

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

DECEMBER 1983 — REVISED MARCH 1988

- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs**

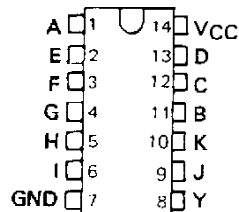
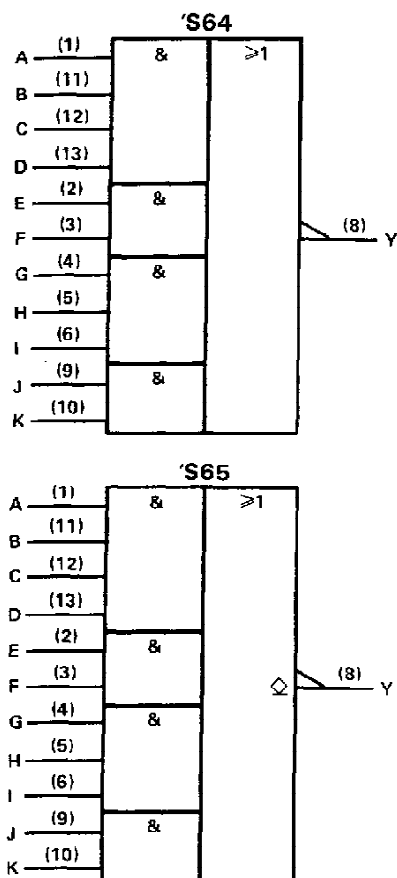
- **Dependable Texas Instruments Quality and Reliability**

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.

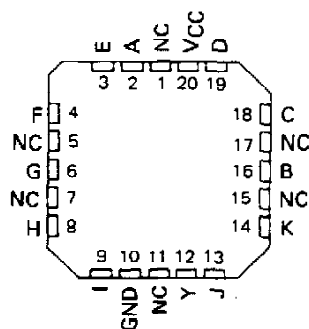
The SN54S64 and the SN54S65 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74S64 and the SN74S65 are characterized for operation from 0°C to 70°C .

logic symbols[†]



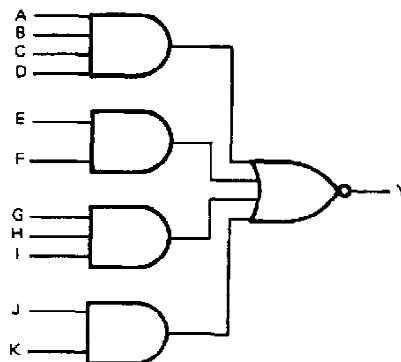
SN54S64, SN54S65 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

logic diagram (each device) (positive logic)

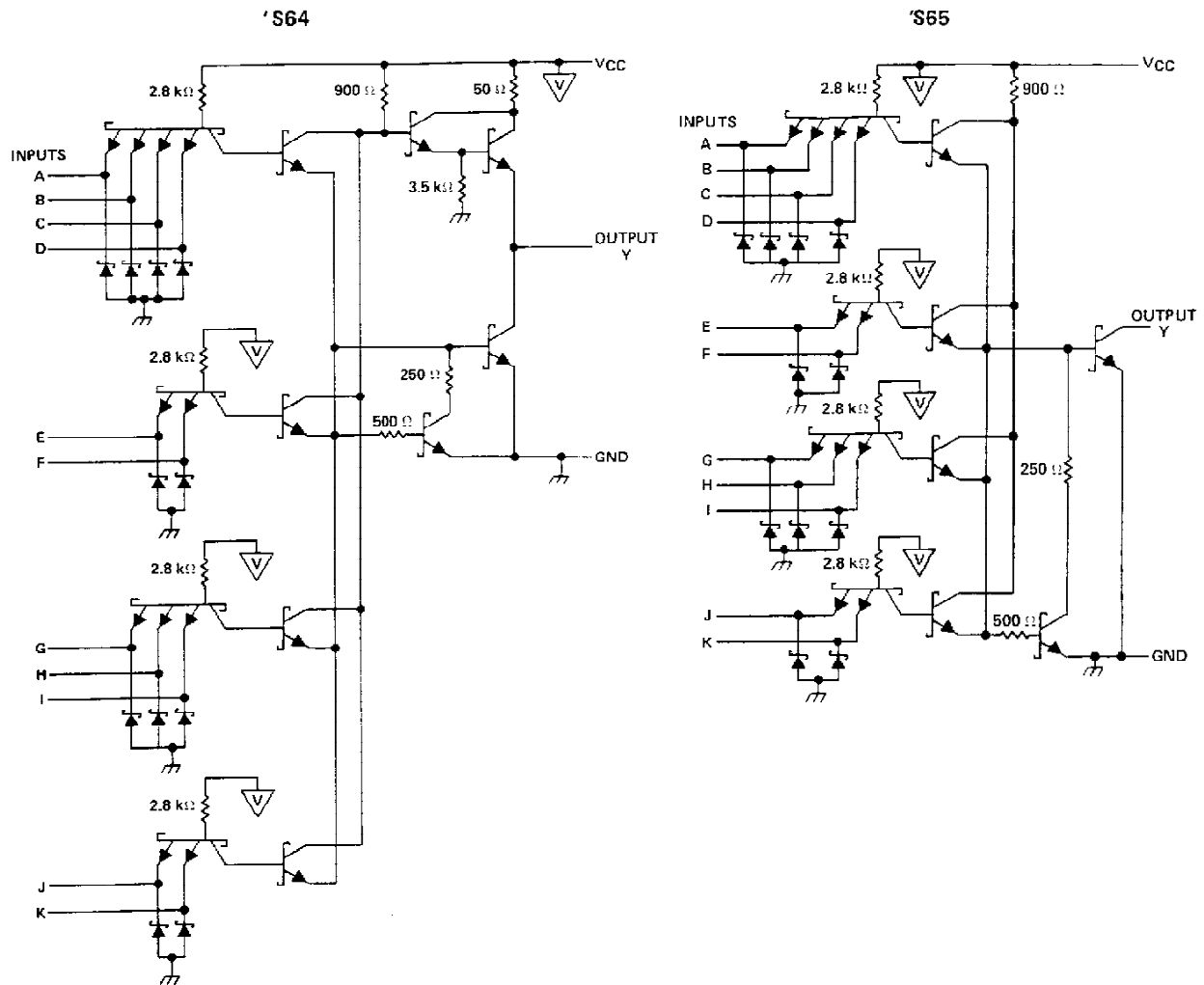


[†] These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

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

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

NOTE 1: Voltage values are with respect to network ground terminal.

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SN54S64, SN74S64

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

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_{OSS}	$V_{CC} = \text{MAX.}$	-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.

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

recommended operating conditions

	SN54S65			SN74S65			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
V_{OH} High-level output voltage			5.5			5.5	V
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†	SN54S65			SN74S65			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$		1.2			1.2		V
I_{OH}	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$					0.25		mA
	$V_{CC} = \text{MIN}, V_{IL} = 0.7 \text{ V}, V_{OH} = 5.5 \text{ V}$		0.25					
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 20 \text{ mA}$	0.2	0.4		0.2	0.4		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_{CCH}	$V_{CC} = \text{MAX}, V_I = 0$	6	11		6	11		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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

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	$R_L = 280 \Omega,$	$C_L = 15 \text{ pF}$	2	5	7.5	ns
t_{PHL}					2	5.5	8.5	ns
t_{PLH}			$R_L = 280 \Omega,$	$C_L = 50 \text{ pF}$		8		ns
t_{PHL}						6.5		ns

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

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