



# THE DATASHEET OF 74HC08D



## 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

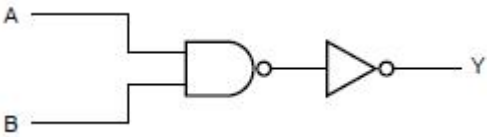


Fig.2 IEC logic symbol

#### 2.2、 Pinning information

SOP-14

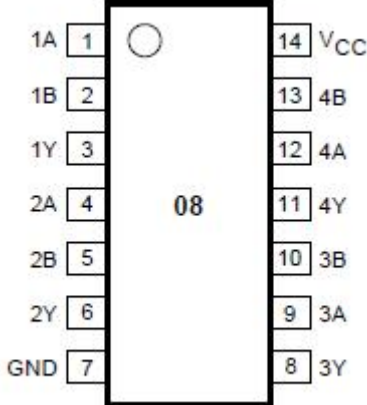


Fig.3 Pin configuration

### 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	V <sub>CC</sub>	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 <sub>CC</sub>		-0.5	+7	V
Input clamping current	I <sub>IK</sub>	V <sub>O</sub> < -0.5V 或 V <sub>O</sub> > V <sub>CC</sub> +0.5V	-	±20	mA
Output clamping current	I <sub>OK</sub>	V <sub>O</sub> = -0.5V ~ V <sub>CC</sub> +0.5V	-	±20	mA
Output current	I <sub>O</sub>		-	±25	mA
VCC or GND current	I <sub>CC</sub> , I <sub>GND</sub>		-	±50	mA
Storage temperature	T <sub>STG</sub>		-65	+150	°C
Soldering temperature	T <sub>L</sub>	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 <sub>CC</sub>		2.0	5.0	6.0	V
Input voltage	V <sub>I</sub>		0	-	V <sub>CC</sub>	V
Output voltage	V <sub>O</sub>		0	-	V <sub>CC</sub>	V
Input transition rise and fall rate	tr,tf	V <sub>CC</sub> =2.0V	-	-	1000	ns
		V <sub>CC</sub> =4.5V	-	6.0	500	ns
		V <sub>CC</sub> =6.0V	-	-	400	ns
Ambient temperature	T <sub>amb</sub>		-40	+25	+85	°C

### 3.3、Electrical Characteristics

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

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

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

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

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

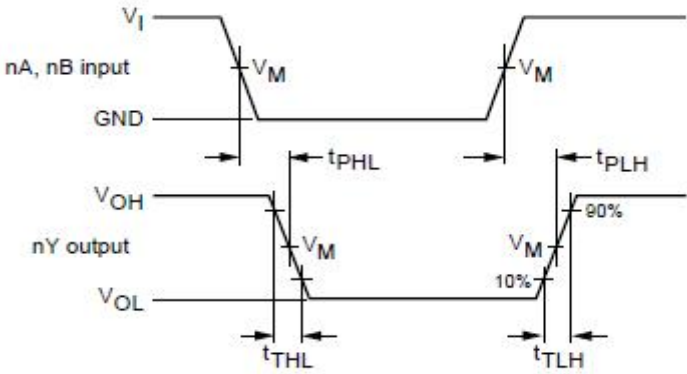
Parameter	Symbol	Conditions	Min.	Type	Max.	Unit
nA, nB to nY propagation delay time	$t_{PHL}/t_{PLH}$	$V_{CC} = 2.0V$	—	25	90	ns
		$V_{CC} = 4.5V$	—	9	18	ns
		$V_{CC} = 6.0V$	—	7	15	ns
Output transition time	$t_{THL}/t_{TLH}$	$V_{CC} = 2.0V$	—	19	75	ns
		$V_{CC} = 4.5V$	—	7	15	ns
		$V_{CC} = 6.0V$	—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

