Quad 2-input AND gate | 74LV08

FEATURES

- Wide operating voltage: 1.0 to 5.5 V
- Optimized for Low Voltage applications: 1.0 to 3.6 V
- Accepts TTL input levels between V_{CC} = 2.7 V and V_{CC} = 3.6 V
- Typical V_{OLP} (output ground bounce) < 0.8 V at V_{CC} = 3.3 V, T_{amb} = 25°C.
- Typical V_{OHV} (output V_{OH} undershoot) > 2 V at V_{CC} = 3.3 V, T_{amb} = 25°C.
- Output capability: standard
- I_{CC} category: SSI

DESCRIPTION

The 74LV08 is a low-voltage Si-gate CMOS device and is pin and function compatible with 74HC/HCT08.

The 74LV08 provides the 2-input AND function.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25°C; $t_r = t_f \leq 2.5$ ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	Propagation delay nA, nB to nY	C_L = 15 pF; V_{CC} = 3.3 V	7	ns
C_I	Input capacitance		3.5	pF
C_{PD}	Power dissipation capacitance per gate	See Notes 1 and 2	10	pF

NOTES:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in µW)
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:
   f_i = input frequency in MHz; C_L = output load capacitance in pF;
   f_o = output frequency in MHz; V_{CC} = supply voltage in V;
   $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. The condition is V_I = GND to V_{CC}.

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	PKG. DWG. #
14-Pin Plastic DIL	–40°C to +125°C	74LV08 N	74LV08 N	SOT27-1
14-Pin Plastic SO	–40°C to +125°C	74LV08 D	74LV08 D	SOT108-1
14-Pin Plastic SSOP Type II	–40°C to +125°C	74LV08 DB	74LV08 DB	SOT337-1
14-Pin Plastic TSSOP Type I	–40°C to +125°C	74LV08 PW	74LV08PW DH	SOT402-1

PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1, 4, 9, 12	1A – 4A	Data inputs
2, 5, 10, 13	1Y – 4B	Data inputs
3, 6, 8, 11	1Y – 4Y	Data outputs
7	GND	Ground (0 V)
14	V_{CC}	Positive supply voltage

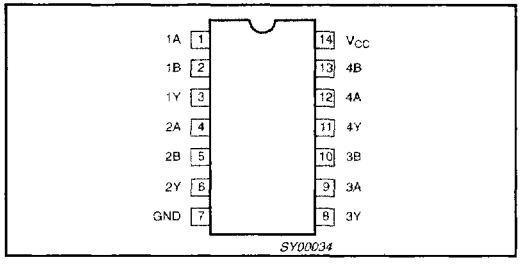
FUNCTION TABLE

INPUTS		OUTPUTS
nA	nB	nY
L	L	L
L	H	L
H	L	L
H	H	H

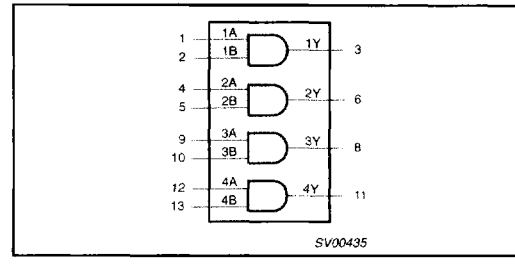
NOTES:

H = HIGH voltage level
L = LOW voltage level

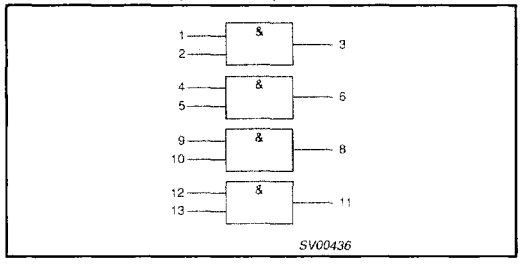
PIN CONFIGURATION



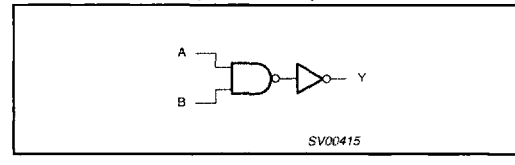
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM (ONE GATE)



RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP.	MAX	UNIT
V_{CC}	DC supply voltage	See Note1	1.0	3.3	5.5	V
V_I	Input voltage		0	–	V_{CC}	V
V_O	Output voltage		0	–	V_{CC}	V
T_{amb}	Operating ambient temperature range in free air	See DC and AC characteristics	−40 −40		+85 +125	°C
t_r, t_f	Input rise and fall times	V_{CC} = 1.0V to 2.0V V_{CC} = 2.0V to 2.7V V_{CC} = 2.7V to 3.6V V_{CC} = 3.6V to 5.5V	– – – –	– – – –	500 200 100 50	ns/V

NOTE:

1. The LV is guaranteed to function down to V_{CC} = 1.0V (input levels GND or V_{CC}); DC characteristics are guaranteed from V_{CC} = 1.2V to V_{CC} = 5.5V.

ABSOLUTE MAXIMUM RATINGS[1, 2]

In accordance with the Absolute Maximum Rating System (IEC 134).
Voltages are referenced to GND (ground = 0V).

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		–0.5 to +7.0	V
$\pm I_{IK}$	DC input diode current	$V_I < -0.5$ or $V_I > V_{CC} + 0.5V$	20	mA
$\pm I_{OK}$	DC output diode current	$V_O < -0.5$ or $V_O > V_{CC} + 0.5V$	50	mA
$\pm I_O$	DC output source or sink current – standard outputs	$-0.5V < V_O < V_{CC} + 0.5V$	25	mA
$\pm I_{GND}$, $\pm I_{CC}$	DC V_{CC} or GND current for types with – standard outputs		50	mA
T_{stg}	Storage temperature range		–65 to +150	°C
P_{TOT}	Power dissipation per package – plastic DIL – plastic mini-pack (SO) – plastic shrink mini-pack (SSOP and TSSOP)	for temperature range: –40 to +125°C above +70°C derate linearly with 12 mW/K above +70°C derate linearly with 8 mW/K above +60°C derate linearly with 5.5 mW/K	 750 500 400	mW

NOTES:
1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions. Voltages are referenced to GND (ground = 0V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			-40°C to +85°C			-40°C to +125°C		
			MIN	TYP.[1]	MAX	MIN	MAX	
V_{IH}	HIGH level Input voltage	V_{CC} = 1.2V	0.9			0.9		V
		V_{CC} = 2.0V	1.4			1.4		
		V_{CC} = 2.7 to 3.6V	2.0			2.0		
		V_{CC} = 4.5 to 5.5V	0.7*V_{CC}			0.7*V_{CC}		
V_{IL}	LOW level Input voltage	V_{CC} = 1.2V			0.3		0.3	V
		V_{CC} = 2.0V			0.6		0.6	
		V_{CC} = 2.7 to 3.6V			0.8		0.8	
		V_{CC} = 4.5 to 5.5			0.3*V_{CC}		0.3*V_{CC}	
V_{OH}	HIGH level output voltage; all outputs	V_{CC} = 1.2V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100µA		1.2				V
		V_{CC} = 2.0V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100µA	1.8	2.0		1.8		
		V_{CC} = 2.7V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100µA	2.5	2.7		2.5		
		V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100µA	2.8	3.0		2.8		
		V_{CC} = 4.5V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100µA	4.3	4.5		4.3		
V_{OH}	HIGH level output voltage; STANDARD outputs	V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 6mA	2.40	2.82		2.20		V
		V_{CC} = 4.5V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 12mA	3.60	4.20		3.50		
V_{OL}	LOW level output voltage; all outputs	V_{CC} = 1.2V; $V_I = V_{IH}$ or V_{IL}; I_O = 100µA		0				V
		V_{CC} = 2.0V; $V_I = V_{IH}$ or V_{IL}; I_O = 100µA		0	0.2		0.2	
		V_{CC} = 2.7V; $V_I = V_{IH}$ or V_{IL}; I_O = 100µA		0	0.2		0.2	
		V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; I_O = 100µA		0	0.2		0.2	
		V_{CC} = 4.5V; $V_I = V_{IH}$ or V_{IL}; I_O = 100µA		0	0.2		0.2	
V_{OL}	LOW level output voltage; STANDARD outputs	V_{CC} = 3.0V; $V_I = V_{IH}$ or V_{IL}; I_O = 6mA		0.25	0.40		0.50	V
		V_{CC} = 4.5V; $V_I = V_{IH}$ or V_{IL}; I_O = 12mA		0.35	0.55		0.65	

