Single 2-input Exclusive−OR Gate

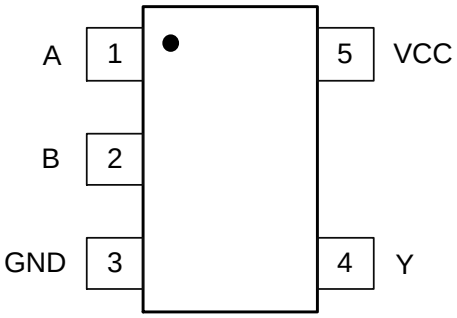
General Description

The SN74AHCT1G86 is a single 2-input exclusive-OR gate. The device performs the Boolean function $Y = A \oplus B$ or $Y = \bar{A}B + A\bar{B}$ in positive logic.

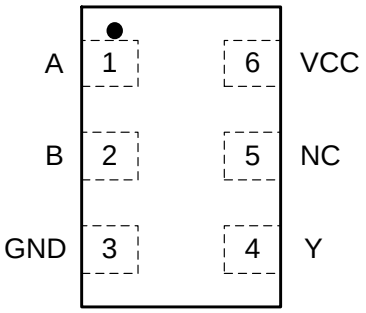
Features

- Operating Range of 4.5V to 5.5V
- Max t_{pd} of 8ns at 5V
- Low Power Consumption, 10μA Maximum I_{CC}
- 8mA Output Drive at 5V
- Inputs Are TTL-Voltage Compatible
- Packages are SC70-5,SOT23-5 or small DFN6
- MSL3(SC70-5,SOT23-5，DFN6(1*1.5)

Pin Configuration



SOT23-5/SC70-5



DFN6（1*1.5）

Figure1. Top View

Pin Function

SC70-5/ SOT23-5

Pin No.	Pin Name	Function
1	A	Input A
2	B	Input B
3	GND	Ground
4	Y	Output
5	VCC	Supply Voltage

DFN6

Pin No.	Pin Name	Function
1	A	Input A
2	B	Input B
3	GND	Ground
4	Y	Output
5	NC	No connect
6	VCC	Supply Voltage

Block Diagram

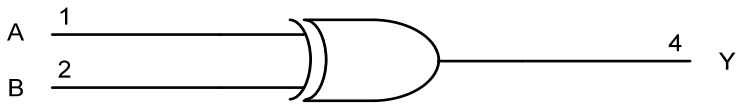


Figure2. Logic Symbol

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 (1)		−0.5 ≤ V_I ≤+7.0	V
V_O	DC Output Voltage Output in Higher or Low State		−0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current V_I < GND		−20	mA
I_{OK}	DC Output Diode Current V_O < GND, V_O > V_{CC}		±20	mA
I_O	DC Output Sink Current		±25	mA
I_{CC}	DC Supply Current per Supply Pin		±50	mA
I_{GND}	DC Ground Current per Supply Pin		±50	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
V_{ESD}	ESD Classification	Human Body Model (2)	±4000	V
		Charged Device Model (3)	±1000	
I_{LU}	Latch up Current Above V_{CC} and GND at 125°C (4)		±100	mA

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SC70-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	300	°C/W
	SOT23-5		250	
	DFN6(1.0×1.5)		440	
P_D	SC70-5	Power Dissipation in Still Air at 85°C	215	mW
	SOT23-5		260	
	DFN6(1.0×1.5)		150	

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	4.5	5.5	V
V_{IH}	High-level Input Voltage	2		V
V_{IL}	Low-level Input Voltage		0.8	V
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage	0	V_{CC}	V
I_{OH}	High-level Output Current		-8	mA
I_{OL}	Low-level Output Current		8	mA
t/v	Input Transition Rise and Fall Rate		20	ns/V
T_A	Operating Temperature Range	-40	125	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied.

