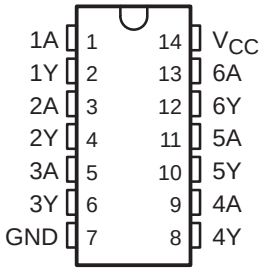
- **Converts TTL Voltage Levels to MOS Levels**
- **High Sink-Current Capability**
- **Input Clamping Diodes Simplify System Design**
- **Open-Collector Driver for Indicator Lamps and Relays**
- **Inputs Fully Compatible With Most TTL Circuits**

SN5407, SN5417 . . . J OR W PACKAGE
SN7407, SN7417 . . . N PACKAGE
(TOP VIEW)



description

These monolithic TTL hex buffers/drivers feature high-voltage open-collector outputs for interfacing with high-level circuits (such as MOS), or for driving high-current loads (such as lamps or relays), and also are characterized for use as buffers for driving TTL inputs. The SN5407 and SN7407 have minimum breakdown voltages of 30 V, and the SN5417 and SN7417 have minimum breakdown voltages of 15 V. The maximum sink current is 30 mA for the SN5407 and SN5417 and 40 mA for the SN7407 and SN7417.

These devices perform the Boolean function Y = A in positive logic.

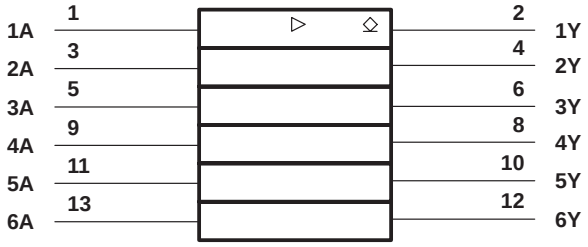
These circuits are completely compatible with most TTL families. Inputs are diode clamped to minimize transmission-line effects, which simplifies design. Typical power dissipation is 145 mW and average propagation delay time is 14 ns.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN7407N	SN7407N
			SN7417N	SN7417N
–55°C to 125°C	CDIP – J	Tube	SNJ5407J	SNJ5407J
			SNJ5417J	SNJ5417J
	CFP – W	Tube	SNJ5407W	SNJ5407W
			SNJ5417W	SNJ5417W

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

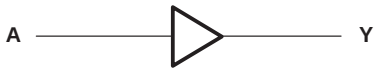
logic symbol‡



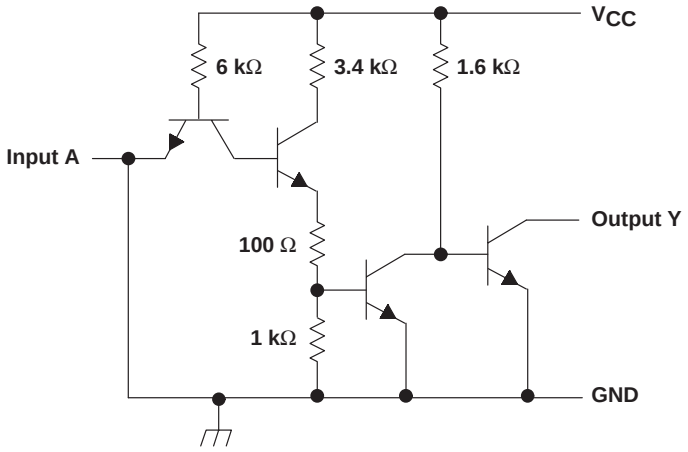
‡ This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

logic diagram, each buffer/driver (positive logic)



schematic



Resistor values shown are nominal.

