.5V$		24	
$\Delta t/\Delta v$	Input Transition Rise or Fall Rate	$V_{CC}=1.8V \pm 0.15V, 2.5V \pm 0.2V$		20	ns/V
		$V_{CC}=3.3V \pm 0.3V$		10	
		$V_{CC}=5V \pm 0.5V$		5	
T_A	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	ΔI _{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

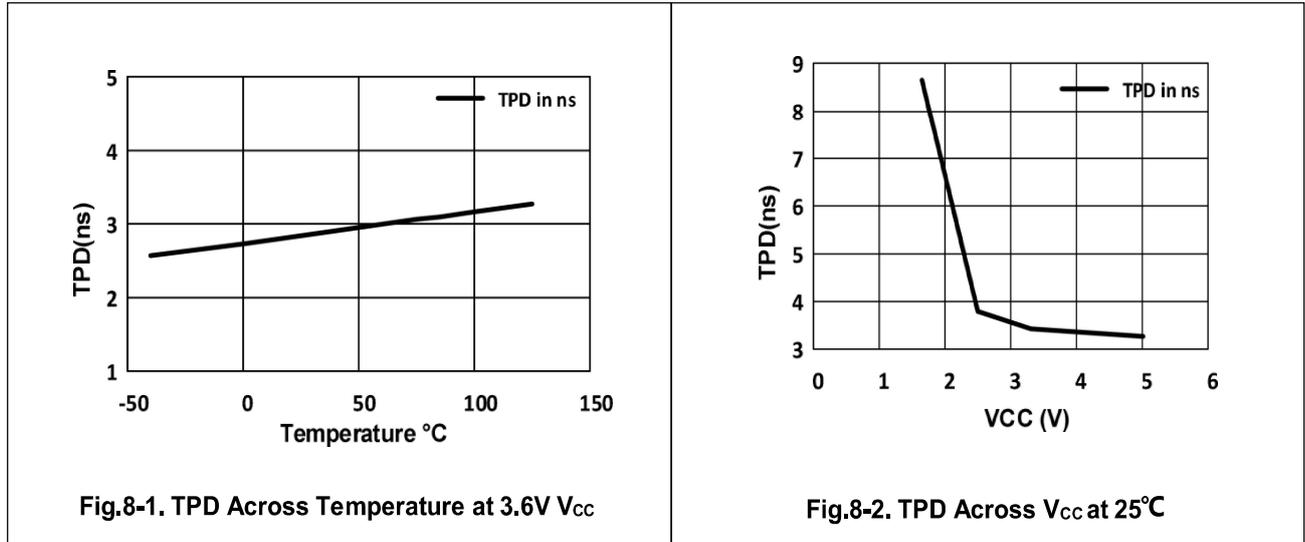
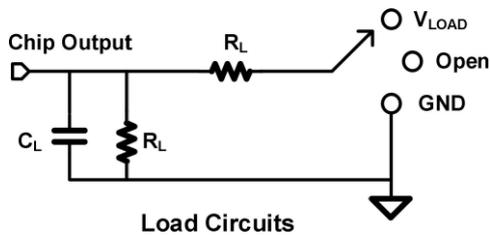
Operating Characteristics

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

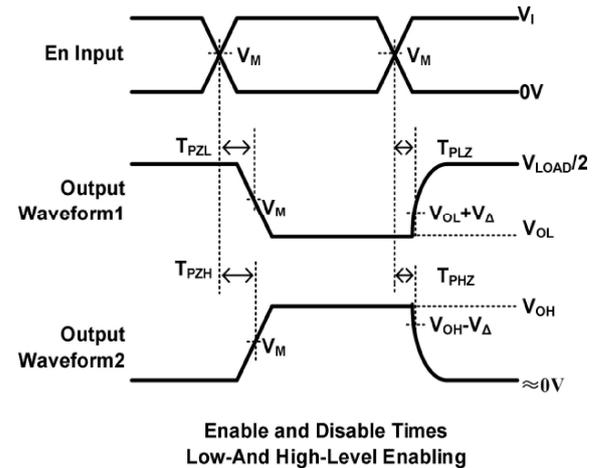
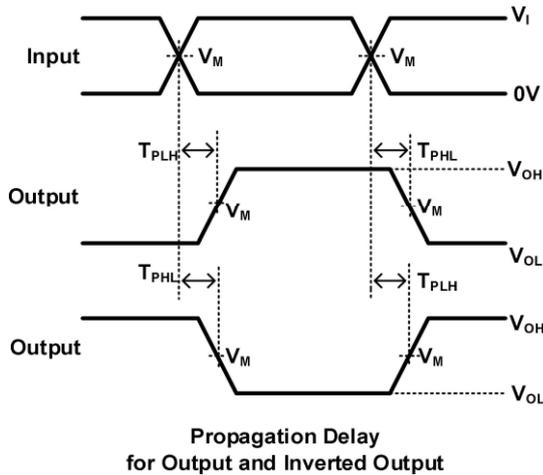
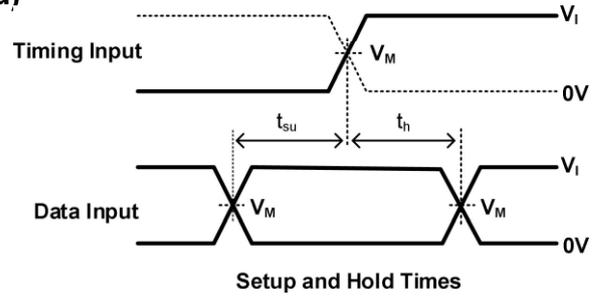
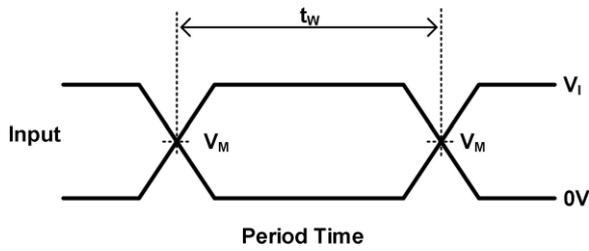
Typical Characteristics

