

# SN54S64, SN54S65, SN74S64, SN74S65

## 4-2-3-2 INPUT AND-OR-INVERT GATES

SDLS205 - DECEMBER 1983 - REVISED MARCH 1988

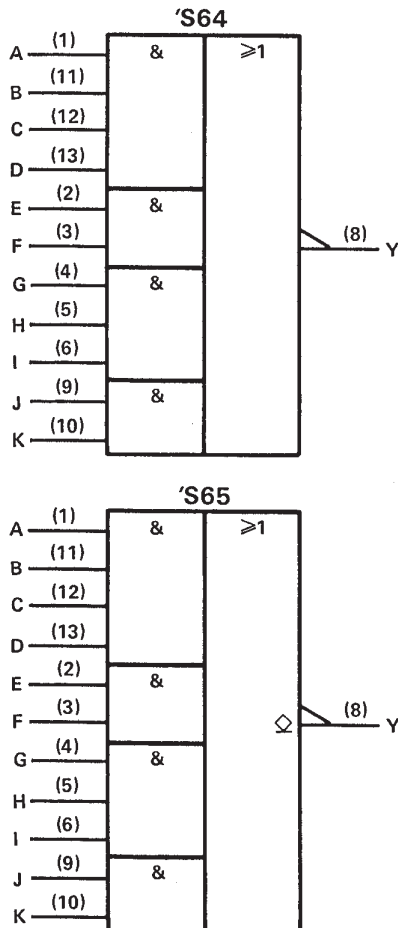
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

### description

These devices contain 4-2-3-2 input AND-OR-INVERT gates. They perform the Boolean function  $Y = ABCD + EF + GHI + JK$ . The 'S64 has totem-pole outputs and the 'S65 has open-collector outputs.

The SN54S64 and the SN54S65 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74S64 and the SN74S65 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

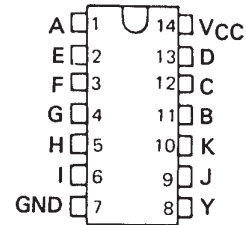
### logic symbols†



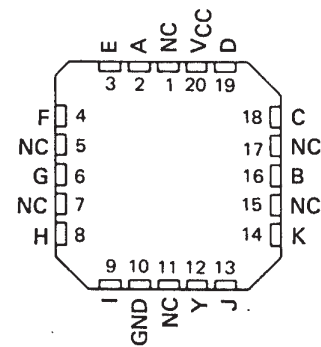
†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

SN54S64, SN54S65 . . . J OR W PACKAGE  
SN74S64, SN74S65 . . . D OR N PACKAGE  
(TOP VIEW)

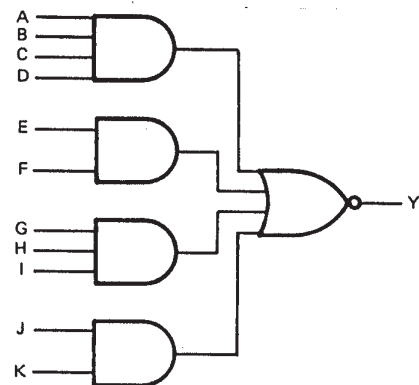


SN54S64, SN54S65 . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

### logic diagram (each device) (positive logic)



PRODUCTION DATA information is 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.



