

PORTAS LÓGICAS

Schmitt Trigger

1. Objetivo

Compreender o comportamento de portas lógicas com entradas "schmitt trigger".

2. Motivações

- a) O que é uma porta lógica com entradas "schmitt trigger"?
- b) Qual a vantagem desta em relação às convencionais?
- c) Quando seu uso torna-se interessante?
- d) Quais os exemplos de aplicação?

3. Lista de Materiais

- Multímetro digital
- Osciloscópio
- Gerador de funções
- Painel digital
- 2x cabos banana-banana pequenos
- 2x cabos BNC-jacaré
- 1x cabo BNC-BNC
- Caixa com fios
- Alicate de corte
- Alicate de bico
- Espátula
- CI: 1x 7400
- CI: 1x 9093
- Capacitor: 1x 150nF
- Resistor: 1x 1k Ω
- Potenciômetro: 1x 4k7 Ω (lin.)

4. Procedimentos Experimentais

4.1. Parte I

a) Montar o circuito da Figura 1.

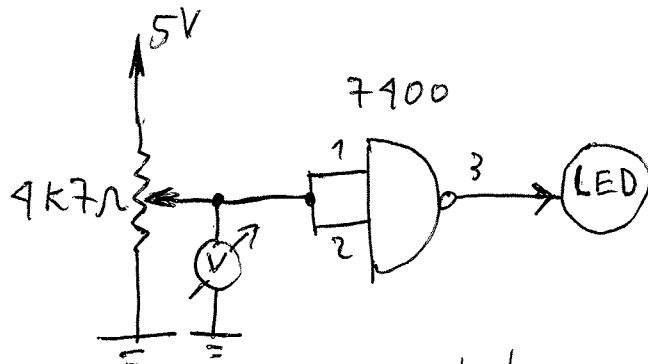
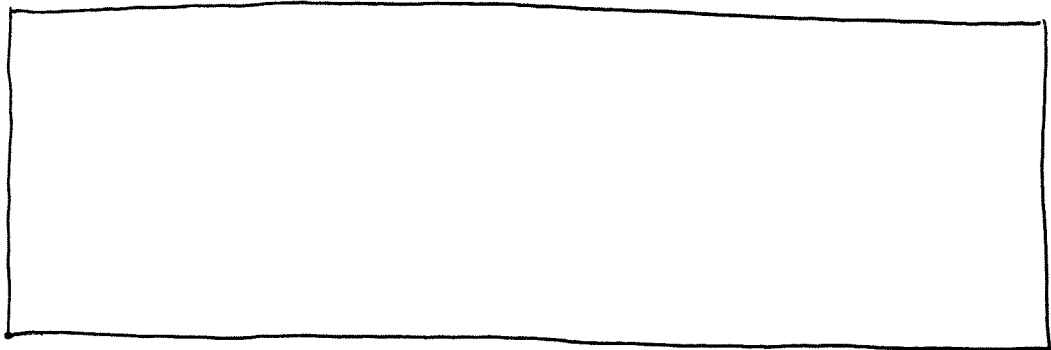


Figura 1: Esquema elétrico com 7400.

b) Variar o potenciômetro lentamente e observar o comportamento do LED. Dar especial atenção à faixa de tensão entre 0,8V e 2,0V.

Descreva o que ocorre:



c) Substituir o CI 7400 pelo 4093, de forma a obter o circuito da Figura 2.

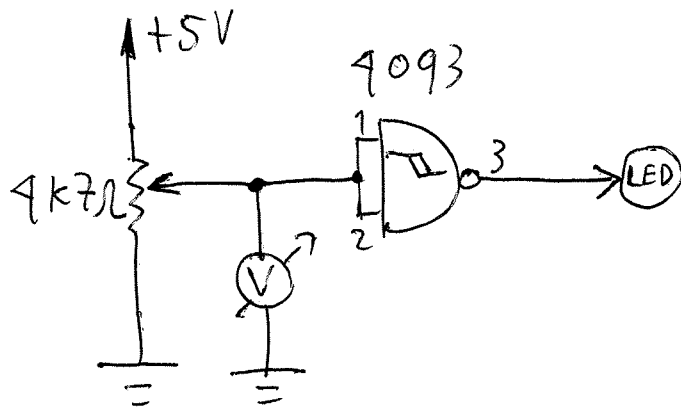


Figura 2: Esquema elétrico com 4093.