DC ELECTRICAL CHARACTERISTICS (Continued)

Over recommended operating conditions. Voltages are referenced to GND (ground = 0V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			-40°C to +85°C			-40°C to +125°C		
			MIN	TYP.[1]	MAX	MIN	MAX	
I_I	Input leakage current	V_{CC} = 5.5V; V_I = V_{CC} or GND			1.0		1.0	µA
I_{CC}	Quiescent supply current; SSI	V_{CC} = 5.5V; V_I = V_{CC} or GND; I_O = 0			20.0		40	µA
ΔI_{CC}	Additional quiescent supply current	V_{CC} = 2.7V to 3.6V; V_I = V_{CC} – 0.6V			500		850	µA

NOTE:
1. All typical values are measured at T_{amb} = 25°C.

AC CHARACTERISTICS

GND = 0V; $t_r = t_f \leq$ 2.5ns; C_L = 50pF; R_L = 1KΩ

SYMBOL	PARAMETER	WAVEFORM	CONDITION	LIMITS					UNIT
				–40 to +85 °C			–40 to +125 °C		
			V_{CC}(V)	MIN	TYP[1]	MAX	MIN	MAX	
t_{PHL}/t_{PLH}	Propagation delay nA, nB to nY	Figures 1, 2	1.2		45				ns
			2.0		15	26		33	
			2.7		11	17		21	
			3.0 to 3.6		9[2]	15		19	
			4.5 to 5.5			11		14	

NOTES:
1. Unless otherwise stated, all typical values are measured at T_{amb} = 25°C.
2. Typical values are measured at V_{CC} = 3.3 V.

AC WAVEFORMS

V_M = 1.5 V at $V_{CC} \geq$ 2.7 V and $\leq$ 3.6 V;
V_M = 0.5 × V_{CC} at V_{CC} < 2.7 V and $\geq$ 4.5 V;
V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.

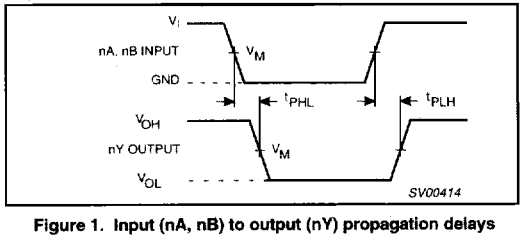


Figure 1. Input (nA, nB) to output (nY) propagation delays and output transition times.

TEST CIRCUIT

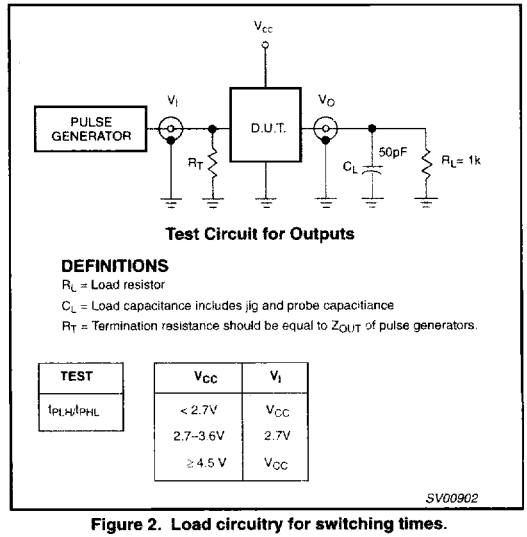


Figure 2. Load circuitry for switching times.