

# SN74LS670

## 4 x 4 Register File with 3-State Outputs

The TTL/MSI SN74LS670 is a high-speed, low-power 4 x 4 Register File organized as four words by four bits. Separate read and write inputs, both address and enable, allow simultaneous read and write operation.

The 3-state outputs make it possible to connect up to 128 outputs to increase the word capacity up to 512 words. Any number of these devices can be operated in parallel to generate an n-bit length.

- Simultaneous Read/Write Operation
- Expandable to 512 Words by n-Bits
- Typical Access Time to 20 ns
- 3-State Outputs for Expansion
- Typical Power Dissipation of 125 mW

### GUARANTEED OPERATING RANGES

Symbol	Parameter	Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage	4.75	5.0	5.25	V
T <sub>A</sub>	Operating Ambient Temperature Range	0	25	70	°C
I <sub>OH</sub>	Output Current – High			-2.6	mA
I <sub>OL</sub>	Output Current – Low			24	mA

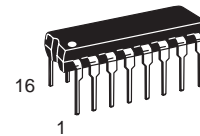


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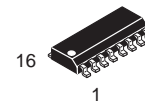
Formerly a Division of Motorola

<http://onsemi.com>

**LOW  
POWER  
SCHOTTKY**



**PLASTIC  
N SUFFIX  
CASE 648**



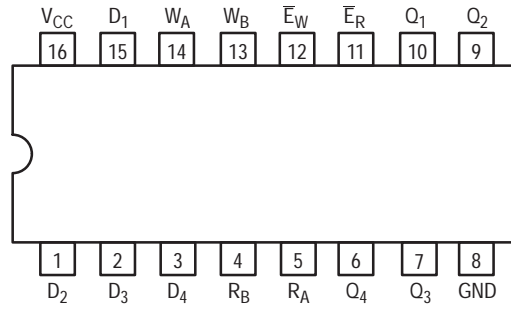
**SOIC  
D SUFFIX  
CASE 751B**

### ORDERING INFORMATION

Device	Package	Shipping
SN74LS670N	16 Pin DIP	2000 Units/Box
SN74LS670D	16 Pin	2500/Tape & Reel

# SN74LS670

## CONNECTION DIAGRAM DIP (TOP VIEW)



NOTE:  
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

### PIN NAMES

D <sub>1</sub> - D <sub>4</sub>	Data Inputs
W <sub>A</sub> , W <sub>B</sub>	Write Address Inputs
$\bar{E}_W$	Write Enable (Active LOW) Input
R <sub>A</sub> , R <sub>B</sub>	Read Address Inputs
$\bar{E}_R$	Read Enable (Active LOW) Input
Q <sub>1</sub> - Q <sub>4</sub>	Outputs

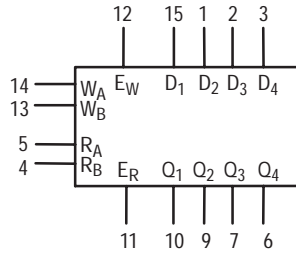
### LOADING (Note a)

HIGH	LOW
0.5 U.L.	0.25 U.L.
0.5 U.L.	0.25 U.L.
1.0 U.L.	0.5 U.L.
0.5 U.L.	0.25 U.L.
1.5 U.L.	0.75 U.L.
65 U.L.	15 U.L.

### NOTES:

a) 1 TTL Unit Load (U.L.) = 40  $\mu$ A HIGH/1.6 mA LOW.

