



**MOTOROLA**

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# AM26LS31

## Quad Line Driver with NAND Enabled Three-State Outputs

The Motorola AM26LS31 is a quad differential line driver intended for digital data transmission over balanced lines. It meets all the requirements of EIA-422 Standard and Federal Standard 1020.

The AM26LS31 provides an enable/disable function common to all four drivers as opposed to the split enables on the MC3487 EIA-422 driver.

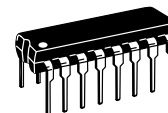
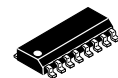
The high impedance output state is assured during power down.

- Full EIA-422 Standard Compliance
- Single +5.0 V Supply
- Meets Full  $V_O = 6.0\text{ V}$ ,  $V_{CC} = 0\text{ V}$ ,  $I_O < 100\text{ }\mu\text{A}$  Requirement
- Output Short Circuit Protection
- Complementary Outputs for Balanced Line Operation
- High Output Drive Capability
- Advanced LS Processing
- PNP Inputs for MOS Compatibility

### QUAD EIA-422 LINE DRIVER WITH THREE-STATE OUTPUTS

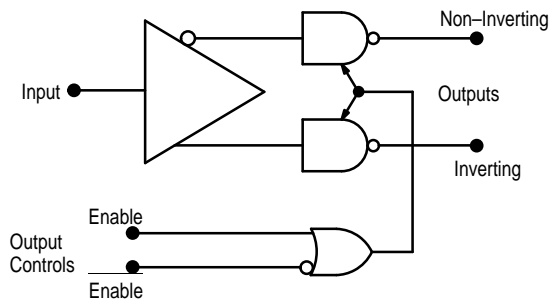
#### SEMICONDUCTOR TECHNICAL DATA

**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751B  
(SO-16)

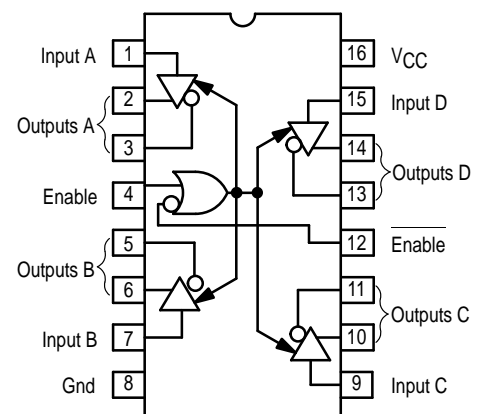


**PC SUFFIX**  
PLASTIC PACKAGE  
CASE 648

#### Representative Block Diagrams



#### PIN CONNECTIONS



#### TRUTH TABLE

| Input | Control Inputs (E/E) | Non-Inverting Output | Inverting Output |
|-------|----------------------|----------------------|------------------|
| H     | H/L                  | H                    | L                |
| L     | H/L                  | L                    | H                |
| X     | L/H                  | Z                    | Z                |

L = Low Logic State  
H = High Logic State

X = Irrelevant  
Z = Third-State (High Impedance)

#### ORDERING INFORMATION

| Device     | Operating Temperature Range           | Package     |
|------------|---------------------------------------|-------------|
| AM26LS31PC | $T_A = 0\text{ to }+70^\circ\text{C}$ | Plastic DIP |
| MC26LS31D* |                                       | SO-16       |

\* Note that the surface mount MC26LS31D device uses the same die as in the plastic DIP AM26LS31DC device, but with an MC prefix to prevent confusion with the package suffix.

## MAXIMUM RATINGS

| Rating                               | Symbol    | Value         | Unit |
|--------------------------------------|-----------|---------------|------|
| Power Supply Voltage                 | $V_{CC}$  | 8.0           | Vdc  |
| Input Voltage                        | $V_I$     | 5.5           | Vdc  |
| Operating Ambient Temperature Range  | $T_A$     | 0 to + 70     | °C   |
| Operating Junction Temperature Range | $T_J$     | 150           | °C   |
| Storage Temperature Range            | $T_{stg}$ | – 65 to + 150 | °C   |

**ELECTRICAL CHARACTERISTICS** (Unless otherwise noted, specifications apply  $4.75\text{ V} \leq V_{CC} \leq 5.25\text{ V}$  and  $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ . Typical values measured at  $V_{CC} = 5.0\text{ V}$ , and  $T_A = 25^\circ\text{C}$ .)

