

TYPES SN7400, SN74LS00, SN74S00
SN5400, SN54LS00, SN54S00
QUADRUPLE 2-INPUT POSITIVE-NAND GATES
 REVISED DECEMBER 1983

- Package Options Include Standard Plastic (N) and Ceramic (J) 300-mil Dual-In-Line Packages, Plastic Small Outline (D) and Ceramic Chip Carrier (FK) Package
- Dependable Texas Instruments Quality and Reliability

description

These devices contain four independent 2-input NAND gates.

The SN54LS01 is characterized for Operation over the full military temperature range of -55 °C to 125 °C. The SN74LS01 is characterized for Operation from 0 °C to 70 °C.

FUNCTION TABLE (each gate)

INPUTS		OUTPUT
A	B	Y
H	H	L
L	X	H
X	L	H

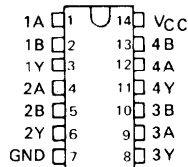
logic diagram (each gate)



positive logic

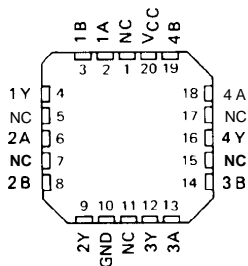
$$Y = \overline{A \cdot B} \text{ or } Y = \overline{A} + \overline{B}$$

**SN5400, SN54LS00,
 SN54S00 ... J PACKAGE
 SN7400, SN74LS00, SN74S00 ...
 D OR N PACKAGE
 (TOP VIEW)**



SN54LS00, SN54S00 FK PACKAGE

(TOP VIEW)



NC - No internal connection

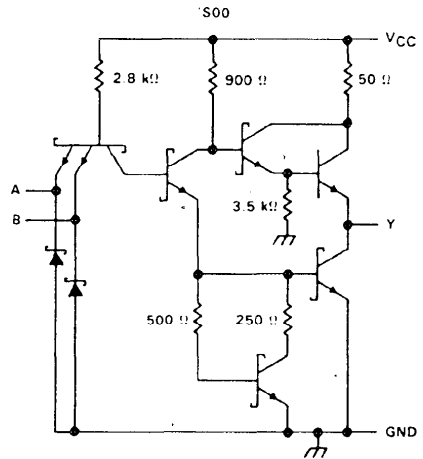
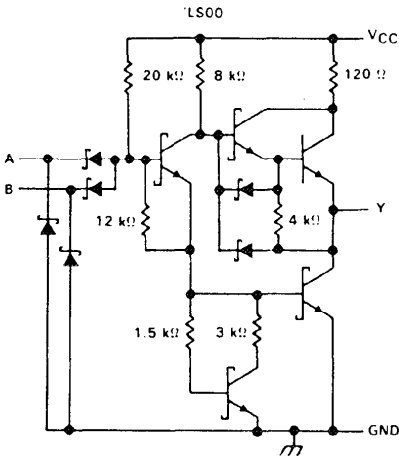
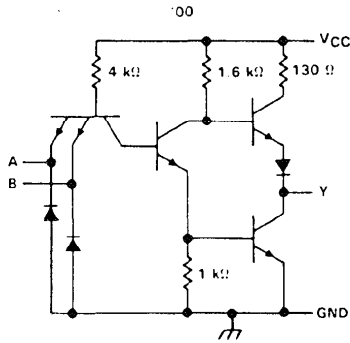
PRODUCTION DATA

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.



TYPES SN7400, SN74LS00, SN74S00
SN5400, SN54LS00, SN54S00
QUADRUPLE 2-INPUT POSITIVE-NAND GATES

schematics (each gate)



Resistor values shown are nominal.

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

Supply voltage, V_{CC} (see Note 1)	7V
Input voltage: '00, 'S00	5.5V
'LS00	7V
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

TYPES SN7400, SN5400 QUADRUPLE 2-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN5400			SN7400			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			-0.4			-0.4	mA
I_{OL} Low-level output current			16			16	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 †	SN5400		SN7400		UNIT		
		MIN	TYP ‡	MAX	MIN		TYP ‡	MAX
V_{IK}	$V_{CC} = \text{MIN.}$, $I_I = -12 \text{ mA}$			1.5		-1.5	V	
V_{OH}	$V_{CC} = \text{MIN.}$, $V_{IL} = 0.8 \text{ V.}$, $I_{OH} = -0.4 \text{ mA}$	2.4	3.4	2.4	3.4		V	
V_{OL}	$V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V.}$, $I_{OL} = 16 \text{ mA}$		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}	$V_{CC} = \text{MAX.}$, $V_I = 2.4 \text{ V}$			40		40	µA	
I_{IL}	$V_{CC} = \text{MAX.}$, $V_I = 0.4 \text{ V}$			-1.6		-1.6	mA	
$I_{OS} §$	$V_{CC} = \text{MAX.}$	-20		-55	-18		-55	mA
I_{CCH}	$V_{CC} = \text{MAX.}$, $V_I = 0 \text{ V}$		4	8		4	8	mA
I_{CCL}	$V_{CC} = \text{MAX.}$, $V_I = 4.5 \text{ V}$		12	22		12	22	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.