### LOGIC SYMBOL

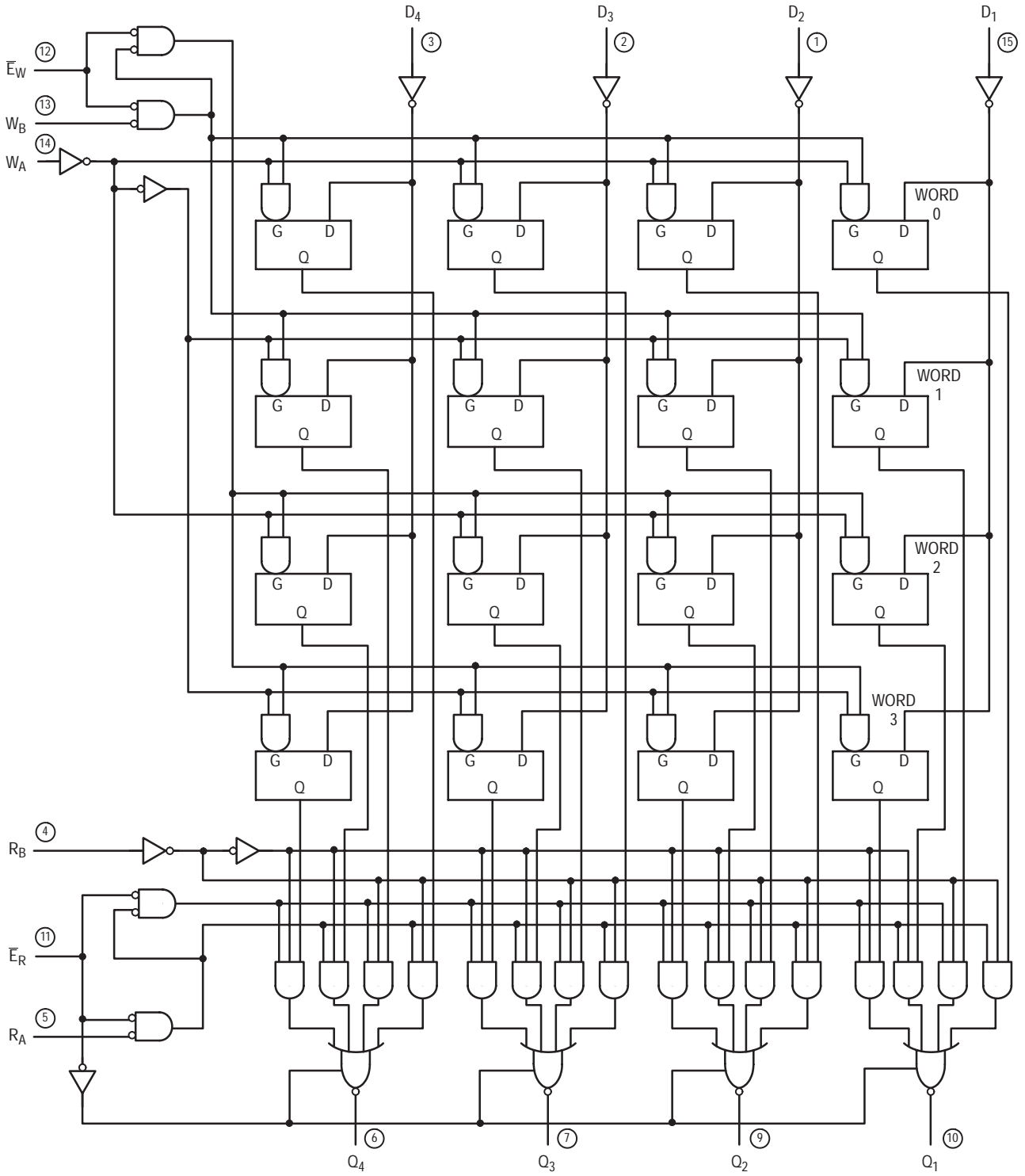


V<sub>CC</sub> = PIN 16

GND = PIN 8

# SN74LS670

## LOGIC DIAGRAM



V<sub>CC</sub> = PIN 16  
GND = PIN 8  
○ = PIN NUMBERS

# SN74LS670

## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
$V_{IH}$	Input HIGH Voltage	2.0			V	Guaranteed Input HIGH Voltage for All Inputs
$V_{IL}$	Input LOW Voltage			0.8	V	Guaranteed Input LOW Voltage for All Inputs
$V_{IK}$	Input Clamp Diode Voltage		-0.65	-1.5	V	$V_{CC} = \text{MIN}$ , $I_{IN} = -18 \text{ mA}$
$V_{OH}$	Output HIGH Voltage	2.4	3.1		V	$V_{CC} = \text{MIN}$ , $I_{OH} = \text{MAX}$ , $V_{IN} = V_{IH}$ or $V_{IL}$ per Truth Table
$V_{OL}$	Output LOW Voltage		0.25	0.4	V	$I_{OL} = 12 \text{ mA}$ $V_{CC} = V_{CC} \text{ MIN}$ , $V_{IN} = V_{IL}$ or $V_{IH}$ per Truth Table
			0.35	0.5	V	
$I_{OZH}$	Output Off Current HIGH			20	$\mu\text{A}$	$V_{CC} = \text{MAX}$ , $V_O = 2.7 \text{ V}$
$I_{OZL}$	Output Off Current LOW			-20	$\mu\text{A}$	$V_{CC} = \text{MAX}$ , $V_O = 0.4 \text{ V}$
$I_{IH}$	Input HIGH Current D, R, W $E_W$ $E_R$			20 40 60	$\mu\text{A}$	$V_{CC} = \text{MAX}$ , $V_{IN} = 2.7 \text{ V}$
	D, R, W $E_W$ $E_R$			0.1 0.2 0.3	mA	$V_{CC} = \text{MAX}$ , $V_{IN} = 7.0 \text{ V}$
$I_{IL}$	Input LOW Current D, R, W $E_W$ $E_R$			-0.4 -0.8 -1.2	mA	$V_{CC} = \text{MAX}$ , $V_{IN} = 0.4 \text{ V}$
$I_{OS}$	Short Circuit Current (Note 1)	-30		-130	mA	$V_{CC} = \text{MAX}$
$I_{CC}$	Power Supply Current			50	mA	$V_{CC} = \text{MAX}$