- d) Repetir a variação do potenciômetro, lentamente. Em relação ao outro circuito, o que ocorreu? Descreva abaixo:

4.2. Parte II

- a) Montar o circuito da Figura 3.

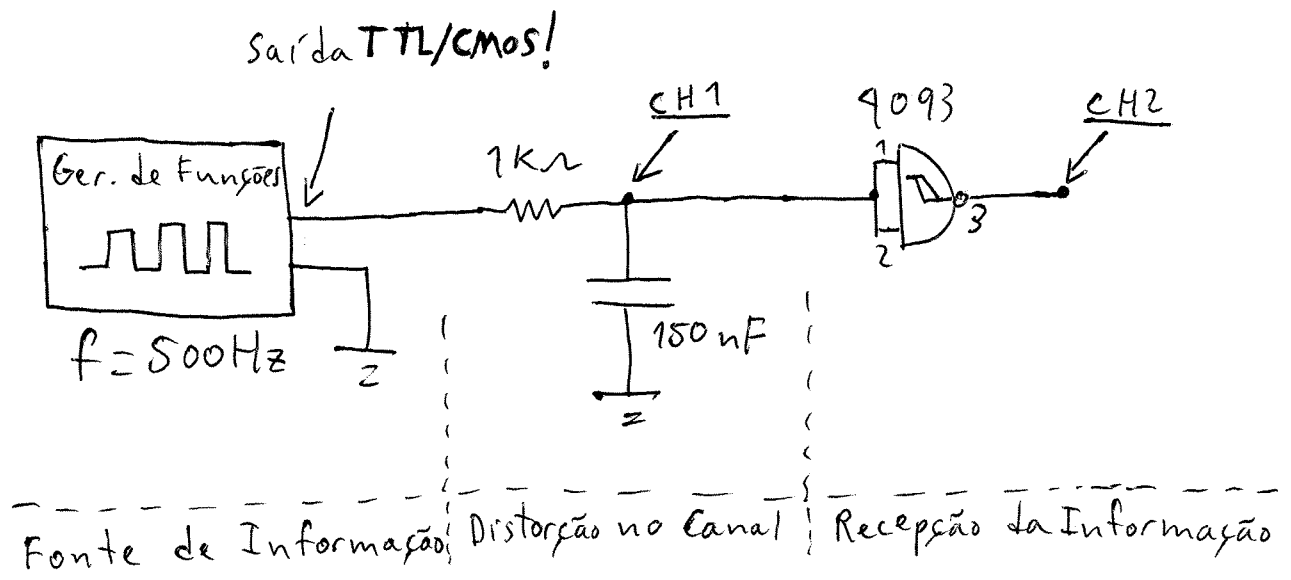
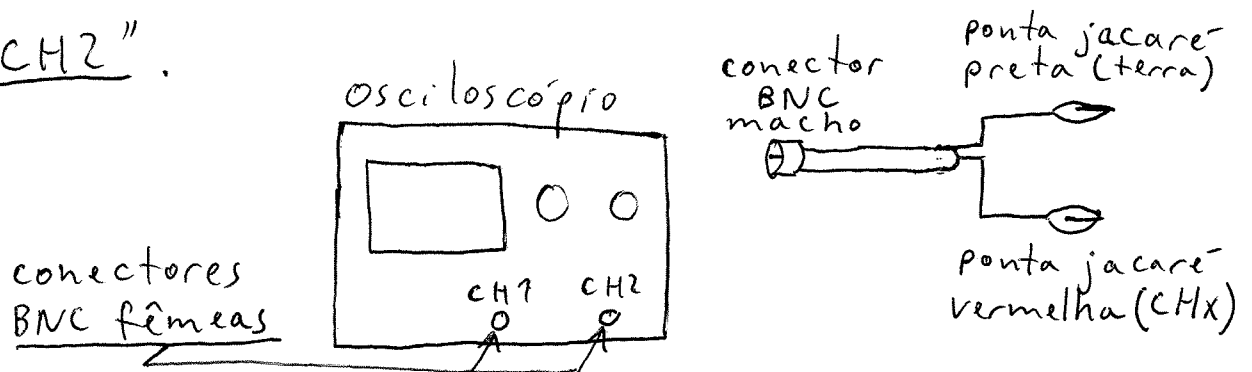


