

1-70-01-07

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

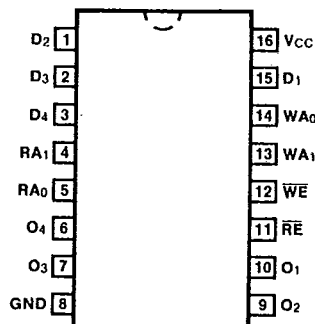
DESCRIPTION — The '170 contains 16 high speed, low power, transparent D-type latches arranged as four words of four bits each, to function as a 4 X 4 register file. Separate read and write inputs, both address and enable, allow simultaneous read and write operation. Open-collector outputs make it possible 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**

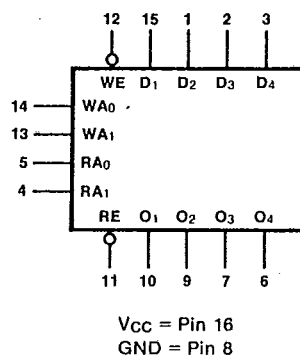
ORDERING CODE: See Section 9

| PKGS | PIN OUT | COMMERCIAL GRADE | MILITARY GRADE | PKG TYPE |
|-----------------|---------|--|--|----------|
| | | V _{CC} = +5.0 V ±5%, T _A = 0°C to +70°C | V _{CC} = +5.0 V ±10%, T _A = -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 |

CONNECTION DIAGRAM
 PINOUT A



LOGIC SYMBOL



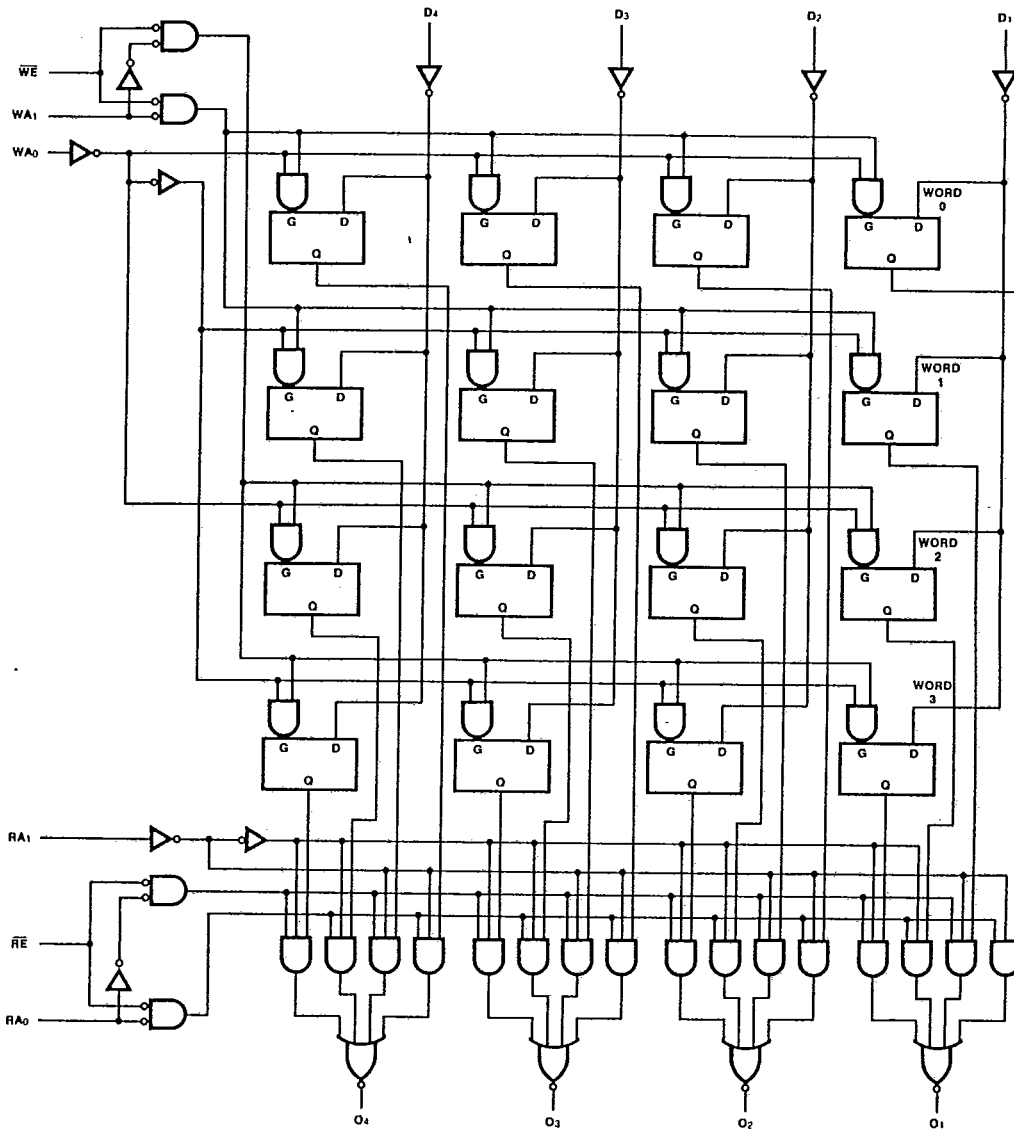
INPUT LOADING/FAN-OUT: See Section 3 for U.L. definitions

