

*N* 54/74170 011734  
 54LS/74LS170 011735  
 4 X 4 REGISTER FILE  
 (With Open-Collector Outputs)

**DESCRIPTION** — The '170 contains 16 high speed, low power, transparent D-type latches arranged as four words of four bits each, to function as a 4 X 4 register file. Separate read and write inputs, both address and enable, allow simultaneous read and write operation. Open-collector outputs make it possible to connect up to 128 outputs in a wired-AND configuration 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 '670 provides a similar function to this device but it features 3-state outputs.

- **SIMULTANEOUS READ/WRITE OPERATION**
- **EXPANDABLE TO 512 WORDS OF n-BITS**
- **TYPICAL ACCESS TIME OF 20 ns**
- **LOW LEAKAGE OPEN-COLLECTOR OUTPUTS FOR EXPANSION**

**ORDERING CODE:** See Section 9

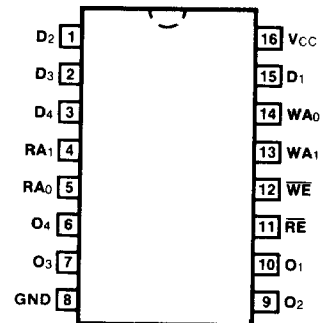
PKGS	PIN OUT	COMMERCIAL GRADE	MILITARY GRADE	PKG TYPE
		V <sub>CC</sub> = +5.0 V ±5%, T <sub>A</sub> = 0°C to +70°C	V <sub>CC</sub> = +5.0 V ±10%, T <sub>A</sub> = -55°C to +125°C	
Plastic DIP (P)	A	74170PC, 74LS170PC		9B
Ceramic DIP (D)	A	74170DC, 74LS170DC	54170DM, 54LS170DM	7B
Flatpak (F)	A	74170FC, 74LS170FC	54170FM, 54LS170DM	4L

**INPUT LOADING/FAN-OUT:** See Section 3 for U.L. definitions

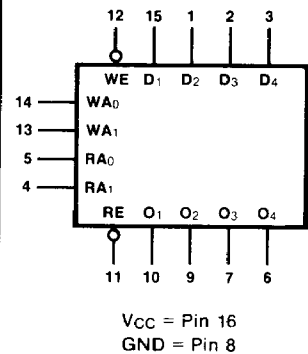
PIN NAMES	DESCRIPTION	54/74 (U.L.) HIGH/LOW	54/74LS (U.L.) HIGH/LOW
D <sub>1</sub> — D <sub>4</sub>	Data Inputs	1.0/1.0	0.5/0.25
WA <sub>0</sub> , WA <sub>1</sub>	Write Address Inputs	1.0/1.0	0.5/0.25
WE	Write Enable Input (Active LOW)	1.0/1.0	1.0/0.5
RA <sub>0</sub> , RA <sub>1</sub>	Read Address Inputs	1.0/1.0	0.5/0.25
RE	Read Enable Input (Active LOW)	1.0/1.0	1.0/0.5
O <sub>1</sub> — O <sub>4</sub>	Data Outputs	OC*/10	OC*/5.0 (2.5)

