

# MC3446 QUADRUPLER BUS TRANSCEIVER

D2290, JANUARY 1977—REVISED SEPTEMBER 1988

- Driver Inputs Compatible with TTL and MOS Circuitry
- Driver Outputs Stay Off During Power Up and Power Down
- Drivers Feature Open-Collector Outputs for Party-Line Operation
- Designed for Interchangeability with Motorola MC3446
- Meet IEEE Standard 488-1975

## description

These circuits are quadruple single-ended line transceivers designed for bidirectional flow of data and instructions. The bus terminal characteristic complies with paragraph 3.5.3 of IEEE Standard 488 (see Figure 3). Each driver output is tied to the junction of an internal voltage divider that sets the no-load output voltage and provides bus termination. The driver outputs are guaranteed to be "off" during power up and power down if either input is high. The receivers feature 950 millivolts typical hysteresis for noise immunity.

The MC3446 is characterized for operation from 0°C to 70°C.

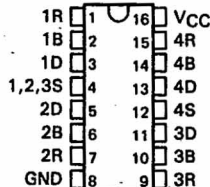
FUNCTION TABLE  
(TRANSMITTING)

| INPUTS  | OUTPUT |
|---------|--------|
| S D B R |        |
| L H H H | H      |
| L L L L | L      |

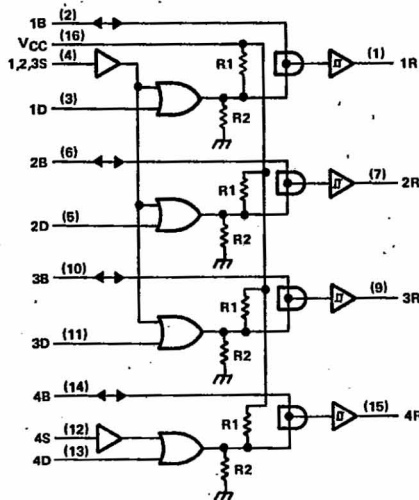
FUNCTION TABLE  
(RECEIVING)

| INPUTS  | OUTPUT |
|---------|--------|
| S B D R |        |
| H H X H | H      |
| H L X L | L      |

D, J, OR N DUAL-IN-LINE PACKAGE  
(TOP VIEW)

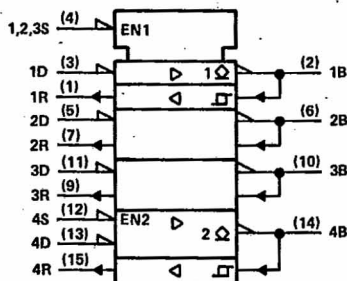


logic diagram (positive logic)



R1 = 2.4 kΩ NOM, R2 = 5 kΩ NOM

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

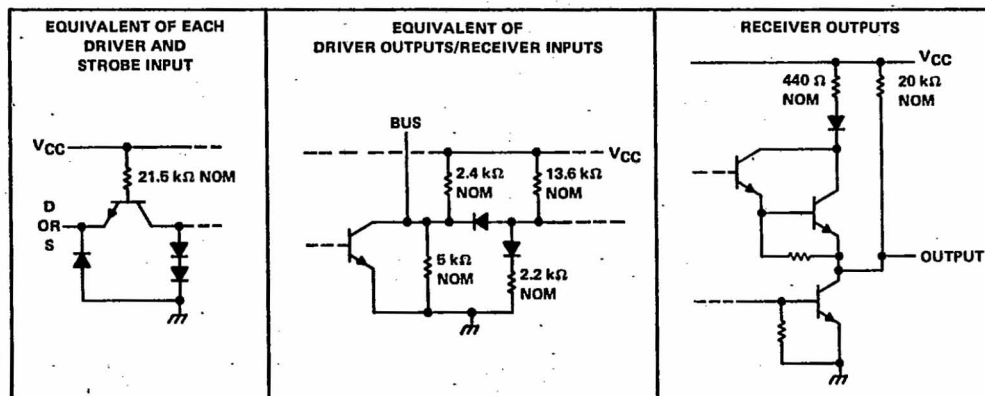
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TEXAS  
INSTRUMENTS

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schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

|                                                                                    |                |
|------------------------------------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                                              | 7 V            |
| Input voltage                                                                      | 5.5 V          |
| Driver output current                                                              | 150 mA         |
| Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2): |                |
| D package                                                                          | 950 mW         |
| J package                                                                          | 1025 mW        |
| N package                                                                          | 1050 mW        |
| Operating free-air temperature range                                               | 0°C to 70°C    |
| Storage temperature range                                                          | -65°C to 150°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package            | 300°C          |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D and N package      | 260°C          |

NOTES: 1. Voltage values are with respect to network ground terminal.

