BANDO N. 24565/2022

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Prova orale

Gruppo quesiti 1

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
    1. Il Candidato/la Candidata prenda in esame il datasheet del componente allegato (HEF4001B - Quad 2-input NOR gate - https://assets.nexperia.com/documents/data-sheet/HEF4001B.pdf) e ne commenti i parametri principali ivi evidenziati e ne descriva possibili settori di utilizzo.
    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per l'analisi dell'andamento nel tempo di un segnale elettrico. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

- Il/la Candidato/a discuta criticamente il proprio elaborato scritto.

- Il Candidato/la Candidata illustri sinteticamente le proprie esperienze lavorative pregresse che ritiene piu' significative anche in relazione alla attivita' prevista dalla posizione messa a concorso.

- Il/la Candidato/a illustri quali sono i sistemi operativi principalmente utilizzati per i personal computer.

- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dal datasheet della macchina per bonding and test Bondtek 5600Ci (https://www.fsbondtec.at/wp-content/uploads/2021/11/DataSheet_5600Ci_EN_02.pdf):

  "5600Ci: The fully automatic bond tester 5600Ci complements F&S BONDTEC Semiconductor GmbH die- and wire- bonders. The PC controlled moving table allows any number of bonds to be tested automatically from a stored program. Results can be analyzed and output immediately or exported in a number of database formats for subsequent analysis as desired. Powerful extended capabilities enable measurements such as force/time curves to be made and deliver more data about the quality of the bond tested. Exchangeable measurement cartridges ensure rapid conversion to different force ranges. The calibration curves of all measurement cartridges are stored internally; additional heads for shear, peel and tweezer testing with customer-specific tools and jaws are available."

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Prova orale

Gruppo quesiti 2

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
    1. Il Candidato/la Candidata prenda in esame il datasheet del componente allegato (SN74LS00 - Quad 2-input NAND gate - https://www.ti.com/lit/gpn/sn74ls00 e ne commenti i parametri principali ivi evidenziati e ne descriva possibili settori di utilizzo.
    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per la verifica funzionale e temporale di un circuito elettronico digitale. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

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- Il Candidato/la Candidata illustri sinteticamente le proprie esperienze lavorative pregresse che ritiene piu' significative anche in relazione alla attivita' prevista dalla posizione messa a concorso.

- Il/la Candidato/a illustri a che cosa serve un foglio di calcolo elettronico.

- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dalla Application Note Agilent "Multielement Nanoparticle Analysis of Semiconductor Process Chemicals Using spICP-QQQ" (https://www.agilent.com/cs/library/applications/application-nanoparticle-semicon-spicp-qqq-5994-0987en-us-agilent.pdf):
  "Technologies such as smartphones, cloud computing, the Internet of Things (IoT), and development of autonomous vehicles continue to drive demand for semiconductor products. To meet the requirements for higher integrated circuit (IC) performance and improved device yield, contamination must be controlled in the wafer substrate and on the surface of the device during fabrication. Given the nanometer scale of device features, there is a critical need to monitor metallic nanoparticles (NPs), as well as dissolved metals. Analysis of NPs present in bulk chemicals, silicon wafers, and cleaning bath solutions is important. If a particle is present between two metal lines, it may cause electrical shorting to occur, and surface defects can affect the growth of new layers on the silicon wafer."

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Prova orale

Gruppo quesiti 3

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
    1. Il Candidato/la Candidata prenda in esame il datasheet del componente allegato (diodo 1N4001 thru 1N4007, https://www.vishay.com/docs/88503/1n4001.pdf) e ne commenti i parametri principali ivi evidenziati e ne descriva possibili settori di utilizzo.
    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per la misura della tensione di breakdown di un diodo zener. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

- Il/la Candidato/a discuta criticamente il proprio elaborato scritto.

- Il Candidato/la Candidata illustri sinteticamente le proprie esperienze lavorative pregresse che ritiene piu' significative anche in relazione alla attivita' prevista dalla posizione messa a concorso.

- Il/la Candidato/a illustri quali sono i principali standard di trasmissione dati presenti in un personal computer.

- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dal manuale dell'oscilloscopio portatile ScopeMeter® Test Tool 190 Series della Fluke (https://dam-assets.fluke.com/s3fs-public/190_104_umeng0200_2.pdf?8kPeJ5vfsl6IfBb8akGkKudQymmWSZbH):
  "The Connect-and-View feature lets the test tool display complex, unknown signals automatically. This function optimizes the position, range, time base, and triggering and assures a stable display of virtually any waveform. If the signal changes, the setup is automatically adjusted to maintain the best display result. This feature is especially useful for quickly checking several signals. [...]
  The SCOPE RECORD function is a roll mode that logs a long waveform of each active input. This function can be used to monitor waveforms like motion control signals or the power-on event of an Uninterruptable Power Supply (UPS). During recording, fast transients are captured. Because of the deep memory, recording can be done for more than one day. This function is similar to the roll mode in many DSO's but has deeper memory and better functionality."

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Prova orale

Gruppo quesiti 4

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
    1. Il Candidato/la Candidata prenda in esame il datasheet del componente allegato (SN74Ls08 - Quad 2-input AND gate - https://www.ti.com/lit/gpn/sn74ls08 e ne commenti i parametri principali ivi evidenziati e ne descriva possibili settori di utilizzo.
    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per la misura del periodo e/o della frequenza di un segnale ripetitivo. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

- Il/la Candidato/a discuta criticamente il proprio elaborato scritto.

- Il Candidato/la Candidata illustri sinteticamente le proprie esperienze lavorative pregresse che ritiene piu' significative anche in relazione alla attivita' prevista dalla posizione messa a concorso.

- Il/la Candidato/a illustri quali sono le principali differenze tra un compilatore e un interprete.

- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dal datasheet della sonda differenziale Tektronix Differential Probes TDP1500, TDP3500 and TDP4000 Datasheet(https://download.tek.com/datasheet/TDP1500-TDP3500-TDP4000-Datasheet-EN-US-51W-20565-9.pdf):
  "Differential active probes provide truer signal reproduction and fidelity for high-frequency measurements. With ultra-low input capacitance and versatile device-under-test connection capabilities, the TDP1500, TDP3500 and TDP4000 Differential-ended Active probes provide excellent high-speed electrical and mechanical performance required for today's digital system designs. [...] Specifically designed for use and direct connection to oscilloscopes with the TekVPI™ probe interface, the TDP1500, TDP3500 and TDP4000 Differential probes achieve high-speed signal acquisition and measurement fidelity by solving three traditional problems: i) DUT loading effects - Are reduced by lower input capacitance and high input resistance; ii) DUT connectivity - A variety of accessories exist for attaching to small SMDs, some come standard or recommended; iii) Maximizing of system (oscilloscope and probe) bandwidth - Probing solutions for all measurements for TekVPI interface oscilloscope models up to 4 GHz. "

