

Description

The 74AHC1G09 is a single 2-input positive AND gate with an open drain output. The device is designed for operation with a power supply range of 2.0V to 5.5V. The open-drain output can be connected to other open drain outputs to implement active-low wired-OR or active-high wired-AND functions. The gate performs the positive Boolean function:

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

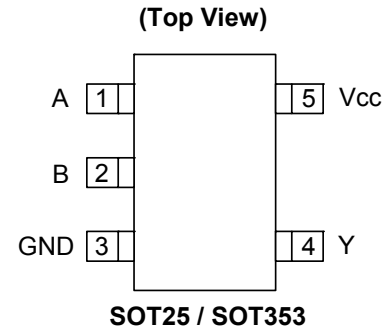
A pull-up resistor is required to achieve a high output state.

Features

- Supply Voltage Range from 2.0V to 5.5V
- 8mA sink current at 5.0 V
- 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)
 - **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
 - **Halogen and Antimony Free. "Green" Device (Note 3)**

Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignments



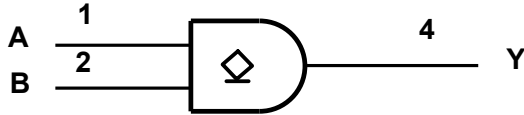
Applications

- 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.	Function
A	1	Data Input
B	2	Data Input
GND	3	Ground
Y	4	Data Output
V _{CC}	5	Supply Voltage

Logic Diagram



Functional Table

Inputs		Output
A	B	Y
H	H	Z
L	X	L
X	L	L

Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	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})	±20	mA
I _O	Continuous output current (V _O = 0 to V _{CC})	±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	°C
T _{STG}	Storage Temperature	-65 to +150	°C

Note: 4. 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.

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Recommended Operating Conditions (Note 5) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Min	Max	Unit
V _{CC}	Operating Voltage	2.0	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	5.5	V
I _{OL}	Low-Level Output Current	V _{CC} = 2V	50	μA
		V _{CC} = 5V ± 0.5V	4	mA
		V _{CC} = 3V	8	
Δt/ΔV	Input transition rise or fall rate	V _{CC} = 3.3V ± 0.3V	100	ns/V
		V _{CC} = 5V ± 0.5V	20	
T _A	Operating free-air temperature	-40	+125	°C

 Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V _{CC}	+25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _{OL}	High-level Input Voltage	I _{OL} = 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 _{OL} = 4mA	3V			0.36		0.44		0.55	
	I _{OL} = 8mA	4.5V			0.36		0.44		0.55		
I _I	Input Current	V _I = 5.5V or GND	0 to 5.5V			±0.1		±1		±2	μA
I _{oz}	Z-state Output Current	V _I = 5.5V or GND	0 to 5.5V			±0.25		±2.5		±10	μA
I _{CC}	Supply Current	V _I = 5.5V or GND I _O = 0	5.5V			1		10		40	μA
C _i	Input Capacitance	V _I = V _{CC} – or GND	5.5V		2.0	10		10		10	pF
θ _{JA}	Thermal Resistance Junction-to-Ambient	SOT25	(Note 6)		204						°C/W
		SOT353		371							
θ _{JC}	Thermal Resistance Junction-to-Case	SOT25	(Note 6)		52						°C/W
		SOT353		143							

Note: 6. Test conditions for SOT25, and SOT353: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Switching Characteristics

 $V_{CC} = 3.3V \pm 0.3$ (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_{pd}	A or B	Y	$C_L = 15pF$	0.6	4.6	7.5	0.6	8.5	0.6	9.0	ns
			$C_L = 50pF$	0.6	6.5	11.0	0.6	12.0	0.6	12.5	ns

 $V_{CC} = 5V \pm 0.5V$ (see Figure 1)

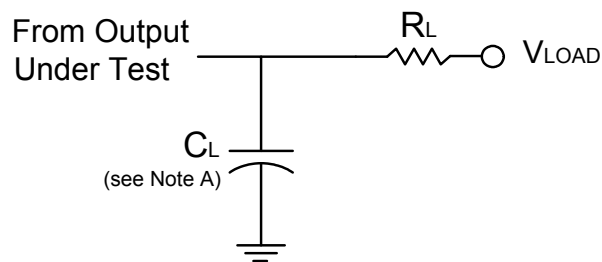
Parameter	From (Input)	TO (OUTPUT)		+25°C			-40°C to +85°C		-40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	$C_L = 15pF$	0.6	3.2	5.5	0.6	6.5	0.6	7.0	ns
			$C_L = 50pF$	0.6	4.6	7.5	0.6	8.0	0.6	8.5	ns