| Characteristic  | Symbol            | Min    | Typ    | Max            | Unit          |
|---|-------------------|--------|--------|----------------|---------------|
| Input Voltage – Low Logic State   | $V_{IL}$          | –      | –      | 0.8            | Vdc           |
| Input Voltage – High Logic State  | $V_{IH}$          | 2.0    | –      | –              | Vdc           |
| Input Current – Low Logic State<br>( $V_{IL} = 0.4\text{ V}$ )  | $I_{IL}$          | –      | –      | – 360          | $\mu\text{A}$ |
| Input Current – High Logic State<br>( $V_{IH} = 2.7\text{ V}$ )<br>( $V_{IH} = 7.0\text{ V}$ )  | $I_{IH}$          | –<br>– | –<br>– | + 20<br>+ 100  | $\mu\text{A}$ |
| Input Clamp Voltage<br>( $I_{IK} = -18\text{ mA}$ )   | $V_{IK}$          | –      | –      | – 1.5          | V             |
| Output Voltage – Low Logic State<br>( $I_{OL} = 20\text{ mA}$ )   | $V_{OL}$          | –      | –      | 0.5            | V             |
| Output Voltage – High Logic State<br>( $I_{OH} = -20\text{ mA}$ )   | $V_{OH}$          | 2.5    | –      | –              | V             |
| Output Short Circuit Current<br>( $V_{IH} = 2.0\text{ V}$ ) Note 1  | $I_{OS}$          | – 30   | –      | – 150          | mA            |
| Output Leakage Current – Hi-Z State<br>( $V_{OL} = 0.5\text{ V}$ , $V_{IL(E)} = 0.8\text{ V}$ , $V_{IH(E)} = 2.0\text{ V}$ )<br>( $V_{OH} = 2.5\text{ V}$ , $V_{IL(E)} = 0.8\text{ V}$ , $V_{IH(E)} = 2.0\text{ V}$ ) | $I_{O(Z)}$        | –<br>– | –<br>– | – 20<br>+ 20   | $\mu\text{A}$ |
| Output Leakage Current – Power OFF<br>( $V_{OH} = 6.0\text{ V}$ , $V_{CC} = 0\text{ V}$ )<br>( $V_{OL} = -0.25\text{ V}$ , $V_{CC} = 0\text{ V}$ )  | $I_{O(off)}$      | –<br>– | –<br>– | + 100<br>– 100 | $\mu\text{A}$ |
| Output Offset Voltage Difference, Note 2  | $V_{OS} - V_{OS}$ | –      | –      | $\pm 0.4$      | V             |
| Output Differential Voltage, Note 2   | $V_{OD}$          | 2.0    | –      | –              | V             |
| Output Differential Voltage Difference, Note 2  | $ \Delta V_{OD} $ | –      | –      | $\pm 0.4$      | V             |
| Power Supply Current<br>(Output Disabled) Note 3  | $I_{CCX}$         | –      | 60     | 80             | mA            |

**NOTES:** 1. Only one output may be shorted at a time.  
2. See EIA Specification EIA-422 for exact test conditions.  
3. Circuit in three-state condition.

**SWITCHING CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ,  $T_A = 25^\circ\text{C}$  unless otherwise noted.)

| Characteristic  | Symbol   | Min              | Typ              | Max                  | Unit |
|---|--|------------------|------------------|----------------------|------|
| Propagation Delay Times<br>High to Low Output<br>Low to High Output   | $t_{PHL}$<br>$t_{PLH}$                                       | –<br>–           | –<br>–           | 20<br>20             | ns   |
| Output Skew   |  | –                | –                | 6.0                  | ns   |
| Propagation Delay – Control to Output<br>( $C_L = 10\text{ pF}$ , $R_L = 75\ \Omega$ to Gnd)<br>( $C_L = 10\text{ pF}$ , $R_L = 180\ \Omega$ to $V_{CC}$ )<br>( $C_L = 30\text{ pF}$ , $R_L = 75\ \Omega$ to Gnd)<br>( $C_L = 30\text{ pF}$ , $R_L = 180\ \Omega$ to $V_{CC}$ ) | $t_{PHZ(E)}$<br>$t_{PLZ(E)}$<br>$t_{PZH(E)}$<br>$t_{PZL(E)}$ | –<br>–<br>–<br>– | –<br>–<br>–<br>– | 30<br>35<br>40<br>45 | ns   |