\*OC—Open Collector

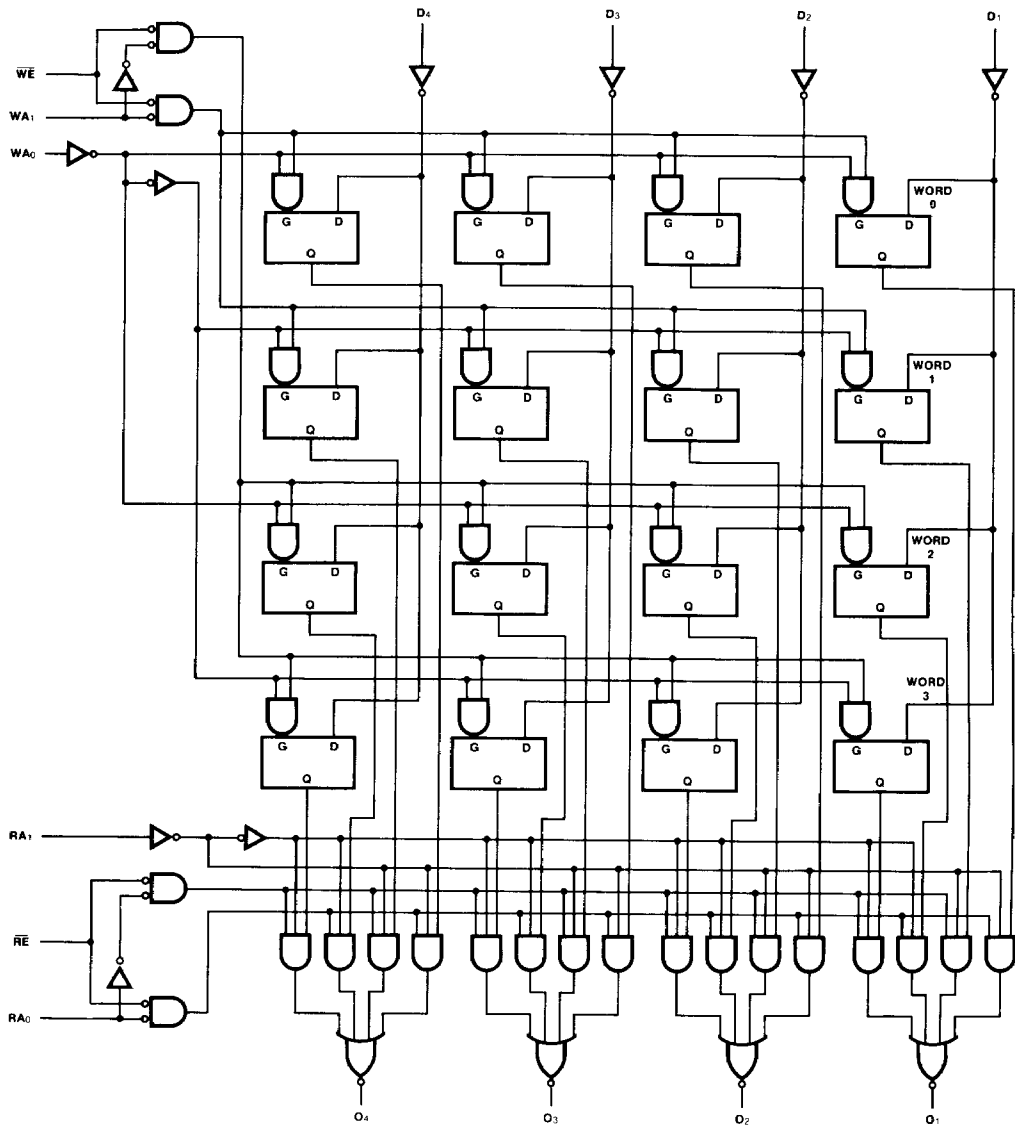
**CONNECTION DIAGRAM  
PINOUT A**



**LOGIC SYMBOL**



LOGIC DIAGRAM



WRITE FUNCTION TABLE

WRITE INPUTS			D INPUTS TO
$\overline{WE}$	WA <sub>1</sub>	WA <sub>0</sub>	
L	L	L	Word 0
L	L	H	Word 1
L	H	L	Word 2
L	H	H	Word 3
H	X	X	None (hold)

READ FUNCTION TABLE

READ INPUTS			OUTPUTS FROM
$\overline{RE}$	RA <sub>1</sub>	RA <sub>0</sub>	
L	L	L	Word 0
L	L	H	Word 1
L	H	L	Word 2
L	H	H	Word 3
H	X	X	None (HIGH Z)

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

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

SYMBOL	PARAMETER	54/74		54/74LS		UNITS	CONDITIONS
		Min	Max	Min	Max		
$I_{OH}$	Output HIGH Current	30		20		$\mu A$	$V_{CC} = \text{Min}, V_{OH} = 5.5 V$
$I_{CC}$	Power Supply Current	XC	150	40		mA	$V_{CC} = \text{Max}; D_n, \overline{WE}, \overline{RE} = 4.5 V; WA_n, RA_n = Gnd$
		XM	140	40			

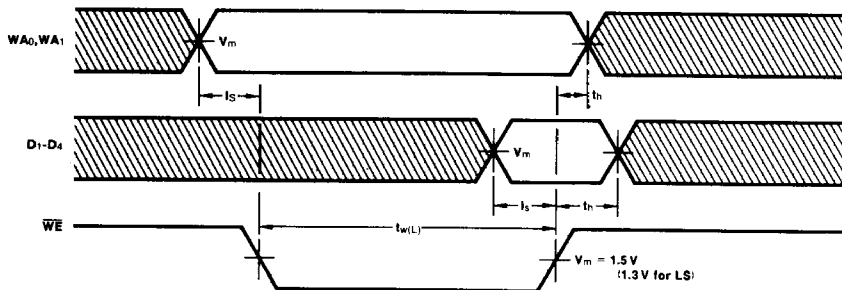
**AC CHARACTERISTICS:**  $V_{CC} = +5.0 V, T_A = +25^\circ C$  (See Section 3 for waveforms and load configurations)

SYMBOL	PARAMETER	54/74		54/74LS		UNITS	CONDITIONS
		$C_L = 15 pF$ $R_L = 400 \Omega$		$C_L = 15 pF$			
		Min	Max	Min	Max		
$t_{PLH}$ $t_{PHL}$	Propagation Delay* $RA_0$ or $RA_1$ to $O_n$	35 40		35 35		ns	Figs. 3-1, 3-20
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\overline{RE}$ to $O_n$	15 30		30 30			
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\overline{WE}$ to $O_n$	40 45		35 35		ns	Figs. 3-1, 3-9
$t_{PLH}$ $t_{PHL}$	Propagation Delay $D_n$ to $O_n$	30 45		35 35			

\*Measured at least 25 ns after entry of new data at selected location.

**AC OPERATING REQUIREMENTS:**  $V_{CC} = +5.0 V, T_A = +25^\circ C$ 

SYMBOL	PARAMETER	54/74		54/74LS		UNITS	CONDITIONS
		Min	Max	Min	Max		
$t_s$	Setup Time HIGH or LOW $D_n$ to rising $\overline{WE}$	10		10		ns	Fig. a
$t_h$	Hold Time HIGH or LOW $D_n$ to rising $\overline{WE}$	15		5.0			
$t_s$	Setup Time HIGH or LOW $WA_n$ to falling $\overline{WE}$	15		10			
$t_h$	Hold Time HIGH or LOW $WA_n$ to rising $\overline{WE}$	5.0		5.0			
$t_w(L)$	$\overline{WE}$ or $\overline{RE}$ Pulse Width LOW	25		25		ns	


**Fig. a**