

# 74HC1G08; 74HCT1G08

## 2-input AND gate

Rev. 04 — 17 July 2007

Product data sheet

## 1. General description

74HC1G08 and 74HCT1G08 are high-speed, Si-gate CMOS devices. They provide a 2-input AND function.

The HC device has CMOS input switching levels and supply voltage range 2 V to 6 V.

The HCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V.

The standard output currents are half those of the 74HC08 and 74HCT08.

## 2. Features

- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- SOT353-1 and SOT753 package options

## 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC1G08GW 74HCT1G08GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74HC1G08GV 74HCT1G08GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753

## 4. Marking

Table 2. Marking codes

Type number	Marking
74HC1G08GW	HE
74HCT1G08GW	TE
74HC1G08GV	H08
74HCT1G08GV	T08

## 5. Functional diagram

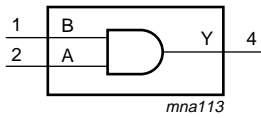


Fig 1. Logic symbol

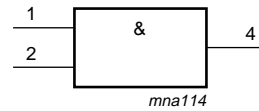


Fig 2. IEC logic symbol

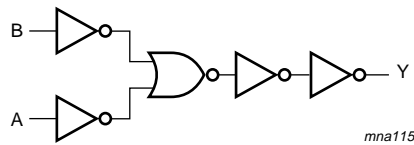


Fig 3. Logic diagram

## 6. Pinning information

### 6.1 Pinning

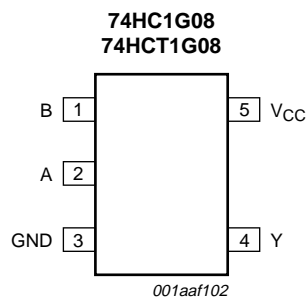


Fig 4. Pin configuration

### 6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
B	1	data input
A	2	data input
GND	3	ground (0 V)
Y	4	data output
V <sub>CC</sub>	5	supply voltage

## 7. Functional description

**Table 4. Function table**

H = HIGH voltage level; L = LOW voltage level

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

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V). [\[1\]](#)

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7.0	V
$I_{IK}$	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{OK}$	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_O$	output current	$-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$	-	$\pm 12.5$	mA
$I_{CC}$	supply current		-	25	mA
$I_{GND}$	ground current		-25	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$	<a href="#">[2]</a> -	200	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] Above 55 °C the value of  $P_{tot}$  derates linearly with 2.5 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	74HC1G08			74HCT1G08			Unit
			Min	Typ	Max	Min	Typ	Max	
$V_{CC}$	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
$V_I$	input voltage		0	-	$V_{CC}$	0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	0	-	$V_{CC}$	V
$T_{amb}$	ambient temperature		-40	+25	+125	-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0\text{ V}$	-	-	625	-	-	-	ns/V
		$V_{CC} = 4.5\text{ V}$	-	-	139	-	-	139	ns/V
		$V_{CC} = 6.0\text{ V}$	-	-	83	-	-	-	ns/V

10. Static characteristics

Table 7. Static characteristics

Voltages are referenced to GND (ground = 0 V). All typical values are measured at  $T_{amb} = 25\text{ }^\circ\text{C}$ .

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
<b>For type 74HC1G08</b>								
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	V
		V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	5.9	-	V
		I <sub>O</sub> = -2.0 mA; V <sub>CC</sub> = 4.5 V	4.13	4.32	-	3.7	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	-	0.1	V
		I <sub>O</sub> = 2.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.33	-	0.4	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	1.0	-	1.0	μA
		V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	10	-	20	μA
C <sub>I</sub>	input capacitance		-	1.5	-	-	-	pF
<b>For type 74HCT1G08</b>								
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	V
		I <sub>O</sub> = -2.0 mA; V <sub>CC</sub> = 4.5 V	4.13	4.32	-	3.7	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>						
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	V
		I <sub>O</sub> = 2.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.33	-	0.4	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	1.0	-	1.0	μA