ALLEGATO 3
III VERBALE

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Prova orale

Gruppo quesiti 2

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
    1. Il Candidato/la Candidata prenda in esame il datasheet del componente allegato (SN74LS00 - Quad 2-input NAND gate - https://www.ti.com/lit/gpn/sn74ls00 e ne commenti i parametri principali ivi evidenziati e ne descriva possibili settori di utilizzo.
    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per la verifica funzionale e temporale di un circuito elettronico digitale. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

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- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dalla Application Note Agilent "Multielement Nanoparticle Analysis of Semiconductor Process Chemicals Using spICP-QQQ" (https://www.agilent.com/cs/library/applications/application-nanoparticle-semicon-spicp-qqq-5994-0987en-us-agilent.pdf):
  "Technologies such as smartphones, cloud computing, the Internet of Things (IoT), and development of autonomous vehicles continue to drive demand for semiconductor products. To meet the requirements for higher integrated circuit (IC) performance and improved device yield, contamination must be controlled in the wafer substrate and on the surface of the device during fabrication. Given the nanometer scale of device features, there is a critical need to monitor metallic nanoparticles (NPs), as well as dissolved metals. Analysis of NPs present in bulk chemicals, silicon wafers, and cleaning bath solutions is important. If a particle is present between two metal lines, it may cause electrical shorting to occur, and surface defects can affect the growth of new layers on the silicon wafer."

TEXAS INSTRUMENTS

SN5400, SN54LS00, SN54S00
SN7400, SN74LS00, SN74S00

SDLS025D – DECEMBER 1983 – REVISED MAY 2017

SNx400, SNx4LS00, and SNx4S00 Quadruple 2-Input Positive-NAND Gates

1 Features

- Package Options Include:
  - Plastic Small-Outline (D, NS, PS)
  - Shrink Small-Outline (DB)
  - Ceramic Flat (W)
  - Ceramic Chip Carriers (FK)
  - Standard Plastic (N)
  - Ceramic (J)
- Also Available as Dual 2-Input Positive-NAND Gate in Small-Outline (PS) Package
- Inputs Are TTL Compliant; V_{IH} = 2 V and V_{IL} = 0.8 V
- Inputs Can Accept 3.3-V or 2.5-V Logic Inputs
- SN5400, SN54LS00, and SN54S00 are Characterized For Operation Over the Full Military Temperature Range of –55°C to 125°C

2 Applications

- AV Receivers
- Portable Audio Docks
- Blu-Ray Players
- Home Theater
- MP3 Players or Recorders
- Personal Digital Assistants (PDAs)

3 Description

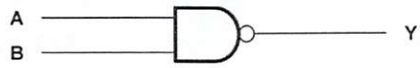
The SNx4xx00 devices contain four independent, 2-input NAND gates. The devices perform the Boolean function $Y = \overline{A \cdot B}$ or $Y = \overline{A} + \overline{B}$ in positive logic.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74LS00DB	SSOP (14)	6.20 mm × 5.30 mm
SN7400D, SN74LS00D, SN74S00D	SOIC (14)	8.65 mm × 3.91 mm
SN74LS00NSR	PDIP (14)	19.30 × 6.35 mm
SNJ5400J, SNJ54LS00J, SNJ54S00J	CDIP (14)	19.56 mm × 6.67 mm
SNJ5400W, SNJ54LS00W, SNJ54S00W	CFP (14)	9.21 mm × 5.97 mm
SN54LS00FK, SN54S00FK	LCCC (20)	8.89 mm × 8.89 mm
SN7400NS, SN74LS00NS, SN74S00NS	SO (14)	10.30 mm × 5.30 mm
SN7400PS, SN74LS00PS	SO (8)	6.20 mm × 5.30 mm

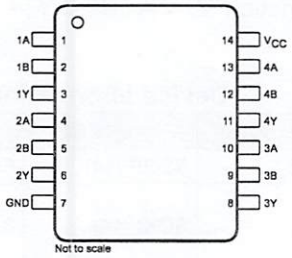
(1) For all available packages, see the orderable addendum at the end of the data sheet.

Logic Diagram, Each Gate (Positive Logic)

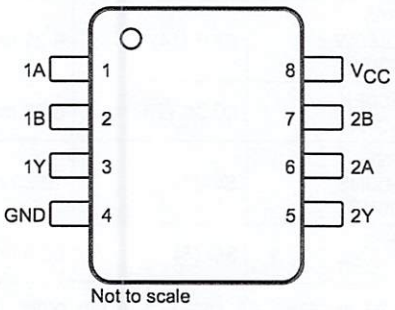


5 Pin Configuration and Functions

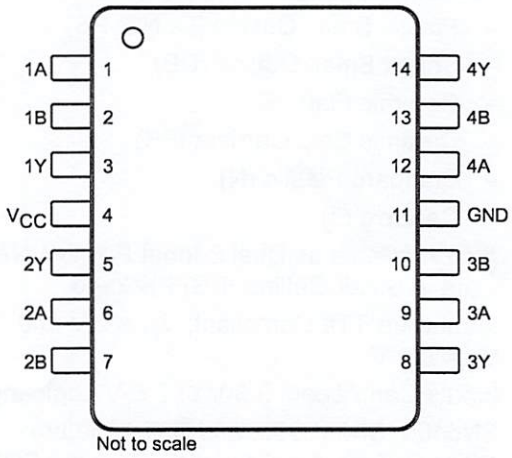
SN5400 J, SN54xx00 J and W, SN74x00 D, N, and NS, or SN74LS00 D, DB, N, and NS Packages
14-Pin CDIP, CFP, SOIC, PDIP, SO, or SSOP
Top View



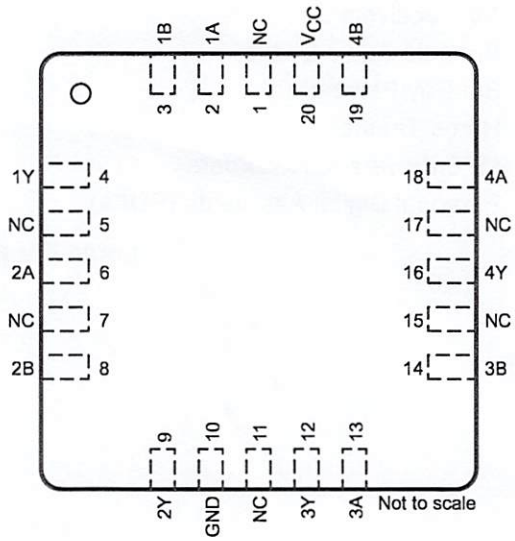
SN5400 W Package
14-Pin CFP
Top View



SN74xx00 PS Package
18-Pin SO
Top View



SN54xx00 FK Package
20-Pin LCCC
Top View



Pin Functions

PIN					I/O	DESCRIPTION
NAME	CDIP, CFP, SOIC, PDIP, SO, SSOP	SO (SN74xx00)	CFP (SN5400)	LCCC		
1A	1	1	1	2	I	Gate 1 input
1B	2	2	2	3	I	Gate 1 input
1Y	3	3	3	4	O	Gate 1 output
2A	4	6	6	6	I	Gate 2 input
2B	5	7	7	8	I	Gate 2 input
2Y	6	5	5	9	O	Gate 2 output
3A	10	—	9	13	I	Gate 3 input
3B	9	—	10	14	I	Gate 3 input

