

General Description

The SN74LVC1G86 is a high performance single 2-input Exclusive-OR Gate operating from a 2.3V to 5.5V supply.

Features

- Tiny SC70-5, SOT23-5 and DFN6-1.0mm*1.5mm Packages
- Extremely High Speed: t_{PD} 2.5ns (typical) at V_{CC} = 5.0V
- Designed for 1.65V to 5.5V V_{CC} Operation, CMOS Compatible
- Over Voltage Tolerant Inputs, V_{IN} may be Between 0 and 7.0V for V_{CC} Between 0.5 and 5.5V
- TTL Compatible – Interface Capability with 5.0V TTL Logic with V_{CC} = 2.7V to 3.6V
- LVC MOS Compatible
- 24mA Output Sink Capability, Pullup may be between 0 and 7.0V
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 20
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Pin Configuration

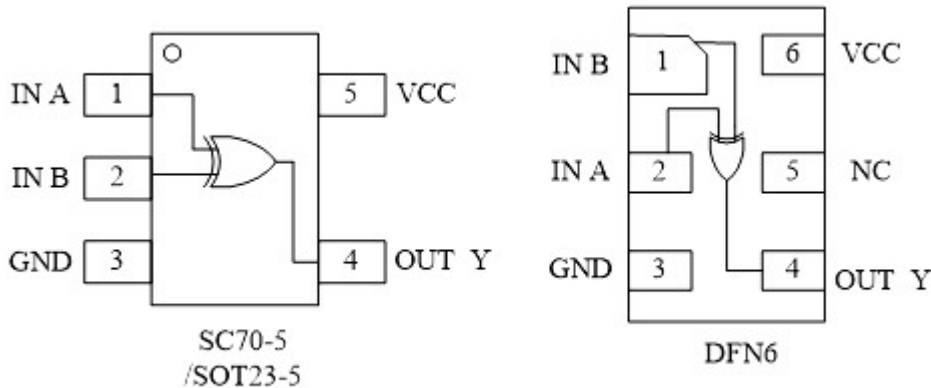


Figure1: Top View

Pin Function

(SC70-5/ SOT23-5)

PIN	FUNCTION
1	IN B
2	INA
3	GND
4	Y
5	VCC

DFN6-1.0×1.5

PIN	FUNCTION
1	IN B
2	IN A
3	GND
4	Y
5	NC
6	VCC

Block Diagram

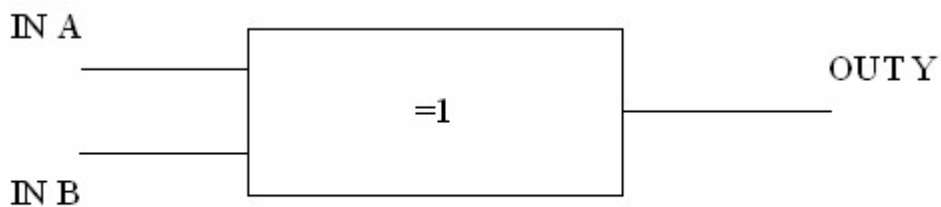


Figure2.Logic symbol

Functional Description

Function Table

Input		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	-0.5 to 7.0	V
V_I	DC Input Voltage	$-0.5 \leq V_I \leq +7.0$	V
V_O	DC Output Voltage Output in Higher or Low State (Note 1)	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current $V_I < GND$	-50	mA
I_{OK}	DC Output Diode Current $V_O < GND, V_O > V_{CC}$	± 50	mA
I_O	DC Output Sink Current	± 50	mA
I_{CC}	DC Supply Current per Supply Pin	± 100	mA
I_{GND}	DC Ground Current per Supply Pin	± 100	mA
T_{STG}	Storage Temperature Range	-65 to 150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
T_J	Junction Temperature Under Bias	150	°C
θ_{JA}	Thermal Resistance SC70-5 (Note 1)	435	°C/W
	SOT23-5	300	
	DFN6	450	
P_D	Power Dissipation in Still Air at 85°C SC70-5	150	mW
	SOT23-5	200	
	DFN6	130	
MSL	Moisture Sensitivity	Level 1	
F_R	Flammability Rating Oxygen Index:28 to 34	UL94V-0@0.12in	
ESD	ESD Classification Human Body Model (Note 2)	2000	V
	Machine Model (Note3)	200	
	Charged Device Model (Note 4)	N/A	
$I_{Latchup}$	Latchup Performance Above VCC and Below GND at 125°C (Note 5)	± 100	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. IO absolute maximum rating must be observed.
2. Tested to EIA/JESD22-A114-A, rated to EIA/JESD22-A114-B.
3. Tested to EIA/JESD22-A115-A, rated to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit	
V _{CC}	DC Supply Voltage Operating	1.65	5.5	V	
	Date Retention	1.5	5.5		
V _{IN}	DC Input Voltage	0	5.5	V	
V _{OUT}	DC Output Voltage (High or Low State)	0	5.5	V	
T _A	Operating Temperature Range	-55	125	°C	
t _r , t _f	Input Rise and Fall Time	V _{CC} = 2.5 V ± 0.2 V	0	20	ns/V
		V _{CC} = 3.0 V ± 0.3 V	0	10	
		V _{CC} = 5.0 V ± 0.5 V	0	5	