**Table 7. Static characteristics ...continued**

Voltages are referenced to GND (ground = 0 V). All typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
$I_{CC}$	supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$ ; $V_{CC} = 5.5\text{ V}$	-	-	10	-	20	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input; $V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$ ; $V_I = V_{CC} - 2.1\text{ V}$ ; $I_O = 0\text{ A}$	-	-	500	-	850	$\mu\text{A}$
$C_I$	input capacitance		-	1.5	-	-	-	pF

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

$GND = 0\text{ V}$ ;  $t_r = t_f \leq 6.0\text{ ns}$ ; All typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ . For test circuit see [Figure 6](#)

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	

### For type 74HC1G08

$t_{pd}$	propagation delay	A and B to Y; see <a href="#">Figure 5</a> <a href="#">[1]</a>						
		$V_{CC} = 2.0\text{ V}$ ; $C_L = 50\text{ pF}$	-	25	115	-	135	ns
		$V_{CC} = 4.5\text{ V}$ ; $C_L = 50\text{ pF}$	-	9	23	-	27	ns
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	7	-	-	-	ns
$C_{PD}$	power dissipation capacitance	$V_I = GND$ to $V_{CC}$ <a href="#">[2]</a>	-	19	-	-	-	pF
		$V_{CC} = 6.0\text{ V}$ ; $C_L = 50\text{ pF}$	-	8	20	-	23	ns

### For type 74HCT1G08

$t_{pd}$	propagation delay	A and B to Y; see <a href="#">Figure 5</a> <a href="#">[1]</a>						
		$V_{CC} = 4.5\text{ V}$ ; $C_L = 50\text{ pF}$	-	11	23	-	27	ns
		$V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$	-	11	-	-	-	ns
$C_{PD}$	power dissipation capacitance	$V_I = GND$ to $V_{CC} - 1.5\text{ V}$ <a href="#">[2]</a>	-	21	-	-	-	pF

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[2]  $C_{PD}$  is used to determine the dynamic power dissipation  $P_D$  ( $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = input frequency in MHz

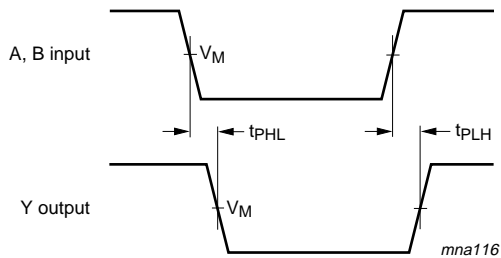
$f_o$  = output frequency in MHz

$C_L$  = output load capacitance in pF

$V_{CC}$  = supply voltage in Volts

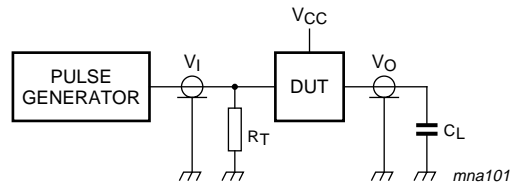
$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs

12. Waveforms



For 74HC1G08:  $V_M = 0.5 \times V_{CC}$ ;  $V_I = \text{GND to } V_{CC}$   
 For 74HCT1G08:  $V_M = 1.3 \text{ V}$ ;  $V_I = \text{GND to } 3.0 \text{ V}$

Fig 5. The input (A and B) to output (Y) propagation delays



Test data is given in [Table 8](#). Definitions for test circuit:

$C_L$  = Load capacitance including jig and probe capacitance

$R_T$  = Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator

Fig 6. Load circuitry for switching times

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1



Fig 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753



Fig 8. Package outline SOT753 (SC-74A)



## 14. Abbreviations

Table 9. Abbreviations

Acronym	Description
DUT	Device Under Test
TTL	Transistor-Transistor Logic

## 15. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT1G08_4	20070717	Product data sheet	-	74HC_HCT1G08_3
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Package SOT353 changed to SOT353-1 in <a href="#">Table 1</a> and <a href="#">Figure 7</a>.</li> <li>Quick Reference Data and Soldering sections removed.</li> <li><a href="#">Section 2 "Features"</a> updated.</li> </ul>			
74HC_HCT1G08_3	20020517	Product specification	-	74HC_HCT1G08_2
74HC_HCT1G08_2	20010302	Product specification	-	74HC_HCT1G08_1
74HC_HCT1G08_1	19981110	Preliminary specification	-	-

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Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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