Electrical Characteristics

DC Electrical Characteristics

Symbol	Parameter	Condition	V_{CC} (V)	T_A=25°C			-40°C≤T_A≤85°C		-40°C≤T_A≤125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V_{OH}	High−Level Output Voltage	I_{OH}=−50μA	4.5	4.4	4.5		4.4		4.4		V
		I_{OH}=−8mA	4.5	3.94			3.8		3.8		
V_{OL}	Low−Level Output Voltage	I_{OL}=50μA	4.5			0.1		0.1		0.1	V
		I_{OL}=8mA	4.5			0.36		0.44		0.44	
I_I	Input Current	V_{IN} = 5.5V or GND	0 to 5.5			±0.1		±1		±1	μA
I_{CC}	Supply Current	V_{IN} = V_{CC} or GND, I_O = 0	5.5			1		10		10	μA
ΔI_{CC} [5]	Change in Supply Current	One input at 3.4 V, Other Inputs at V_{CC} or GND	5.5			1.35		1.5		1.5	mA
C_I	Input Capacitance	V_{IN} = V_{CC} or GND	5		3	10		10		10	pF

Note5: This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

Switching Characteristics

Over recommended operating free-air temperature range, V_{CC} = 5V±0.5V (unless otherwise noted)

(see Figure 3)

Symbol	Parameter	Condition	T_A=25°C			−40°C≤T_A≤85°C		−40°C≤T_A≤125°C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_{PLH}	Propagation Delay	C_L= 15pF		2.5	6.2	1	8	1	9	ns
t_{PHL}		C_L= 15pF		5.5	6.2	1	8	1	9	ns
t_{PLH}		C_L= 50pF		2.5	7.9	1	9	1	10	ns
t_{PHL}		C_L= 50pF		6.0	8.3	1	9	1	10	ns

