

SN5409, SN54LS09, SN54S09, SN7409, SN74LS09, SN74S09

QUADRUPLE 2-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

DECEMBER 1983 - REVISED MARCH 1988

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

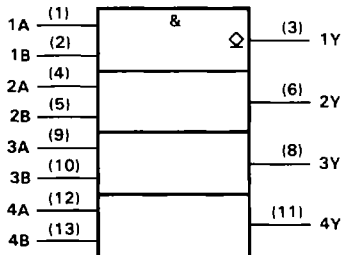
These devices contain four independent 2-input AND gates. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher V_{OH} levels.

The SN5409, SN54LS09, and SN54S09 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7409, SN74LS09, and SN74S09 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

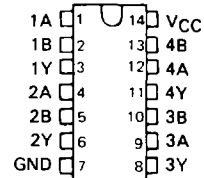
INPUTS		OUTPUT
A	B	Y
H	H	H
L	X	L
X	L	L

logic symbol

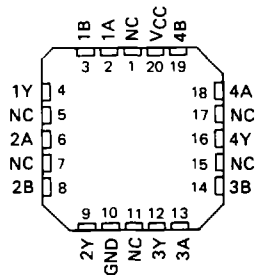


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, N, and W packages

SN5409, SN54LS09, SN54S09 . . . J OR W PACKAGE
SN7409 . . . N PACKAGE
SN74LS09, SN74S09 . . . D OR N PACKAGE
(TOP VIEW)

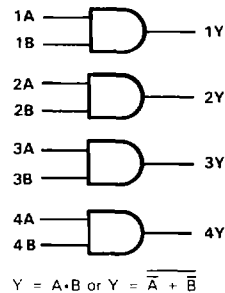


SN54LS09, SN54S09 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

logic diagram (positive logic)

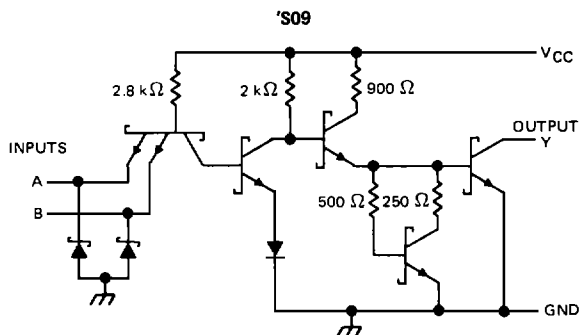
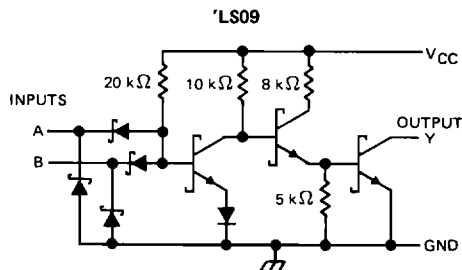
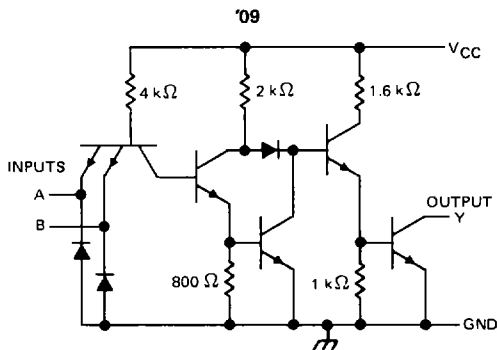


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TTL Devices

**SN5409, SN54LS09, SN54S09,
SN7409, SN74LS09, SN74S09**
QUADRUPLE 2-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

schematics (each gate)



Resistor values shown are nominal

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: '09, 'S09	5.5 V
'LS09	7 V
Off-state output voltage	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1 Voltage values are with respect to network ground terminal.

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TTL Devices

SN5409, SN7409
QUADRUPLE 2-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN5409			SN7409			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage	0.8			0.8			V
V _{OH} High-level output voltage	5.5			5.5			V
I _{OL} Low-level output current	16			16			mA
T _A Operating free-air temperature	- 55			125			0 70 °C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT
V _{IK}	V _{CC} = MIN, I _I = - 12 mA			- 1.5	V
I _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{OH} = 5.5 V			0.25	mA
V _{OL}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OL} = 16 mA		0.2	0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			40	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			- 1.6	mA
I _{CCH}	V _{CC} = MAX, V _I = 4.5 V		11	21	mA
I _{CCL}	V _{CC} = MAX, V _I = 0 V		20	33	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A or B	Y	R _L = 400 Ω, C _L = 15 pF		21	32	ns
t _{PHL}					16	24	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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TTL Devices

SN54LS09, SN74LS09

QUADRUPLE 2-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54LS09			SN74LS09			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage			0.7			0.8	V
V _{OH} High-level output voltage			5.5			5.5	V
I _{OL} Low-level output current			4			8	mA
T _A Operating free-air temperature	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	SN54LS09		SN74LS09		UNIT
		MIN	TYP‡	MAX	MIN	
V _{IK}	V _{CC} = MIN, I _I = -18 mA		-1.5		-1.5	V
I _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{OH} = 5.5 V		0.1		0.1	mA
V _{OL}	V _{CC} = MIN, V _{IL} = MAX, I _{OL} = 4 mA	0.25	0.4	0.25	0.4	V
	V _{CC} = MIN, V _{IL} = MAX, I _{OL} = 8 mA			0.35	0.5	
I _I	V _{CC} = MAX, V _I = 7 V		0.1		0.1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V		20		20	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V		-0.4		-0.4	mA
I _{CCH}	V _{CC} = MAX, V _I = 4.5 V	2.4	4.8	2.4	4.8	mA
I _{CCL}	V _{CC} = MAX, V _I = 0 V	4.4	8.8	4.4	8.8	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A or B	Y	R _L = 2 kΩ, C _L = 15 pF	20	35		ns
t _{PHL}				17	35		ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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TTL Devices

SN54S09, SN74S09
QUADRUPLE 2-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54S09			SN74S09			UNIT	
	MIN	NOM	MAX	MIN	NOM	MAX		
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V	
V _{IH} High-level input voltage	2			2			V	
V _{IL} Low-level input voltage	0.8			0.8			V	
V _{OH} High-level output voltage	5.5			5.5			V	
I _{OL} Low-level output current	20			20			mA	
T _A Operating free-air temperature	-55			0			70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT	
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.2	V	
I _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{OH} = 5.5 V			0.25	mA	
V _{OL}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OL} = 20 mA			0.5	V	
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA	
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			50	μA	
I _{IL}	V _{CC} = MAX, V _I = 0.5 V			-2	mA	
I _{CCH}	V _{CC} = MAX, V _I = 4.5 V			18	32	mA
I _{CCL}	V _{CC} = MAX, V _I = 0 V			32	57	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A or B	Y	R _L = 280 Ω, C _L = 15 pF	6.5	10	ns	
t _{PHL}				6.5	10	ns	
t _{PLH}			R _L = 280 Ω, C _L = 50 pF	9	ns		
t _{PHL}				9	ns		

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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TTL Devices