

DS26LS31C/DS26LS31M Quad High Speed Differential Line Driver

General Description

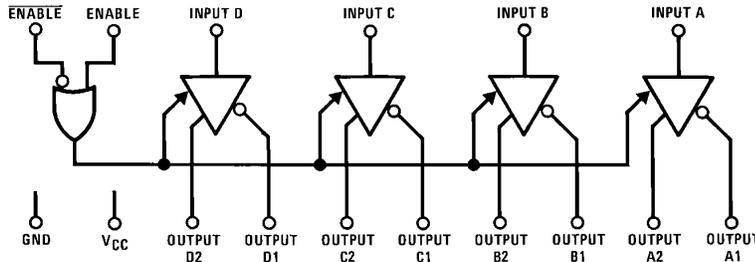
The DS26LS31 is a quad differential line driver designed for digital data transmission over balanced lines. The DS26LS31 meets all the requirements of EIA Standard RS-422 and Federal Standard 1020. It is designed to provide unipolar differential drive to twisted-pair or parallel-wire transmission lines.

The circuit provides an enable and disable function common to all four drivers. The DS26LS31 features TRI-STATE® outputs and logically ANDed complementary outputs. The inputs are all LS compatible and are all one unit load.

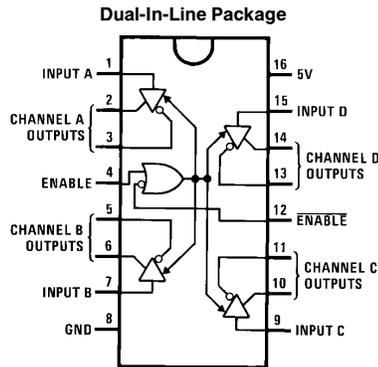
Features

- Output skew—2.0 ns typical
- Input to output delay—10 ns typical
- Operation from single 5V supply
- Outputs won't load line when $V_{CC} = 0V$
- Four line drivers in one package for maximum package density
- Output short-circuit protection
- Complementary outputs
- Meets the requirements of EIA Standard RS-422
- Pin compatible with AM26LS31
- Available in military and commercial temperature range

Logic and Connection Diagrams



TL/F/5778-1



TL/F/5778-2

Top View
Order Number DS26LS31CJ, DS26LS31CM,
DS26LS31CN or DS26LS31MJ
See NS Package Number J16A, M16A or N16A

For Complete Military 883 Specifications, see RETS Data Sheet.
Order Number DS26LS31MJ/883 or DS26LS31MW/883
See NS Package J16A or W16A

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Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

| | |
|----------------------------|-------------|
| Supply Voltage | 7V |
| Input Voltage | 7V |
| Output Voltage | 5.5V |
| Output Voltage (Power OFF) | -0.25 to 6V |

Maximum Power Dissipation* at 25°C

| | |
|--------------------|---------|
| Cavity Package | 1509 mW |
| Molded DIP Package | 1476 mW |
| SO Package | 1051 mW |

*Derate cavity package 10.1 mW/°C above 25°C; derate molded DIP package 11.9 mW/°C above 25°C; derate SO package 8.41 mW/°C above 25°C.

Operating Conditions

| | Min | Max | Units |
|--------------------------|------|------|-------|
| Supply Voltage, V_{CC} | | | |
| DS26LS31M | 4.5 | 5.5 | V |
| DS26LS31 | 4.75 | 5.25 | V |
| Temperature, T_A | | | |
| DS26LS31M | -55 | +125 | °C |
| DS26LS31 | 0 | +70 | °C |

Electrical Characteristics (Notes 2, 3 and 4)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|----------|------------------------------|--------------------------------|-----|-----|------|-------|
| V_{OH} | Output High Voltage | $I_{OH} = -20$ mA | 2.5 | | | V |
| V_{OL} | Output Low Voltage | $I_{OL} = 20$ mA | | | 0.5 | V |
| V_{IH} | Input High Voltage | | 2.0 | | | V |
| V_{IL} | Input Low Voltage | | | | 0.8 | V |
| I_{IL} | Input Low Current | $V_{IN} = 0.4$ V | | -40 | -200 | μA |
| I_{IH} | Input High Current | $V_{IN} = 2.7$ V | | | 20 | μA |
| I_I | Input Reverse Current | $V_{IN} = 7$ V | | | 0.1 | mA |
| I_O | TRI-STATE Output Current | $V_O = 2.5$ V | | | 20 | μA |
| | | $V_O = 0.5$ V | | | -20 | μA |
| V_{CL} | Input Clamp Voltage | $I_{IN} = -18$ mA | | | -1.5 | V |
| I_{SC} | Output Short-Circuit Current | | -30 | | -150 | mA |
| I_{CC} | Power Supply Current | All Outputs Disabled or Active | | 35 | 60 | mA |

