

Am25LS257 • Am54LS/74LS257

Am25LS258 • Am54LS/74LS258

Quadruple 2-Line To 1-Line Data Selectors/Multiplexers With 3-State Outputs

DISTINCTIVE CHARACTERISTICS

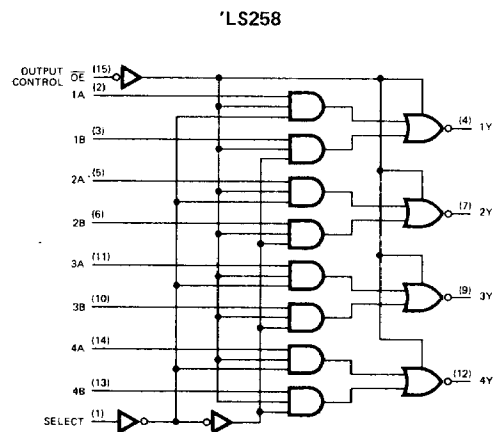
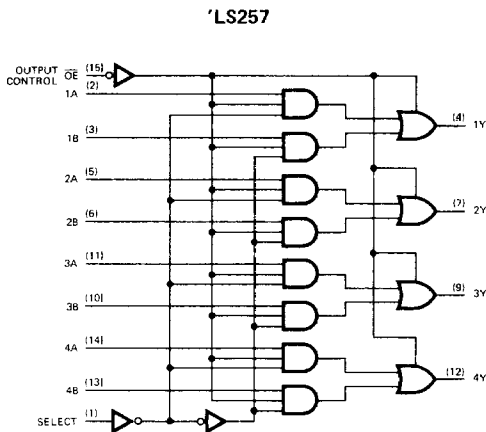
- Three-state outputs
- Pin-outs identical to standard TTL 'LS157 and 'LS158 devices
- Am25LS devices offer the following improvements over Am54/74LS
 - Higher speed
 - 50mV lower V_{OL}
 - Twice the fan-out over military range
 - 440 μ A source current
- 100% product assurance screening to MIL-STD-883 requirements

FUNCTIONAL DESCRIPTION

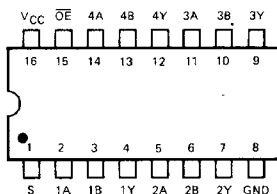
The 2-line to 1-line data selector multiplexer can be used to transfer data to a common data bus directly by using the three-state capability of the device. With the output control (OE) HIGH, the four outputs of the data selector are in the high impedance state. With the output control LOW, the selected four bits (A or B inputs) are bussed onto the four data lines.

The Am54LS/74LS257 and 258 are standard performance versions of the Am25LS257 and 258. See appropriate electrical characteristic tables for detailed Am25LS improvements.

LOGIC DIAGRAMS

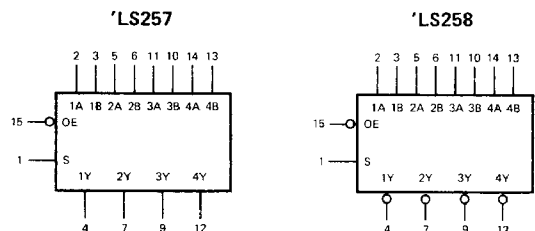


CONNECTION DIAGRAM Top View



Note: Pin 1 is marked for orientation.

LOGIC SYMBOLS



VCC = Pin 16
GND = Pin 8

Am25LS/54LS/74LS257/258

Am25LS257 • Am25LS258

ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

COM'L $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 5\%$ (MIN. = 4.75V MAX. = 5.25V)
 MIL $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 5.0\text{V} \pm 10\%$ (MIN. = 4.50V MAX. = 5.50V)

DC CHARACTERISTICS OVER OPERATING RANGE

| Parameters | Description | Test Conditions (Note 1) | Min. | Typ. (Note 2) | Max. | Units | |
|------------|---|---|---------------------------------|------------------|-------|---------------|----|
| V_{OH} | Output HIGH Voltage | $V_{CC} = \text{MIN.},$ $V_{IN} = V_{IH}$ or V_{IL} | MIL, $I_{OH} = -1\text{mA}$ | 2.4 | 3.4 | Volts | |
| | | | COM'L, $I_{OH} = -2.6\text{mA}$ | 2.4 | 3.2 | | |
| V_{OL} | Output LOW Voltage | | $I_{OL} = 4\text{mA}$ | | 0.4 | Volts | |
| | | | $I_{OL} = 8\text{mA}$ | | 0.45 | | |
| V_{IH} | Input HIGH Level | Guaranteed input logical HIGH voltage for all inputs | 2 | | | Volts | |
| V_{IL} | Input LOW Level | Guaranteed input logical LOW voltage for all inputs | MIL | | 0.7 | Volts | |
| | | | COM'L | | 0.8 | | |
| V_I | Input Clamp Voltage | $V_{CC} = \text{MIN.}, I_{IN} = -18\text{mA}$ | | | -1.5 | Volts | |
| I_{IL} | Input LOW Current | $V_{CC} = \text{MAX.}, V_{IN} = 0.4\text{V}$ | S, \overline{OE} | | -0.36 | mA | |
| | | | Others | | -0.4 | | |
| I_{IH} | Input HIGH Current | $V_{CC} = \text{MAX.}, V_{IN} = 2.7\text{V}$ | S, \overline{OE} | | 20 | μA | |
| | | | Others | | 20 | | |
| I_I | Input HIGH Current | $V_{CC} = \text{MAX.}, V_{IN} = 7.0\text{V}$ | S, \overline{OE} | | 0.1 | mA | |
| | | | Others | | 0.1 | | |
| I_{OZ} | Off-State (HIGH Impedance) Output Current | $V_{CC} = \text{MAX.}$ | $V_O = 2.4\text{V}$ | | 20 | μA | |
| | | | $V_O = 0.4\text{V}$ | | -20 | | |
| I_{SC} | Output Short Circuit Current (Note 3) | $V_{CC} = \text{MAX.}$ | -15 | | -85 | mA | |
| I_{CC} | Power Supply Current | $V_{CC} = \text{MAX.}$ (Note 4) | All Outputs HIGH | LS257 | 6.3 | 10.0 | mA |
| | | | | LS258 | 4.3 | 8.0 | |
| | | | All Outputs LOW | LS257 | 8.2 | 13.5 | mA |
| | | | | LS258 | 6.1 | 11.0 | |
| | | | All Outputs OFF | LS257 | 9.7 | 15.3 | mA |
| | | | | LS258 | 7.2 | 11.2 | |

- Notes: 1. For conditions shown as MIN. or MAX. use the appropriate value specified under Electrical Characteristics for the applicable device type.
 2. Typical limits are at $V_{CC} = 5.0\text{V}$, 25°C ambient and maximum loading.
 3. Not more than one output should be shorted at a time and duration of the short circuit test should not exceed one second.
 4. I_{CC} is measured with all outputs open and all possible inputs grounded while achieving the stated output conditions.

Am25LS • Am54LS/74LS

MAXIMUM RATINGS (Above which the useful life may be impaired)

| | |
|---|--|
| Storage Temperature | $-65^\circ\text{C to } +150^\circ\text{C}$ |
| Temperature (Ambient) Under Bias | $-55^\circ\text{C to } +125^\circ\text{C}$ |
| Supply Voltage to Ground Potential Continuous | $-0.5\text{V to } +7.0\text{V}$ |
| DC Voltage Applied to Outputs for High Output State | $-0.5\text{V to } +V_{CC} \text{ max.}$ |
| DC Input Voltage | $-0.5\text{V to } +7.0\text{V}$ |
| DC Output Current, Into Outputs | 30 mA |
| DC Input Current | $-30\text{mA to } +5.0\text{mA}$ |

Am54LS/74LS257 • Am54LS/74LS258

ELECTRICAL CHARACTERISTICS

The Following Conditions Apply Unless Otherwise Specified:

| | | | |
|-------|--|---------------------------------|-----------------------------|
| COM'L | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ | $V_{CC} = 5.0\text{V} \pm 5\%$ | (MIN. = 4.75V MAX. = 5.25V) |
| MIL | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ | $V_{CC} = 5.0\text{V} \pm 10\%$ | (MIN. = 4.50V MAX. = 5.50V) |

DC CHARACTERISTICS OVER OPERATING RANGE

| Parameters | Description | Test Conditions (Note 1) | Min. | Typ. (Note 2) | Max. | Units | |
|-----------------|---|--|----------------------------------|------------------|------|-------|-------|
| V _{OH} | Output HIGH Voltage | V _{CC} = MIN., V _{IN} = V _{IH} or V _{IL} | 54LS, I _{OH} = -1mA | 2.4 | 3.4 | | Volts |
| | | | 74LS, I _{OH} = -2.6mA | 2.4 | 3.2 | | |
| V _{OL} | Output LOW Voltage | | All, I _{OL} = 4mA | | | 0.4 | Volts |
| | | | 74LS only, I _{OL} = 8mA | | | 0.5 | |
| V _{IH} | Input HIGH Level | Guaranteed input logical HIGH voltage for all inputs | 2 | | | Volts | |
| V _{IL} | Input LOW Level | Guaranteed input logical LOW voltage for all inputs | 54LS | | | 0.7 | Volts |
| | | | 74LS | | | 0.8 | |
| V _I | Input Clamp Voltage | V _{CC} = MIN., I _{IN} = -18mA | | | -1.5 | Volts | |
| I _{IL} | Input LOW Current | V _{CC} = MAX., V _{IN} = 0.4V | S | | | -0.8 | mA |
| | | | Others | | | -0.4 | |
| I _{IH} | Input HIGH Current | V _{CC} = MAX., V _{IN} = 2.7V | S | | | 40 | μA |
| | | | Others | | | 20 | |
| I _I | Input HIGH Current | V _{CC} = MAX., V _{IN} = 7.0V | S | | | 0.2 | mA |
| | | | Others | | | 0.1 | |
| I _{OZ} | Off-State (HIGH Impedance) Output Current | V _{CC} = MAX. | V _O = 2.4V | | | 20 | μA |
| | | | V _O = 0.4V | | | -20 | |
| I _{SC} | Output Short Circuit Current (Note 3) | V _{CC} = MAX. | -15 | | -100 | mA | |
| I _{CC} | Power Supply Current | V _{CC} = MAX. (Note 4) | All Outputs HIGH | LS257 | 5.9 | 10 | mA |
| | | | | LS258 | 4.1 | 8 | |
| | | | All Outputs LOW | LS257 | 9.2 | 16 | mA |
| | | | | LS258 | 6.2 | 11 | |
| | | | All Outputs OFF | LS257 | 10 | 17 | mA |
| | | | | LS258 | 7.0 | 12 | |

- Notes: 1. For conditions shown as MIN. or MAX. use the appropriate value specified under Electrical Characteristics for the applicable device type.
 2. Typical limits are at V_{CC} = 5.0V, 25°C ambient and maximum loading.
 3. Not more than one output should be shorted at a time and duration of the short circuit test should not exceed one second.
 4. I_{CC} is measured with all outputs open and all possible inputs grounded while achieving the stated output conditions.

Am25LS/54LS/74LS257/258

SWITCHING CHARACTERISTICS

($T_A = +25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$)

| Parameters | Description | Am25LS | | | Am54LS/74LS | | | Units | Test Condition | |
|------------|-------------------|--------|------|------|-------------|------|------|-------|----------------|---|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | | | |
| t_{PLH} | Data to Output | LS257 | | 8 | 12 | | 12 | 18 | ns | $C_L = 15\text{pF}$ $R_L = 2.0\text{k}\Omega$ |
| | | LS258 | | 6 | 12 | | 12 | 18 | | |
| t_{PHL} | Data to Output | LS257 | | 8 | 12 | | 12 | 18 | | |
| | | LS258 | | 7 | 12 | | 12 | 18 | | |
| t_{PLH} | Select to Output | LS257 | | 14 | 21 | | 14 | 21 | | |
| | | LS258 | | 14 | 21 | | 14 | 21 | | |
| t_{PHL} | Select to Output | LS257 | | 14 | 21 | | 14 | 21 | | |
| | | LS258 | | 14 | 21 | | 14 | 21 | | |
| t_{ZH} | Control to Output | | | 13 | 20 | | 20 | 30 | ns | |
| t_{ZL} | | | | 13 | 20 | | 20 | 30 | | |
| t_{HZ} | | | | 12 | 20 | | 14 | 21 | | |
| t_{LZ} | Control to Output | | | 13 | 20 | | 14 | 21 | ns | $C_L = 5.0\text{pF}$ $R_L = 2.0\text{k}\Omega$ |

Am25LS ONLY SWITCHING CHARACTERISTICS OVER OPERATING RANGE*

| Parameters | Description | Am25LS COM'L | | Am25LS MIL | | Units | Test Conditions | |
|------------|-------------------|---|------|--|------|-------|-----------------|---|
| | | Min. | Max. | Min. | Max. | | | |
| | | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ | | | | |
| | | $V_{CC} = 5.0\text{V} \pm 5\%$ | | $V_{CC} = 5.0\text{V} \pm 10\%$ | | | | |
| t_{PLH} | Data to Output | LS257 | | 20 | | 23 | ns | $C_L = 50\text{pF}$ $R_L = 2.0\text{k}\Omega$ |
| | | LS258 | | 20 | | 23 | | |
| t_{PHL} | Data to Output | LS257 | | 20 | | 23 | | |
| | | LS258 | | 20 | | 23 | | |
| t_{PLH} | Select to Output | LS257 | | 31 | | 36 | | |
| | | LS258 | | 31 | | 36 | | |
| t_{PHL} | Select to Output | LS257 | | 31 | | 36 | | |
| | | LS258 | | 31 | | 36 | | |
| t_{ZH} | Control to Output | | | 30 | | 35 | ns | |
| t_{ZL} | | | | 30 | | 35 | | |
| t_{HZ} | Control to Output | | | 26 | | 30 | ns | $R_L = 2.0\text{k}\Omega$ $C_L = 5.0\text{pF}$ |
| t_{LZ} | | | | 26 | | 30 | | |

*AC performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.

DEFINITION OF FUNCTIONAL TERMS

1A, 2A, 3A, 4A The data inputs for the 4-bits of the A word.

1B, 2B, 3B, 4B The data inputs for the 4-bits of the B word.

1Y, 2Y, 3Y, 4Y The four outputs of the multiplexer.

OE Output Control When the output control is HIGH, the four outputs are in the high impedance state. When the output control is LOW, the selected A or B input is present at the output.

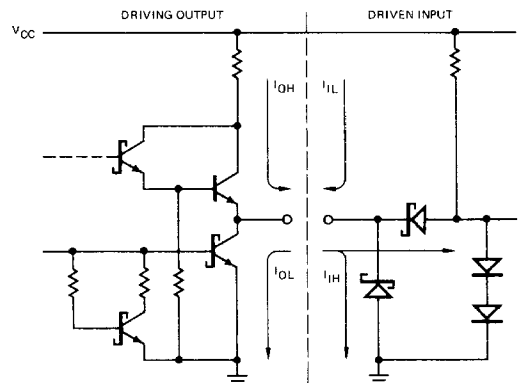
S Select When the select input is LOW, the A word is present at the output. When the select input is HIGH, the B word is present at the output.

FUNCTION TABLE

| INPUTS | | OUTPUTS | | | |
|----------------|--------|---------|---|--------|--------|
| Output Control | Select | A | B | 'LS257 | 'LS258 |
| H | X | X | X | Z | Z |
| L | L | L | X | L | H |
| L | L | L | X | H | L |
| L | H | X | L | L | H |
| L | H | X | H | H | L |

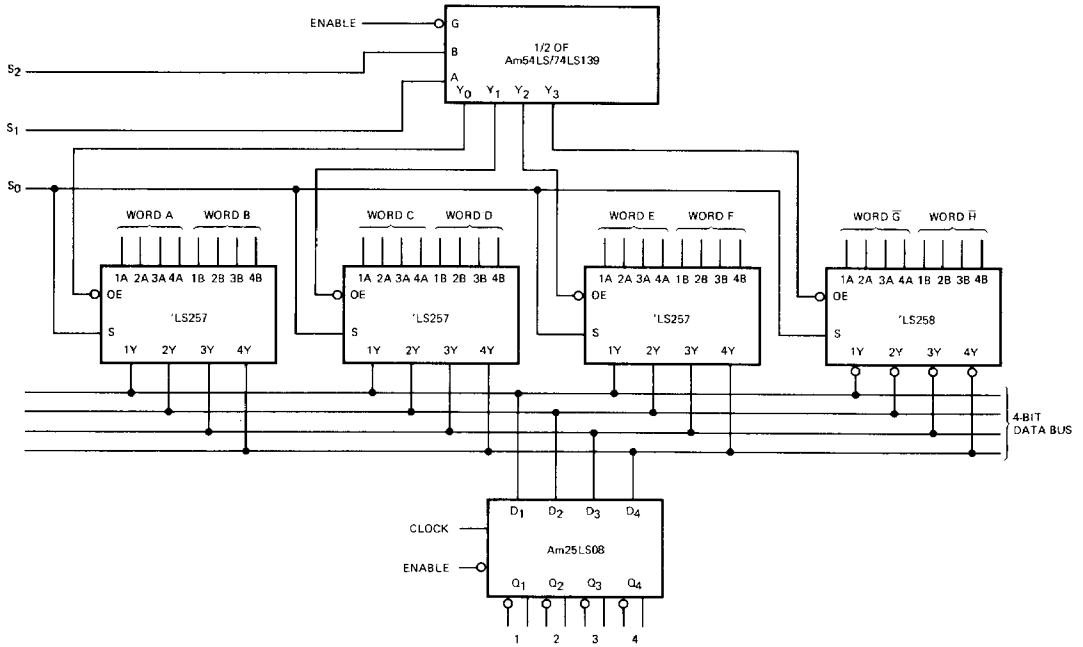
H = HIGH L = LOW X = Don't Care Z = High Impedance

Am25LS • Am54LS/74LS LOW-POWER SCHOTTKY INPUT/OUTPUT CURRENT INTERFACE CONDITIONS



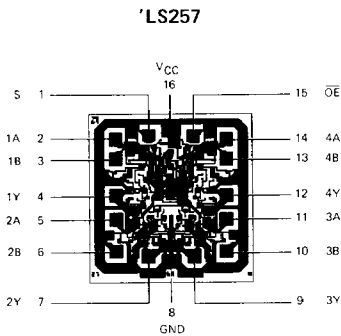
Note: Actual current flow direction shown.

APPLICATION

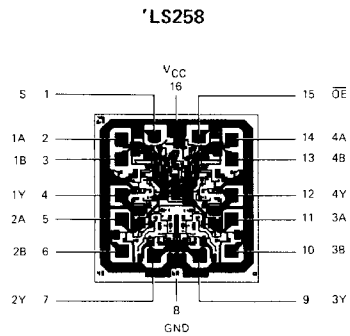


8-Word, 4-Bit Multiplexer

Metallization and Pad Layout



DIE SIZE 0.057" X 0.057"



DIE SIZE 0.057" X 0.057"