Figure 1. Three-State Enable Test Circuit and Waveforms

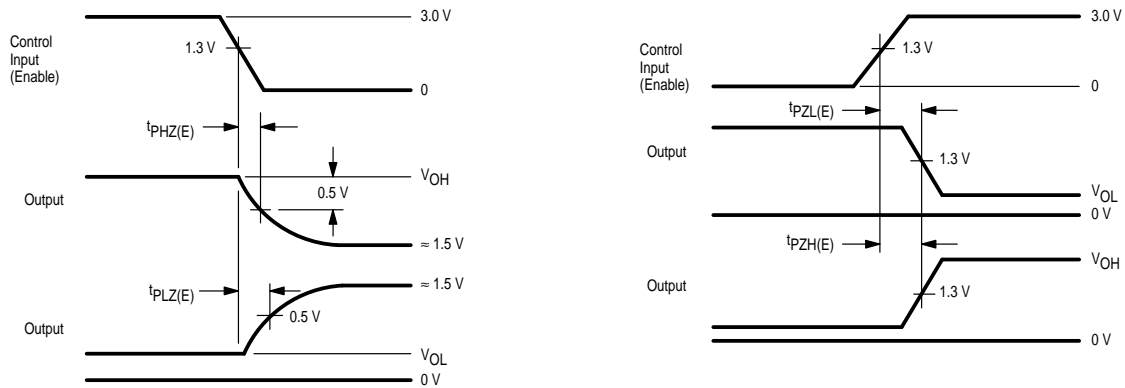
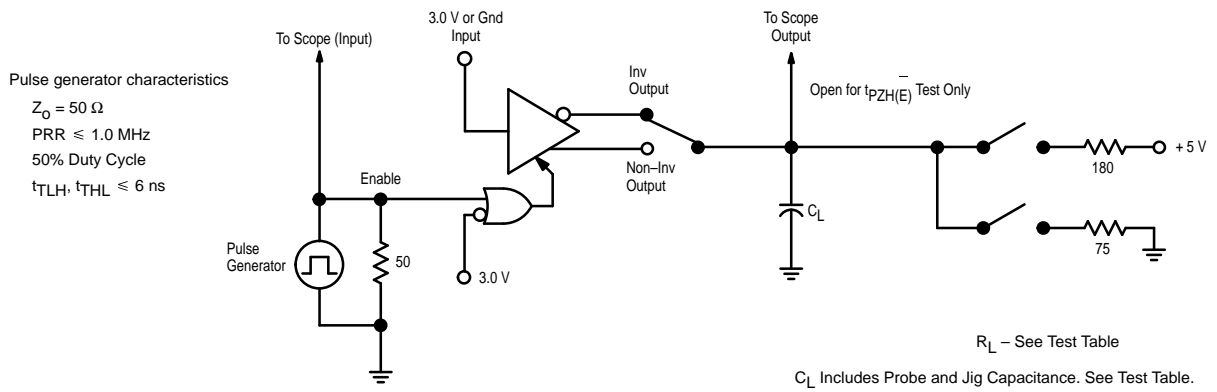
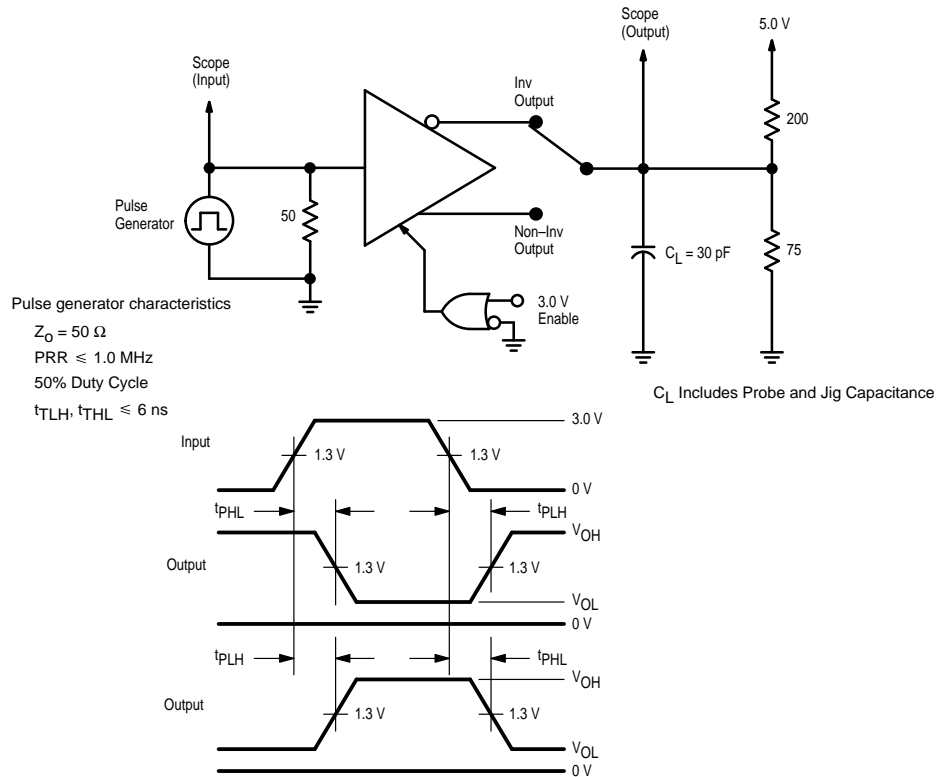
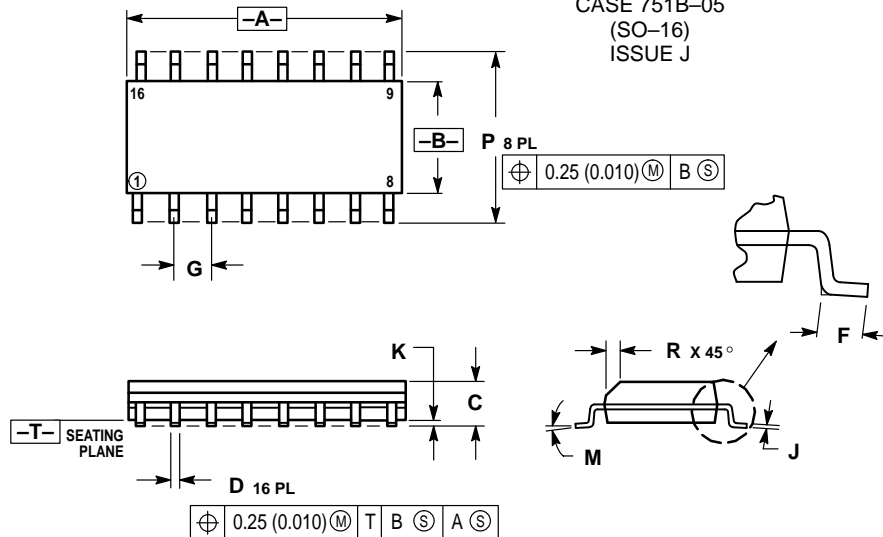