Figura 3: Esquema elétrico para exemplo de aplicação.

b) No esquema elétrico, note-se:

- Fonte de Informação: simula a geração de uma informação ^{digital} qualquer a ser transmitida por um determinado canal (010101...).
- Distorção no Canal: simula a distorção que ocorre na informação digital transmitida pelo canal.
- Recepção da Informação: usa o comportamento "Schmitt trigger" para recuperar a informação transmitida e que foi distorcida pelo canal; no contexto, a informação digital é: 010101...

c) Com o auxílio de um osciloscópio, observe o sinal nos pontos intitulados "CH1" e "CH2".

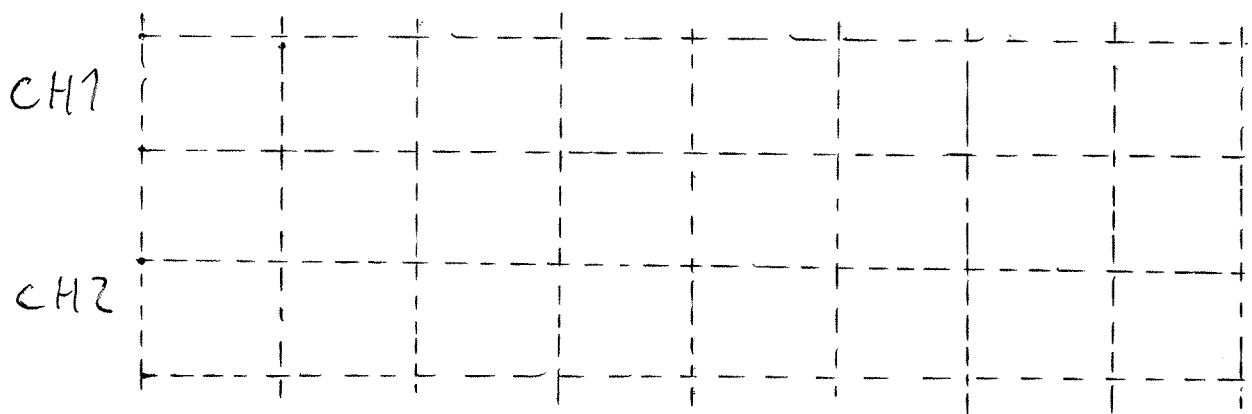


Nota: não é o objetivo estudar a operação do osciloscópio nesse momento; portanto, solicite a ajuda do professor para os corretos ajustes, caso sinta dificuldade.

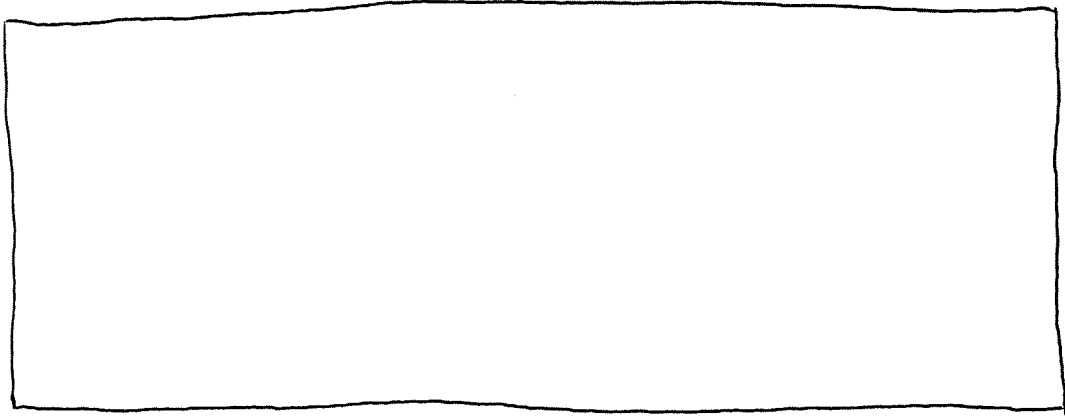
Ajustes básicos sugeridos:

- Base de tempo: 1ms/DIV
- Escala de tensão: 5V/DIV
- Sincronismo: CH1
- Exibição: DUAL
- Acoplamento: DC

d) Reproduza abaixo os sinais observados:



e) Os sinais observados são coerentes? Por quê?
Responda abaixo:



MC14093B

Quad 2-Input “NAND” Schmitt Trigger

The MC14093B Schmitt trigger is constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. These devices find primary use where low power dissipation and/or high noise immunity is desired. The MC14093B may be used in place of the MC14011B quad 2-input NAND gate for enhanced noise immunity or to “square up” slowly changing waveforms.

- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-Power TTL Loads or One Low-Power Schottky TTL Load Over the Rated Temperature Range
- Triple Diode Protection on All Inputs
- Pin-for-Pin Compatible with CD4093
- Can be Used to Replace MC14011B
- Independent Schmitt-Trigger at each Input

MAXIMUM RATINGS* (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	– 0.5 to + 18.0	V
V_{in} , V_{out}	Input or Output Voltage (DC or Transient)	– 0.5 to $V_{DD} + 0.5$	V
I_{in} , I_{out}	Input or Output Current (DC or Transient), per Pin	± 10	mA
P_D	Power Dissipation, per Package†	500	mW
T_{stg}	Storage Temperature	– 65 to + 150	°C
T_L	Lead Temperature (8-Second Soldering)	260	°C

* Maximum Ratings are those values beyond which damage to the device may occur.

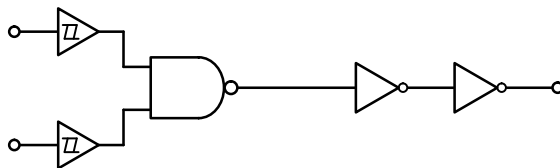
† Temperature Derating:

Plastic “P and D/DW” Packages: – 7.0 mW/°C From 65°C To 125°C

Ceramic “L” Packages: – 12 mW/°C From 100°C To 125°C

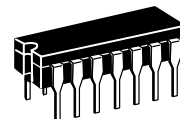
EQUIVALENT CIRCUIT SCHEMATIC

(1/4 OF CIRCUIT SHOWN)

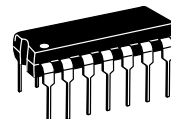


This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.



L SUFFIX
CERAMIC
CASE 632



P SUFFIX
PLASTIC
CASE 646



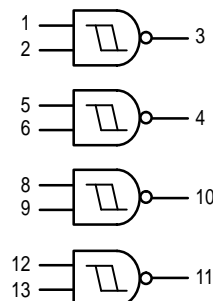
D SUFFIX
SOIC
CASE 751A

ORDERING INFORMATION

MC14XXXBCP Plastic
MC14XXXBCL Ceramic
MC14XXXBD SOIC

$T_A = -55^\circ$ to 125°C for all packages.

LOGIC DIAGRAM



$V_{DD} = \text{PIN } 14$
 $V_{SS} = \text{PIN } 7$



SN5414, SN54LS14, SN7414, SN74LS14

HEX SCHMITT-TRIGGER INVERTERS

DECEMBER 1983—REVISED MARCH 1988

- Operation from Very Slow Edges
- Improved Line-Receiving Characteristics
- High Noise Immunity

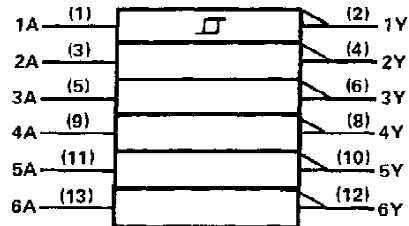
description

Each circuit functions as an inverter, but because of the Schmitt action, it has different input threshold levels for positive (V_{T+}) and for negative going (V_{T-}) signals.

These circuits are temperature-compensated and can be triggered from the slowest of input ramps and still give clean, jitter-free output signals.

The SN5414 and SN54LS14 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7414 and the SN74LS14 are characterized for operation from 0°C to 70°C .