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

Supply voltage range, V_{CC} . . . . . 0.5 V to 7 V
Input voltage range, V_I (see Note 1) . . . . . 0.5 V to 5.5 V
Output voltage, V_O (see Notes 1 and 2): SN5407, SN7407 . . . . . 30 V
SN5417, SN7417 . . . . . 15 V
Package thermal impedance, θ_{JA} (see Note 3) . . . . . 80°C/W
Storage temperature range, T_{stg} . . . . . –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values are with respect to GND.
2. This is the maximum voltage that should be applied to any output when it is in the off state.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	SN5407, SN5417	4.5	5	5.5	V
		SN7407, SN7417	4.75	5	5.25	
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage				0.8	V
V_{OH}	High-level output voltage	SN5407, SN7407			30	V
		SN5417, SN7417			15	
I_{OL}	Low-level output current	SN5407, SN5417			30	mA
		SN7407, SN7417			40	
T_A	Operating free-air temperature	SN5407, SN5417	–55		125	°C
		SN7407, SN7417	0		70	

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

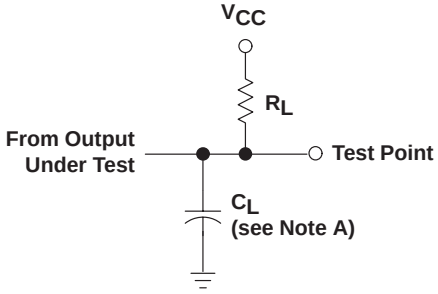
PARAMETER	TEST CONDITIONS†			MIN	TYP‡	MAX	UNIT
V_{IK}	V_{CC} = MIN,	I_I = –12 mA				–1.5	V
I_{OH}	V_{CC} = MIN,	V_{IL} = 0.8 V	V_{OH} = 30 V (SN5407, SN7407)			0.25	mA
			V_{OH} = 15 V (SN5417, SN7417)			0.25	
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V	I_{OL} = 16 mA			0.4	V
			I_{OL} = 30 mA (SN5407, SN5417)			0.7	
			I_{OL} = 40 mA (SN7407, SN7417)			0.7	
I_I	V_{CC} = MAX,	V_I = 5.5 V				1	mA
I_{IH}	V_{CC} = MAX,	V_{IH} = 2.4 V				40	μA
I_{IL}	V_{CC} = MAX,	V_{IL} = 0.4 V				–1.6	mA
I_{CCH}	V_{CC} = MAX				29	41	mA
I_{CCL}	V_{CC} = MAX				21	30	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.

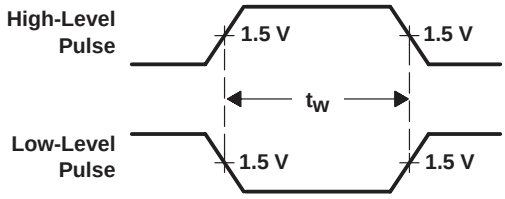
switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	A	Y	R_L = 110 Ω, C_L = 15 pF			6	10	ns
t_{PHL}						20	30	
t_{PLH}	A	Y	R_L = 150 Ω, C_L = 50 pF	SN5407, SN5417			15	ns
t_{PHL}				SN5407, SN5417			26	

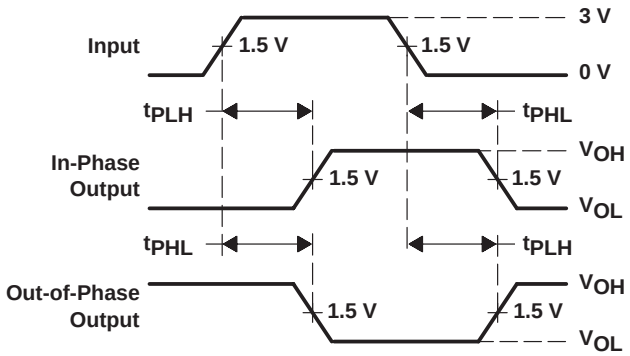
PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT



VOLTAGE WAVEFORMS
PULSE WIDTHS



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

NOTES: A. C_L includes probe and jig capacitance.
B. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 7 ns, t_f ≤ 7 ns.
D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Customers are responsible for their applications using TI components.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.