MOTOROLA

SN54/74LS670

4 x 4 REGISTER FILE WITH 3-STATE OUTPUTS

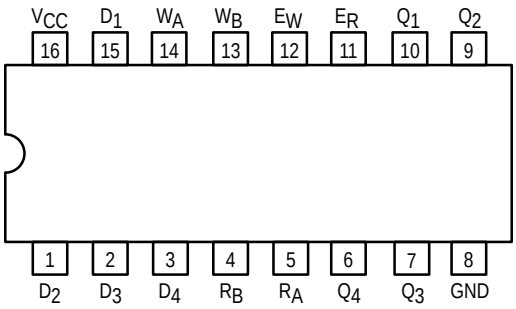
The TTL/MSI SN54/74LS670 is a high-speed, low-power 4 x 4 Register File organized as four words by four bits. Separate read and write inputs, both address and enable, allow simultaneous read and write operation.

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.

The SN54/74LS170 provides a similar function to this device but it features open-collector outputs.

- 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

CONNECTION DIAGRAM DIP (TOP VIEW)



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

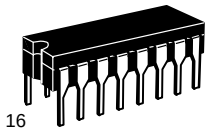
PIN NAMES

		LOADING (Note a) HIGH	LOADING (Note a) LOW
$D_1 – D_4$	Data Inputs	0.5 U.L.	0.25 U.L.
$\overline{W}_A$, W_B	Write Address Inputs	0.5 U.L.	0.25 U.L.
E_W	Write Enable (Active LOW) Input	1.0 U.L.	0.5 U.L.
$\overline{R}_A$, R_B	Read Address Inputs	0.5 U.L.	0.25 U.L.
E_R	Read Enable (Active LOW) Input	1.5 U.L.	0.75 U.L.
$Q_1 – Q_4$	Outputs (Note b)	65 (25) U.L.	15 (7.5) U.L.

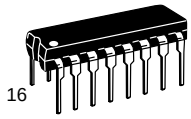
NOTES:
a) 1 TTL Unit Load (U.L.) = 40 µA HIGH/1.6 mA LOW.
b) The Output LOW drive factor is 7.5 U.L. for Military (54) and 15 U.L. for Commercial (74) Temperature Ranges. The Output HIGH drive factor is 25 U.L. for Military and 65 U.L. for Commercial Temperature Ranges.