2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in Appendix A. In the J package, use the 8.2 mW/°C curve, in the D package, use the 7.6 mW/°C curve, and in the N package, use the 9.2-mW/°C curve.

recommended operating conditions

|                                       |          | MIN  | NOM | MAX  | UNIT |
|---------------------------------------|----------|------|-----|------|------|
| Supply voltage, $V_{CC}$              |          | 4.75 | 5   | 5.25 | V    |
| High-level input voltage, $V_{IH}$    | D or S   | 2    |     |      | V    |
| Low-level input voltage, $V_{IL}$     | D or S   |      |     | 0.8  | V    |
| High-level output current, $I_{OH}$   | Receiver |      |     | -0.4 | mA   |
| Low-level output current, $I_{OL}$    | Driver   |      |     | 48   | mA   |
|                                       | Receiver |      |     | 8    | mA   |
| Operating free-air temperature, $T_A$ |          | 0    |     | 70   | °C   |

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electrical characteristics over recommended ranges of  $V_{CC}$  and operating free-air temperature (unless otherwise noted)

| PARAMETER           |                                        |        | TEST CONDITIONS                                                        | MIN  | TYP† | MAX  | UNIT          |
|---------------------|----------------------------------------|--------|------------------------------------------------------------------------|------|------|------|---------------|
| $V_{IK}$            | Input clamp voltage                    | D or S | $I_I = -12 \text{ mA}$                                                 |      |      | -1.5 | V             |
| $V_{T+}$            | Positive-going input threshold voltage | B      |                                                                        | 1.5  | 1.8  | 2    | V             |
| $V_{T-}$            | Negative-going input threshold voltage | B      |                                                                        | 0.6  | 0.85 | 1.1  | V             |
| $V_{hys}$           | Input hysteresis, $(V_{T+} - V_{T-})$  | B      |                                                                        | 400  | 950  |      | mV            |
| $V_{OH}$            | High-level output voltage              | B      | $V_{IH} = 2.4 \text{ V}, I_{OH} = 0$                                   | 2.5  | 3.3  | 3.7  | V             |
|                     |                                        | R      | $V_{IH} = 2 \text{ V}, I_{OH} = -400 \mu\text{A}$                      | 2.4  |      |      |               |
| $V_{OL}$            | Low-level output voltage               | B      | $V_{IL} = 0.8 \text{ V}, I_{OL} = 48 \text{ mA}$                       |      |      | 0.4  | V             |
|                     |                                        | R      | $V_{IL} = 0.8 \text{ V}, I_{OL} = 8 \text{ mA}$                        |      |      | 0.4  |               |
| $I_{O(\text{bus})}$ | Bus current                            | B      | $V_{IH} = 2.4 \text{ V}, V_O = 5.5 \text{ V}$                          |      |      | 2.5  | mA            |
|                     |                                        |        | $V_{IH} = 2.4 \text{ V}, V_O = 5 \text{ V}$                            | 0.7  |      |      |               |
|                     |                                        |        | $V_{IH} = 2.4 \text{ V}, V_O = 0.4 \text{ V}$                          | -1.3 |      | -3.2 |               |
| $V_{OK}$            | Output clamp voltage                   | B      | $I_O = -12 \text{ mA}$                                                 |      |      | -1.5 | V             |
| $I_I$               | Input current at maximum input voltage | D or S | $V_I = 5.5 \text{ V}$                                                  |      |      | 1    | mA            |
| $I_{IH}$            | High-level input current               | D or S | $V_{IH} = 2.4 \text{ V}$                                               |      | 5    | 20   | $\mu\text{A}$ |
| $I_{IL}$            | Low-level input current                | D or S | $V_{CC} = 5 \text{ V}, V_{IL} = 0.4 \text{ V}, T_A = 25^\circ\text{C}$ |      | 0.2  | 0.36 | mA            |
| $I_{OS}$            | Short-circuit output current           | R      | $V_{IH} = 2 \text{ V}$                                                 | 4    |      | 14   | mA            |
| $I_{CCH}$           | Supply current, all outputs high       |        | No load                                                                |      | 10   | 19   | mA            |
| $I_{CCL}$           | Supply current, all outputs low        |        | No load                                                                |      | 32   | 39   | mA            |