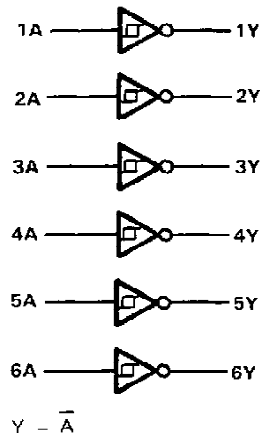
logic symbol†



† 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.

logic diagram (positive logic)

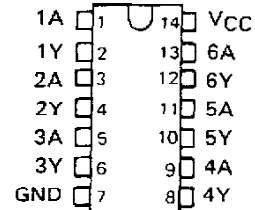


SN5414, SN54LS14 . . . J OR W PACKAGE

SN7414 . . . N PACKAGE

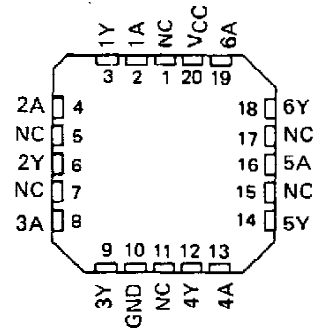
SN74LS14 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS14 . . . FK PACKAGE

(TOP VIEW)



NC—No internal connection

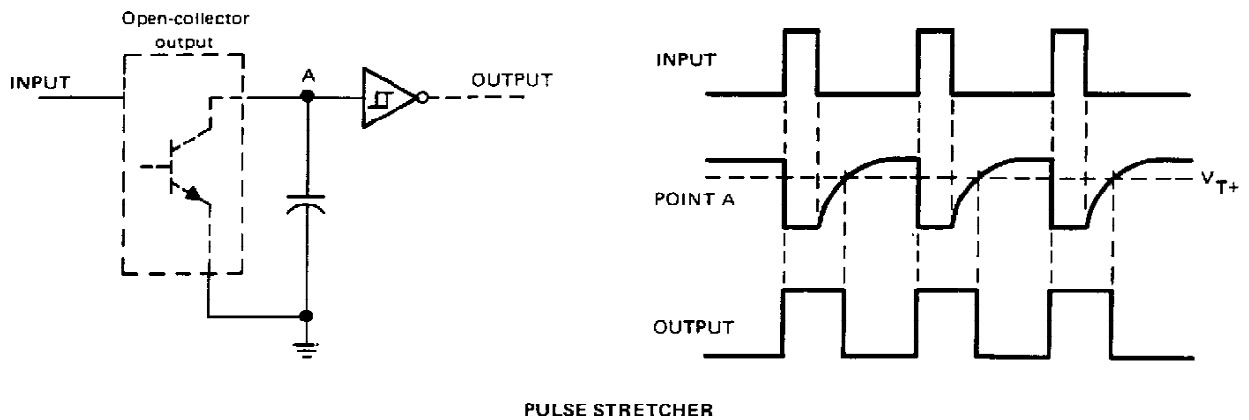
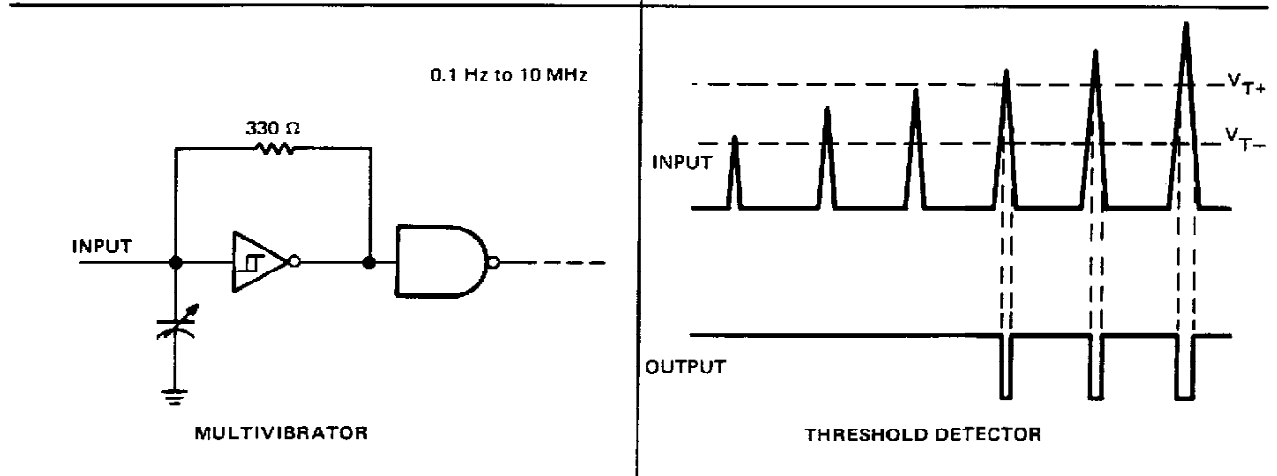
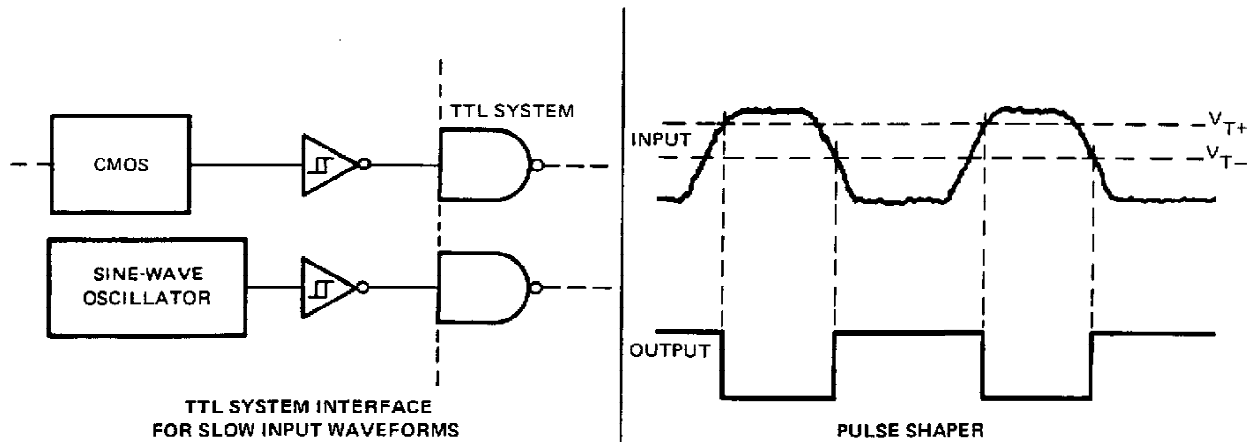
PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