Electrical Characteristics

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	VCC(V)	T _A = 25 °C			-55°C ≤ T _A ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	
V _{IH}	High-Level Input Voltage		1.65 to 1.95 2.3 to 5.5	0.75V _{CC} 0.7V _{CC}			0.75V _{CC} 0.7V _{CC}		V
V _{IL}	Low-Level Input Voltage		1.65 to 1.95 2.3 to 5.5			0.25V _{CC} 0.3V _{CC}		0.25V _{CC} 0.3V _{CC}	V
V _{OH}	High-Level Output Voltage V _{IN} = V _{IL}	I _{OH} = -100µA	1.65 to 5.5	V _{CC} - 0.1	V _{CC}		V _{CC} - 0.1		V
		I _{OH} = -3mA	1.65	1.29	1.52	1.29			
		I _{OH} = -8mA	2.3	1.9	2.1	1.9			
		I _{OH} = -12mA	2.7	2.2	2.4	2.2			
		I _{OH} = -16mA	3.0	2.4	2.7	2.4			
		I _{OH} = -24mA	3.0	2.3	2.5	2.3			
		I _{OH} = -32mA	4.5	3.8	4.0	3.8			
V _{OL}	Low-Level Output Voltage V _{IN} = V _{IH}	I _{OL} = 100µA	1.65 to 5.5		0.0	0.1		0.1	V
		I _{OL} = 3mA	1.65		0.08	0.24		0.24	
		I _{OL} = 8mA	2.3		0.20	0.3		0.3	
		I _{OL} = 12mA	2.7		0.22	0.4		0.4	
		I _{OL} = 16mA	3.0		0.28	0.4		0.4	
		I _{OL} = 24mA	3.0		0.38	0.55		0.55	
		I _{OL} = 32mA	4.5		0.42	0.55		0.55	
I _{IN}	Input Leakage Current	V _{IN} = 5.5 V or GND	0 to 5.5		±0.1			±1.0	µA
I _{OFF}	Power Off Leakage Current	V _{IN} = 5.5 V or V _{OUT} = 5.5 V	0			1		10	µA
I _{CC}	Quiescent Supply Current	V _{IN} = 5.5 V or GND	5.5					10	µA

**AC ELECTRICAL CHARACTERISTICS $t_r=t_f= 2.5\text{ns}$; $C_L = 50\text{pF}$;
 $R_L = 500 \Omega$**

Symbol	Parameter	Condition	$V_{CC}(V)$	$T_A = 25 \text{ }^\circ\text{C}$			$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay (Figure3and4)	$R_L = 1\text{M}\Omega$ $C_L = 15 \text{ pF}$	1.65	2.0	5.3	11.4	2.0	12.0	ns
			1.8	2.0	4.4	9.5	2.0	10.0	
		$R_L = 1\text{M}\Omega$ $C_L = 15 \text{ pF}$	2.5 ± 0.2	0.2	3.5	6.5	0.8	4.1	
		$R_L = 1\text{M}\Omega$ $C_L = 15 \text{ pF}$	3.3 ± 0.3	0.8	2.1	4.5	0.5	3.7	
		$R_L = 500\Omega$ $C_L = 50 \text{ pF}$		1.2	2.9	5.5	1.5	5.2	
		$R_L = 1\text{M}\Omega$ $C_L = 15 \text{ pF}$	5.0 ± 0.5	0.5	1.8	3.9	0.5	4.1	
		$R_L = 500\Omega$ $C_L = 50 \text{ pF}$		0.8	2.4	4.3	0.8	4.5	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	$V_{CC} = 5.5 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	>2.5	pF
C_{PD}	Power Dissipation Capacitance (Note 6)	10MHz, $V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	4	pF
		10MHz, $V_{CC} = 5.5 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	4	

6. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:

$I_{CC(OPR)} = C_{PD} * V_{CC} * f_{in} + I_{CC} * C_{PD}$ is used to determine the no-load dynamic power consumption;

$P_D = C_{PD} * V_{CC}^2 * f_{in} + I_{CC} * V_{CC} * Fig.$

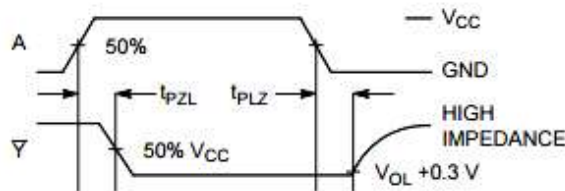


Figure 3. Switching Waveforms

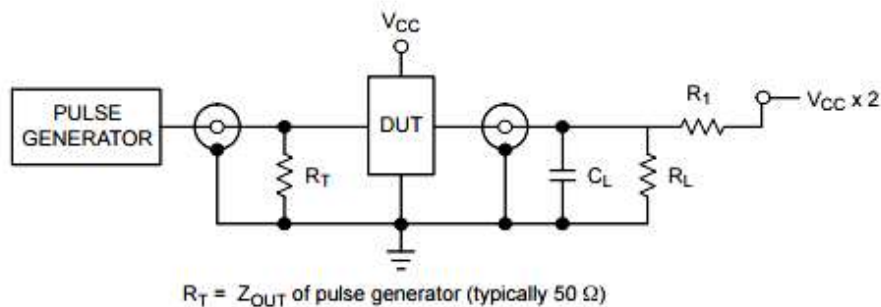
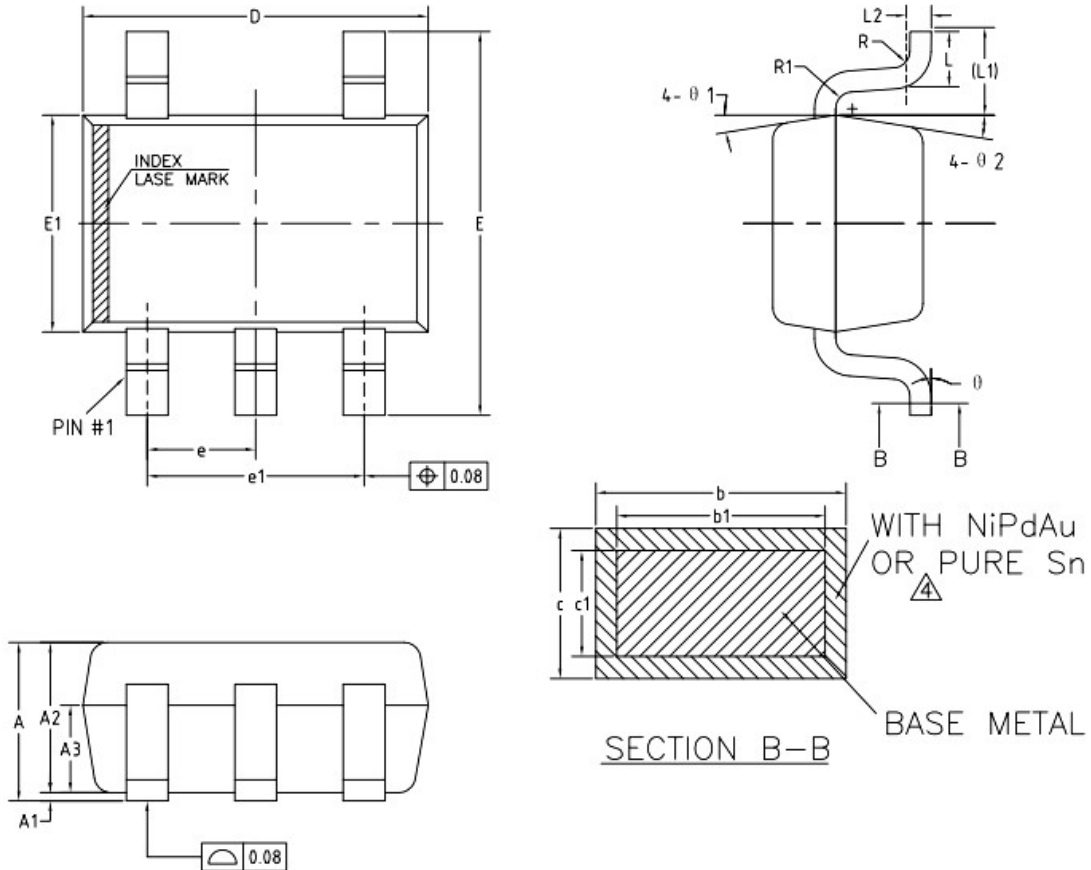


