

# TYPES SN5454, SN54H54, SN54L54, SN54LS54, SN7454, SN74H54, SN74LS54 4-WIDE 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

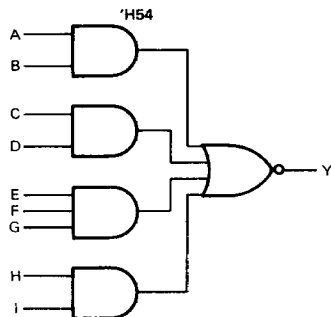
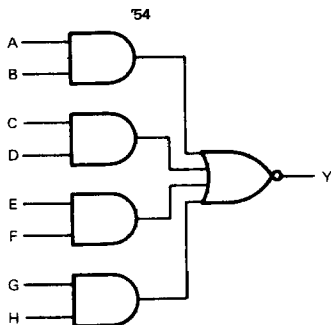
## description

These devices contain 4-wide AND-OR-INVERT gates. They perform the following Boolean functions:

$$\begin{aligned} \text{'54 } Y &= \overline{AB + CD + EF + GH} \\ \text{'H54 } Y &= \overline{AB + CD + EFG + HI} \\ \text{'L54, LS54 } Y &= \overline{AB + CDE + FGH + IJ} \end{aligned}$$

The SN5454, SN54H54, SN54L54, and the SN54LS54 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN7454, SN74H54, and the SN74LS54 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

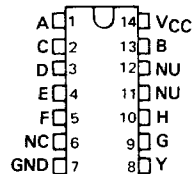
## logic diagrams



### SN5454 . . . J PACKAGE

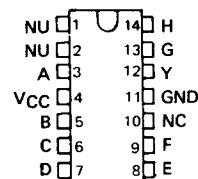
### SN7454 . . . J OR N PACKAGE

#### (TOP VIEW)



### SN5454 . . . W PACKAGE

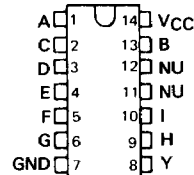
#### (TOP VIEW)



### SN54H54 . . . J PACKAGE

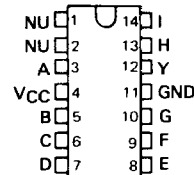
### SN74H54 . . . J OR N PACKAGE

#### (TOP VIEW)



### SN54H54 . . . W PACKAGE

#### (TOP VIEW)



NC - No internal connection

NU - Make no external connection

## 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

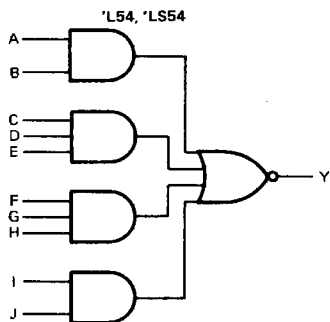
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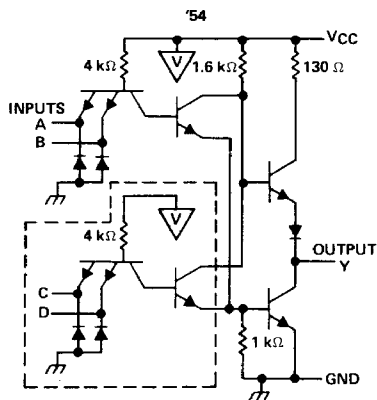
TTL DEVICES

# TYPES SN5454, SN54H54, SN54L54, SN54LS54, SN7454, SN74H54, SN74LS54 4-WIDE AND-OR-INVERT GATES

logic diagrams (continued)



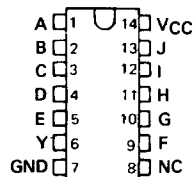
schematics



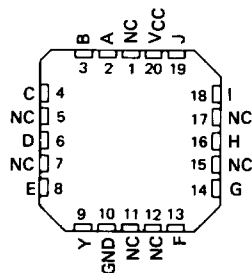
Resistor values shown are nominal.

The portion of the circuits within the dashed lines is repeated for each additional AND section.

