

## **Rochester Electronics Manufactured Components**

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceed the OCM data sheet.

## **Quality Overview**

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
  - Class Q Military
  - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
  - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

# 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

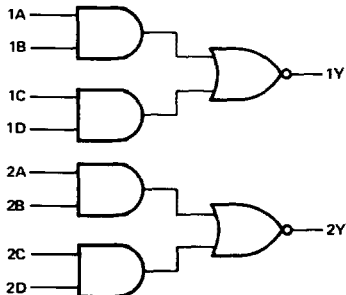
The '51, 'H51, and 'S51 contain two independent 2-wide 2-input AND-OR-INVERT gates. They perform the Boolean function  $Y = AB + CD$ .

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  $2Y = (2A \cdot 2B) + (2C \cdot 2D)$ .

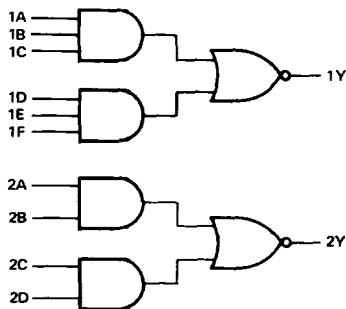
The SN5451, SN54H51, SN54L51, SN54LS51 and SN54S51 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN7451, SN74H51, SN74LS51 and SN74S51 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$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

## logic diagrams

'51, 'H51, 'S51

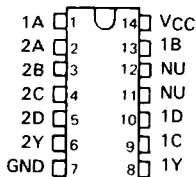


'L51, 'LS51



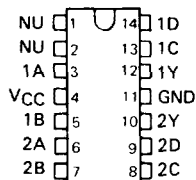
SN5451, SN54H51 ... J PACKAGE  
SN54S51 ... J OR W PACKAGE  
SN7451, SN74H51 ... J OR N PACKAGE  
SN74S51 ... D, J OR N PACKAGE

(TOP VIEW)



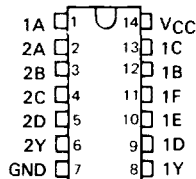
SN5451, SN54H51 ... W PACKAGE

(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.

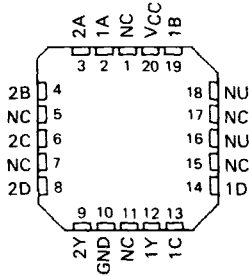
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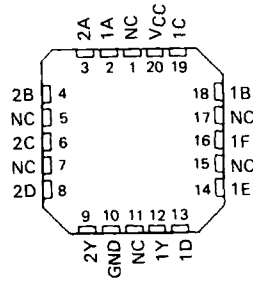
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# TYPES SN5451, SN54H51, SN54L51, SN7451, SN74H51 AND-OR-INVERT GATES

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

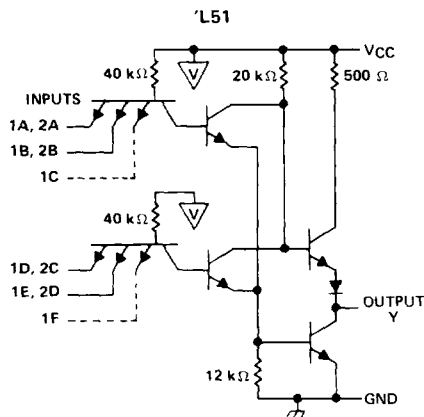
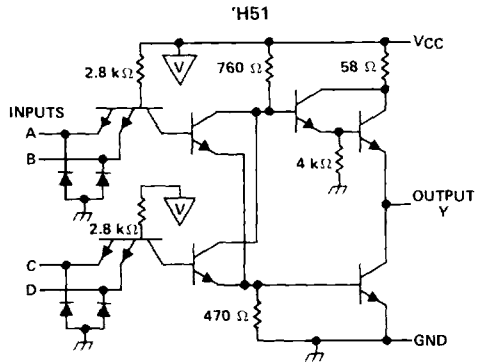
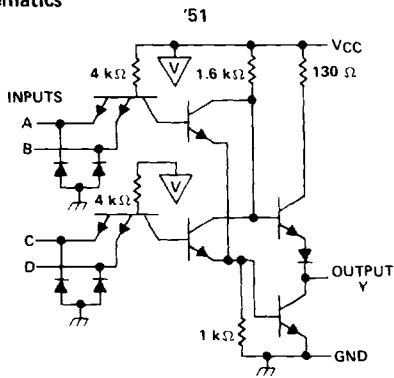