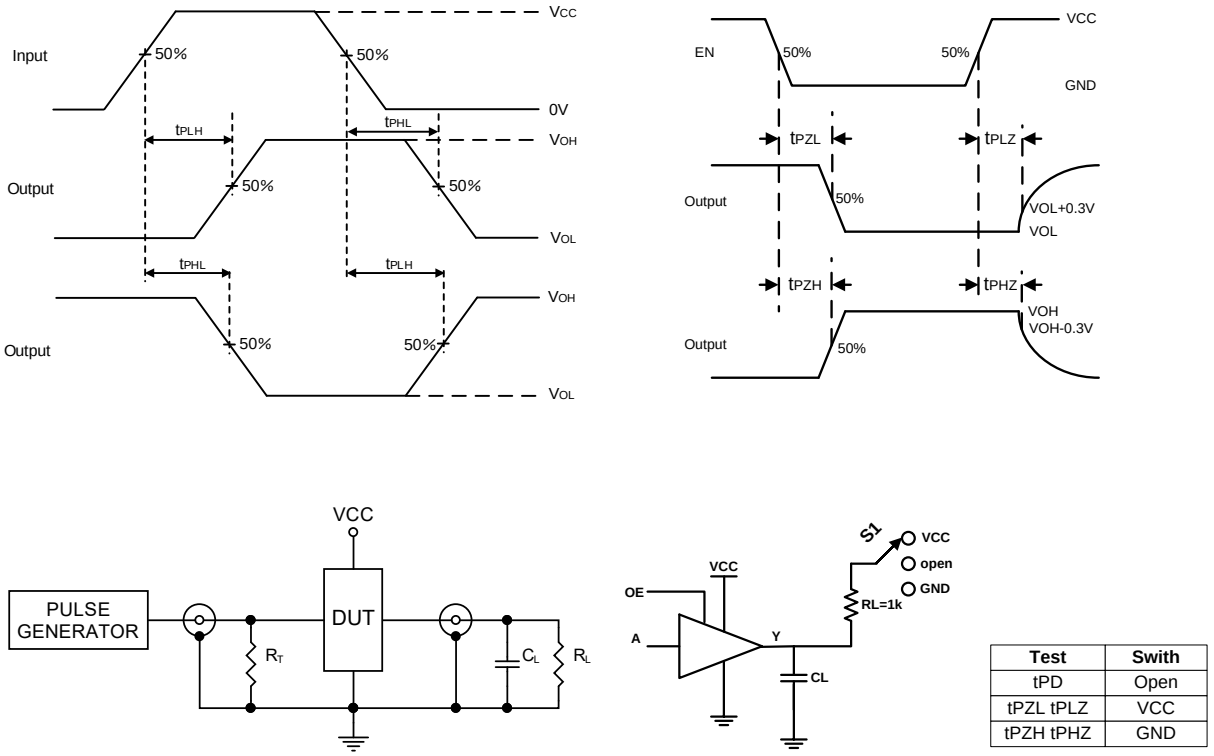
Operating Characteristics

V_{CC} = 5V, T_A = 25°C

Symbol	Parameter	Condition	Typ	Unit
C_{PD}	Power Dissipation Capacitance (6)	No load, f = 1 MHz	13	pF

Note6: 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: $I_{CC(OPR)}=C_{PD}\times V_{CC}\times f_{in}+I_{CC}\times C_{PD}$ is used to determine the no−load dynamic power consumption; $P_D=C_{PD}\times V_{CC}^2\times f_{in}+I_{CC}\times V_{CC}\times$Fig.

Waveform and Test Circuit



Test	Swith
tPD	Open
tPZL tPLZ	VCC
tPZH tPHZ	GND

C_L includes probe and jig capacitance

All input pulses are supplied by generators having the following characteristics:PRR ≤ 1MHz, Z_O=50Ω, t_r ≤ 3ns,t_f ≤ 3ns.

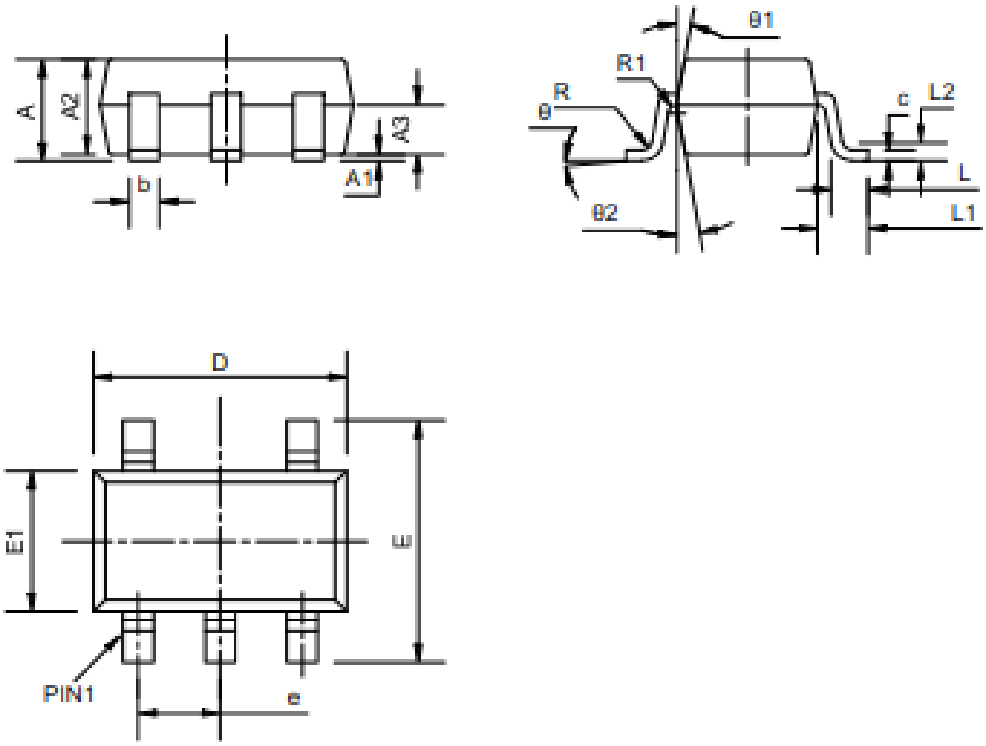
The outputs are measured one at a time with one input transition per measurement.