4 x 4 REGISTER FILE WITH 3-STATE OUTPUTS

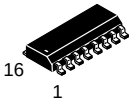
LOW POWER SCHOTTKY



J SUFFIX
CERAMIC
CASE 620-09



N SUFFIX
PLASTIC
CASE 648-08

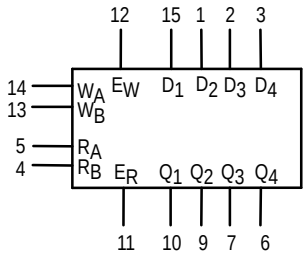


D SUFFIX
SOIC
CASE 751B-03

ORDERING INFORMATION

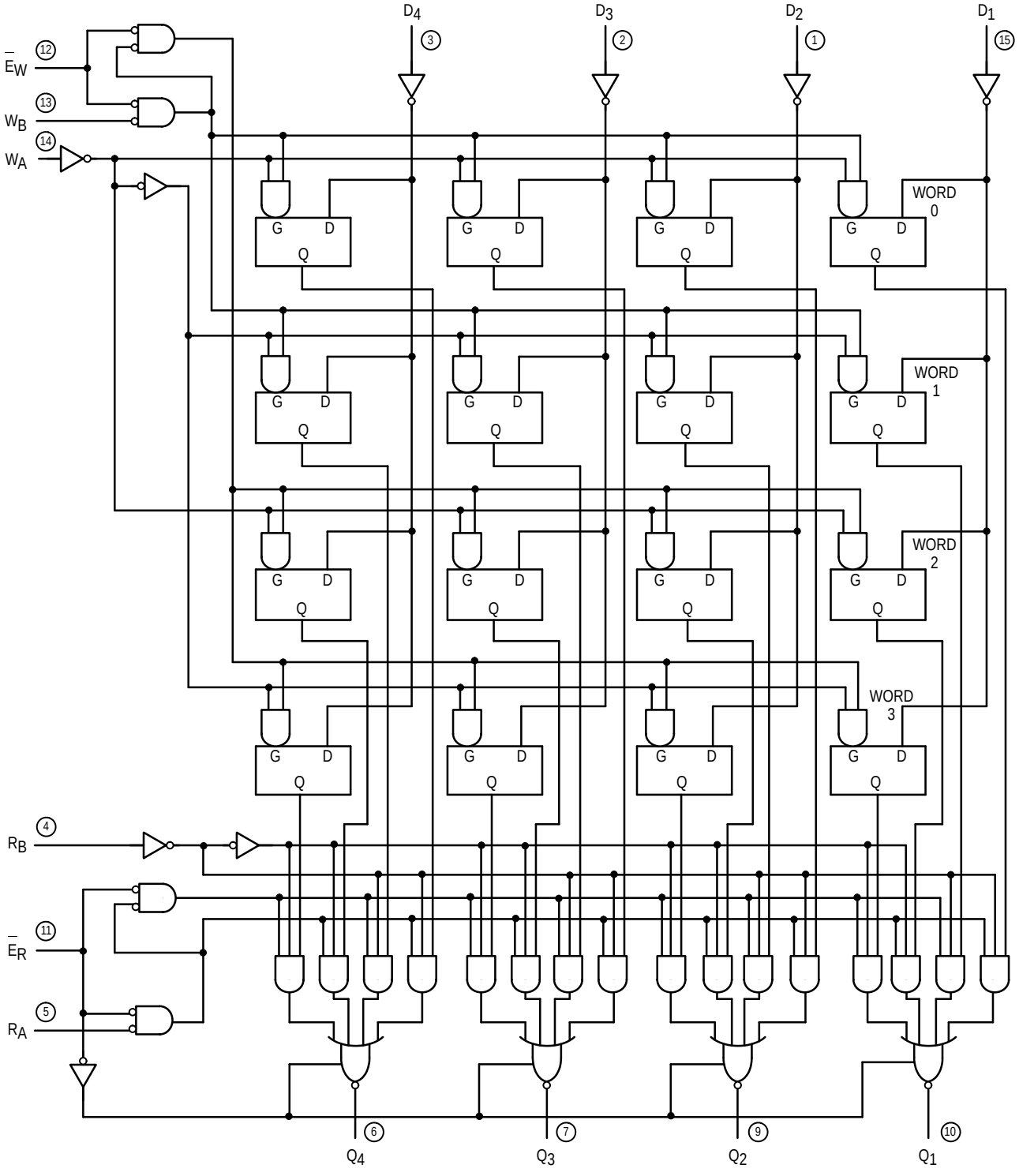
SN54LSXXXJ	Ceramic
SN74LSXXXN	Plastic
SN74LSXXXD	SOIC

LOGIC SYMBOL



V_{CC} = PIN 16
GND = PIN 8

LOGIC DIAGRAM



V_{CC} = PIN 16
GND = PIN 8
◯ = PIN NUMBERS

GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
T_A	Operating Ambient Temperature Range	54 74	–55 0	25 25	125 70	°C
I_{OH}	Output Current — High	54 74			–1.0 –2.6	mA
I_{OL}	Output Current — Low	54 74			12 24	mA

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter		Limits Min	Limits Typ	Limits Max	Unit	Test Conditions	
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
V_{IL}	Input LOW Voltage	54			0.7	V	Guaranteed Input LOW Voltage for All Inputs	
		74			0.8			
V_{IK}	Input Clamp Diode Voltage			–0.65	–1.5	V	V_{CC} = MIN, I_{IN} = –18 mA	
V_{OH}	Output HIGH Voltage	54	2.4	3.4		V	V_{CC} = MIN, I_{OH} = MAX, V_{IN} = V_{IH} or V_{IL} per Truth Table	
		74	2.4	3.1		V		
V_{OL}	Output LOW Voltage	54, 74		0.25	0.4	V	I_{OL} = 12 mA	V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
		74		0.35	0.5	V	I_{OL} = 24 mA	
I_{OZH}	Output Off Current HIGH				20	µA	V_{CC} = MAX, V_O = 2.7 V	
I_{OZL}	Output Off Current LOW				–20	µA	V_{CC} = MAX, V_O = 0.4 V	
I_{IH}	Input HIGH Current D, R, W E_W E_R				20 40 60	µA	V_{CC} = MAX, V_{IN} = 2.7 V	
	D, R, W E_W E_R				0.1 0.2 0.3	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current D, R, W E_W E_R				–0.4 –0.8 –1.2	mA	V_{CC} = MAX, V_{IN} = 0.4 V	
I_{OS}	Short Circuit Current (Note 1)		–30		–130	mA	V_{CC} = MAX	
I_{CC}	Power Supply Current				50	mA	V_{CC} = MAX	

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

AC CHARACTERISTICS (T_A = 25°C)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
t_{PLH} t_{PHL}	Propagation Delay, R_A or R_B to Output		23 25	40 45	ns	V_{CC} = 5.0 V, C_L = 45 pF
t_{PLH} t_{PHL}	Propagation Delay, $\overline{E}_W$ to Output		26 28	45 50	ns	
t_{PLH} t_{PHL}	Propagation Delay, Data to Output		25 23	45 40	ns	
t_{PZH} t_{PZL}	Output Enable Time		15 22	35 40	ns	
t_{PLZ} t_{PHZ}	Output Disable Time		16 30	35 50	ns	C_L = 5.0 pF

AC SETUP REQUIREMENTS (T_A = 25°C)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
t_W	Pulse Width	25			ns	V_{CC} = 5.0 V
t_s	Setup Time, (D)	10			ns	
t_s	Setup Time, (W)	15			ns	
t_h	Hold Time, (D)	15			ns	
t_h	Hold Time, (W)	5.0			ns	
t_{rec}	Recovery Time	25			ns	

AC WAVEFORMS

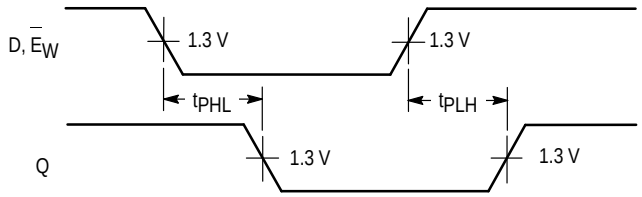


Figure 1

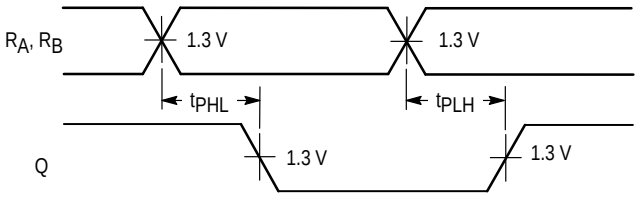


Figure 2

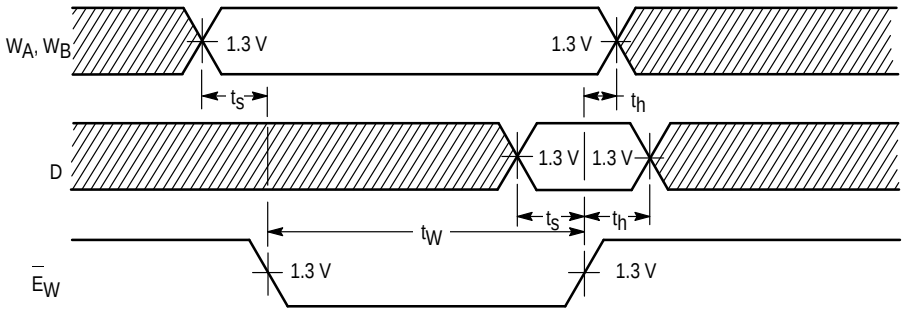


Figure 3