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

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

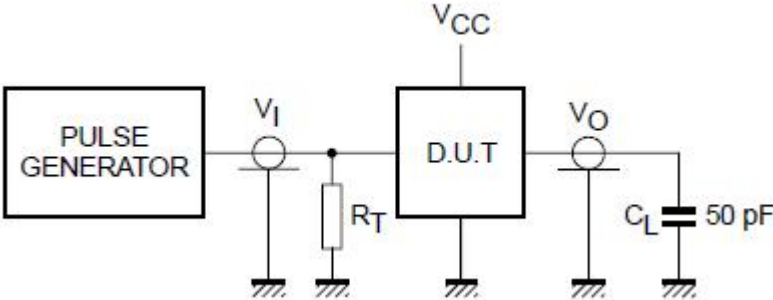


Fig.5 Test circuit for measuring switching times

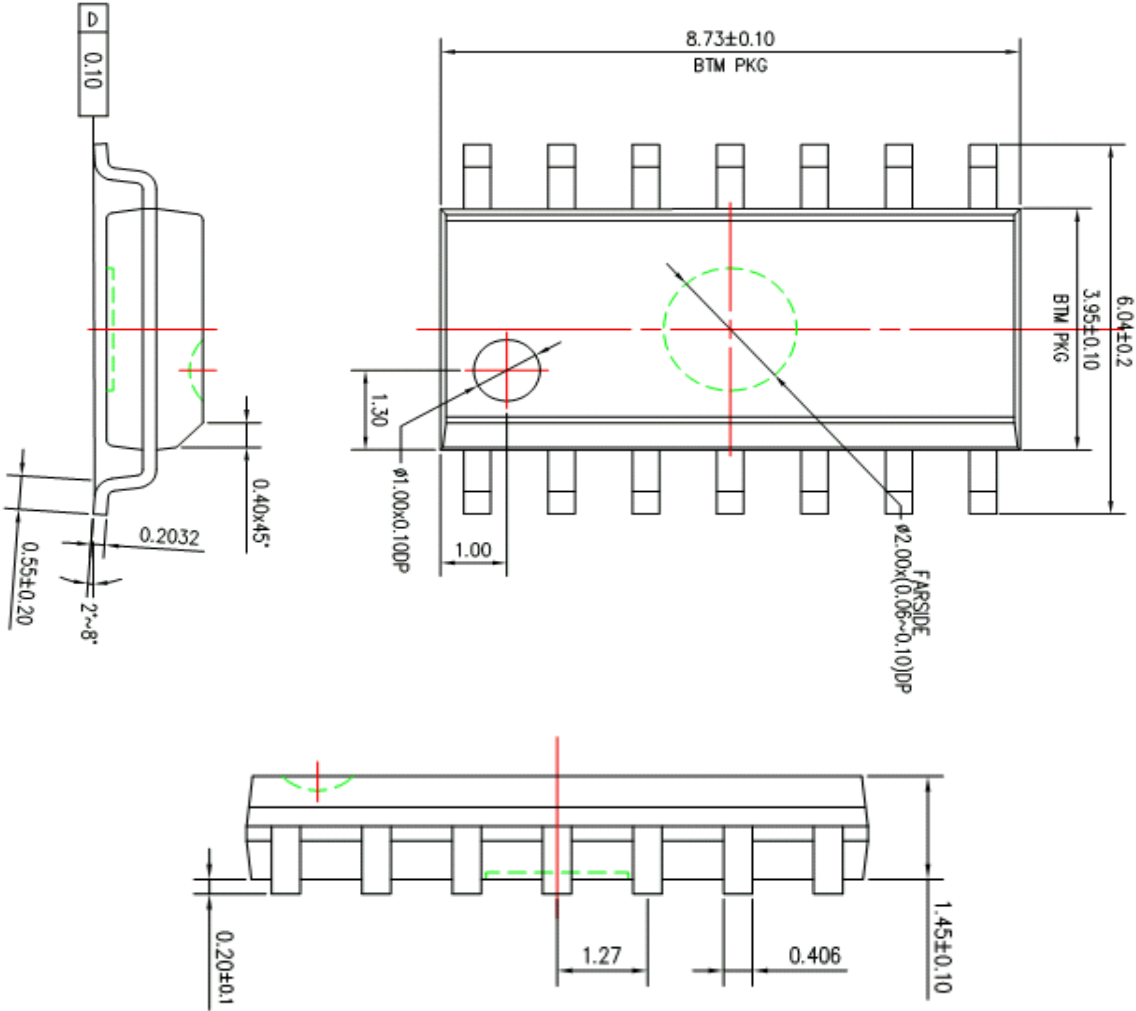
Note:

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

$C_L$  = load capacitance including jig and probe capacitance

5、Package outline

SOP-14



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