Switching Characteristics $V_{CC} = 5$ V, $T_A = 25$ °C

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------|------------------|------------------------|-----|-----|-----|-------|
| t_{PLH} | Input to Output | $C_L = 30$ pF | | 10 | 15 | ns |
| t_{PHL} | Input to Output | $C_L = 30$ pF | | 10 | 15 | ns |
| Skew | Output to Output | $C_L = 30$ pF | | 2.0 | 6.0 | ns |
| t_{LZ} | Enable to Output | $C_L = 10$ pF, S2 Open | | 15 | 35 | ns |
| t_{HZ} | Enable to Output | $C_L = 10$ pF, S1 Open | | 15 | 25 | ns |
| t_{ZL} | Enable to Output | $C_L = 30$ pF, S2 Open | | 20 | 30 | ns |
| t_{ZH} | Enable to Output | $C_L = 30$ pF, S1 Open | | 20 | 30 | ns |

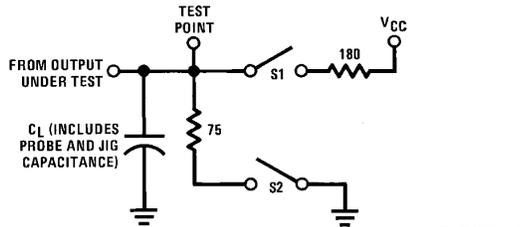
Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The tables of "Electrical Characteristics" provide conditions for actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the -55°C to +125°C temperature range for the DS726LS31M and across the 0°C to +70°C range for the DS26LS31. All typicals are given for $V_{CC} = 5$ V and $T_A = 25$ °C.

Note 3: All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to ground unless otherwise specified.

Note 4: Only one output at a time should be shorted.

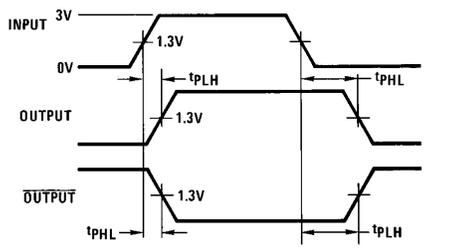
AC Test Circuit and Switching Time Waveforms



Note: S1 and S2 of load circuit are closed except where shown.

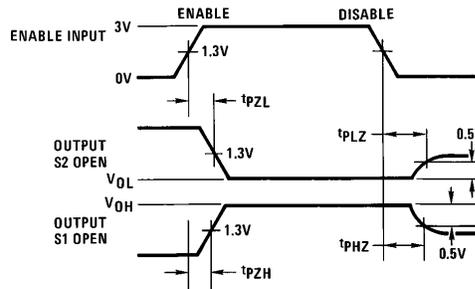
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FIGURE 1. AC Test Circuit



$f = 1 \text{ MHz}$, $t_r \leq 15 \text{ ns}$, $t_f \leq 6 \text{ ns}$

FIGURE 2. Propagation Delays

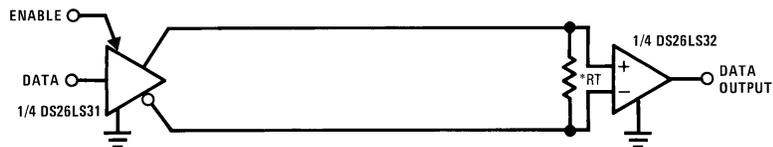


$f = 1 \text{ MHz}$, $t_r \leq 15 \text{ ns}$, $t_f \leq 6 \text{ ns}$

FIGURE 3. Enable and Disable Times

Typical Applications

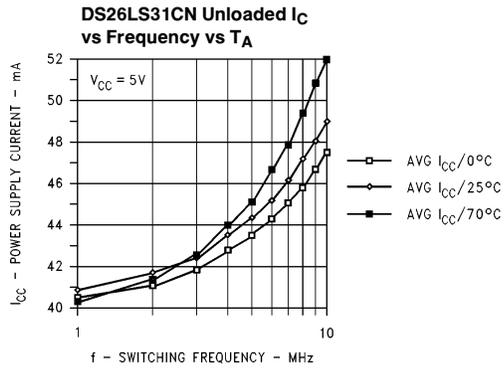
Two-Wire Balanced System, RS-422



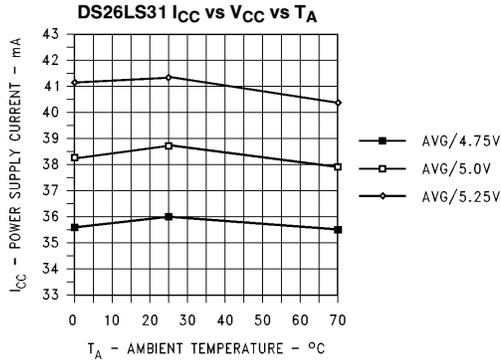
* R_T is optional although highly recommended to reduce reflection.