Figure 4. Test Circuit

Package Dimension

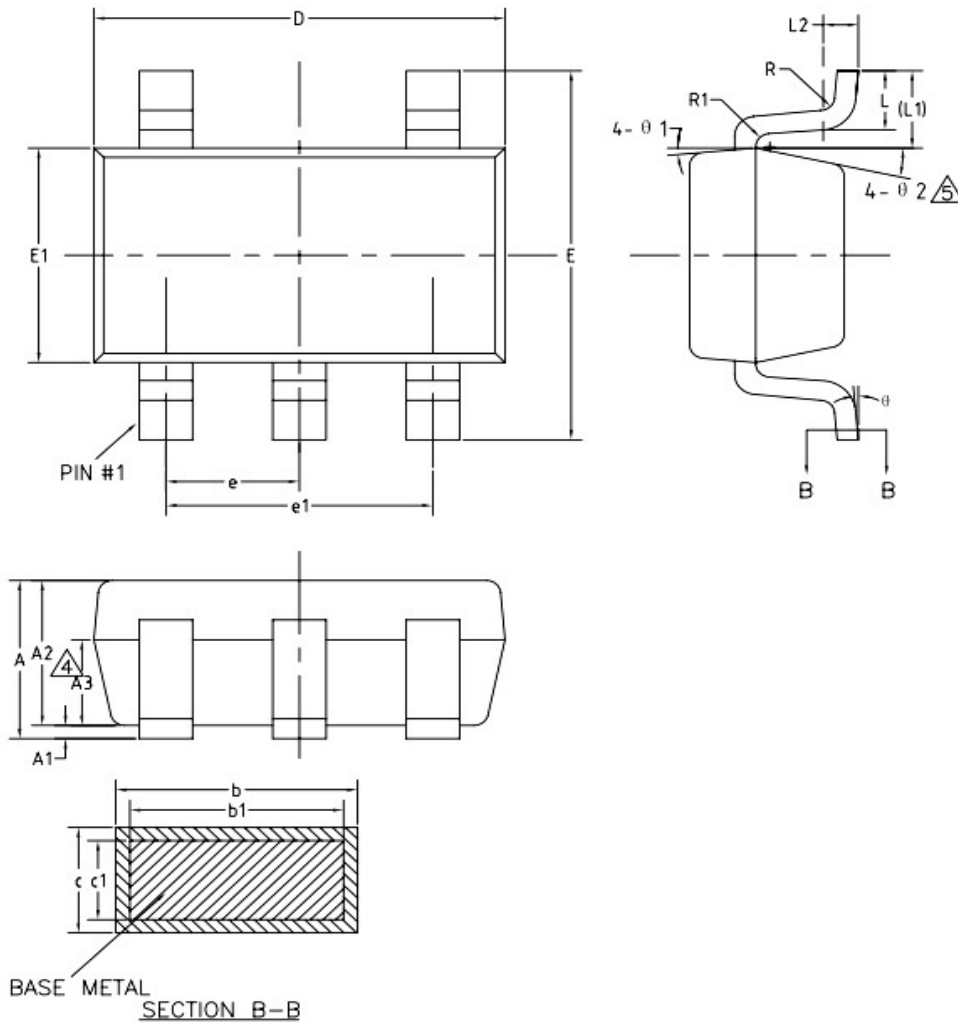
SC70-5






COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX	
A	0.85	—	1.05	
A1	0	—	0.10	
A2	0.80	0.90	1.00	
A3	0.47	0.52	0.57	
b	NiPdAu	0.22	—	0.29
	PURE Sn	0.23	—	0.33
b1	0.22	0.25	0.28	
c	NiPdAu	0.115	—	0.15
	PURE Sn	0.12	—	0.18
c1	0.115	0.13	0.14	
D	2.02	2.07	2.12	
E	2.20	2.30	2.40	
E1	1.25	1.30	1.35	
e	0.60	0.65	0.70	
e1	1.20	1.30	1.40	
L	0.28	0.33	0.38	
L1	0.50REF			
L2	0.15BSC			
R	0.10	—	—	
R1	0.10	—	0.25	
θ	0°	—	8°	
$\theta 1$	6°	9°	12°	
$\theta 2$	6°	9°	12°	