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}	A or B	Y	$R_L = 400 \Omega$, $C_L = 15 \text{ pF}$		11	22	ns
t_{PHL}					7	15	ns

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

TYPES SN74LS00, SN54LS00

QUADRUPLE 2-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54LS00			SN74LS00			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	0.7			0.8			V		
I _{OH} High-level output current	-0.4			-0.4			mA		
I _{OL} Low-level output current	4			8			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 †	SN54LS00			SN74LS00			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA	-1.5			-1.5			V
V _{OH}	V _{CC} = MIN, V _{IL} = MAX, I _{OH} = -0.4 mA	2.5	3.4		2.7	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 4 mA	0.25	0.4		0.25	0.4		V
	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 8 mA				0.35	0.5		
I _I	V _{CC} = MAX, V _I = 7 V	0.1			0.1			mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V	20			20			µA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V	-0.4			-0.4			mA
I _{OS} §	V _{CC} = MAX	-20	-100		-20	-100		mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V	0.8	1.6		0.8	1.6		mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V	2.4	4.4		2.4	4.4		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 V, T_A = 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.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	A or B	Y	RL = 2 kΩ	CL = 15 pF		9	15	nS
t _{PHL}						10	15	nS

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

TYPES SN74S00, SN54S00

QUADRUPLE 2-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54S00			SN74S00			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 †	SN54S00		SN74S00		UNIT
		MIN	TYP‡ MAX	MIN	TYP‡ MAX	
V_{IK}	$V_{CC} = \text{MIN.}$ $I_I = -18 \text{ mA}$		-1.2		-1.2	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}	$V_{CC} = \text{MAX.}$ $V_I = 0 \text{ V}$		10 16		10 16	mA
I_{CCL}	$V_{CC} = \text{MAX.}$ $V_I = 4.5 \text{ V}$		20 36		20 36	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}	A or B	Y	$R_L = 280 \Omega,$ $C_L = 15 \mu\text{F}$		3	4	ns	
t_{PHL}					3	5	ns	
t_{PLH}			$R_L = 280 \Omega,$ $C_L = 50 \text{ pF}$		4.5			
t_{PHL}					5			

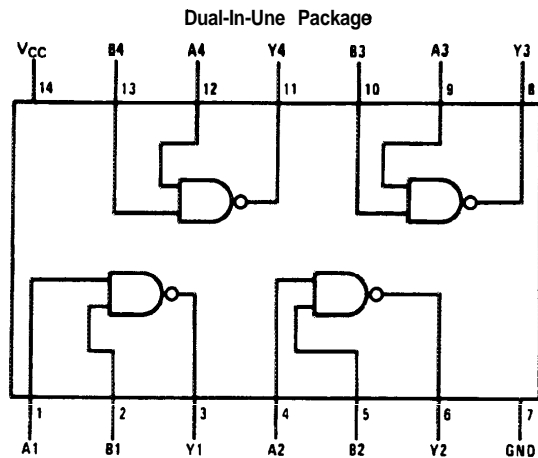
NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

DM5400/DM7400 Quad P-Input NAND Gates

General Description

This device contains four independent gates each of which performs the logic NAND function.

Connection Diagram



Order Number **DM5400J** or **DM7400N**
See NS Package Number **J14A** or **N14A**

TL/F/8613-1

Function Table

$$Y = \overline{AB}$$

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = High Logic Level
L = Low Logic Level

Absolute Maximum Ratings (Note)

Specifications for Military/Aerospace products are not contained in this datasheet. Refer to the associated reliability electrical test specifications document.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
DM54	-55°C to +125°C
DM74	0°C to +70°C
Storage Temperature Range	-65°C to +150%

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	DM5400			DM7400			Units
		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			-0.4			-0.4	mA
I _{OL}	Low Level Output Current			16			16	mA
T _A	Free Air Operating Temperature	-55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = -12 mA			-1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max	2.4	3.4		V
V _{OL}	Low Level output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min		0.2	0.4	V
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 5.5V			1	mA
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.4V			40	μA
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V			-1.6	mA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54 DM74	-20 -1.8	-55 -55	mA
I _{CCH}	Supply Current with Outputs High	V _{CC} = Max		4	8	mA
I _{CCL}	Supply Current with Outputs Low	V _{CC} = Max		12	22	mA

Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	Conditions	Min	Max	Units
t _{PLH}	Propagation Delay Time Low to High Level Output	C _L = 15 pF R _L = 400Ω		22	ns
t _{PHL}	Propagation Delay Time High to Low Level Output			15	ns

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.