Pin Functions (continued)

PIN					I/O	DESCRIPTION
NAME	CDIP, CFP, SOIC, PDIP, SO, SSOP	SO (SN74xx00)	CFP (SN5400)	LCCC		
3Y	8	—	8	12	O	Gate 3 output
4A	13	—	12	18	I	Gate 4 input
4B	12	—	13	19	I	Gate 4 input
4Y	11	—	14	16	O	Gate 4 output
GND	7	4	11	10	—	Ground
NC	—	—	—	1, 5, 7, 11, 15, 17	—	No connect
V_{CC}	14	8	4	20	—	Power supply

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
Supply voltage, V_{CC}(2)			7	V
Input voltage	SNx400 and SNxS400		5.5	V
	SNx4LS00		7	
Junction temperature, T_J			150	°C
Storage temperature, T_{stg}		–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) Voltage values are with respect to network ground terminal.

6.2 ESD Ratings: SN74LS00

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	±500	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	±2000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500-V HBM is possible with the necessary precautions.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250-V CDM is possible with the necessary precautions. Pins listed as ±2000 V may actually have higher performance. ESD Tested on SN74LS00N package.

6.3 Recommended Operating Conditions

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

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	SN54xx00	4.5	5	5.5	V
		SN74xx00	4.75	5	5.25	
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage	SNx400, SN7LS400, and SNx4S00			0.8	V
		SN54LS00			0.7	
I_{OH}	High-level output current	SN5400, SN54LS00, and SN74LS00			–0.4	mA
		SNx4S00			–1	
I_{OL}	Low-level output current	SNx400			16	mA
		SN5LS400			4	
		SN7LS400			8	
		SNx4S00			20	

6.4 Thermal Information

THERMAL METRIC(1)(2)		SN74LS00				UNIT
		D (SOIC)	DB (SSOP)	N (PDIP)	NS (SO)	
		14 PINS	14 PINS	14 PINS	14 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	90.9	102.8	54.8	89.7	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	51.9	53.3	42.1	48.1	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	48	53.4	34.8	50.1	°C/W
ψ_{JT}	Junction-to-top characterization parameter	18.6	16.5	26.9	16.7	°C/W
ψ_{JB}	Junction-to-board characterization parameter	47.8	52.9	34.7	49.8	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report.
(2) The package thermal impedance is calculated in accordance with JESD 51-7.

6.5 Electrical Characteristics: SNx400

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

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{IK}	V_{CC} = MIN and I_I = –12 mA				–1.5	V
V_{OH}	V_{CC} = MIN, V_{IL} = 0.8 V, and I_{OH} = –0.4 mA		2.4	3.4		V
V_{OL}	V_{CC} = MIN, V_{IH} = 2 V, and I_{OL} = 16 mA			0.2	0.4	V
I_I	V_{CC} = MAX and V_I = 5.5 V				1	mA
I_{IH}	V_{CC} = MAX and V_I = 2.4 V				40	µA
I_{IL}	V_{CC} = MAX and V_I = 0.4 V				–1.6	mA
I_{OS}	V_{CC} = MAX	SN5400	–20		–55	mA
		SN7400	–18		–55	
I_{CCH}	V_{CC} = MAX and V_I = 0 V			4	8	mA
I_{CCL}	V_{CC} = MAX and V_I = 4.5 V			12	22	mA

6.6 Electrical Characteristics: SNx4LS00

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

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{IK}	V_{CC} = MIN and I_I = –18 mA				–1.5	V
V_{OH}	V_{CC} = MIN, V_{IL} = MAX, and I_{OH} = –0.4 mA		2.5	3.4		V
V_{OL}	V_{CC} = MIN and V_{IH} = 2 V	I_{OL} = 4 mA		0.25	0.4	V
		I_{OL} = 8 mA (SN74LS00)		0.35	0.5	
I_I	V_{CC} = MAX and V_I = 7 V				0.1	mA
I_{IH}	V_{CC} = MAX and V_I = 2.7 V				20	µA
I_{IL}	V_{CC} = MAX and V_I = 0.4 V				–0.4	mA
I_{OS}	V_{CC} = MAX		–20		–100	mA
I_{CCH}	V_{CC} = MAX and V_I = 0 V			0.8	1.6	mA
I_{CCL}	V_{CC} = MAX and V_I = 4.5 V			2.4	4.4	mA

6.7 Electrical Characteristics: SNx4S00

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IK}	V_{CC} = MIN and I_I = –18 mA			–1.2	V
V_{OH}	V_{CC} = MIN, V_{IL} = 0.8 V, and I_{OH} = –1 mA	2.5	3.4		V
V_{OL}	V_{CC} = MIN, V_{IH} = 2 V, and I_{OL} = 20 mA			0.5	V
I_I	V_{CC} = MAX and V_I = 5.5 V			1	mA
I_{IH}	V_{CC} = MAX and V_I = 2.7 V			50	µA
I_{IL}	V_{CC} = MAX and V_I = 0.5 V			–2	mA

Electrical Characteristics: SNx4S00 (continued)

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_{OS}	V_{CC} = MAX	–40		–100	mA
I_{CCH}	V_{CC} = MAX and V_I = 0 V		10	16	mA
I_{CCL}	V_{CC} = MAX and V_I = 4.5 V		20	36	mA

6.8 Switching Characteristics: SNx400

V_{CC} = 5 V, T_A = 25°C, and over operating free-air temperature range (unless otherwise noted). See Figure 2.

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	R_L = 400 Ω and C_L = 15 pF		11	22	ns
t_{PHL}					7	15	

6.9 Switching Characteristics: SNx4LS00

V_{CC} = 5 V, T_A = 25°C, and over operating free-air temperature range (unless otherwise noted). See Figure 2.

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	R_L = 2 kΩ and C_L = 15 pF		9	15	ns
t_{PHL}					10	15	

6.10 Switching Characteristics: SNx4S00

V_{CC} = 5 V, T_A = 25°C, and over operating free-air temperature range (unless otherwise noted). See Figure 2.

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	R_L = 280 Ω and C_L = 15 pF		3	4.5	ns
			R_L = 280 Ω and C_L = 50 pF		4.5		
t_{PHL}	A or B	Y	R_L = 280 Ω and C_L = 15 pF		3	5	
			R_L = 280 Ω and C_L = 50 pF		5		

ALLEGATO 4
III VERBALE

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Prova orale

Gruppo quesiti 3

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
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    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per la misura della tensione di breakdown di un diodo zener. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

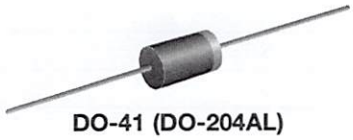
- Il/la Candidato/a discuta criticamente il proprio elaborato scritto.