Figure 2. Propagation Delay Times Input to Output Waveforms and Test Circuit



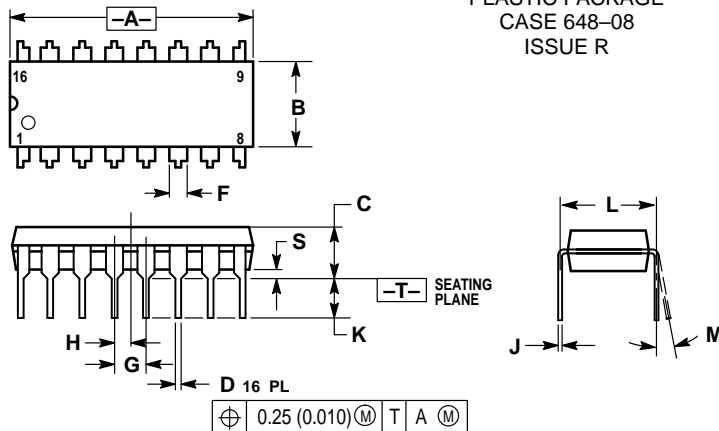
## OUTLINE DIMENSIONS

**D SUFFIX**  
 PLASTIC PACKAGE  
 CASE 751B-05  
 (SO-16)  
 ISSUE J


## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 9.80        | 10.00 | 0.386     | 0.393 |
| B   | 3.80        | 4.00  | 0.150     | 0.157 |
| C   | 1.35        | 1.75  | 0.054     | 0.068 |
| D   | 0.35        | 0.49  | 0.014     | 0.019 |
| F   | 0.40        | 1.25  | 0.016     | 0.049 |
| G   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.19        | 0.25  | 0.008     | 0.009 |
| K   | 0.10        | 0.25  | 0.004     | 0.009 |
| M   | 0°          | 7°    | 0°        | 7°    |
| P   | 5.80        | 6.20  | 0.229     | 0.244 |
| R   | 0.25        | 0.50  | 0.010     | 0.019 |

**PC SUFFIX**  
 PLASTIC PACKAGE  
 CASE 648-08  
 ISSUE R


## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.740     | 0.770 | 18.80       | 19.55 |
| B   | 0.250     | 0.270 | 6.35        | 6.85  |
| C   | 0.145     | 0.175 | 3.69        | 4.44  |
| D   | 0.015     | 0.021 | 0.39        | 0.53  |
| F   | 0.040     | 0.70  | 1.02        | 1.77  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.050 BSC |       | 1.27 BSC    |       |
| J   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.110     | 0.130 | 2.80        | 3.30  |
| L   | 0.295     | 0.305 | 7.50        | 7.74  |
| M   | 0°        | 10°   | 0°          | 10°   |
| S   | 0.020     | 0.040 | 0.51        | 1.01  |

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6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

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