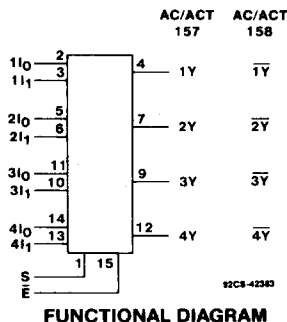


# CD54/74AC157, CD54/74AC158 CD54/74ACT157, CD54/74ACT158



## Quad 2-Input Multiplexers

AC/ACT157 - Non-Inverting

AC/ACT158 - Inverting

### Type Features:

- Buffered inputs
- Typical propagation delay (AC/ACT158):  
3.8 ns @  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{ C}$ ,  $C_L = 50\text{ pF}$

The RCA CD54/74AC157, -158 and CD54/74ACT157, -158 quad 2-input multiplexers use the RCA ADVANCED CMOS technology. Both circuits can select four bits of data from two sources under the control of a common select input (S). The Enable input ( $\bar{E}$ ) is active LOW. When  $\bar{E}$  is HIGH, all of the outputs of the 158 are forced HIGH and in the 157, all of the outputs are forced LOW, regardless of all other input conditions.

The CD74AC/ACT157 and CD74AC/ACT158 are supplied in 16-lead dual-in-line plastic packages (E suffix) and in 16-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to 70°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC157, -158 and CD54ACT157, -158, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

### Family Features:

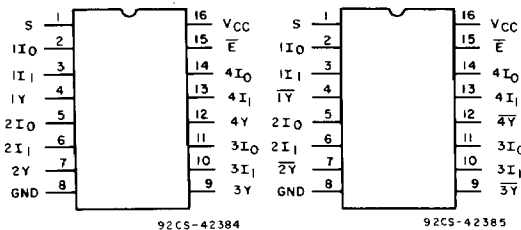
- Exceeds 2-kV ESD Protection - MIL-STD-883, Method 3015
- SCR-Latchup-resistant CMOS process and circuit design
- Speed of bipolar FAST®/AS/S with significantly reduced power consumption
- Balanced propagation delays
- AC types feature 1.5-V to 5.5-V operation and balanced noise immunity at 30% of the supply.
- ± 24-mA output drive current
  - Fanout to 15 FAST® ICs
  - Drives 50-ohm transmission lines

®FAST is a Registered Trademark of Fairchild Semiconductor Corp.

### TRUTH TABLE

| Enable    | Select Input | Data Inputs |       | Output |           |
|-----------|--------------|-------------|-------|--------|-----------|
|           |              |             |       | 157    | 158       |
| $\bar{E}$ | S            | $I_0$       | $I_1$ | Y      | $\bar{Y}$ |
| H         | X            | X           | X     | L      | H         |
| L         | L            | L           | X     | L      | H         |
| L         | L            | H           | X     | H      | L         |
| L         | H            | X           | L     | L      | H         |
| L         | H            | X           | H     | H      | L         |

H = High level, L = Low level, X = Don't care



CD54/74AC/ACT157

CD54/74AC/ACT158

# CD54/74AC157, CD54/74AC158 CD54/74ACT157, CD54/74ACT158

**MAXIMUM RATINGS, Absolute-Maximum Values:**

|  |       |   |
|--|-------|---|
| DC SUPPLY-VOLTAGE ( $V_{CC}$ )   | ..... | -0.5 to 6 V   |
| DC INPUT DIODE CURRENT, $I_{IK}$ (for $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V)                          | ..... | $\pm 20$ mA   |
| DC OUTPUT DIODE CURRENT, $I_{OK}$ (for $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V)                         | ..... | $\pm 50$ mA   |
| DC OUTPUT SOURCE OR SINK CURRENT per Output Pin, $I_O$ (for $V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V)    | ..... | $\pm 50$ mA   |
| DC $V_{CC}$ or GROUND CURRENT ( $I_{CC}$ or $I_{GND}$ )  | ..... | $\pm 100$ mA*                                       |
| POWER DISSIPATION PER PACKAGE ( $P_D$ ):   |       |   |
| For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE E)   | ..... | 500 mW  |
| For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE E)  | ..... | Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW |
| For $T_A = -55$ to $+70^\circ\text{C}$ (PACKAGE TYPE M)  | ..... | 400 mW  |
| For $T_A = +70$ to $+125^\circ\text{C}$ (PACKAGE TYPE M)   | ..... | Derate Linearly at 6 mW/ $^\circ\text{C}$ to 70 mW  |
| OPERATING-TEMPERATURE RANGE ( $T_A$ )  | ..... | -55 to $+125^\circ\text{C}$                         |
| STORAGE TEMPERATURE ( $T_{STG}$ )  | ..... | -65 to $+150^\circ\text{C}$                         |
| LEAD TEMPERATURE (DURING SOLDERING):   |       |   |
| At distance $1/16 \pm 1/32$ in. ( $1.59 \pm 0.79$ mm) from case for 10 s maximum                         | ..... | $+265^\circ\text{C}$                                |
| Unit inserted into PC board min. thickness $1/16$ in. ( $1.59$ mm) with solder contacting lead tips only | ..... | $+300^\circ\text{C}$                                |