- Il Candidato/la Candidata illustri sinteticamente le proprie esperienze lavorative pregresse che ritiene piu' significative anche in relazione alla attivita' prevista dalla posizione messa a concorso.

- Il/la Candidato/a illustri quali sono i principali standard di trasmissione dati presenti in un personal computer.

- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dal manuale dell'oscilloscopio portatile ScopeMeter® Test Tool 190 Series della Fluke (https://dam-assets.fluke.com/s3fs-public/190_104_umeng0200_2.pdf?8kPeJ5vfsl6IfBb8akGkKudQymmWSZbH):
"The Connect-and-View feature lets the test tool display complex, unknown signals automatically. This function optimizes the position, range, time base, and triggering and assures a stable display of virtually any waveform. If the signal changes, the setup is automatically adjusted to maintain the best display result. This feature is especially useful for quickly checking several signals. [...]
The SCOPE RECORD function is a roll mode that logs a long waveform of each active input. This function can be used to monitor waveforms like motion control signals or the power-on event of an Uninterruptable Power Supply (UPS). During recording, fast transients are captured. Because of the deep memory, recording can be done for more than one day. This function is similar to the roll mode in many DSO's but has deeper memory and better functionality."

General Purpose Plastic Rectifier



DO-41 (DO-204AL)

FEATURES

- Low forward voltage drop
- Low leakage current
- High forward surge capability
- Solder dip 275 °C max. 10 s, per JESD 22-B106
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb e3 RoHS COMPLIANT

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	1.0 A
V_{RRM}	50 V, 100 V, 200 V, 400 V, 600 V, 800 V, 1000 V
I_{FSM} (8.3 ms sine-wave)	30 A
I_{FSM} (square wave t_p = 1 ms)	45 A
V_F	1.1 V
I_R	5.0 µA
T_J max.	150 °C
Package	DO-41 (DO-204AL)
Circuit configuration	Single

TYPICAL APPLICATIONS

For use in general purpose rectification of power supplies, inverters, converters, and freewheeling diodes application.

MECHANICAL DATA

Case: DO-41 (DO-204AL), molded epoxy body
Molding compound meets UL 94 V-0 flammability rating
Base P/N-E3 - RoHS-compliant, commercial grade

Terminals: matte tin plated leads, solderable per J-STD-002 and JESD 22-B102
E3 suffix meets JESD 201 class 1A whisker test

Polarity: color band denotes cathode end

MAXIMUM RATINGS (T_A = 25 °C unless otherwise noted)

PARAMETER		SYMBOL	1N4001	1N4002	1N4003	1N4004	1N4005	1N4006	1N4007	UNIT
Maximum repetitive peak reverse voltage		V_{RRM}	50	100	200	400	600	800	1000	V
Maximum RMS voltage		V_{RMS}	35	70	140	280	420	560	700	V
Maximum DC blocking voltage		V_{DC}	50	100	200	400	600	800	1000	V
Maximum average forward rectified current 0.375" (9.5 mm) lead length at T_A = 75 °C		$I_{F(AV)}$	1.0							A
Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load		I_{FSM}	30							A
Non-repetitive peak forward surge current square waveform T_A = 25 °C (fig. 3)	t_p = 1 ms	I_{FSM}	45							A
	t_p = 2 ms		35							
	t_p = 5 ms		30							
Maximum full load reverse current, full cycle average 0.375" (9.5 mm) lead length T_L = 75 °C		$I_{R(AV)}$	30							µA
Rating for fusing (t < 8.3 ms)		I^2t (1)	3.7							A^2s
Operating junction and storage temperature range		T_J, T_{STG}	-50 to +150							°C

Note

(1) For device using on bridge rectifier application

ELECTRICAL CHARACTERISTICS (T_A = 25 °C unless otherwise noted)										
PARAMETER	TEST CONDITIONS		SYMBOL	1N4001	1N4002	1N4003	1N4004	1N4005	1N4006	1N4007	UNIT
Maximum instantaneous forward voltage	1.0 A		V_F	1.1							V
Maximum DC reverse current at rated DC blocking voltage		T_A = 25 °C	I_R	5.0							μA
		T_A = 125 °C		50							
Typical junction capacitance	4.0 V, 1 MHz		C_J	15							pF

THERMAL CHARACTERISTICS (T_A = 25 °C unless otherwise noted)									
PARAMETER	SYMBOL	1N4001	1N4002	1N4003	1N4004	1N4005	1N4006	1N4007	UNIT
Typical thermal resistance	$R_{\theta JA}$ (1)	50							°C/W
	$R_{\theta JL}$ (1)	25							

Note

(1) Thermal resistance from junction to ambient at 0.375" (9.5 mm) lead length, PCB mounted

ORDERING INFORMATION (Example)				
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
1N4004-E3/54	0.33	54	5500	13" diameter paper tape and reel
1N4004-E3/73	0.33	73	3000	Ammo pack packaging

RATINGS AND CHARACTERISTICS CURVES (T_A = 25 °C unless otherwise noted)