†All typical values are at  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

| PARAMETER        |                                                  | FROM | TO | TEST CONDITIONS | MIN | MAX | UNIT |
|------------------|--------------------------------------------------|------|----|-----------------|-----|-----|------|
| t <sub>PLH</sub> | Propagation delay time, low-to-high-level output | D    | B  | See Figure 1    |     | 40  | ns   |
| t <sub>PHL</sub> | Propagation delay time, high-to-low-level output |      |    |                 |     | 50  |      |
| t <sub>PLH</sub> | Propagation delay time, low-to-high-level output | S    | B  |                 |     | 50  | ns   |
| t <sub>PHL</sub> | Propagation delay time, high-to-low-level output |      |    |                 |     | 50  |      |
| t <sub>PLH</sub> | Propagation delay time, low-to-high-level output | B    | R  | See Figure 2    |     | 50  | ns   |
| t <sub>PHL</sub> | Propagation delay time, high-to-low-level output |      |    |                 |     | 40  |      |

PARAMETER MEASUREMENT INFORMATION

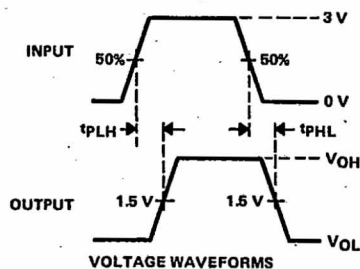
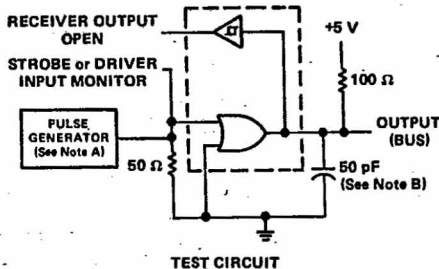


FIGURE 1

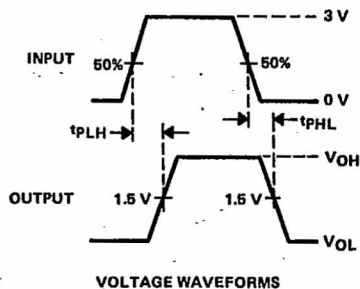
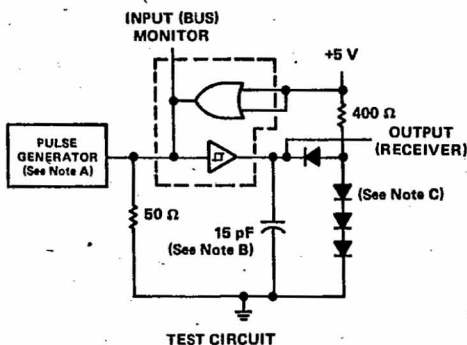


FIGURE 2

- NOTES: A. The input pulse is supplied by a generator having the following characteristics:  $t_W = 100$  ns,  $PRR \leq 1$  MHz,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns,  $Z_{out} = 50 \Omega$ .  
B. This value includes probe and jig capacitance.  
C. All diodes are 1N916 or 1N3064.

TYPICAL CHARACTERISTICS

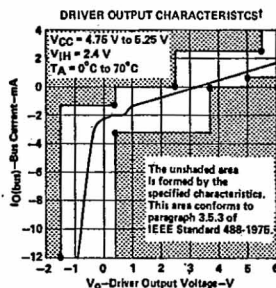


FIGURE 3

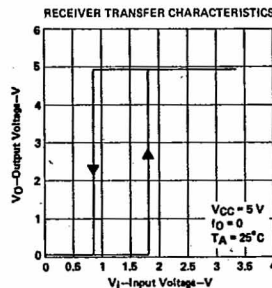


FIGURE 4

†Conditions for typical curve are  $V_{CC} = 5$  V,  $T_A = 25^\circ$  C.