Operating Characteristics

 $T_A = +25^\circ C$

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

Parameter Measurement Information



TEST	Condition
t_{PLZ} (see Notes D and E)	V_{LOAD}
t_{PZL} (see Notes D and F)	V_{LOAD}

V_{CC}	Inputs		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	t_r/t_f					
$3.3V \pm 0.3V$	V_{CC}	$\leq 3ns$	$V_{CC}/2$	V_{CC}	15pF	1K Ω	0.3V
$3.3V \pm 0.3V$	V_{CC}	$\leq 3ns$	$V_{CC}/2$	V_{CC}	50pF	1K Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 3ns$	$V_{CC}/2$	V_{CC}	15pF	1K Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 3ns$	$V_{CC}/2$	V_{CC}	50pF	1K Ω	0.3V

Parameter Measurement Information (cont.)

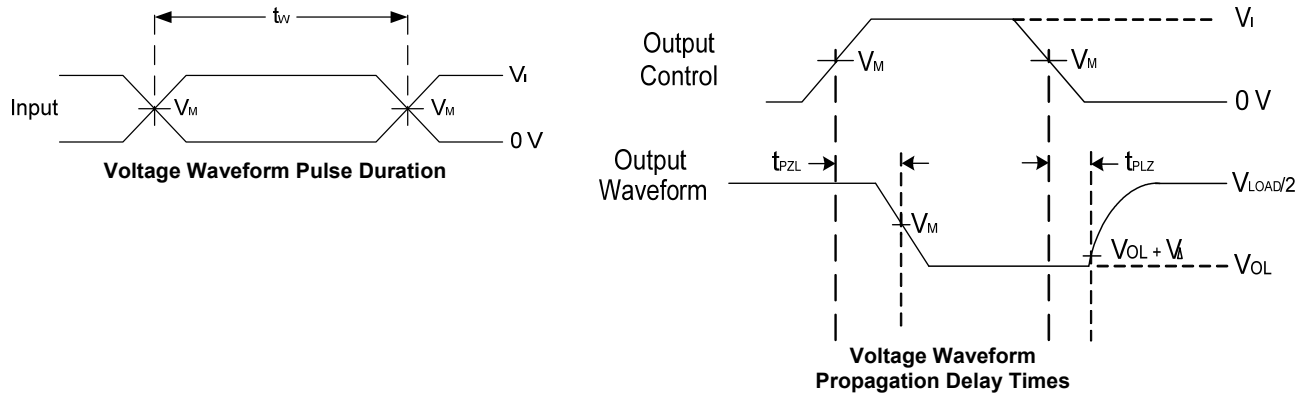
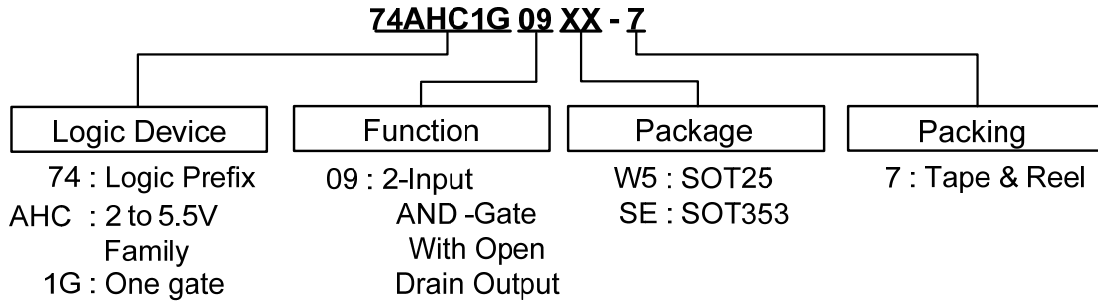