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


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 _Δ
	V _I	T _r /T _f					
1.8V±0.15V	V _{CC}	≤2ns	V _{CC} /2	2×V _{CC}	15pF	1MΩ	0.15V
2.5V±0.15V	V _{CC}	≤2ns	V _{CC} /2	2×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×V _{CC}	15pF	1MΩ	0.3V

Parameter Measurement Information(Continued)


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_{PZL} and t_{PHZ} are the same as t_{dis} .

F. t_{PZL} and t_{PHZ} are the same as t_{on} .

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

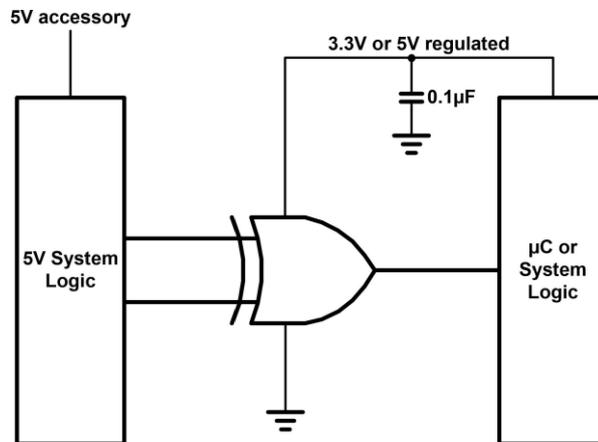
The SN74LVC1G86 device performs the Boolean function $Y = \overline{A}B + A\overline{B}$ in positive logic. This single 2-input exclusive-OR gate is designed for 1.65V to 5.5V V_{CC} operation. A common application is as a true and complement element. If the input is low, the other input is reproduced 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

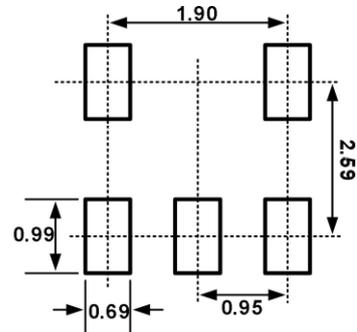
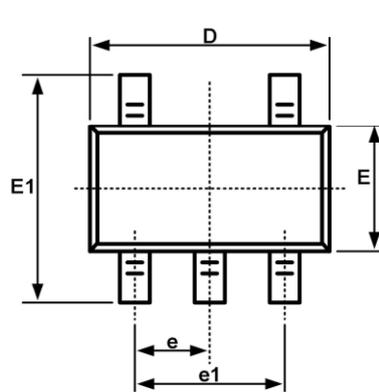
Inputs		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

Application Information

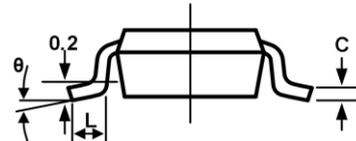
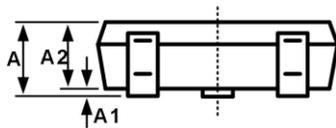
The SN74LVC1G86 device can accept input voltages up to 5.5 V at any valid V_{CC} which makes the device suitable for down translation. This feature of the SN74LVC1G86 makes it ideal for various bus interface applications.



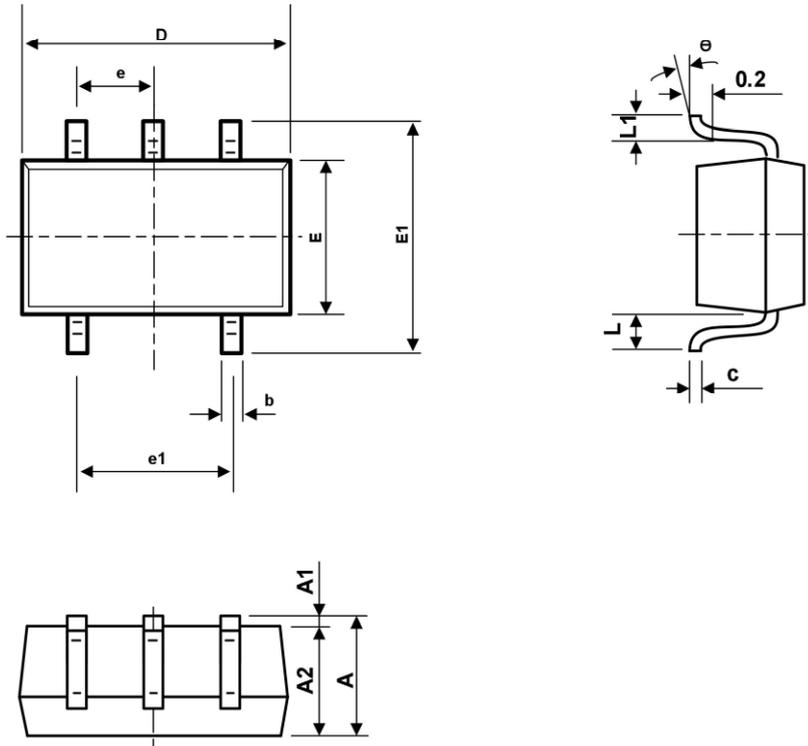
This device uses CMOS technology and has balanced output drive. Take care to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

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
e	0°	8°	0°	8°