All parameters and waveforms are not applicable to all devices.

Figure3. Load Circuit and Voltage Waveforms

Package Dimension

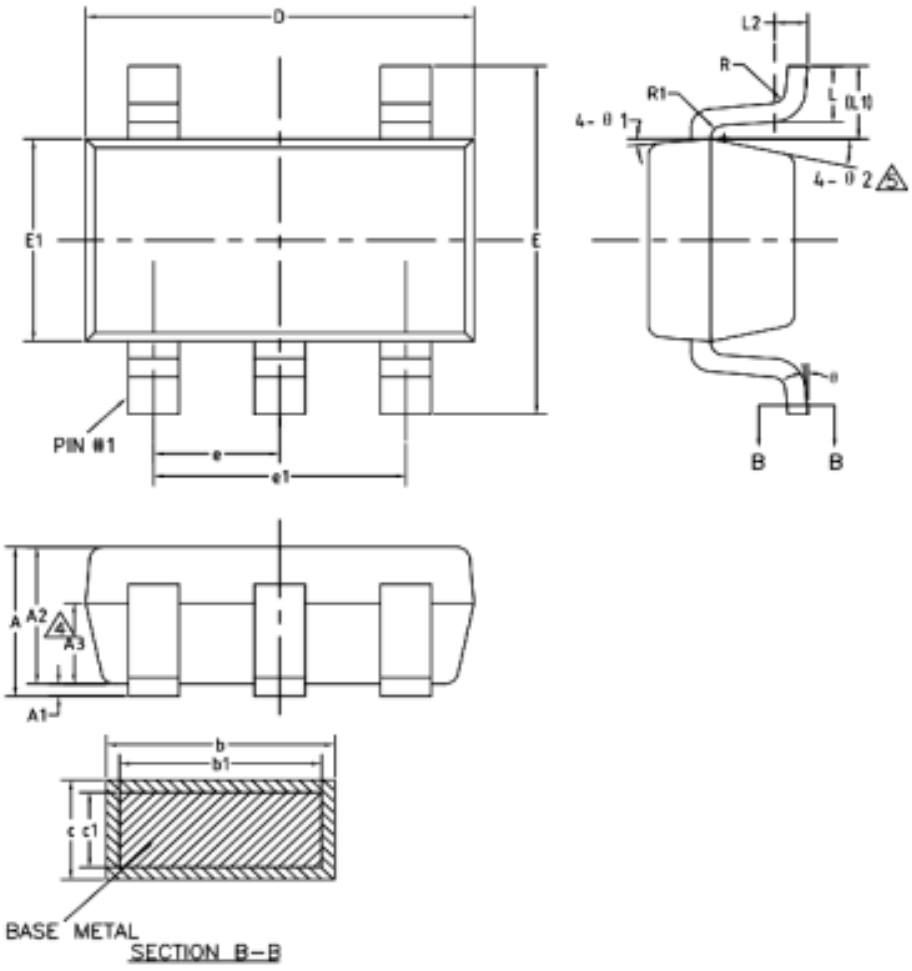
SC70-5



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	0.23	--	0.33
c	0.12	--	0.18
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
L	0.28	0.33	0.38
L1	0.50REF		
L2	0.15BSC		
R	0.10	--	--
R1	0.10	--	0.25
θ	0°	--	8°
θ1	6°	9°	12°
θ2	6°	9°	12°

