

Quad 2-input AND gate

1、 General description

The 74HC08D is a high speed CMOS 2-INPUT AND GATE. It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. The 74HC08D complies with JEDEC standard no.7A. Its main features are as follows:

- Compatible with JEDEC standard no.8-1A
- ESD protection
HBM EIA/JESD22-A114-A exceeds 2000V
MM EIA/JESD22-A115-A exceeds 200V.
- Specified from -40 °C to +85 °C

2、 Diagrams

2.1、 Functional diagram

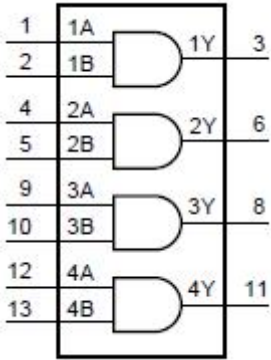


Fig.1 Logic symbol

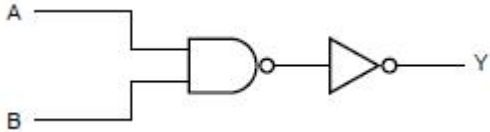


Fig.2 IEC logic symbol

2.2、 Pinning information

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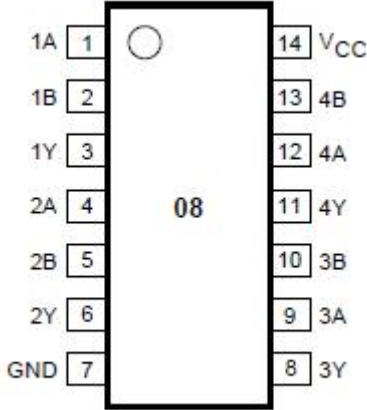


Fig.3 Pin configuration

2.3. Pin description

Pin	Symbol	Description	Pin	Symbol	Description
1	1A	Data input	8	3Y	Data output
2	1B	Data input	9	3A	Data input
3	1Y	Data output	10	3B	Data input
4	2A	Data input	11	4Y	Data output
5	2B	Data input	12	4A	Data input
6	2Y	Data output	13	4B	Data input
7	GND	Ground (0 V)	14	Vcc	supply voltage

2.4. Function table

Input		Output
nA	nB	nY
L	L	L
L	H	L
H	L	L
H	H	H

3. Electrical Characteristics

3.1. Absolute Maximum Ratings

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

Supply voltage	V_{CC}		-0.5	+7	V
Input clamping current	I_{IK}	$V_O < -0.5V$ 或 $V_O > V_{CC} + 0.5V$	-	± 20	mA
Output clamping current	I_{OK}	$V_O = -0.5V \sim V_{CC} + 0.5V$	-	± 20	mA
Output current	I_O		-	± 25	mA
VCC or GND current	I_{CC}, I_{GND}		-	± 50	mA
Storage temperature	T_{STG}		-65	+150	°C
Soldering temperature	T_L	10 秒	SOP	250	°C

Note:

SOP14 Package: When the temperature exceeds 70°C, for every 1°C increase, the rated power dissipation decreases by 8 mW.

3.2. Recommended operating conditions

Parameter	Symbol	Conditions	Min.	Type	Max	Unit
Supply voltage	V_{CC}		2.0	5.0	6.0	V
Input voltage	V_I		0	-	V_{CC}	V
Output voltage	V_O		0	-	V_{CC}	V
Input transition rise and fall rate	tr,tf	$V_{CC}=2.0V$	-	-	1000	ns
		$V_{CC}=4.5V$	-	6.0	500	ns
		$V_{CC}=6.0V$	-	-	400	ns
Ambient temperature	T_{amb}		-40	+25	+85	°C

3.3. Electrical Characteristics

3.3.1. DC Electrical Characteristics 1 (Unless otherwise specified, $T_{amb} = 25^{\circ}\text{C}$, $\text{GND} = 0\text{V}$)