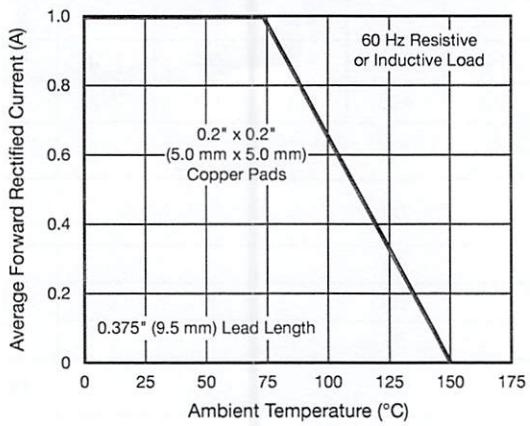


Fig. 1 - Forward Current Derating Curve

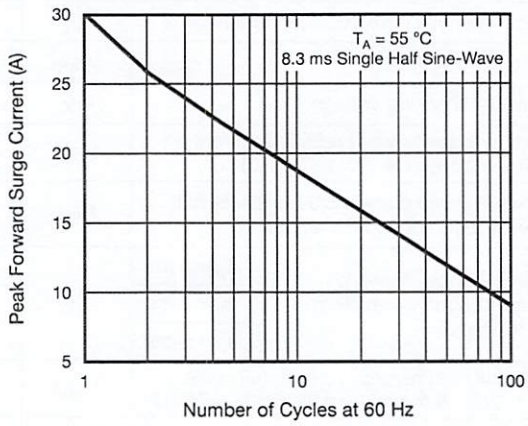


Fig. 2 - Maximum Non-repetitive Peak Forward Surge Current

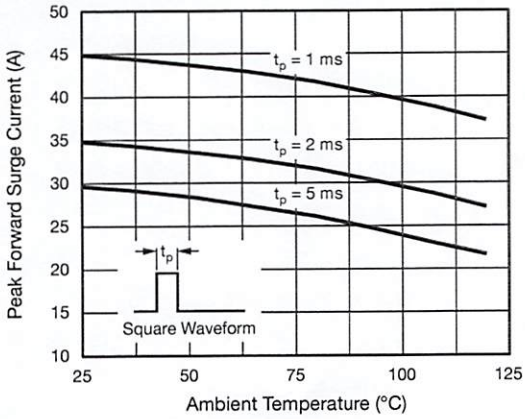


Fig. 3 - Non-Repetitive Peak Forward Surge Current

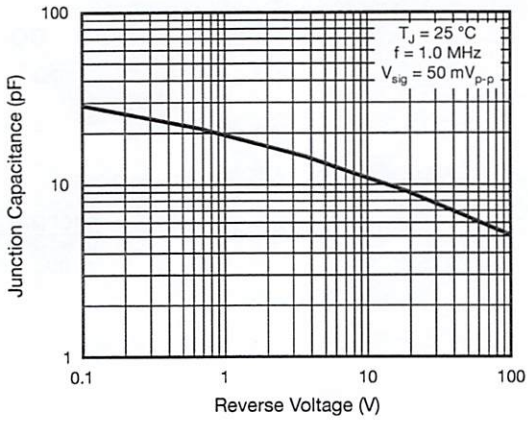


Fig. 6 - Typical Junction Capacitance

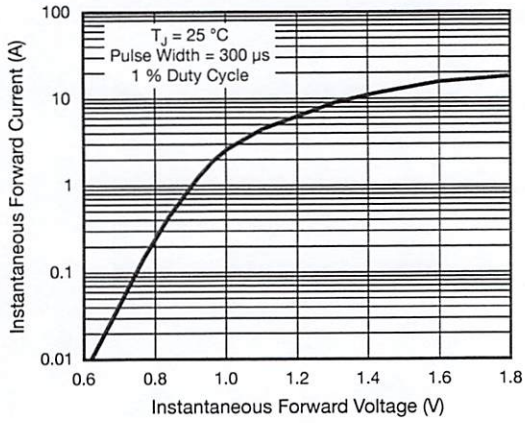


Fig. 4 - Typical Instantaneous Forward Characteristics

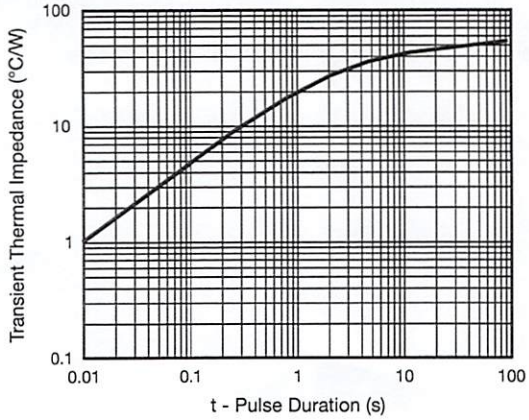


Fig. 7 - Typical Transient Thermal Impedance

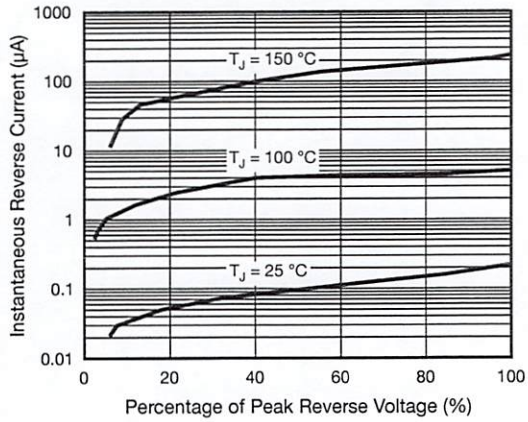
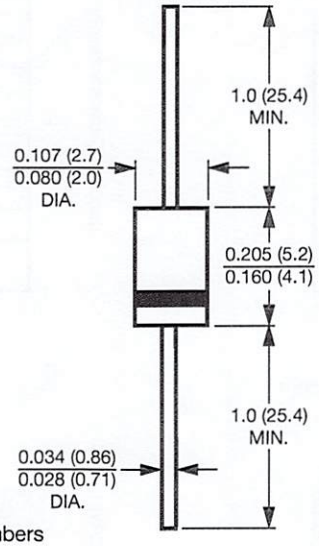


Fig. 5 - Typical Reverse Characteristics

PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

DO-41 (DO-204AL)



Note

- Lead diameter is $\frac{0.026\ (0.66)}{0.023\ (0.58)}$ for suffix "E" part numbers

ALLEGATO 5
II VERBALE

BANDO N. 24565/2022

Concorso per titoli ed esami per un posto per il profilo professionale di Collaboratore Tecnico E.R.di VI livello professionale con contratto di lavoro a tempo indeterminato

Prova orale

Gruppo quesiti 4

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
    1. Il Candidato/la Candidata prenda in esame il datasheet del componente allegato (SN74Ls08 - Quad 2-input AND gate - https://www.ti.com/lit/gpn/sn74ls08 e ne commenti i parametri principali ivi evidenziati e ne descriva possibili settori di utilizzo.
    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per la misura del periodo e/o della frequenza di un segnale ripetitivo. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

- Il/la Candidato/a discuta criticamente il proprio elaborato scritto.

- Il Candidato/la Candidata illustri sinteticamente le proprie esperienze lavorative pregresse che ritiene piu' significative anche in relazione alla attivita' prevista dalla posizione messa a concorso.

- Il/la Candidato/a illustri quali sono le principali differenze tra un compilatore e un interprete.

- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dal datasheet della sonda differenziale Tektronix Differential Probes TDP1500, TDP3500 and TDP4000 Datasheet(https://download.tek.com/datasheet/TDP1500-TDP3500-TDP4000-Datasheet-EN-US-51W-20565-9.pdf):
  "Differential active probes provide truer signal reproduction and fidelity for high-frequency measurements. With ultra-low input capacitance and versatile device-under-test connection capabilities, the TDP1500, TDP3500 and TDP4000 Differential-ended Active probes provide excellent high-speed electrical and mechanical performance required for today's digital system designs. [...] Specifically designed for use and direct connection to oscilloscopes with the TekVPI™ probe interface, the TDP1500, TDP3500 and TDP4000 Differential probes achieve high-speed signal acquisition and measurement fidelity by solving three traditional problems: i) DUT loading effects - Are reduced by lower input capacitance and high input resistance; ii) DUT connectivity - A variety of accessories exist for attaching to small SMDs, some come standard or recommended; iii) Maximizing of system (oscilloscope and probe) bandwidth - Probing solutions for all measurements for TekVPI interface oscilloscope models up to 4 GHz. "

- **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

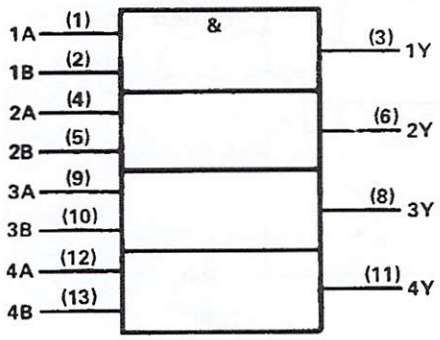
These devices contain four independent 2-input AND gates.