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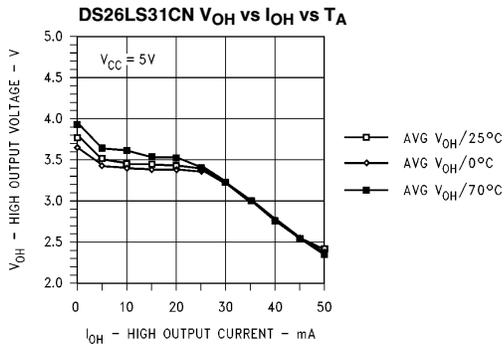
Typical Performance Characteristics



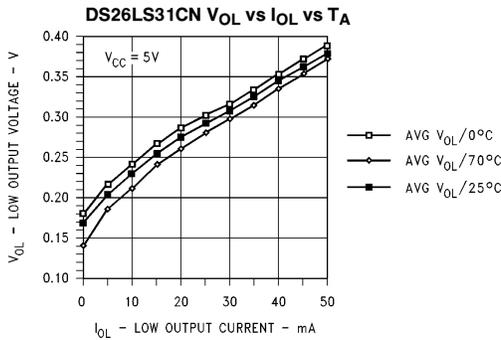
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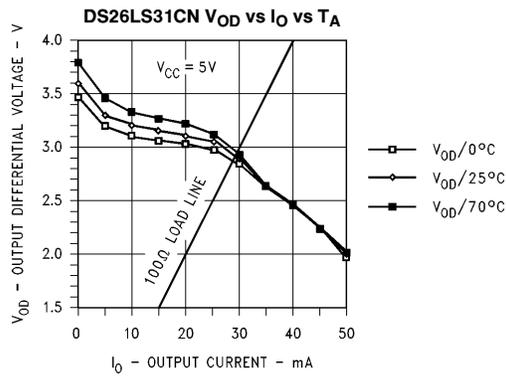
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TL/F/5778-9



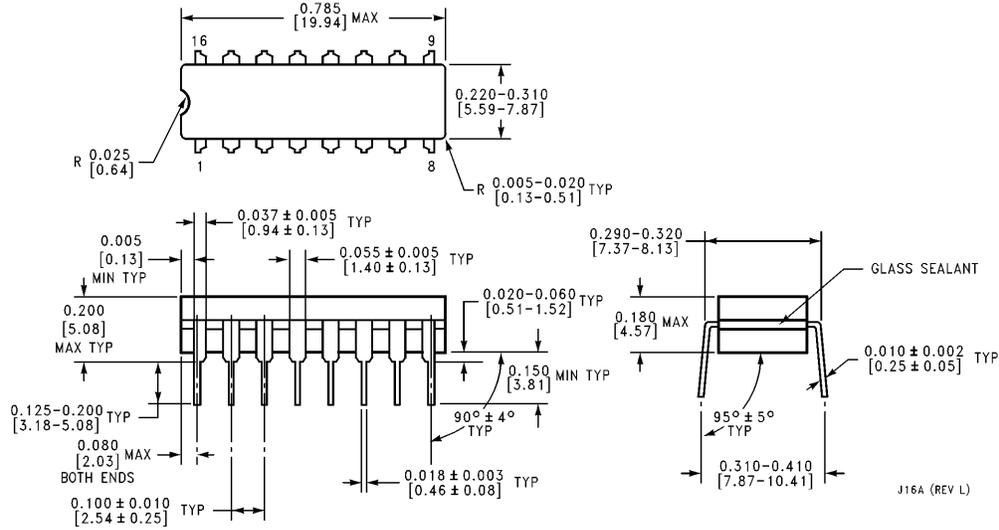
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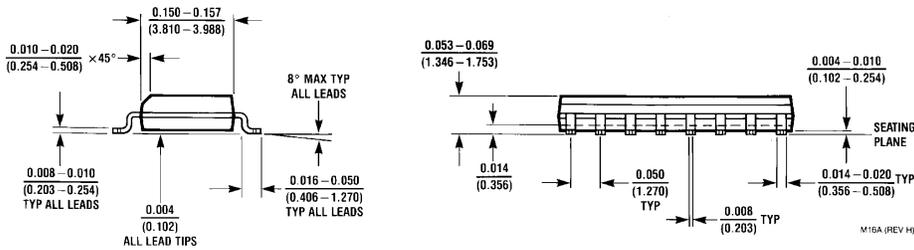
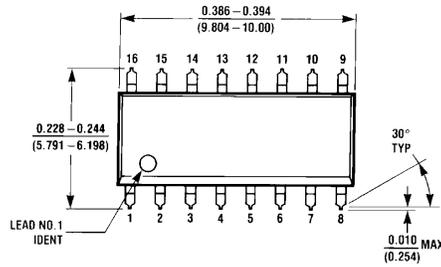
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Physical Dimensions inches (millimeters)