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

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## AC CHARACTERISTICS (T<sub>A</sub> = 25°C)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, R <sub>A</sub> or R <sub>B</sub> to Output		23 25	40 45	ns	V <sub>CC</sub> = 5.0 V, C <sub>L</sub> = 45 pF
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, $\bar{E}_W$ to Output		26 28	45 50	ns	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, Data to Output		25 23	45 40	ns	
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time		15 22	35 40	ns	C <sub>L</sub> = 5.0 pF
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time		16 30	35 50	ns	

## AC SETUP REQUIREMENTS (T<sub>A</sub> = 25°C)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
t <sub>W</sub>	Pulse Width	25			ns	V <sub>CC</sub> = 5.0 V
t <sub>S</sub>	Setup Time, (D)	10			ns	
t <sub>S</sub>	Setup Time, (W)	15			ns	
t <sub>H</sub>	Hold Time, (D)	15			ns	
t <sub>H</sub>	Hold Time, (W)	5.0			ns	
t <sub>rec</sub>	Recovery Time	25			ns	

## AC WAVEFORMS

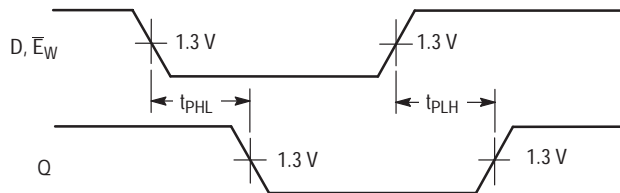


Figure 1.

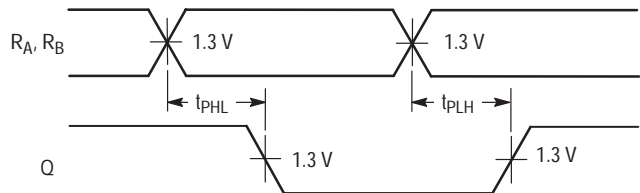


Figure 2.

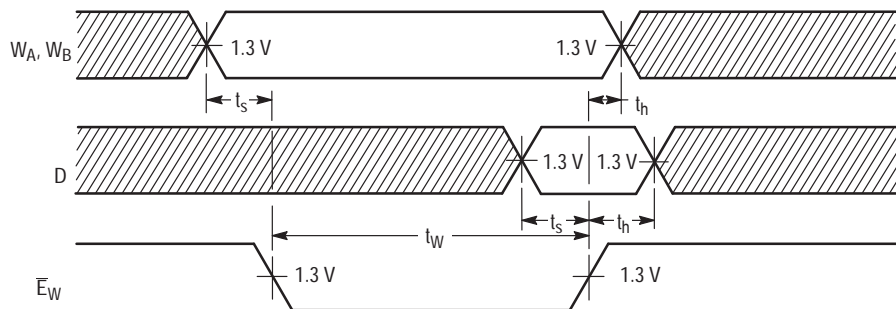


Figure 3.

# SN74LS670

## PACKAGE DIMENSIONS

**N SUFFIX**  
**PLASTIC PACKAGE**  
**CASE 648-08**  
**ISSUE R**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0° 10°		0° 10°	
S	0.020	0.040	0.51	1.01

# SN74LS670

## PACKAGE DIMENSIONS

### D SUFFIX PLASTIC SOIC PACKAGE CASE 751B-05 ISSUE J



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
  5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0° 7°		0° 7°	
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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