The SN5408, SN54LS08, and SN54S08 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN7408, SN74LS08 and SN74S08 are characterized for operation from 0° to 70°C.

FUNCTION TABLE (each gate)

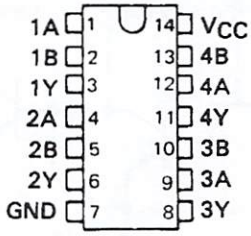
INPUTS		OUTPUT
A	B	Y
H	H	H
L	X	L
X	L	L

logic symbol†

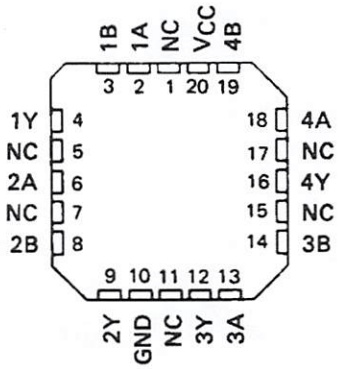


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, N, and W packages.

SN5408, SN54LS08, SN54S08 . . . J OR W PACKAGE
SN7408 . . . J OR N PACKAGE
SN74LS08, SN74S08 . . . D, J OR N PACKAGE
(TOP VIEW)

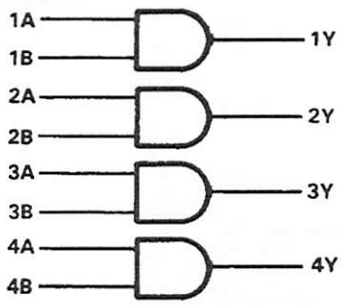


SN54LS08, SN54S08 . . . FK PACKAGE
(TOP VIEW)



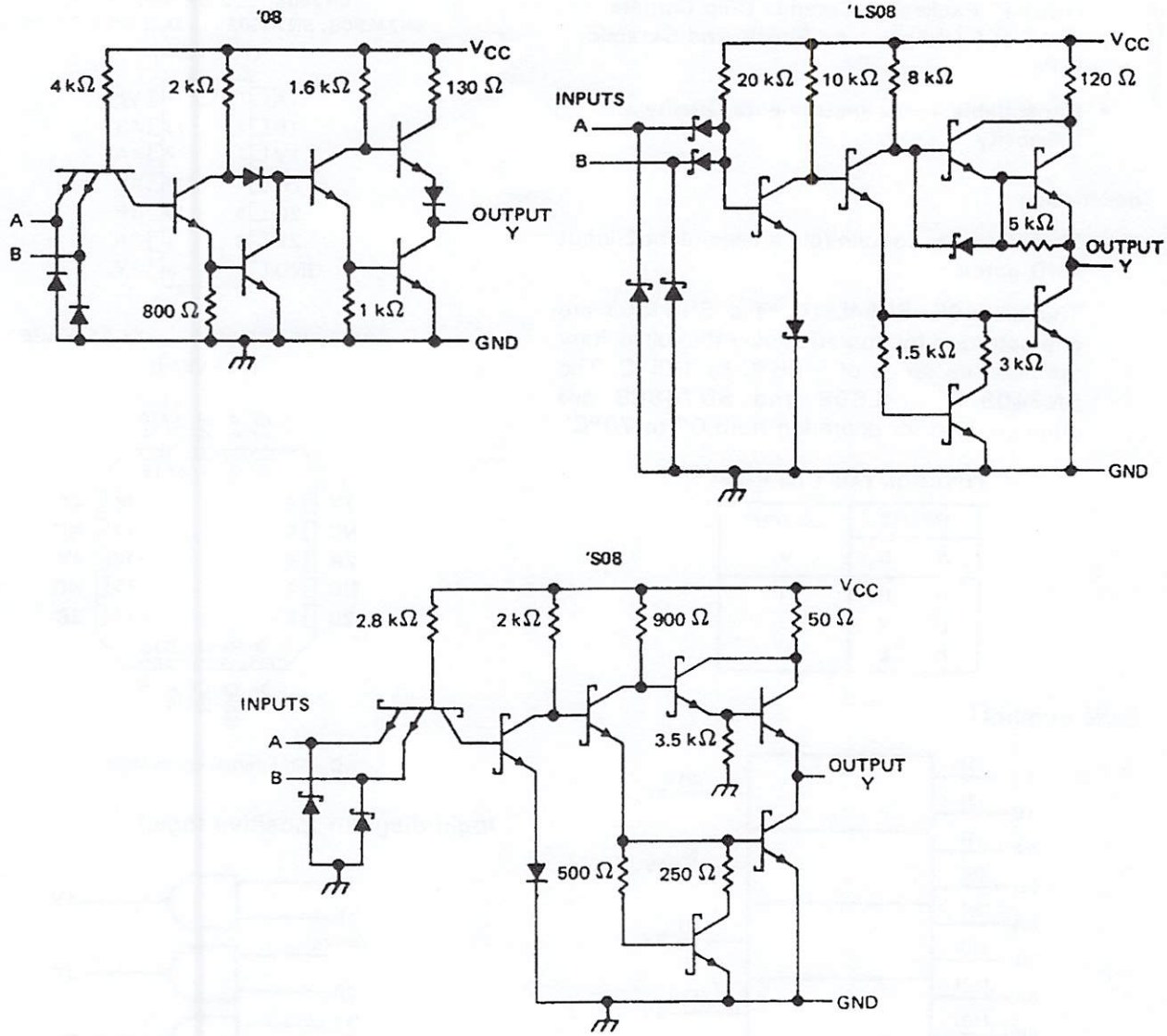
NC—No internal connection

logic diagram (positive logic)



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

schematics (each gate)



Resistor values are nominal.

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: '08, 'S08	5.5 V
'LS08	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.

recommended operating conditions

	SN5408			SN7408			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			– 0.8			– 0.8	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 †	SN5408			SN7408			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN, I_I = – 12 mA			– 1.5			– 1.5	V
V_{OH}	V_{CC} = MIN, V_{IH} = 2 V, I_{OH} = – 0.8 mA	2.4	3.4		2.4	3.4		V
V_{OL}	V_{CC} = MIN, V_{IL} = 0.8 V, I_{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I_I	V_{CC} = MAX, V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.4 V			40			40	μA
I_{IL}	V_{CC} = MAX, V_I = 0.4 V			– 1.6			– 1.6	mA
I_{OS}§	V_{CC} = MAX	– 20		– 55	– 18		– 55	mA
I_{CCH}	V_{CC} = MAX, V_I = 4.5 V		11	21		11	21	mA
I_{CCL}	V_{CC} = MAX, V_I = 0 V		20	33		20	33	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.

