

### 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:

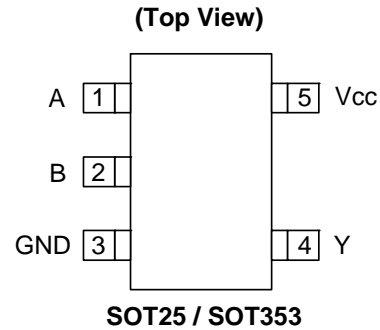
$$Y = A \oplus B \text{ or } Y = \overline{A}B + A\overline{B}$$

### 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)

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 Assignments



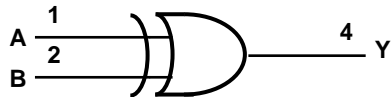
### Applications

- 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

**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
$V_{CC}$	Supply Voltage Range	-0.5 to 6.5	V
$V_I$	Input Voltage Range	-0.5 to 6.5	V
$V_O$	Voltage applied to output in high or low state	-0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	Input Clamp Current $V_I < 0$	-20	mA
$I_{OK}$	Output Clamp Current ( $V_O < 0$ or $V_O > V_{CC}$ )	$\pm 20$	mA
$I_O$	Continuous output current ( $V_O = 0$ to $V_{CC}$ )	$\pm 25$	mA
$I_{CC}$	Continuous current through $V_{CC}$	50	mA
$I_{GND}$	Continuous current through GND	-50	mA
$T_J$	Operating Junction Temperature	-40 to 150	$^{\circ}\text{C}$
$T_{STG}$	Storage Temperature	-65 to 150	$^{\circ}\text{C}$

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
$V_{CC}$	Operating Voltage	2	5.5	V
$V_{IH}$	High-level Input Voltage	$V_{CC} = 2V$	1.5	V
		$V_{CC} = 3V$	2.1	
		$V_{CC} = 5.5V$	3.85	
$V_{IL}$	Low-level input voltage	$V_{CC} = 2V$	0.5	V
		$V_{CC} = 3V$	0.9	
		$V_{CC} = 5.5V$	1.65	
$V_I$	Input Voltage	0	5.5	V
$V_O$	Output Voltage	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 2V$	-50	$\mu\text{A}$
		$V_{CC} = 3.3V \pm 0.3V$	-4	mA
		$V_{CC} = 5V \pm 0.5V$	-8	
$I_{OL}$	Low-level output current	$V_{CC} = 2V$	50	$\mu\text{A}$
		$V_{CC} = 5V \pm 0.5V$	4	mA
		$V_{CC} = 3V$	8	
$\Delta t/\Delta V$	Input transition rise or fall rate	$V_{CC} = 3.3V \pm 0.3V$	100	ns/V
		$V_{CC} = 5V \pm 0.5V$	20	
$T_A$	Operating free-air temperature	-40	125	$^{\circ}\text{C}$

Notes: 3. Unused inputs should be held at  $V_{CC}$  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 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)

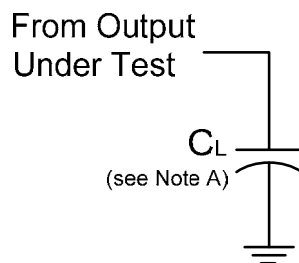
Parameter	From (Input)	TO (OUTPUT)		25°C			-40°C to 85°C		-40°C to 125°C		Unit
				Min	Typ.	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A or B	Y	C <sub>L</sub> =15pF	0.6	3.4	6.8	0.6	8.0	0.6	8.5	ns
			C <sub>L</sub> =50pF	0.6	4.9	8.8	0.6	10.0	0.6	11.5	ns

**Operating Characteristics**

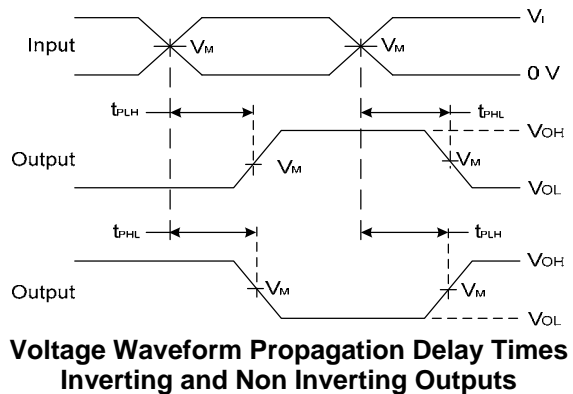
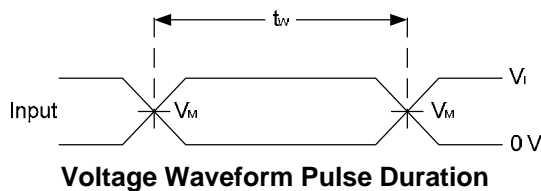
$T_A = 25\text{ }^\circ\text{C}$