Parameter	Symbol	Conditions	Min.	Type	Max	Unit	
High-level input voltage	V_{IH}	$V_{CC}=2.0\text{V}$	1.5	1.2	—	V	
		$V_{CC}=4.5\text{V}$	3.15	2.4	—	V	
		$V_{CC}=6.0\text{V}$	4.2	3.2	—	V	
Low-level input voltage	V_{IL}	$V_{CC}=2.0\text{V}$	—	0.8	0.5	V	
		$V_{CC}=4.5\text{V}$	—	2.1	1.35	V	
		$V_{CC}=6.0\text{V}$	—	2.8	1.8	V	
High-level output voltage	V_{OH}	$V_i=V_{IH}$ 或 V_{IL}	$V_{CC}=2.0\text{V}$, $I_o=-20\mu\text{A}$	1.9	2.0	—	V
			$V_{CC}=4.5\text{V}$, $I_o=-20\mu\text{A}$	4.4	4.5	—	V
			$V_{CC}=6.0\text{V}$, $I_o=-20\mu\text{A}$	5.9	6.0	—	V
			$V_{CC}=4.5\text{V}$, $I_o=-4.0\text{mA}$	3.98	4.32	—	V
			$V_{CC}=6.0\text{V}$, $I_o=-5.2\text{mA}$	5.48	5.81	—	V
Low-level output voltage	V_{OL}	$V_i=V_{IH}$ 或 V_{IL}	$V_{CC}=2.0\text{V}$, $I_o=20\mu\text{A}$	—	0	0.1	V
			$V_{CC}=4.5\text{V}$, $I_o=20\mu\text{A}$	—	0	0.1	V
			$V_{CC}=6.0\text{V}$, $I_o=20\mu\text{A}$	—	0	0.1	V
			$V_{CC}=4.5\text{V}$, $I_o=4.0\text{mA}$	—	0.15	0.26	V
			$V_{CC}=6.0\text{V}$, $I_o=5.2\text{mA}$	—	0.16	0.26	V
Input leakage current	I_{LI}	$V_i=V_{CC}$ 或 GND , $V_{CC}=6.0\text{V}$	—	—	± 0.1	μA	
Off state output current	I_{OZ}	$V_i=V_{IH}$ 或 V_{IL} , $V_o=V_{CC}$ 或 GND , $V_{CC}=6.0\text{V}$	—	—	± 0.5	μA	
Supply current	I_{CC}	$V_i=V_{CC}$ 或 GND , $V_{CC}=6.0\text{V}$, $I_o=0\text{ uA}$	—	—	2.0	μA	

3.3.2. DC Electrical Characteristics 2 (Unless otherwise specified, $T_{amb} = -40 \sim +85^{\circ}\text{C}$, $\text{GND}=0\text{V}$)

Parameter	Sym.	Conditions	Min.	Type	Max	Unit	
High-level input voltage	V_{IH}	$V_{CC}=2.0\text{V}$	1.5	—	—	V	
		$V_{CC}=4.5\text{V}$	3.15	—	—	V	
		$V_{CC}=6.0\text{V}$	4.2	—	—	V	
Low-level input voltage	V_{IL}	$V_{CC}=2.0\text{V}$	—	—	0.5	V	
		$V_{CC}=4.5\text{V}$	—	—	1.35	V	
		$V_{CC}=6.0\text{V}$	—	—	1.8	V	
High-level output voltage	V_{OH}	$V_i=V_{IH}$ 或 V_{IL}	$V_{CC}=2.0\text{V}$, $I_o=-20\mu\text{A}$	1.9	—	—	V
			$V_{CC}=4.5\text{V}$, $I_o=-20\mu\text{A}$	4.4	—	—	V
			$V_{CC}=6.0\text{V}$, $I_o=-20\mu\text{A}$	5.9	—	—	V
			$V_{CC}=4.5\text{V}$, $I_o=-4.0\text{mA}$	3.84	—	—	V
			$V_{CC}=6.0\text{V}$, $I_o=-5.2\text{mA}$	5.34	—	—	V
Low-level output voltage	V_{OL}	$V_i=V_{IH}$ 或 V_{IL}	$V_{CC}=2.0\text{V}$, $I_o=20\mu\text{A}$	—	—	0.1	V
			$V_{CC}=4.5\text{V}$, $I_o=20\mu\text{A}$	—	—	0.1	V
			$V_{CC}=6.0\text{V}$, $I_o=20\mu\text{A}$	—	—	0.1	V
			$V_{CC}=4.5\text{V}$, $I_o=4.0\text{mA}$	—	—	0.33	V
			$V_{CC}=6.0\text{V}$, $I_o=5.2\text{mA}$	—	—	0.33	V
Input leakage current	I_{LI}	$V_i=V_{CC}$ 或 GND , $V_{CC}=6.0\text{V}$	—	—	± 1.0	μA	
Off state output current	I_{OZ}	$V_i=V_{IH}$ 或 V_{IL} , $V_o=V_{CC}$ 或 GND , $V_{CC}=6.0\text{V}$	—	—	± 5.0	μA	
Supply current	I_{CC}	$V_i=V_{CC}$ 或 GND , $V_{CC}=6.0\text{V}$, $I_o=0\text{ uA}$	—	—	20	μA	

