

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

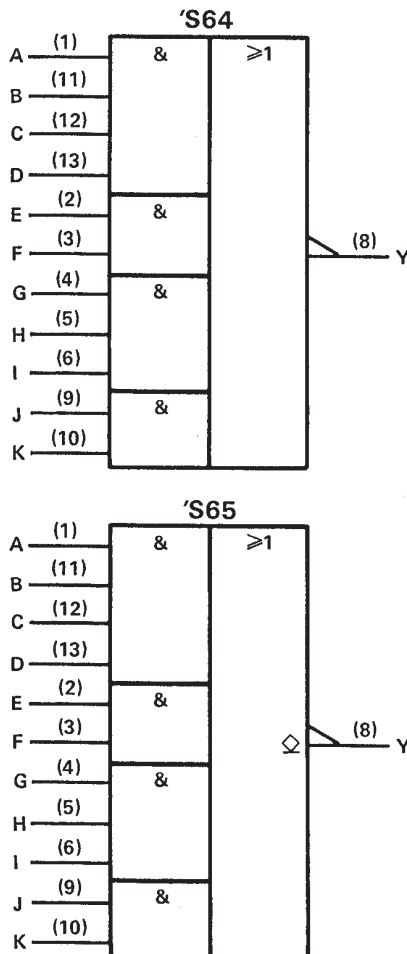
- Dependable Texas Instruments Quality and Reliability

#### description

These devices contain 4-2-3-2 input AND-OR-INVERT gates. They perform the Boolean function  $Y = \overline{ABCD + EF + GHI + JK}$ . 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  $70^{\circ}\text{C}$ .

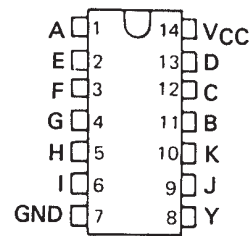
#### logic symbols†



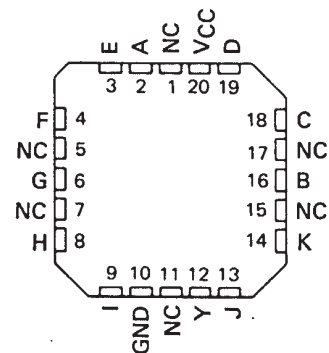
†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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)

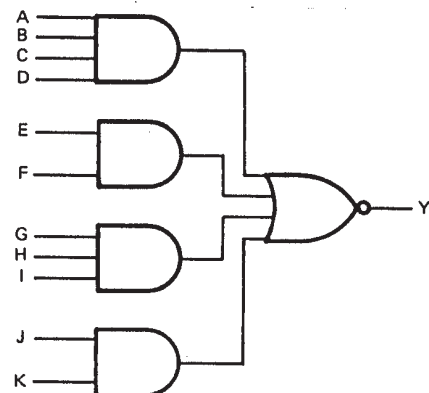


SN54S64, SN54S65 . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

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

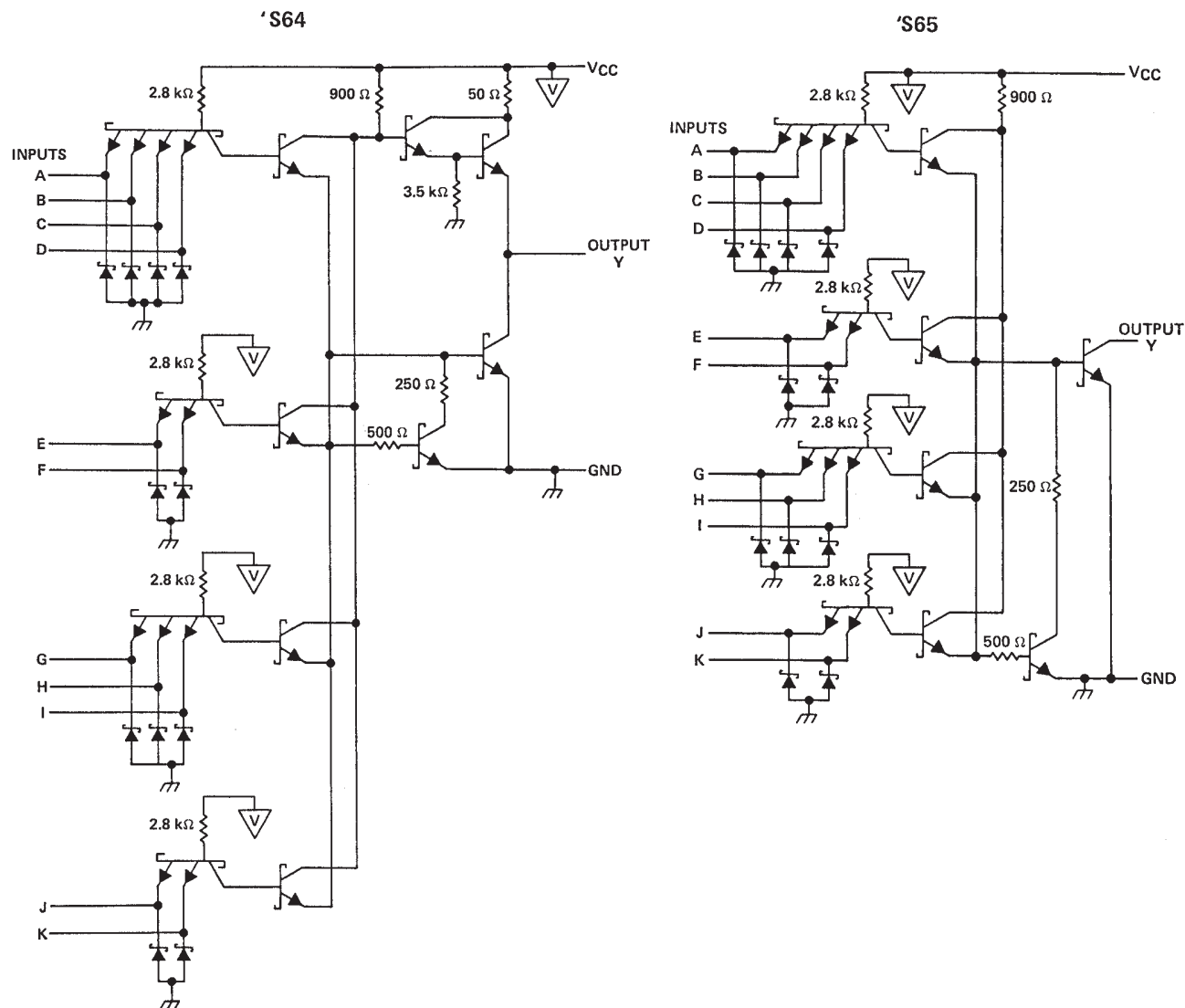


# SN54S64, SN54S65, SN74S64, SN74S65

## 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

# 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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