Parameter	Test Conditions	$V_{CC} = 5\text{ V}$	Unit
		Typ.	
$C_{pd}$	$f = 1\text{ MHz}$ No Load	12	pF

**Parameter Measurement Information**



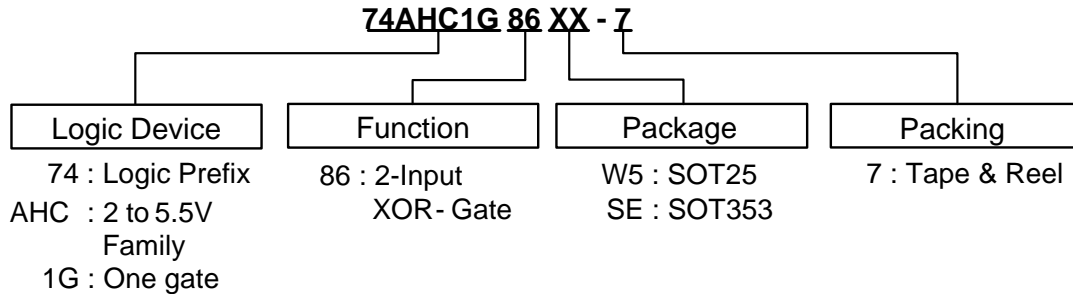
$V_{CC}$	Inputs		$V_M$	$C_L$
	$V_I$	$t_r/t_f$		
$3.3\text{V}\pm 0.3\text{V}$	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	15pF
$5\text{V}\pm 0.5\text{V}$	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	15pF
$3.3\text{V}\pm 0.3\text{V}$	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	50pF
$5\text{V}\pm 0.5\text{V}$	$V_{CC}$	$\leq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



**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  $t_{PD}$ .

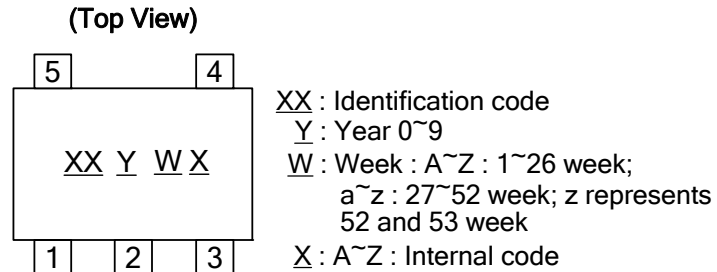
**Ordering Information**



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**

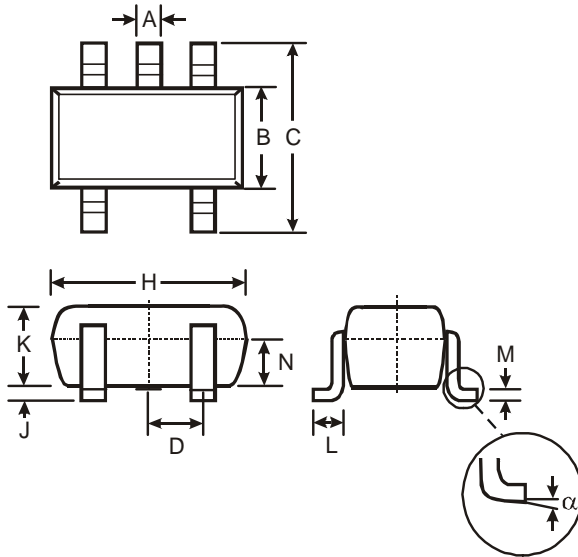


Part Number	Package	Identification Code
74AHC1G86W5	SOT25	YX
74AHC1G86SE	SOT353	YX

NEW PRODUCT

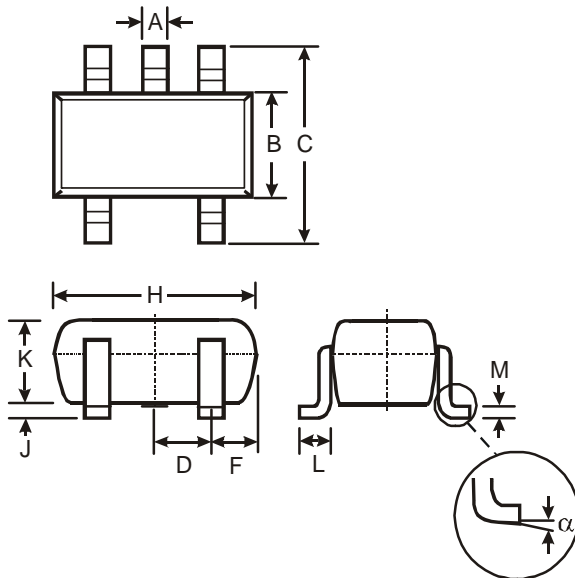
**Package Outline Dimensions (All Dimensions in mm)**

**(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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