| PIN NAMES | DESCRIPTION | 54/74 (U.L.) HIGH/LOW | 54/74LS (U.L.) HIGH/LOW |
|-----------------------------------|---------------------------------|-----------------------|-------------------------|
| D ₁ — D ₄ | Data Inputs | 1.0/1.0 | 0.5/0.25 |
| WA ₀ , WA ₁ | 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 ₀ , RA ₁ | 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 ₁ — O ₄ | Data Outputs | OC*/10 | OC*/5.0 (2.5) |

*OC — Open Collector

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LOGIC DIAGRAM



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WRITE FUNCTION TABLE

| WRITE INPUTS | | | D INPUTS TO |
|--------------|-----------------|-----------------|-------------|
| WE | WA ₁ | WA ₀ | |
| 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 |
|-------------|-----------------|-----------------|---------------|
| RE | RA ₁ | RA ₀ | |
| 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 | | μA | V _{CC} = Min, V _{OH} = 5.5 V |
| I _{CC} | Power Supply Current | XC | | 40 | | mA | V _{CC} = Max; D _n , \overline{WE} , \overline{RE} = 4.5 V; W _{A_n} , R _{A_n} = Gnd |
| | | XM | | 140 | | | |

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

| SYMBOL | PARAMETER | 54/74 | | 54/74LS | | UNITS | CONDITIONS |
|--------------------------------------|--|--|----------|------------------------|-----------------|-------|------------|
| | | C _L = 15 pF R _L = 400 Ω | | C _L = 15 pF | | | |
| | | Min | Max | Min | Max | | |
| t _{PLH} t _{PHL} | Propagation Delay* R _{A0} or R _{A1} 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 | ns | Figs. 3-1, 3-5 | | |
| 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 | ns | Figs. 3-1, 3-5 | | |

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

AC OPERATING REQUIREMENTS: V_{CC} = +5.0 V, T_A = +25°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 | ns | | | |
| t _s | Setup Time HIGH or LOW W _{A_n} to falling \overline{WE} | 15 | 10 | ns | | | |
| t _h | Hold Time HIGH or LOW W _{A_n} to rising \overline{WE} | 5.0 | 5.0 | ns | | | |
| t _w (L) | \overline{WE} or \overline{RE} Pulse Width LOW | 25 | 25 | ns | | | |

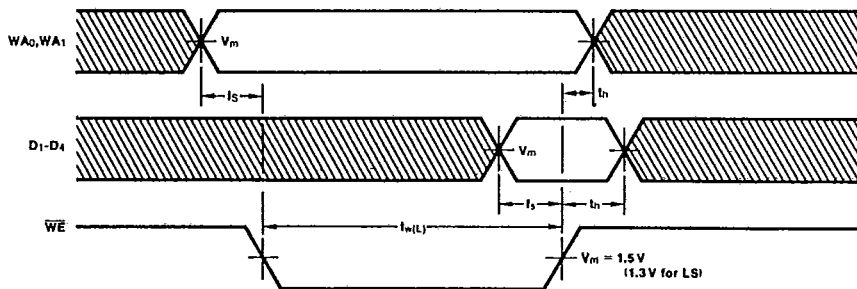


Fig. a