

TYPES SN5451, SN54H51, SN54L51, SN54LS51, SN54S51, SN7451, SN74H51, SN74LS51, SN74S51 AND-OR-INVERT GATES

REVISED DECEMBER 1983

- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

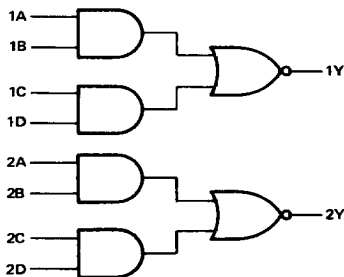
The '51, 'H51, and 'S51 contain two independent 2-wide 2-input AND-OR-INVERT gates. They perform the Boolean function $Y = AB + CD$.

The 'L51 and 'LS51 contain one 2-wide 3-input and one 2-wide 2-input AND-OR-INVERT gates. They perform the Boolean functions $1Y = (1A \cdot 1B \cdot 1C) + (1D \cdot 1E \cdot 1F)$ and $2Y = (2A \cdot 2B) + (2C \cdot 2D)$.

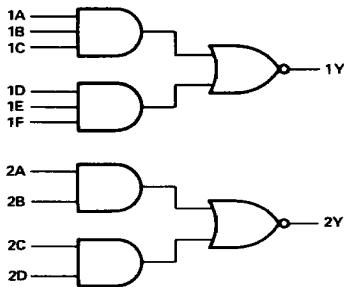
The SN5451, SN54H51, SN54L51, SN54LS51 and SN54S51 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7451, SN74H51, SN74LS51 and SN74S51 are characterized for operation from 0°C to 70°C .

logic diagrams

'51, 'H51, 'S51

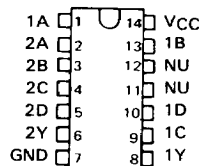


'L51, 'LS51



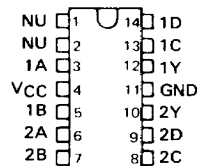
SN5451, SN54H51 ... J PACKAGE
SN54S51 ... J OR W PACKAGE
SN7451, SN74H51 ... J OR N PACKAGE
SN74S51 ... D, J OR N PACKAGE

(TOP VIEW)



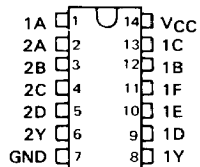
SN5451, SN54H51 ... W PACKAGE

(TOP VIEW)



SN54L51 ... J PACKAGE
SN54LS51 ... J OR W PACKAGE
SN74LS51 ... D, J OR N PACKAGE

(TOP VIEW)



NC - No internal connection
NU - Make no external connection

3

TTL DEVICES

PRODUCTION DATA
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

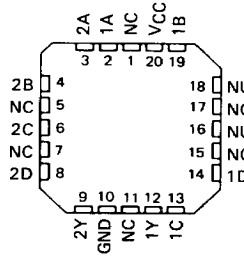
TEXAS
INSTRUMENTS

POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

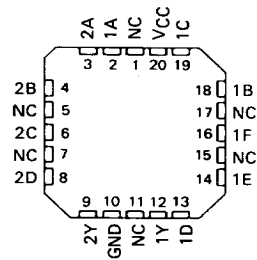
3-213

**TYPES SN5451, SN54H51, SN54L51,
SN7451, SN74H51
AND-OR-INVERT GATES**

SN54S51 ... FK PACKAGE
SN74S51 ... FN PACKAGE
(TOP VIEW)