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	R_L = 400 Ω, C_L = 15 pF		17.5	27	ns
t_{PHL}					12	19	ns

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

recommended operating conditions

		SN54LS08			SN74LS08			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 †			SN54LS08			SN74LS08			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_{IH} = 2 V,	I_{OH} = −0.4 mA	2.5	3.4		2.7	3.4		V
V_{OL}	V_{CC} = MIN,	V_{IL} = MAX,	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
	V_{CC} = MIN,	V_{IL} = MAX,	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 = 4.5 V			2.4	4.8		2.4	4.8	mA
I_{CCL}	V_{CC} = MAX,	V_I = 0 V			4.4	8.8		4.4	8.8	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	R_L = 2 kΩ,	C_L = 15 pF		8	15	ns
t_{PHL}						10	20	ns

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

recommended operating conditions

		SN54S08			SN74S08			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 †	SN54S08			SN74S08			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	V_{CC} = MIN, I_I = −18 mA			−1.2			−1.2	V
V_{OH}	V_{CC} = MIN, V_{IH} = 2 V, I_{OH} = −1 mA	2.5	3.4		2.7	3.4		V
V_{OL}	V_{CC} = MIN, V_{IL} = 0.8 V, I_{OL} = 20 mA			0.5			0.5	V
I_I	V_{CC} = MAX, V_I = 5.5 V			1			1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.7 V			50			50	μA
I_{IL}	V_{CC} = MAX, V_I = 0.5 V			−2			−2	mA
I_{OS}§	V_{CC} = MAX	−40		−100	−40		−100	mA
I_{CCH}	V_{CC} = MAX, V_I = 4.5 V		18	32		18	32	mA
I_{CCL}	V_{CC} = MAX, V_I = 0 V		32	57		32	57	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	R_L = 280 Ω, C_L = 15 pF		4.5	7	ns
t_{PHL}					5	7.5	ns
t_{PLH}			R_L = 280 Ω, C_L = 50 pF		6		ns
t_{PHL}					7.5		ns

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

ALLEGATO 6
II VERBALE

BANDO N. 24565/2022

Concorso per titoli ed esami per un posto per il profilo professionale di Collaboratore Tecnico E.R.di VI livello professionale con contratto di lavoro a tempo indeterminato

Prova orale

Gruppo quesiti 1

- Il/La Candidato/a risponda ad uno ed uno solo a scelta dei seguenti quesiti:
    1. Il Candidato/la Candidata prenda in esame il datasheet del componente allegato (HEF4001B - Quad 2-input NOR gate - https://assets.nexperia.com/documents/data-sheet/HEF4001B.pdf) e ne commenti i parametri principali ivi evidenziati e ne descriva possibili settori di utilizzo.
    2. Il Candidato/la Candidata supponga di dover allestire un banco di prova per l'analisi dell'andamento nel tempo di un segnale elettrico. Il Candidato/la Candidata illustri come allestirebbe il banco di misura, quali strumenti impiegherebbe e con quali caratteristiche, come eseguirebbe la misura e come, infine, documenterebbe i dati raccolti.

- Il/la Candidato/a discuta criticamente il proprio elaborato scritto.

- Il Candidato/la Candidata illustri sinteticamente le proprie esperienze lavorative pregresse che ritiene piu' significative anche in relazione alla attivita' prevista dalla posizione messa a concorso.

- Il/la Candidato/a illustri quali sono i sistemi operativi principalmente utilizzati per i personal computer.

- Il Candidato/la Candidata legga e traduca il seguente periodo, tratto dal datasheet della macchina per bonding and test Bondtek 5600Ci (https://www.fsbondtec.at/wp-content/uploads/2021/11/DataSheet_5600Ci_EN_02.pdf):

  "5600Ci: The fully automatic bond tester 5600Ci complements F&S BONDTEC Semiconductor GmbH die- and wire- bonders. The PC controlled moving table allows any number of bonds to be tested automatically from a stored program. Results can be analyzed and output immediately or exported in a number of database formats for subsequent analysis as desired. Powerful extended capabilities enable measurements such as force/time curves to be made and deliver more data about the quality of the bond tested. Exchangeable measurement cartridges ensure rapid conversion to different force ranges. The calibration curves of all measurement cartridges are stored internally; additional heads for shear, peel and tweezer testing with customer-specific tools and jaws are available."

HEF4001B

Quad 2-input NOR gate

Rev. 11 — 19 November 2021 Product data sheet

1. General description

The HEF4001B is a quad 2-input NOR gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{DD}.

2. Features and benefits

- Wide supply voltage range from 3.0 V to 15.0 V
- CMOS low power dissipation
- High noise immunity
- Fully static operation
- 5 V, 10 V, and 15 V parametric ratings
- Standardized symmetrical output characteristics
- Complies with JEDEC standard JESD 13-B
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-B exceeds 200 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
HEF4001BT	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1

4. Functional diagram

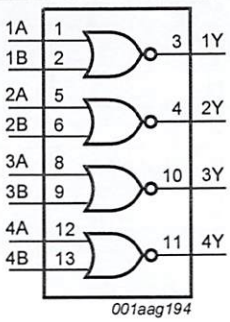


Fig. 1. Functional diagram

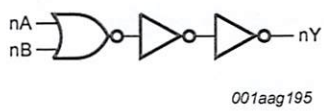


Fig. 2. Logic diagram (one gate)

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5. Pinning information

5.1. Pinning

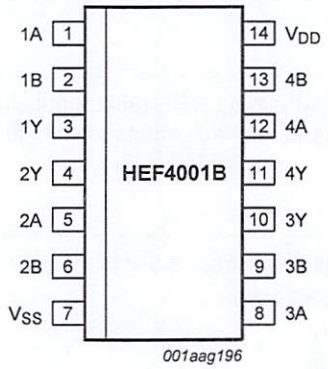


Fig. 3. Pin configuration SOT108-1 (SO14)

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1A, 2A, 3A, 4A	1, 5, 8, 12	input
1B, 2B, 3B, 4B	2, 6, 9, 13	input
1Y, 2Y, 3Y, 4Y	3, 4, 10, 11	output
V_{SS}	7	ground (0 V)
V_{DD}	14	supply voltage

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level.

Input		Output
nA	nB	nY
L	L	H
L	H	L
H	L	L
H	H	L

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to V_{SS} = 0 V (ground).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DD}	supply voltage		-0.5	+18	V
I_{IK}	input clamping current	V_I < -0.5 V or V_I > V_{DD} + 0.5 V	-	±10	mA
V_I	input voltage		-0.5	V_{DD} + 0.5	V
I_{OK}	output clamping current	V_O < -0.5 V or V_O > V_{DD} + 0.5 V	-	±10	mA
$I_{I/O}$	input/output current		-	±10	mA
I_{DD}	supply current		-	50	mA
T_{stg}	storage temperature		-65	+150	°C
T_{amb}	ambient temperature		-40	+125	°C
P_{tot}	total power dissipation	T_{amb} = -40 °C to + 125 °C [1]	-	500	mW
P	power dissipation	per output	-	100	mW

[1] For SOT108-1 (SO14) package: P_{tot} derates linearly with 10.1 mW/K above 100 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DD}	supply voltage		3	-	15	V
V_I	input voltage		0	-	V_{DD}	V
T_{amb}	ambient temperature	in free air	-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V_{DD} = 5 V	-	-	3.75	µs/V
		V_{DD} = 10 V	-	-	0.5	µs/V
		V_{DD} = 15 V	-	-	0.08	µs/V

9. Static characteristics

Table 6. Static characteristics

V_{SS} = 0 V; V_I = V_{SS} or V_{DD}; unless otherwise specified.