SN54LS51 ... FK PACKAGE  
SN74LS51 ... FN PACKAGE  
(TOP VIEW)



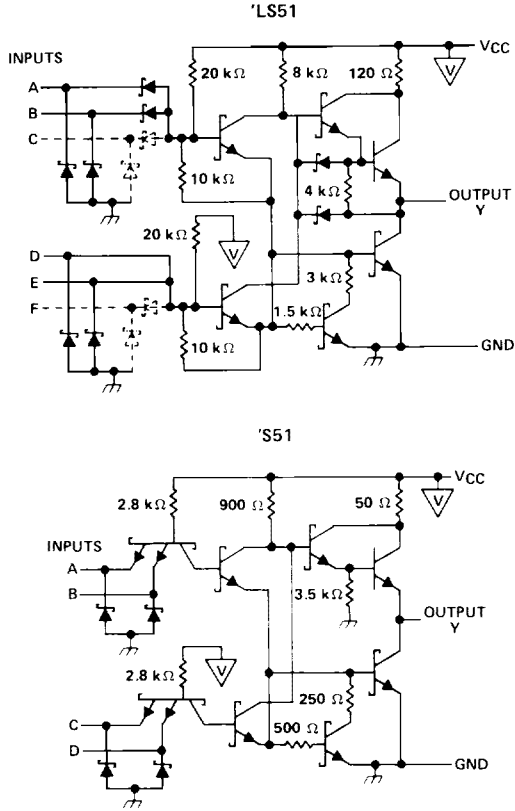
NC - No internal connection  
NU - Make no external connection

## schematics



**TYPES SN5451, SN54H51, SN54L51, SN54LS51, SN54S51,  
SN7451, SN74H51, SN74L51, 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**

# TYPES SN5451, SN7451 AND-OR-INVERT GATES

## recommended operating conditions

	SN5451			SN7451			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage			0.8			0.8	V
I <sub>OH</sub> High-level output current			-0.4			-0.4	mA
I <sub>OL</sub> Low-level output current			16			16	mA
T <sub>A</sub> Operating free-air temperature	-55		125	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 <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -12 mA			-1.5			-1.5	V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -0.4 mA	2.4	3.4		2.4	3.4		V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 16 mA		0.2	0.4		0.2	0.4	V
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V			1			1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V			40			40	μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V			-1.6			-1.6	mA
I <sub>OS§</sub>	V <sub>CC</sub> = MAX	-20		-55	-18		-55	mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V		4	8		4	8	mA
I <sub>CCL</sub>	V <sub>CC</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Y	R <sub>L</sub> = 400 Ω, C <sub>L</sub> = 15 pF		13	22	ns
t <sub>PHL</sub>					8	15	

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

3

TTL DEVICES

# TYPES SN54H51, SN74H51 AND-OR-INVERT GATES

## 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			°C

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

PARAMETER	TEST CONDITIONS †	MIN	TYP ‡	MAX	UNIT
$V_{IK}$	$V_{CC} = \text{MIN}$ , $I_I = -8 \text{ mA}$	-1.5			V
$V_{OH}$	$V_{CC} = \text{MIN}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -0.5 \text{ mA}$	2.4	3.4		V
$V_{OL}$	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $I_{OL} = 20 \text{ mA}$		0.2	0.4	V
$I_I$	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$	1			mA
$I_{IH}$	$V_{CC} = \text{MAX}$ , $V_I = 2.4 \text{ V}$	50			$\mu\text{A}$
$I_{IL}$	$V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$	-2			mA
$I_{OS} §$	$V_{CC} = \text{MAX}$	-40		-100	mA
$I_{CCH}$	$V_{CC} = \text{MAX}$ , $V_I = 0 \text{ V}$		8.2	12.8	mA
$I_{CCL}$	$V_{CC} = \text{MAX}$ , 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  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