3.3.3. AC Electrical Characteristics 1 (Unless otherwise specified, $T_{amb} = 25^{\circ}\text{C}$, $\text{GND} = 0\text{V}$, $t_r = t_f = 6.0\text{ns}$, $C_L = 50\text{pF}$; See Figure 4 and Figure 5)

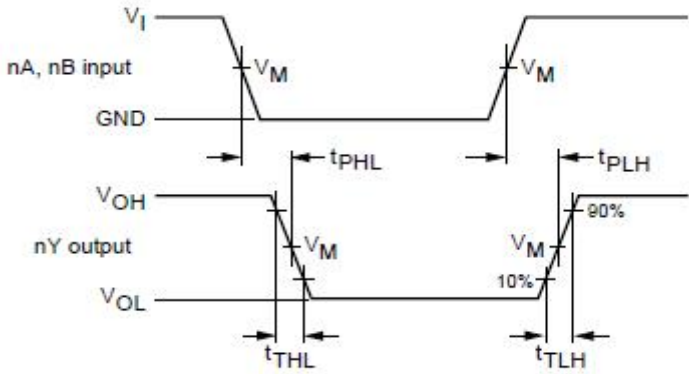
Parameter	Symbol	Conditions	Min.	Type	Max.	Unit
nA, nB to nY propagation delay time	t_{PHL}/t_{PLH}	$V_{CC} = 2.0\text{V}$	—	25	90	ns
		$V_{CC} = 4.5\text{V}$	—	9	18	ns
		$V_{CC} = 6.0\text{V}$	—	7	15	ns
Output transition time	t_{THL}/t_{TLH}	$V_{CC} = 2.0\text{V}$	—	19	75	ns
		$V_{CC} = 4.5\text{V}$	—	7	15	ns
		$V_{CC} = 6.0\text{V}$	—	6	13	ns

3.3.4. AC Electrical Characteristics 2 (Unless otherwise specified, $T_{amb} = -40 \sim +85^{\circ}\text{C}$, $\text{GND} = 0\text{V}$, $t_r = t_f = 6.0\text{ns}$, $C_L = 50\text{pF}$; See Figure 4 and Figure 5)

Parameter	Symbol	Conditions	Min.	Type	Max.	Unit
nA, nB to nY propagation delay time	t_{PHL}/t_{PLH}	$V_{CC} = 2.0\text{V}$	—	—	115	ns
		$V_{CC} = 4.5\text{V}$	—	—	23	ns
		$V_{CC} = 6.0\text{V}$	—	—	20	ns
Output transition time	t_{THL}/t_{TLH}	$V_{CC} = 2.0\text{V}$	—	—	95	ns
		$V_{CC} = 4.5\text{V}$	—	—	19	ns
		$V_{CC} = 6.0\text{V}$	—	—	16	ns

4. Waveforms and test circuit

4.1. Waveforms



74HC08: $V_M = 50\%$; $V_I = \text{GND to VCC}$

Fig.4 Input(nA, nB) to output(nY) propagation delays waveforms

4.2. Test circuit

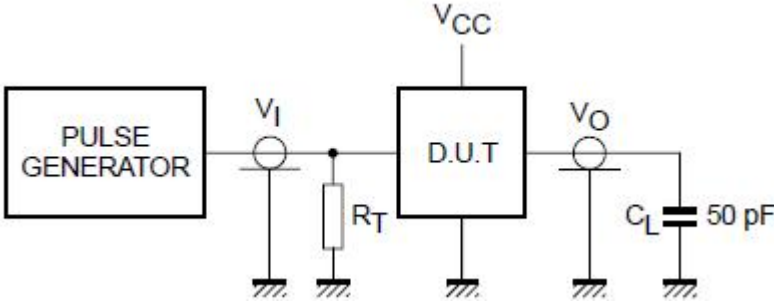


Fig.5 Test circuit for measuring switching times

Note:

R_T = termination resistance should be equal to output impedance of the signal generator.

C_L = load capacitance including jig and probe capacitance

5、Package outline

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