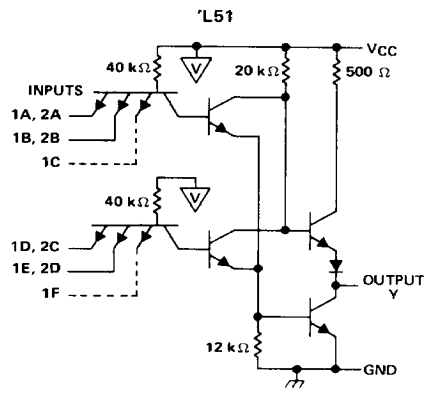
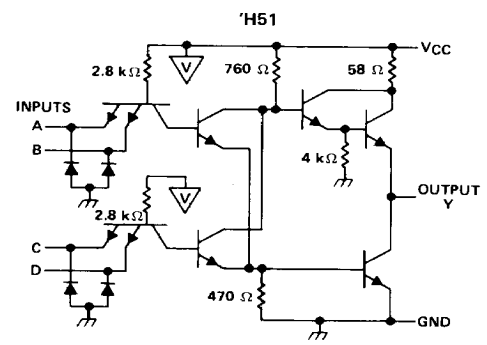
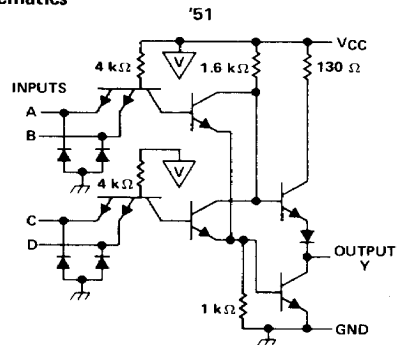
SN54LS51 ... FK PACKAGE
SN74LS51 ... FN PACKAGE
(TOP VIEW)



NC - No internal connection
NU - Make no external connection

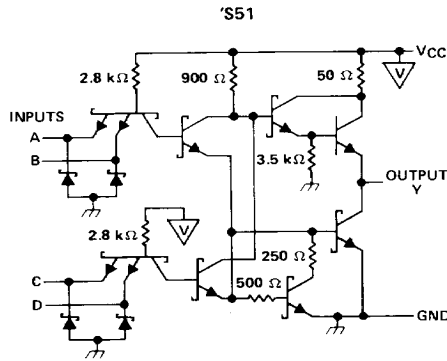
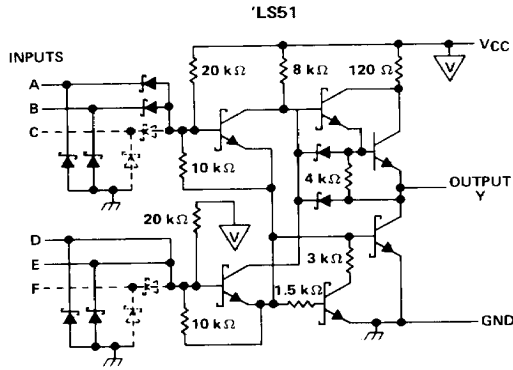
schematics

3 TTL DEVICES



TYPES SN5451, SN54H51, SN54L51, SN54LS51, SN54S51,
SN7451, SN74H51, SN74LS51, SN74S51
AND-OR-INVERT GATES

schematics



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

Supply voltage, V_{CC} (see Note 1): '51, 'H51, 'LS51, 'S51	7 V
'L51	8 V
Input voltage: '51, 'H51, 'L51, 'S51	5.5 V
'LS51	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.

3

TTL DEVICES



POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

3-215

TYPES SN5451, SN7451 AND-OR-INVERT GATES

recommended operating conditions

	SN5451			SN7451			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
I _{OH} High-level output current	-0.4			-0.4			mA
I _{OL} Low-level output current	16			16			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 †	SN5451			SN7451			UNIT
		MIN	TYP ‡	MAX	MIN	TYP ‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -12 mA	-1.5			-1.5			V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -0.4 mA	2.4	3.4		2.4	3.4	V	
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 16 mA	0.2		0.4	0.2		0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V	1			1			mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V	40			40			μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V	-1.6			-1.6			mA
I _{OS} §	V _{CC} = MAX	-20	-55		-18	-55		mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V	4		8	4		8	mA
I _{CCL}	V _{CC} = MAX, See Note 2	7.4		14	7.4		14	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.

§ Not more than one output should be shorted at a time.

NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	Any	Y	R _L = 400 Ω, C _L = 15 pF	13		22	ns
t _{PHL}				8		15	

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES

recommended operating conditions

	SN54H51			SN74H51			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
I _{OH} High-level output current			-0.5			-0.5	mA
I _{OL} Low-level output current			20			20	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 = -8 mA			-1.5	V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -0.5 mA	2.4	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 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			50	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-2	mA
I _{OS} §	V _{CC} = MAX	-40		-100	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		8.2	12.8	mA
I _{CCL}	V _{CC} = MAX, See Note 2		15.2	24	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.

§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	Any	Y	R _L = 280 Ω, C _L = 25 pF		6.8	11	ns
t _{PHL}					6.2	11	ns

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES



POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

3-217

TYPE SN54L51 AND-OR-INVERT GATES

recommended operating conditions

	SN54L51			UNIT
	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	V
V _{IH} High-level input voltage	2			V
V _{IL} Low-level input voltage			0.7	V
I _{OH} High-level output current			-0.1	mA
I _{OL} Low-level output current			2	mA
T _A Operating free-air temperature	-55	125		°C

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

PARAMETER	TEST CONDITIONS †	SN54L51			UNIT
		MIN	TYP ‡	MAX	
V _{OH}	V _{CC} = MIN, V _{IL} = 0.7 V, I _{OH} = -0.1 mA	2.4	3.3		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 2 mA				V
I _I	V _{CC} = MAX, V _I = 5.5 V		0.15	0.3	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			0.1	mA
I _{IL}	V _{CC} = MAX, V _I = 0.3 V			10	μA
I _{OS} §	V _{CC} = MAX			-0.18	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V	-3		-15	mA
I _{CCL}	V _{CC} = MAX, See Note 2		0.44	0.8	mA
			0.76	1.3	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.

§ Not more than one output should be shorted at a time.

NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

3

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
				50	90	ns	
t _{PLH}	Any	Y	R _L = 4 kΩ, C _L = 50 pF	35	60	ns	
t _{PHL}							

NOTE 3: See General Information Section for load circuits and voltage waveforms.

TTL DEVICES

recommended operating conditions

	SN54LS51			SN74LS51			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
I _{OH} High-level output current			-0.4			-0.4	mA
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 †	SN54LS51			SN74LS51			UNIT
		MIN	TYP ‡	MAX	MIN	TYP ‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5			-1.5	V
V _{OH}	V _{CC} = MIN, V _{IL} = MAX, I _{OH} = -0.4 mA	2.5	3.4		2.7	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 4 mA		0.25	0.4		0.25	0.4	V
	V _{CC} = MIN, V _{IH} = 2 V, 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 _{OS} §	V _{CC} = MAX	-20		-100	-20		-100	mA
I _{CC}	V _{CC} = MAX, V _I = 0 V		0.8	1.6		0.8	1.6	mA
I _{CCL}	V _{CC} = MAX, See Note 2		1.4	2.8		1.4	2.8	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.

§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	Any	Y	R _L = 2 kΩ,	C _L = 15 pF		12	20	ns
t _{PHL}						12.5	20	ns

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES



POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

3-219

TYPES SN54S51, SN74S51 AND-OR-INVERT GATES

recommended operating conditions

	SN54S51			SN74S51			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
I _{OH} High-level output current			-1			-1	mA
I _{OL} Low-level output current			20			20	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 †	SN54S51			SN74S51			UNIT
		MIN	TYP ‡	MAX	MIN	TYP ‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.2			-1.2	V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -1 mA	2.5	3.4		2.7	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA			0.5			0.5	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			50			50	μA
I _{IL}	V _{CC} = MAX, V _I = 0.5 V			-2			-2	mA
I _{OS} §	V _{CC} = MAX	-40		-100	-40		-100	mA
I _{CC} H	V _{CC} = MAX, V _I = 0 V		8.2	17.8		8.2	17.8	mA
I _{CC} L	V _{CC} = MAX, See Note 2		13.6	22		13.6	22	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.

§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.
NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	Any	Y	R _L = 280 Ω,	C _L = 15 pF	3.5	5.5	ns	
t _{PHL}								
t _{PLH}			R _L = 280 Ω,	C _L = 50 pF	5	ns		
t _{PHL}							5.5	ns

NOTE 3: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES