

Am2926 • Am2929

Schottky Three-State Quad Bus Driver/Receiver

Distinctive Characteristics

- Advanced Schottky technology
- 48mA driver sink current
- 3-state outputs on driver and receiver
- PNP inputs
- Am2926 has inverting outputs
- Am2929 has non-inverting outputs
- Driver propagation delay – 14ns max for Am2926; 17ns max for Am2929
- Receiver propagation delay – 14ns max for Am2926; 17ns max for Am2929

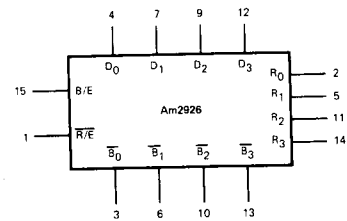
FUNCTIONAL DESCRIPTION

The Am2926 and Am2929 are high speed bus transceivers consisting of four bus drivers with three-state outputs and four bus receivers, also with three-state outputs. Each driver output is internally connected to a receiver input. Both the drivers and receivers have PNP inputs.

One buffered common "bus enable" input is connected to the four drivers and another buffered common "receiver enable" input is connected to the receivers. A LOW on the bus enable (B/E) input forces the four driver outputs to the high-impedance state. A HIGH on the bus enable (B/E) input forces the four driver outputs to the high-impedance state. A HIGH on the bus enable allows input data to be transferred onto the data bus.

A HIGH on the receiver enable (R/E) input forces the four receiver outputs to the high-impedance state while a LOW on the receiver enable input allows the received data to be transferred to the output. The complementary design of the bus enable and receiver enable inputs allows these control inputs to be connected together externally such that a single transmit/receive function is derived.

LOGIC SYMBOL

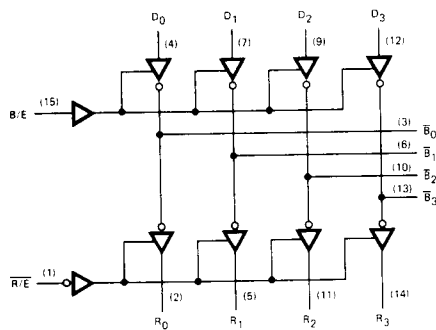


V_{CC} = Pin 16
GND = Pin 8

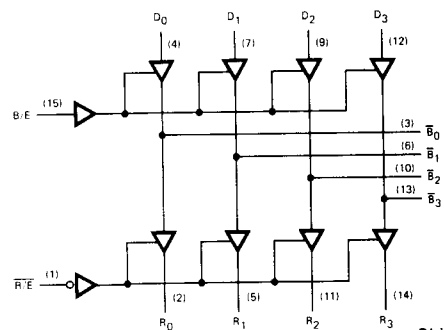
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LOGIC DIAGRAMS

Am2926
Inverting Output (3-State)

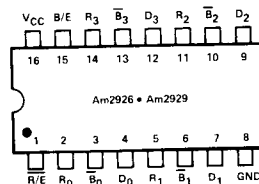


Am2929
Non-Inverting Output (3-State)



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CONNECTION DIAGRAM Top View



BL1-081

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

| | |
|---|--------------------------------|
| Storage Temperature | -65°C to +150°C |
| Temperature (Ambient) Under Bias | -55°C to +125°C |
| Supply Voltage to Ground Potential (Pin 16 to Pin 8) Continuous | -0.5V to +7V |
| DC Voltage Applied to Outputs for HIGH Output State | -0.5V to +V _{CC} max. |
| DC Input Voltage | -0.5V to +5.5V |
| DC Output Current, Into Outputs (Receiver) | 30mA |
| DC Output Current, Into Outputs (BUS) | 80mA |
| DC Input Current | -30mA to +5.0mA |

ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE

The Following Conditions Apply Unless Otherwise Noted:

Am2926PC, DC, XC Am2929PC, DC, XC T_A = 0°C to +75°C (COM'L) MIN. = 4.75 V MAX. = 5.25 VAm2929DM, XM Am2926DM, XM T_A = -55°C to +125°C (MIL) MIN. = 4.50 V MAX. = 5.50 V**DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE**

| Parameters | Description | Test Conditions (Note 1) | Min. | Typ. (Note 2) | Max. | Units |
|------------|-------------|--------------------------|------|------------------|------|-------|
|------------|-------------|--------------------------|------|------------------|------|-------|

Driver

| | | | | | | |
|-----------------|--|--|-----|--|------|-------|
| I _{IL} | Low Level Input Current | V _{IN} = 0.4 V | | | -200 | μA |
| I _{IL} | Low Level Input Current (Disabled) | V _{IN} = 0.4 V | | | -25 | μA |
| I _{IH} | High Level Input Current (D _{IN} , D _E) | V _{IN} = V _{CC} MAX. | | | 25 | μA |
| V _{OL} | Low Level Output Voltage | I _{OUT} = 48 mA (Note 5) | | | 0.5 | Volts |
| V _{OH} | High Level Output Voltage | I _{OUT} = -10 mA, V _{CC} = V _{CC} MIN. (Note 6) | 2.4 | | | Volts |
| I _{OS} | Short Circuit Output Current | V _{OUT} = 0 V, V _{CC} = V _{CC} MAX. (Note 4) | -50 | | -150 | mA |

Receiver

| | | | | | | |
|-----------------|--|--|-----|--|------|-------|
| I _{IL} | Low Level Input Current | V _{IN} = 0.4 V | | | -200 | μA |
| I _{IH} | High Level Input Current (R _E) | V _{IN} = V _{CC} MAX. | | | 25 | μA |
| V _{OL} | Low Level Output Voltage | I _{OUT} = 20 mA (Note 5) | | | 0.5 | Volts |
| V _{OH} | High Level Output Voltage | I _{OUT} = -100 μA, V _{CC} = 5.0 V | 3.5 | | | Volts |
| | | I _{OUT} = -2.0 mA (Note 6) | 2.4 | | | |
| I _{OS} | Short Circuit Output Current | V _{OUT} = 0 V, V _{CC} = V _{CC} MAX. | -30 | | -75 | mA |

Both Driver and Receiver

| | | | | | | |
|--------------------------------------|---------------------------------------|--------------------------|--|--|---------|-------|
| V _{TL} | Low Level Input Threshold Voltage | | 0.85 | | | Volts |
| V _{TH} | High Level Input Threshold Voltage | | | | 2.0 | Volts |
| I _O | Low Level Output Off Leakage Current | V _{OUT} = 0.5 V | | | -100 | μA |
| | High Level Output Off Leakage Current | V _{OUT} = 2.4 V | | | 100 | μA |
| V _I | Input Clamp Voltage | I _{IN} = -12 mA | | | -1.0 | Volts |
| P _{WR} / I _{CC} | Power/Current Consumption | Am2926 | V _{CC} = V _{CC} MAX. | | 457/87 | mW/mA |
| | | Am2929 | V _{CC} = V _{CC} MAX. | | 578/110 | |

Switching Characteristics (T_A = +25°C, V_{CC} = 5.0 V)

| Parameters | Description | Test Conditions | Am2926 | | | Am2929 | | | Units |
|------------------|------------------------------------|-----------------|--------|------|------|--------|------|------|-------|
| | | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| t _{PLH} | Driver Input to Bus | Figure 1 | | 10 | 14 | | 13 | 17 | ns |
| t _{PHL} | | | | 10 | 14 | | 13 | 17 | |
| t _{PLH} | Bus to Receiver Output | Figure 2 | | 9.0 | 14 | | 12 | 17 | ns |
| t _{PHL} | | | | 6.0 | 14 | | 9.0 | 17 | |
| t _{ZL} | Driver Enable to Bus | Figure 3 | | 19 | 25 | | 21 | 28 | ns |
| t _{LZ} | | | | 15 | 20 | | 18 | 23 | |
| t _{ZL} | Receiver Enable to Receiver Output | Figure 4 | | 15 | 20 | | 18 | 23 | ns |
| t _{LZ} | | | | 10 | 15 | | 13 | 18 | |

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 V, 25°C ambient and maximum loading.

3. Actual input currents = Unit Load Current x Input Load Factor (See Loading Rules).

4. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

5. Output sink current is supplied through a resistor to V_{CC}.

6. Measurements apply to each output and the associated data input independently.

DEFINITION OF FUNCTIONAL TERMS

D_0, D_1, D_2, D_3 The four driver inputs.

$\overline{B}_0, \overline{B}_1, \overline{B}_2, \overline{B}_3$ The four driver outputs and receiver inputs (data is inverted).

R_0, R_1, R_2, R_3 The four receiver outputs. Data from the bus is inverted while data from the driver inputs is non-inverted.

B/E Bus enable input. When the bus enable input is LOW, the four driver outputs are in the high-impedance state.

$\overline{R/E}$ Receiver enable input. When the receiver enable input is HIGH, the four receiver outputs are in the high-impedance state.

LOADING RULES (In Unit Loads)

| Input/Output | Pin No.'s | LOW Input Unit Load | Output HIGH | Fan-out Output LOW |
|------------------|-----------|---------------------|-------------|--------------------|
| $\overline{R/E}$ | 1 | 1/8 | — | — |
| R_0 | 2 | — | 50 | 10 |
| \overline{B}_0 | 3 | 1/16 | 250 | 25 |
| D_0 | 4 | 1/8 | — | — |
| R_1 | 5 | — | 50 | 10 |
| \overline{B}_1 | 6 | 1/16 | 250 | 25 |
| D_1 | 7 | 1/8 | — | — |
| GND | 8 | — | — | — |
| D_2 | 9 | 1/8 | — | — |
| \overline{B}_2 | 10 | 1/16 | 250 | 25 |
| R_2 | 11 | — | 50 | 10 |
| D_3 | 12 | 1/8 | — | — |
| \overline{B}_3 | 13 | 1/16 | 250 | 25 |
| R_3 | 14 | — | 50 | 10 |
| B/E | 15 | 1/8 | — | — |
| VCC | 16 | — | — | — |

A TTL Unit Load is defined as -1.6mA measured at 0.4V LOW and $40\mu\text{A}$ measured at 2.4V HIGH.

DRIVER FUNCTION TABLE

| INPUTS | | Am2926 OUTPUT | Am2929 OUTPUT |
|--------|-------|------------------|------------------|
| B/E | D_i | \overline{B}_i | \overline{B}_i |
| L | X | Z | Z |
| H | L | H | L |
| H | H | L | H |

L = LOW
H = HIGH
i = 0, 1, 2, or 3

X = Don't Care
Z = High Impedance

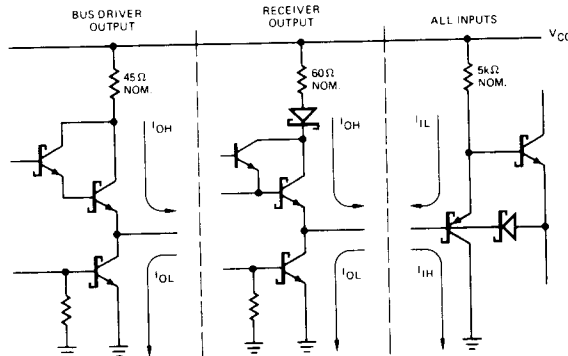
RECEIVER FUNCTION TABLE

| INPUTS | | Am2926 OUTPUT | Am2929 OUTPUT |
|------------------|------------------|---------------|---------------|
| $\overline{R/E}$ | \overline{B}_i | R_i | R_i |
| H | X | Z | Z |
| L | L | H | L |
| L | H | L | H |

L = LOW
H = HIGH
i = 0, 1, 2, or 3

X = Don't Care
Z = High Impedance

INPUT/OUTPUT CURRENT INTERFACE CONDITIONS



Note: Actual current flow direction shown.

AC TEST CIRCUITS AND WAVEFORMS

PROPAGATION DELAY (Data In to Bus)

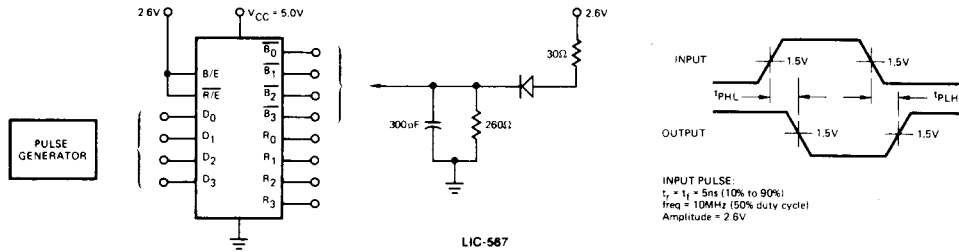


Figure 1

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PROPAGATION DELAY (Bus to Receiver Out)

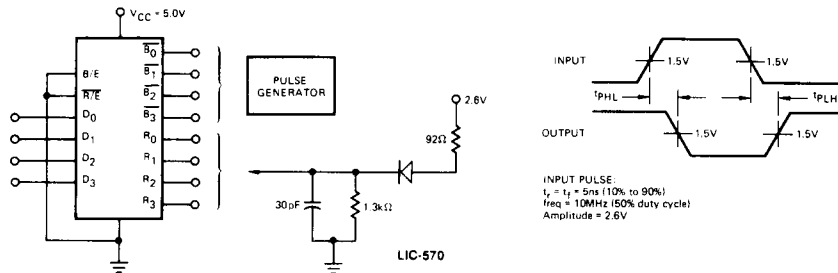


Figure 2

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PROPAGATION DELAY (Bus Enable to Bus Output)

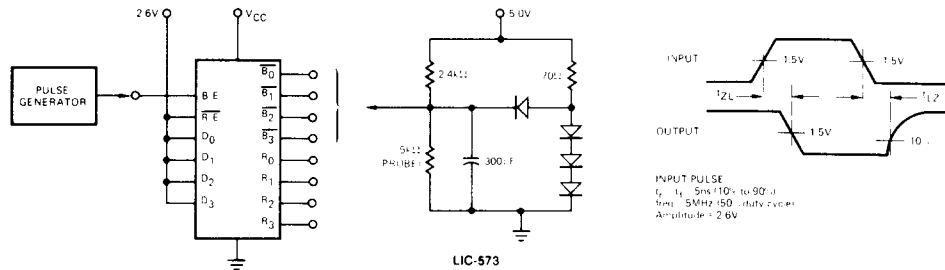


Figure 3

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PROPAGATION DELAY (Receive Enable to Receive Output)

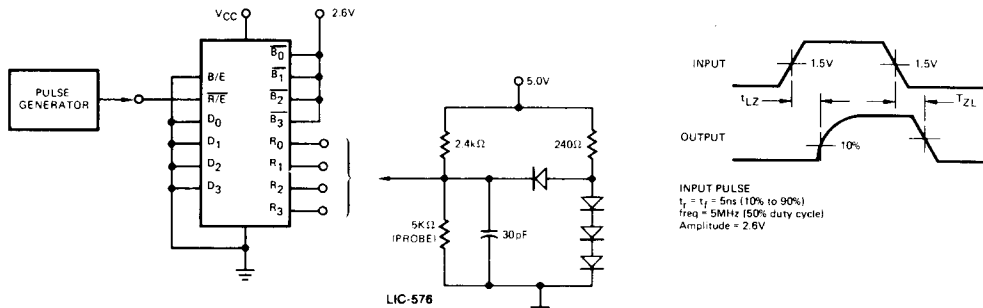
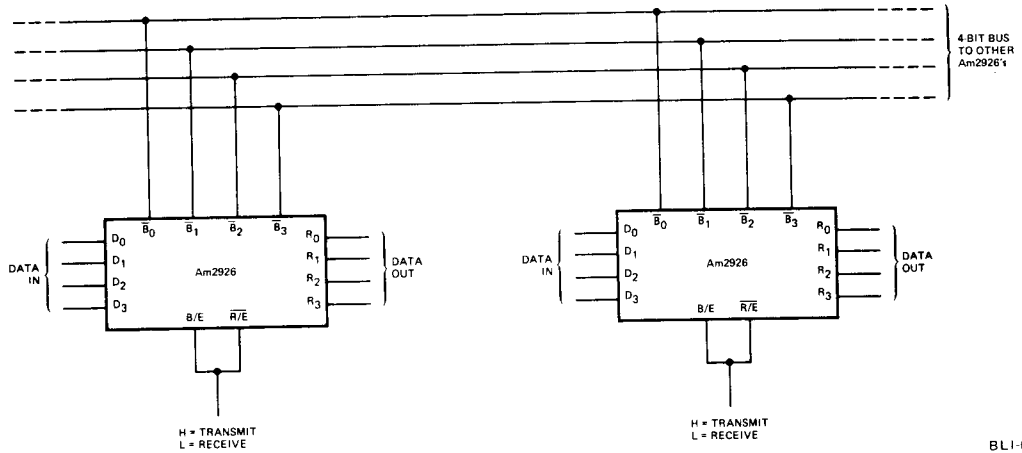


Figure 4

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APPLICATION



ORDERING INFORMATION

Order the part number according to the table below to obtain the desired package, temperature range, and screening level.

| Am2926 Order Number | Am2929 Order Number | Package Type (Note 1) | Operating Range (Note 2) | Screening Level (Note 3) |
|------------------------|------------------------|--------------------------|-----------------------------|---|
| AM2929PC | AM2929PC | P-16-1 | C | C-1 |
| AM2929DC | AM2929DC | D-16-1 | C | C-1 |
| AM2929DC-B | AM2929DC-B | D-16-1 | C | B-1 |
| AM2926DM | | D-16-1 | M | C-3 |
| AM2926DM-B | | D-16-1 | M | B-3 |
| AM2926XC | *AM2929XC | Dice | C | Visual inspection to MIL-STD-883 Method 2010 B. |
| AM2926XM | | Dice | M | |

Notes:

1. P = Molded DIP, D = Hermetic DIP, F = Flat Pak. Number following letter is number of leads. See Appendix B for detailed outline. Where Appendix B contains several dash numbers, any of the variations of the package may be used unless otherwise specified.
2. C = 0 to 70°C, V_{CC} = 4.75V to 5.25V. M = -55 to + 125°C, V_{CC} = 4.50V to 5.50V.
3. See Appendix A for details of screening. Levels C-1 and C-3 conform to MIL-STD-883, Class C. Level B-3 conforms to MIL-STD-883, Class B.

Metallization and Pad Layouts