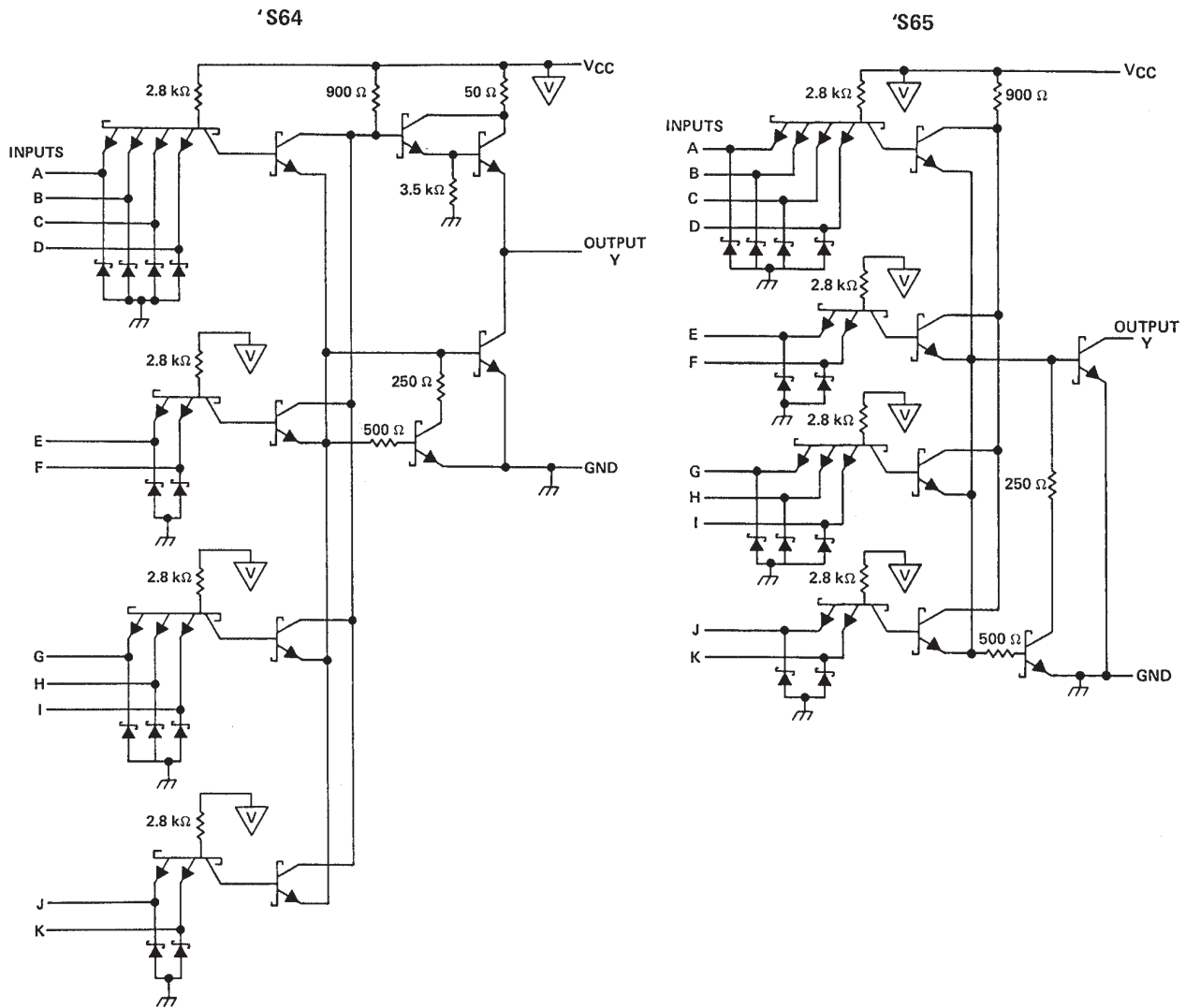
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SN54S64, SN54S65,  
SN74S64, SN74S65  
4-2-3-2 INPUT AND-OR-INVERT GATES

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schematics (each gate)



Resistor values shown are nominal and in ohms.

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

Supply voltage, $V_{CC}$ (see Note 1) .....	7 V
Input voltage .....	5.5 V
Off-state output voltage, 'S65 .....	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



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# SN54S64, SN54S65

## 4-2-3-2 INPUT AND-OR-INVERT GATES

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### recommended operating conditions

	SN54S64			SN74S64			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 †	SN54S64			SN74S64			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IK}$	$V_{CC} = \text{MIN}$ , $I_I = -18 \text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = \text{MIN}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -1 \text{ mA}$	2.5	3.4		2.7	3.4		V
$V_{OL}$	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $I_{OL} = 20 \text{ mA}$			0.5			0.5	V
$I_I$	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$			1			1	mA
$I_{IH}$	$V_{CC} = \text{MAX}$ , $V_I = 2.7 \text{ V}$			50			50	µA
$I_{IL}$	$V_{CC} = \text{MAX}$ , $V_I = 0.5 \text{ V}$			-2			-2	mA
$I_{OS}§$	$V_{CC} = \text{MAX}$	-40		-100	-40		-100	mA
$I_{CCH}$	$V_{CC} = \text{MAX}$ , $V_I = 0$		7	12.5		7	12.5	mA
$I_{CCL}$	$V_{CC} = \text{MAX}$ , $V_I = 4.5 \text{ V}$		8.5	16		8.5	16	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.

### switching characteristics, $V_{CC} = 5 \text{ V}$ , $T_A = 25^\circ\text{C}$ (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
$t_{PLH}$	Any	Y	$R_L = 280 \Omega$ , $C_L = 15 \text{ pF}$		3.5	5.5	ns	
$t_{PHL}$					3.5	5.5	ns	
$t_{PLH}$			$R_L = 280 \Omega$ , $C_L = 50 \text{ pF}$			5		ns
$t_{PHL}$						5.5		ns

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



# SN54S65, SN74S65

## 4-2-3-2 INPUT AND-OR-INVERT GATES

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### recommended operating conditions

	SN54S65			SN74S65			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
V <sub>OH</sub> High-level output voltage			5.5			5.5	V
I <sub>OL</sub> Low-level output current			20			20	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†	SN54S65			SN74S65			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA			1.2			1.2	V
I <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, V <sub>OH</sub> = 5.5 V						0.25	mA
	V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.7 V, V <sub>OH</sub> = 5.5 V			0.25				
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		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> = 2.7 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>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0		6	11		6	11	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 4.5 V		8.5	16		8.5	16	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.

### switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)

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	2	5	7.5	ns
t <sub>PHL</sub>				2	5.5	8.5	ns
t <sub>PLH</sub>			R <sub>L</sub> = 280 Ω, C <sub>L</sub> = 50 pF	8		ns	
t <sub>PHL</sub>				6.5		ns	

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



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