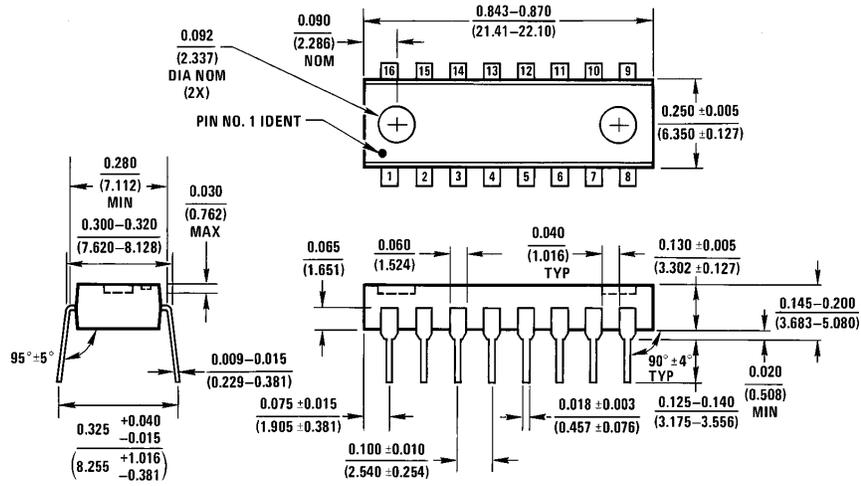


Ceramic Dual-In-Line Package (J)
Order Number DS26LS31CJ or DS26LS31MJ
NS Package Number J16A



Small Outline Package (M)
Order Number DS26LS31CM
NS Package Number M16A

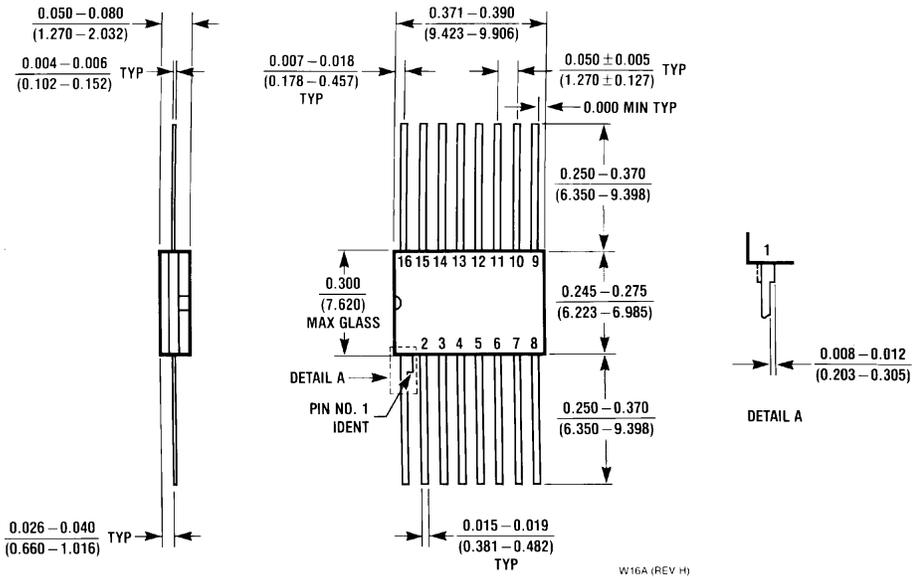
Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number DS26LS31CN
NS Package Number N16A

N16A (REV E)

Physical Dimensions inches (millimeters) (Continued)



**16 Lead Ceramic Flatpak (F)
NS Package Number W16A**

W16A (REV. H)

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National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

<http://www.national.com>

National Semiconductor Europe

Fax: +49 (0) 180-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 180-530 85 85
English Tel: +49 (0) 180-532 78 32
Français Tel: +49 (0) 180-532 93 58
Italiano Tel: +49 (0) 180-534 16 80

National Semiconductor Hong Kong Ltd.

19th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.

Tel: 81-043-299-2308
Fax: 81-043-299-2408

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