SN54L54 ... J PACKAGE  
SN54LS54 ... J OR W PACKAGE  
SN74LS54 ... D, J OR N PACKAGE  
(TOP VIEW)



SN54LS54 ... FK PACKAGE  
SN74LS54 ... FN PACKAGE  
(TOP VIEW)



NC - No internal connection

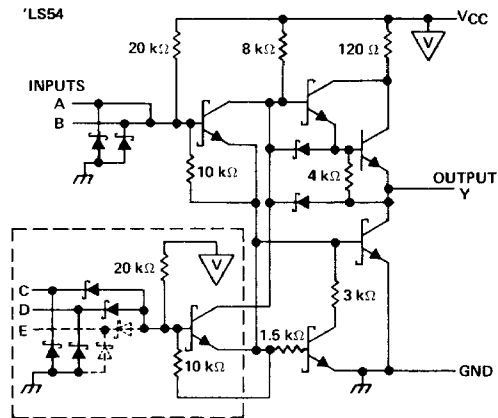
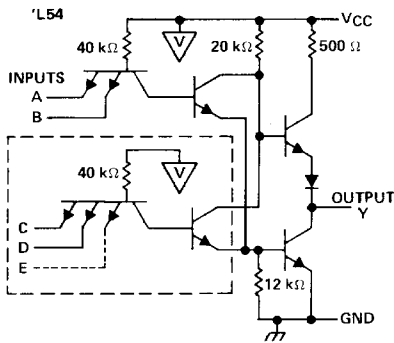
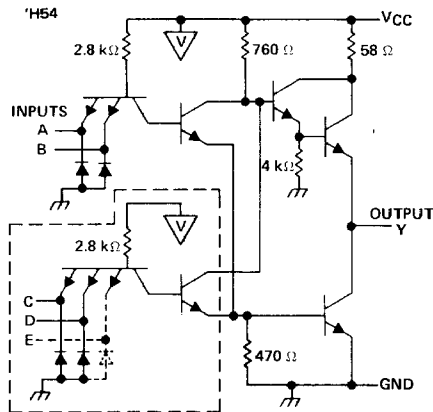
NU - Make no external connection

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TTL DEVICES

TYPES SN5454, SN54H54, SN54L54, SN54LS54,  
SN7454, SN74H54, SN74LS54  
4-WIDE AND-OR-INVERT GATES

schematics (continued)



Resistor values shown are nominal.

In 'L54 and 'LS54 circuits, 3-input gate represented by additional dashed line.

The portion of the circuits within the dashed lines is repeated for each additional AND section.

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

Supply voltage, $V_{CC}$ (see Note 1): '54, 'H54, 'L54	7 V
'L54	8 V
Input voltage: '54, 'H54, 'L54	5.5 V
'LS54	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

# TYPES SN5454, SN7454

## 4-WIDE AND-OR-INVERT GATES

### recommended operating conditions

	SN5454			SN7454			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†	SN5454			SN7454			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			0.2			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			4			mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, See Note 2	5.1	9.5		5.1	9.5	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	ns

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

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## TTL DEVICES

# TYPES SN54H54, SN74H54 4-WIDE AND-OR-INVERT GATES

## recommended operating conditions

	SN54H54			SN74H54			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			V
I <sub>OH</sub> High-level output current				-0.5			mA
I <sub>OL</sub> Low-level output current				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†	MIN	TYP‡	MAX	UNIT
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -8 mA	-1.5			V
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -0.5 mA	2.4	3.4		V
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 20 mA		0.2	0.4	V
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V				1 mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V				50 µA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V				-2 mA
I <sub>OS§</sub>	V <sub>CC</sub> = MAX	-40		100	mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V				7.1 mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, See Note 2				9.4 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: An 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> = 25 pF	7		11	ns
t <sub>PHL</sub>				6.2		11	ns

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

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TTL DEVICES

# TYPE SN54L54

## 4-WIDE AND-OR-INVERT GATES

### recommended operating conditions

	SN54L54			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†	SN54L54			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		0.39	0.8	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, See Note 2		0.60	0.9	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.

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### 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.

TTL DEVICES

# TYPES SN54LS54, SN74LS54 4-WIDE AND-OR-INVERT GATES

## recommended operating conditions

		SN54LS54			SN74LS54			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			0.8	V	
I <sub>OH</sub>	High-level output current				-0.4			-0.4	mA	
I <sub>OL</sub>	Low-level output current				4			8	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†	SN54LS54			SN74LS54			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			0.25			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			0.1	mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V	20			20			20	μA
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V	-0.4			-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			1			2	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.

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TTL DEVICES