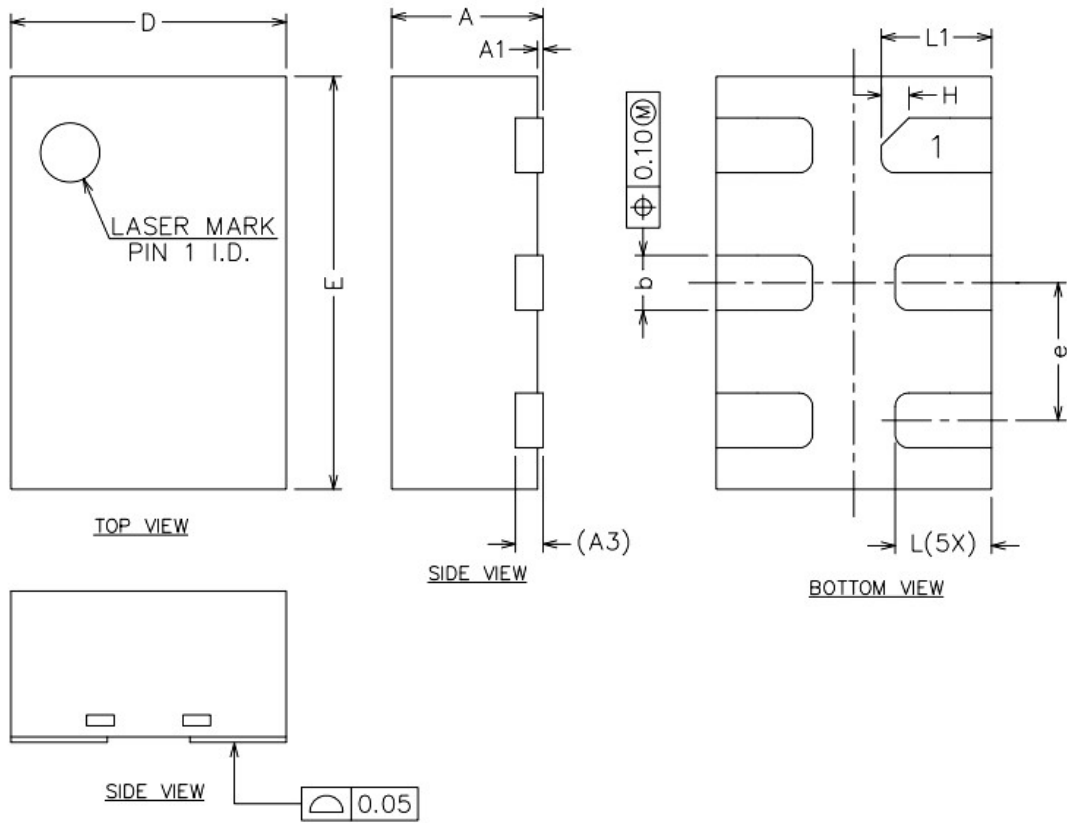
SOT23-5



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	—	—	1.25
 A1	0	—	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	—	0.50
b1	0.36	0.38	0.45
c	0.14	—	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
 e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59REF		
L2	0.25BSC		
R	0.10	—	—
R1	0.10	—	0.25
θ	0°	—	8°
θ 1	3°	5°	7°
 θ 2	6°	—	14°

DFN6



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	—	0.60
A1	0.00	0.02	0.05
A3	0.10REF		
b	0.15	0.20	0.25
D	0.90	1.00	1.10
E	1.40	1.50	1.60
e	0.40	0.50	0.60
H	0.10REF		
L	0.30	0.35	0.40
L1	0.35	0.40	0.45

Ordering information

Order code	Marking code	Package	Baseqty	Deliverymode
UMW SN74LVC1G86DBVR	C86J	SOT23-5	3000	Tape and reel
UMW SN74LVC1G86DCKR	CH5	SC70-5	3000	Tape and reel
UMW SN74LVC1G86DRYR	CH	SC70-5	3000	Tape and reel

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