§ 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, $V_{CC} = 5 \text{ V}$ , $T_A = 25^\circ\text{C}$ (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$	Any	Y	$R_L = 280 \Omega$ , $C_L = 25 \text{ pF}$		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

# TYPE SN54L51 AND-OR-INVERT GATES

## recommended operating conditions

	SN54L51			UNIT
	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	V
V <sub>IH</sub> High-level input voltage	2			V
V <sub>IL</sub> Low-level input voltage	0.7			V
I <sub>OH</sub> High-level output current	-0.1			mA
I <sub>OL</sub> Low-level output current	2			mA
T <sub>A</sub> 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 <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.7 V, I <sub>OH</sub> = -0.1 mA	2.4	3.3	V	
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 2 mA	0.15		0.3	V
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V			0.1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V			10	μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.3 V			-0.18	mA
I <sub>OS</sub> §	V <sub>CC</sub> = MAX	-3	-15		mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V	0.44		0.8	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, See Note 2	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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Y	R <sub>L</sub> = 4 kΩ, C <sub>L</sub> = 50 pF	50		90	ns
t <sub>PHL</sub>				35		60	ns

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

3

TTL DEVICES

# TYPES SN54LS51, SN74LS51 AND-OR-INVERT GATES

## recommended operating conditions

	SN54LS51			SN74LS51			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage				0.7			V
I <sub>OH</sub> High-level output current				-0.4			mA
I <sub>OL</sub> Low-level output current				4			mA
T <sub>A</sub> Operating free-air temperature	-55			125			°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 <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA	-1.5			-1.5			V	
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OH</sub> = -0.4 mA	2.5	3.4		2.7	3.4	V		
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 4 mA	0.25	0.4		0.25	0.4	V		
	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 8 mA				0.35	0.5			
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V	0.1			0.1			mA	
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V	20			20			μA	
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V	-0.4			-0.4			mA	
I <sub>OS§</sub>	V <sub>CC</sub> = MAX	-20		-100	-20		-100	mA	
I <sub>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V	0.8			0.8			1.6	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, See Note 2	1.4			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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Y	R <sub>L</sub> = 2 kΩ,	C <sub>L</sub> = 15 pF		12	20	ns
t <sub>PHL</sub>						12.5	20	ns

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

3

TTL DEVICES



# TYPES SN54S51, SN74S51 AND-OR-INVERT GATES

## recommended operating conditions

	SN54S51			SN74S51			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage	0.8			0.8			V
I <sub>OH</sub> High-level output current	-1			-1			mA
I <sub>OL</sub> Low-level output current	20			20			mA
T <sub>A</sub> Operating free-air temperature	-55			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 <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>J</sub> = -18 mA	-1.2			-1.2			V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -1 mA	2.5	3.4		2.7	3.4		V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 20 mA	0.5			0.5			V
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V	1			1			mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V	50			50			µA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5 V	-2			-2			mA
I <sub>OS</sub> §	V <sub>CC</sub> = MAX	-40		-100	-40		-100	mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V	8.2 17.8			8.2 17.8			mA
I <sub>CCL</sub>	V <sub>CC</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25 °C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Y	R <sub>L</sub> = 280 Ω,	C <sub>L</sub> = 15 pF	3.5	5.5	ns	
t <sub>PHL</sub>					3.5	5.5	ns	
t <sub>PLH</sub>			R <sub>L</sub> = 280 Ω,	C <sub>L</sub> = 50 pF	5		ns	
t <sub>PHL</sub>					5.5		ns	

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

3

TTL DEVICES