\* For up to 4 outputs per device; add  $\pm 25$  mA for each additional output.

**RECOMMENDED OPERATING CONDITIONS:**

For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTIC  | LIMITS |          | UNITS            |
|---|--------|----------|------------------|
|   | MIN.   | MAX.     |                  |
| Supply-Voltage Range, $V_{CC}$ *:<br>(For $T_A =$ Full Package-Temperature Range) |        |          |                  |
| AC Types  | 1.5    | 5.5      | V                |
| ACT Types   | 4.5    | 5.5      | V                |
| DC Input or Output Voltage, $V_I, V_O$  | 0      | $V_{CC}$ | V                |
| Operating Temperature, $T_A$  | -55    | +125     | $^\circ\text{C}$ |
| Input Rise and Fall Slew Rate, $dt/dv$  |        |          |                  |
| at 1.5 V to 3 V(AC Types)   | 0      | 50       | ns/V             |
| at 3.6 V to 5.5 V(AC Types)   | 0      | 20       | ns/V             |
| at 4.5 V to 5.5 V(ACT Types)  | 0      | 10       | ns/V             |

\*Unless otherwise specified, all voltages are referenced to ground.

# CD54/74AC157, CD54/74AC158 CD54/74ACT157, CD54/74ACT158

**STATIC ELECTRICAL CHARACTERISTICS: AC Series**

| CHARACTERISTICS                                  | TEST CONDITIONS                          |        | V <sub>CC</sub><br>(V) | AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C |      |            |      |             |      | UNITS |   |
|--|--|--------|------------------------|--|------|------------|------|-------------|------|-------|---|
|  |  |        |                        | +25  |      | -40 to +85 |      | -55 to +125 |      |       |   |
|  |  |        |                        | MIN.                                       | MAX. | MIN.       | MAX. | MIN.        | MAX. |       |   |
| High-Level Input Voltage<br>V <sub>IH</sub>      |  |        | 1.5                    | 1.2  | —    | 1.2        | —    | 1.2         | —    | V     |   |
|  |  |        | 3                      | 2.1  | —    | 2.1        | —    | 2.1         | —    |       |   |
|  |  |        | 5.5                    | 3.85                                       | —    | 3.85       | —    | 3.85        | —    |       |   |
| Low-Level Input Voltage<br>V <sub>IL</sub>       |  |        | 1.5                    | —  | 0.3  | —          | 0.3  | —           | 0.3  | V     |   |
|  |  |        | 3                      | —  | 0.9  | —          | 0.9  | —           | 0.9  |       |   |
|  |  |        | 5.5                    | —  | 1.65 | —          | 1.65 | —           | 1.65 |       |   |
| High-Level Output Voltage<br>V <sub>OH</sub>     | V <sub>IH</sub><br>or<br>V <sub>IL</sub> | #, * { | -0.05                  | 1.5  | 1.4  | —          | 1.4  | —           | 1.4  | —     | V |
|  |  |        | -0.05                  | 3  | 2.9  | —          | 2.9  | —           | 2.9  | —     |   |
|  |  |        | -0.05                  | 4.5  | 4.4  | —          | 4.4  | —           | 4.4  | —     |   |
|  |  |        | -4                     | 3  | 2.58 | —          | 2.48 | —           | 2.4  | —     |   |
|  |  |        | -24                    | 4.5  | 3.94 | —          | 3.8  | —           | 3.7  | —     |   |
|  |  |        | -75                    | 5.5  | —    | —          | 3.85 | —           | —    | —     |   |
|  |  |        | -50                    | 5.5  | —    | —          | —    | —           | 3.85 | —     |   |
| Low Level Output Voltage<br>V <sub>OL</sub>      | V <sub>IH</sub><br>or<br>V <sub>IL</sub> | #, * { | 0.05                   | 1.5  | —    | 0.1        | —    | 0.1         | —    | 0.1   | V |
|  |  |        | 0.05                   | 3  | —    | 0.1        | —    | 0.1         | —    | 0.1   |   |
|  |  |        | 0.05                   | 4.5  | —    | 0.1        | —    | 0.1         | —    | 0.1   |   |
|  |  |        | 12                     | 3  | —    | 0.36       | —    | 0.44        | —    | 0.5   |   |
|  |  |        | 24                     | 4.5  | —    | 0.36       | —    | 0.44        | —    | 0.5   |   |
|  |  |        | 75                     | 5.5  | —    | —          | —    | 1.65        | —    | —     |   |
|  |  |        | 50                     | 5.5  | —    | —          | —    | —           | —    | 1.65  |   |
| Input Leakage Current<br>I <sub>I</sub>          | V <sub>CC</sub><br>or<br>GND             |        | 5.5                    | —  | ±0.1 | —          | ±1   | —           | ±1   | μA    |   |
| Quiescent Supply Current, MSI<br>I <sub>CC</sub> | V <sub>CC</sub><br>or<br>GND             | 0      | 5.5                    | —  | 8    | —          | 80   | —           | 160  | μA    |   |

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

\* Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

# CD54/74AC157, CD54/74AC158 CD54/74ACT157, CD54/74ACT158

## STATIC ELECTRICAL CHARACTERISTICS: ACT Series

| CHARACTERISTICS   | TEST CONDITIONS    |  | V <sub>CC</sub> (V) | AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C |      |            |      |             |      | UNITS |    |
|---|--------------------|--|---------------------|--|------|------------|------|-------------|------|-------|----|
|   |                    |  |                     | +25  |      | -40 to +85 |      | -55 to +125 |      |       |    |
|   | V <sub>I</sub> (V) | I <sub>O</sub> (mA)                        |                     | MIN.                                       | MAX. | MIN.       | MAX. | MIN.        | MAX. |       |    |
| High-Level Input Voltage  | V <sub>IH</sub>    |  | 4.5 to 5.5          | 2  | —    | 2          | —    | 2           | —    | V     |    |
| Low-Level Input Voltage   | V <sub>IL</sub>    |  | 4.5 to 5.5          | —  | 0.8  | —          | 0.8  | —           | 0.8  | V     |    |
| High-Level Output Voltage   | V <sub>OZH</sub>   | V <sub>IH</sub> or V <sub>IL</sub><br>#, * | -0.05               | 4.5  | 4.4  | —          | 4.4  | —           | 4.4  | —     | V  |
|   |                    |  | -24                 | 4.5  | 3.94 | —          | 3.8  | —           | 3.7  | —     |    |
|   |                    |  | -75                 | 5.5  | —    | —          | 3.85 | —           | —    | —     |    |
|   |                    |  | -50                 | 5.5  | —    | —          | —    | —           | 3.85 | —     |    |
| Low-Level Output Voltage  | V <sub>OL</sub>    | V <sub>IH</sub> or V <sub>IL</sub><br>#, * | 0.05                | 4.5  | —    | 0.1        | —    | 0.1         | —    | 0.1   | V  |
|   |                    |  | 24                  | 4.5  | —    | 0.36       | —    | 0.44        | —    | 0.5   |    |
|   |                    |  | 75                  | 5.5  | —    | —          | —    | 1.65        | —    | —     |    |
|   |                    |  | 50                  | 5.5  | —    | —          | —    | —           | —    | 1.65  |    |
| Input Leakage Current   | I <sub>I</sub>     | V <sub>CC</sub> or GND                     | 5.5                 | —  | ±0.1 | —          | ±1   | —           | ±1   | μA    |    |
| Quiescent Supply Current, MSI   | I <sub>CC</sub>    | V <sub>CC</sub> or GND                     | 0                   | 5.5  | —    | 8          | —    | 80          | —    | 160   | μA |
| Additional Quiescent Supply Current per Input Pin<br>TTL Inputs High<br>1 Unit Load | ΔI <sub>CC</sub>   | V <sub>CC</sub> -2.1                       | 4.5 to 5.5          | —  | 2.4  | —          | 2.8  | —           | 3    | mA    |    |

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

\* Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

### ACT INPUT LOADING TABLE

| INPUT     | UNIT LOAD* |      |
|-----------|------------|------|
|           | 157        | 158  |
| I (All)   | 0.37       | 0.37 |
| $\bar{E}$ | 0.83       | 0.83 |
| S         | 1.33       | 1.33 |

\*Unit load is ΔI<sub>CC</sub> limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

# CD54/74AC157, CD54/74AC158 CD54/74ACT157, CD54/74ACT158

SWITCHING CHARACTERISTICS: AC Series;  $t_r, t_f = 3 \text{ ns}$ ,  $C_L = 50 \text{ pF}$

| CHARACTERISTICS                       | SYMBOL         | $V_{CC}$<br>(V)        | AMBIENT TEMPERATURE ( $T_A$ ) - °C |                      |                      |      | UNITS |    |
|---------------------------------------|----------------|------------------------|------------------------------------|----------------------|----------------------|------|-------|----|
|                                       |                |                        | -40 to +85                         |                      | -55 to +125          |      |       |    |
|                                       |                |                        | MIN.                               | MAX.                 | MIN.                 | MAX. |       |    |
| Propagation Delays:<br>Data to Output | (157)          | $t_{PLH}$<br>$t_{PHL}$ | 1.5                                | —                    | 97                   | —    | 106   | ns |
|                                       |                |                        | 3.3*                               | 3.2                  | 10.8                 | 3    | 11.9  |    |
| Enable to Output                      | (157)          | $t_{PLH}$<br>$t_{PHL}$ | 5†                                 | 2.2                  | 7.7                  | 2.1  | 8.5   | ns |
|                                       |                |                        | 1.5                                | —                    | 154                  | —    | 169   |    |
| Select to Output                      | (157)          | $t_{PLH}$<br>$t_{PHL}$ | 3.3                                | 5.1                  | 17.2                 | 4.7  | 18.9  | ns |
|                                       |                |                        | 5                                  | 3.6                  | 12.3                 | 3.4  | 13.5  |    |
| Data to Output                        | (158)          | $t_{PLH}$<br>$t_{PHL}$ | 1.5                                | —                    | 164                  | —    | 180   | ns |
|                                       |                |                        | 3.3                                | 5.4                  | 18.5                 | 5.1  | 20.3  |    |
| Enable to Output                      | (158)          | $t_{PLH}$<br>$t_{PHL}$ | 5                                  | 3.8                  | 13.2                 | 3.6  | 14.5  | ns |
|                                       |                |                        | 1.5                                | —                    | 91                   | —    | 100   |    |
| Select to Output                      | (158)          | $t_{PLH}$<br>$t_{PHL}$ | 3.3                                | 3                    | 12.8                 | 2.8  | 11.2  | ns |
|                                       |                |                        | 5                                  | 2.2                  | 7.3                  | 2    | 8     |    |
| Power Dissipation Capacitance         | (157)<br>(158) | $C_{PD}\S$             | 1.5                                | —                    | 135                  | —    | 149   | pF |
|                                       |                |                        | 3.3                                | 4.5                  | 15.2                 | 4.2  | 16.7  |    |
| Input Capacitance                     | $C_i$          | —                      | 5                                  | 3.2                  | 10.8                 | 3    | 11.9  | pF |
|                                       |                |                        | 1.5                                | —                    | 147                  | —    | 161   |    |
| Power Dissipation Capacitance         | (157)<br>(158) | $C_{PD}\S$             | 3.3                                | 4.9                  | 16.5                 | 4.5  | 18.1  | pF |
|                                       |                |                        | 5                                  | 3.5                  | 11.7                 | 3.2  | 12.9  |    |
| Power Dissipation Capacitance         | (157)<br>(158) | $C_{PD}\S$             | —                                  | 156 Typ.<br>149 Typ. | 156 Typ.<br>149 Typ. | —    | 10    | pF |
| Input Capacitance                     | $C_i$          | —                      | —                                  | 10                   | —                    | 10   | pF    |    |

SWITCHING CHARACTERISTICS: ACT Series;  $t_r, t_f = 3 \text{ ns}$ ,  $C_L = 50 \text{ pF}$

| CHARACTERISTICS                       | SYMBOL         | $V_{CC}$<br>(V)        | AMBIENT TEMPERATURE ( $T_A$ ) - °C |                      |                      |      | UNITS |    |
|---------------------------------------|----------------|------------------------|------------------------------------|----------------------|----------------------|------|-------|----|
|                                       |                |                        | -40 to +85                         |                      | -55 to +125          |      |       |    |
|                                       |                |                        | MIN.                               | MAX.                 | MIN.                 | MAX. |       |    |
| Propagation Delays:<br>Data to Output | (157)          | $t_{PLH}$<br>$t_{PHL}$ | 5†                                 | 2.5                  | 8.6                  | 2.4  | 9.5   | ns |
|                                       |                |                        | 1.5                                | —                    | 154                  | —    | 169   |    |
| Enable to Output                      | (157)          | $t_{PLH}$<br>$t_{PHL}$ | 5                                  | 3.6                  | 12.3                 | 3.4  | 13.5  | ns |
|                                       |                |                        | 1.5                                | —                    | 164                  | —    | 180   |    |
| Select to Output                      | (157)          | $t_{PLH}$<br>$t_{PHL}$ | 3.3                                | 5.1                  | 17.2                 | 4.7  | 18.9  | ns |
|                                       |                |                        | 5                                  | 3.6                  | 12.3                 | 3.4  | 13.5  |    |
| Data to Output                        | (158)          | $t_{PLH}$<br>$t_{PHL}$ | 1.5                                | —                    | 164                  | —    | 180   | ns |
|                                       |                |                        | 3.3                                | 5.4                  | 18.5                 | 5.1  | 20.3  |    |
| Enable to Output                      | (158)          | $t_{PLH}$<br>$t_{PHL}$ | 5                                  | 3.8                  | 13.2                 | 3.6  | 14.5  | ns |
|                                       |                |                        | 1.5                                | —                    | 91                   | —    | 100   |    |
| Select to Output                      | (158)          | $t_{PLH}$<br>$t_{PHL}$ | 3.3                                | 3                    | 12.8                 | 2.8  | 11.2  | ns |
|                                       |                |                        | 5                                  | 2.2                  | 7.3                  | 2    | 8     |    |
| Power Dissipation Capacitance         | (157)<br>(158) | $C_{PD}\S$             | 1.5                                | —                    | 135                  | —    | 149   | pF |
|                                       |                |                        | 3.3                                | 4.5                  | 15.2                 | 4.2  | 16.7  |    |
| Input Capacitance                     | $C_i$          | —                      | 5                                  | 3.2                  | 10.8                 | 3    | 11.9  | pF |
|                                       |                |                        | 1.5                                | —                    | 147                  | —    | 161   |    |
| Power Dissipation Capacitance         | (157)<br>(158) | $C_{PD}\S$             | —                                  | 156 Typ.<br>149 Typ. | 156 Typ.<br>149 Typ. | —    | 10    | pF |
| Input Capacitance                     | $C_i$          | —                      | —                                  | 10                   | —                    | 10   | pF    |    |

\*3.3 V: min. is @ 3.6 V  
max. is @ 3 V

†5 V: min. is @ 5.5 V  
max. is @ 4.5 V

$\S C_{PD}$  is used to determine the dynamic power consumption, per function.

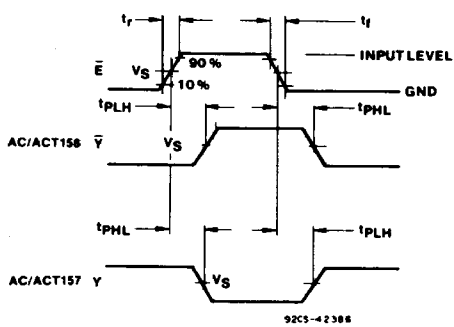
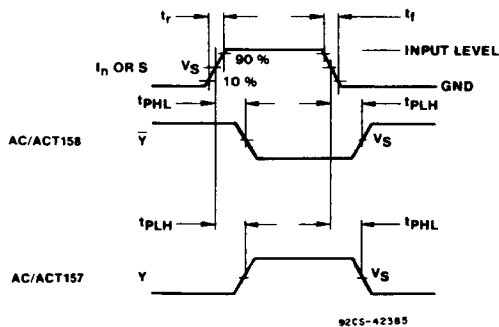
For AC Series,  $P_D = C_{PD} V_{CC}^2 f_i + \Sigma(C_L V_{CC}^2 f_o)$

For ACT Series,  $P_D = C_{PD} V_{CC}^2 f_i + \Sigma(C_L V_{CC}^2 f_o) + V_{CC} \Delta I_{CC}$

where  $f_i$  = input frequency  
 $f_o$  = output frequency  
 $C_L$  = output load capacitance  
 $V_{CC}$  = supply voltage.

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# CD54/74AC157, CD54/74AC158 CD54/74ACT157, CD54/74ACT158



|                                 | CD54/74AC    | CD54/74ACT   |
|---------------------------------|--------------|--------------|
| Input Level                     | $V_{CC}$     | 3 V          |
| Input Switching Voltage, $V_S$  | $0.5 V_{CC}$ | 1.5 V        |
| Output Switching Voltage, $V_S$ | $0.5 V_{CC}$ | $0.5 V_{CC}$ |

Fig. 3 - Inputs or select to output propagation delays.

Fig. 4 - Enable to output propagation delays.