Symbol	Parameter	Conditions	V_{DD}	T_{amb} = -40 °C		T_{amb} = +25 °C		T_{amb} = +85 °C		T_{amb} = +125 °C		Unit
				Min	Max	Min	Max	Min	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$\|I_O\|$ < 1 µA	5 V	3.5	-	3.5	-	3.5	-	3.5	-	V
			10 V	7.0	-	7.0	-	7.0	-	7.0	-	V
			15 V	11.0	-	11.0	-	11.0	-	11.0	-	V
V_{IL}	LOW-level input voltage	$\|I_O\|$ < 1 µA	5 V	-	1.5	-	1.5	-	1.5	-	1.5	V
			10 V	-	3.0	-	3.0	-	3.0	-	3.0	V
			15 V	-	4.0	-	4.0	-	4.0	-	4.0	V
V_{OH}	HIGH-level output voltage	$\|I_O\|$ < 1 µA	5 V	4.95	-	4.95	-	4.95	-	4.95	-	V
			10 V	9.95	-	9.95	-	9.95	-	9.95	-	V
			15 V	14.95	-	14.95	-	14.95	-	14.95	-	V

Symbol	Parameter	Conditions	V_{DD}	T_{amb} = -40 °C		T_{amb} = +25 °C		T_{amb} = +85 °C		T_{amb} = +125 °C		Unit
				Min	Max	Min	Max	Min	Max	Min	Max	
V_{OL}	LOW-level output voltage	$\|I_O\|$ < 1 µA	5 V	-	0.05	-	0.05	-	0.05	-	0.05	V
			10 V	-	0.05	-	0.05	-	0.05	-	0.05	V
			15 V	-	0.05	-	0.05	-	0.05	-	0.05	V
I_{OH}	HIGH-level output current	V_O = 2.5 V	5 V	-	-1.7	-	-1.4	-	-1.1	-	-1.1	mA
		V_O = 4.6 V	5 V	-	-0.64	-	-0.5	-	-0.36	-	-0.36	mA
		V_O = 9.5 V	10 V	-	-1.6	-	-1.3	-	-0.9	-	-0.9	mA
		V_O = 13.5 V	15 V	-	-4.2	-	-3.4	-	-2.4	-	-2.4	mA
I_{OL}	LOW-level output current	V_O = 0.4 V	5 V	0.64	-	0.5	-	0.36	-	0.36	-	mA
		V_O = 0.5 V	10 V	1.6	-	1.3	-	0.9	-	0.9	-	mA
		V_O = 1.5 V	15 V	4.2	-	3.4	-	2.4	-	2.4	-	mA
I_I	input leakage current		15 V	-	±0.1	-	±0.1	-	±1.0	-	±1.0	µA
I_{DD}	supply current	all valid input combinations; I_O = 0 A	5 V	-	0.25	-	0.25	-	7.5	-	7.5	µA
			10 V	-	0.5	-	0.5	-	15.0	-	15.0	µA
			15 V	-	1.0	-	1.0	-	30.0	-	30.0	µA
C_I	input capacitance			-	-	-	7.5	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

T_{amb} = 25 °C unless otherwise specified.; for waveforms see Fig. 4; for test circuit see Fig. 5.

Symbol	Parameter	Extrapolation formula [1]	V_{DD}	Min	Typ	Max	Unit
t_{PHL}	HIGH to LOW propagation delay	33 + 0.55 × C_L	5 V	-	60	120	ns
		14 + 0.23 × C_L	10 V	-	25	50	ns
		12 + 0.16 × C_L	15 V	-	20	40	ns
t_{PLH}	LOW to HIGH propagation delay	23 + 0.55 × C_L	5 V	-	50	100	ns
		14 + 0.23 × C_L	10 V	-	25	45	ns
		12 + 0.16 × C_L	15 V	-	20	35	ns
t_{THL}	HIGH to LOW output transition time	10 + 1.00 × C_L	5 V	-	60	120	ns
		9 + 0.42 × C_L	10 V	-	30	60	ns
		6 + 0.28 × C_L	15 V	-	20	40	ns
t_{TLH}	LOW to HIGH output transition time	10 + 1.00 × C_L	5 V	-	60	120	ns
		9 + 0.42 × C_L	10 V	-	30	60	ns
		6 + 0.28 × C_L	15 V	-	20	40	ns

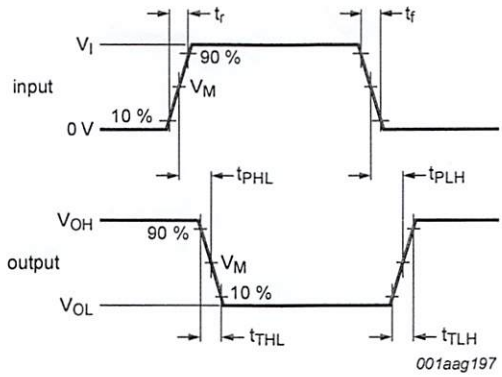
[1] The typical value of the propagation delay and output transition time can be calculated with the extrapolation formula (C_L in pF).

Table 8. Dynamic power dissipation

V_{SS} = 0 V; $t_r = t_f \leq$ 20 ns; T_{amb} = 25 °C.

Symbol	Parameter	V_{DD}	Typical formula	Where
P_D	dynamic power dissipation	5 V	$P_D = 1100 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ (µW)	f_i = input frequency in MHz; f_o = output frequency in MHz; C_L = output load capacitance in pF; $\Sigma(f_o \times C_L)$ = sum of the outputs; V_{DD} = supply voltage in V.
		10 V	$P_D = 5000 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ (µW)	
		15 V	$P_D = 14200 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ (µW)	

10.1. Waveforms and test circuit



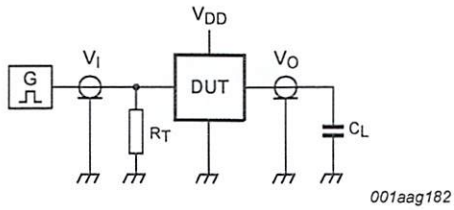
Measurement points are given in Table 9.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 4. Propagation delay, output transition time

Table 9. Measurement points

Supply voltage	Input	Output
V_{DD}	V_M	V_M
5 V to 15 V	$0.5V_{DD}$	$0.5V_{DD}$



Test data is given in Table 10.

Definitions for test circuit:

DUT = Device Under Test.

C_L = load capacitance including jig and probe capacitance.

R_T = termination resistance should be equal to the output impedance Z_o of the pulse generator.

Fig. 5. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load
V_{DD}	V_I	t_r, t_f	C_L
5 V to 15 V	V_{SS} or V_{DD}	≤ 20 ns	50 pF