Figure 1 Load Circuit and Voltage Waveforms

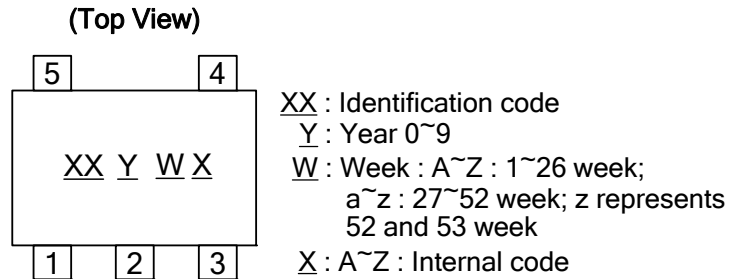
- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 1 MHz.
 - C. The inputs are measured one at a time with one transition per measurement.
 - D. For the open drain device t_{PLZ} and t_{PZL} are the same as t_{PD} .
 - E. t_{PZL} is measured at V_M .
 - F. t_{PLZ} is measured at $V_{OL} + V_{\Delta}$.

Ordering Information



Part Number	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
74AHC1G09W5-7	W5	SOT25	3000/Tape & Reel	-7
74AHC1G09SE-7	SE	SOT353	3000/Tape & Reel	-7

Marking Information



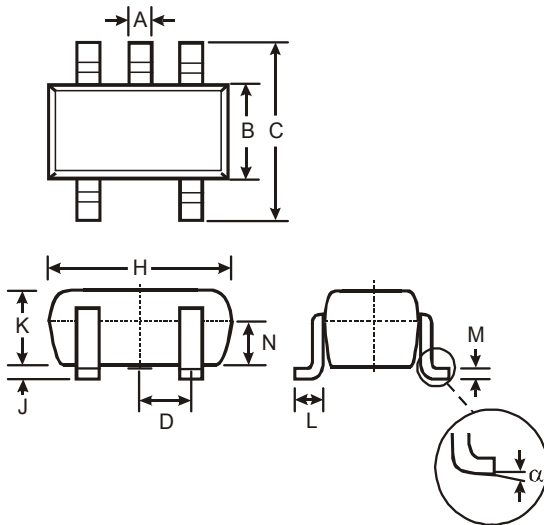
Part Number	Package	Identification Code
74AHC1G09W5	SOT25	YN
74AHC1G09SE	SOT353	YN

Package Outline Dimensions (All dimensions in mm.)

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

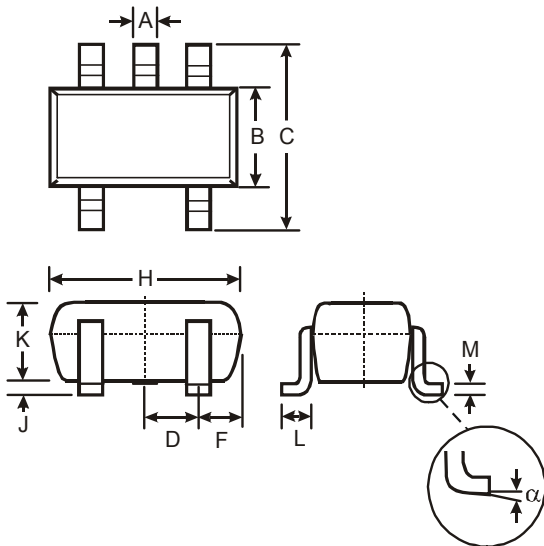
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(1) Package Type: SOT25



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
α	0°	8°	—
All Dimensions in mm			

(2) Package Type: SOT353

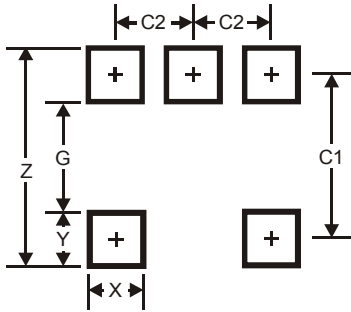


SOT353		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Typ	
F	0.40	0.45
H	1.80	2.20
J	0	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.22
α	0°	8°
All Dimensions in mm		

Suggested Pad Layout

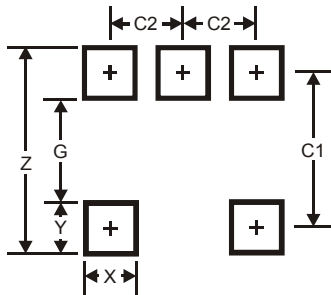
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

(1) Package Type: SOT25



Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(2) Package Type: SOT353



Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

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