SN5414, SN54LS14,
SN7414, SN74LS14
HEX SCHMITT-TRIGGER INVERTERS

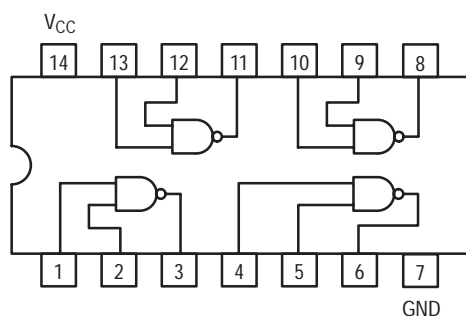
TYPICAL APPLICATION DATA



SN74LS00

Quad 2-Input NAND Gate

- ESD > 3500 Volts



GUARANTEED OPERATING RANGES

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	4.75	5.0	5.25	V
T_A	Operating Ambient Temperature Range	0	25	70	°C
I_{OH}	Output Current – High			-0.4	mA
I_{OL}	Output Current – Low			8.0	mA

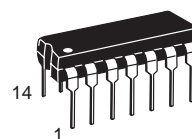


ON Semiconductor

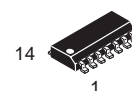
Formerly a Division of Motorola

<http://onsemi.com>

**LOW
POWER
SCHOTTKY**



**PLASTIC
N SUFFIX
CASE 646**



**SOIC
D SUFFIX
CASE 751A**

ORDERING INFORMATION

Device	Package	Shipping
SN74LS00N	14 Pin DIP	2000 Units/Box
SN74LS00D	14 Pin	2500/Tape & Reel