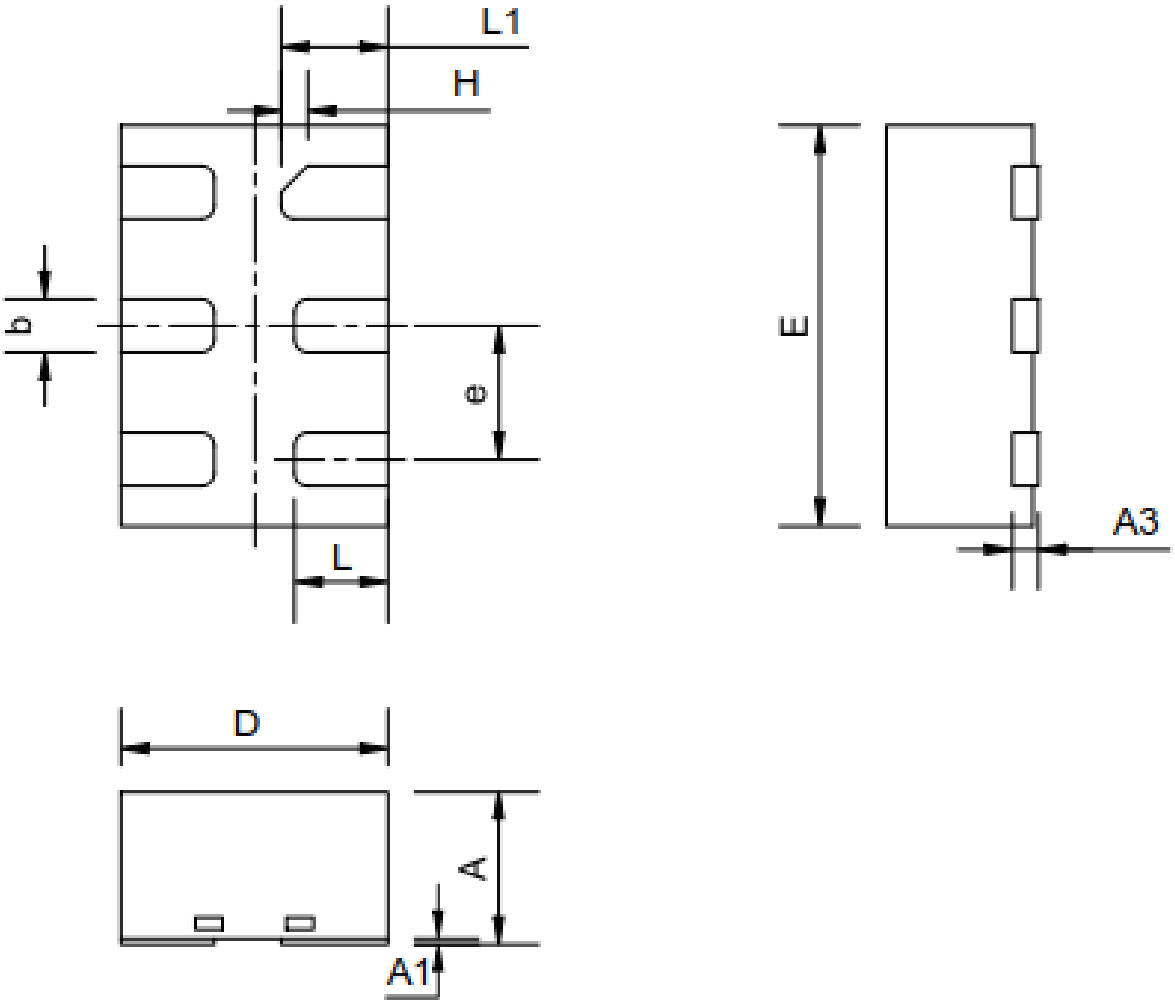
SOT23-5



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(1.0×1.5)



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	--	0.60
A1	0	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

Orderinginformation

Order code	Marking code	Package	Baseqty	Deliverymode
UMW SN74AHCT1G86DBVR	B86G U	SOT23-5	3000	Tape and reel
UMW SN74AHCT1G86DCKR	BHJ U	SC70-5	3000	Tape and reel
UMW SN74AHCT1G86DRYR	—	DFN6（1*1.5）	5000	Tape and reel