

## DS26LS31C/DS26LS31M Quad High Speed Differential Line Driver

Check for Samples: [DS26LS31C](#), [DS26LS31M](#)

### FEATURES

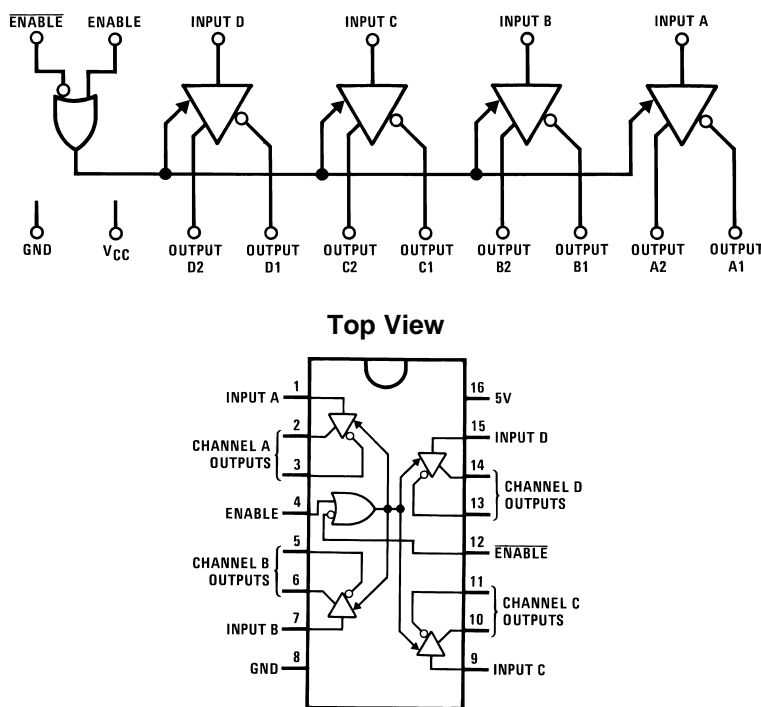
- Output Skew—2.0 ns Typical
- Input to output delay—10 ns Typical
- Operation from Single 5V Supply
- Outputs Won't Load Line when  $V_{CC} = 0V$
- Four Line Drivers in One Package for Maximum Package Density
- Output Short-Circuit Protection
- Complementary Outputs
- Meets the Requirements of EIA Standard RS-422
- Pin Compatible with AM26LS31
- Available in Military and Commercial Temperature Range

### 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.

### Logic and Connection Diagrams



For Complete Military Product Specifications, refer to the appropriate SMD or MDS.

**Figure 1. PDIP Package**  
See Package D0016A or NFG0016E  
See Package Numbers NAJ0020A, NFE0016A or NAD0016A



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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

## Absolute Maximum Ratings<sup>(1)(2)</sup>

Supply Voltage	7V
Input Voltage	7V
Output Voltage	5.5V
Output Voltage (Power OFF)	–0.25 to 6V
Maximum Power Dissipation <sup>(3)</sup> at 25°C	
Cavity Package	1509 mW
NFG0016E Package	1476 mW
D0016A Package	1051 mW

- (1) "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be verified. They are not meant to imply that the devices should be operated at these limits. The [Electrical Characteristics](#) provide conditions for actual device operation.
- (2) If Military/Aerospace specified devices are required, please contact the TI Sales Office/Distributors for availability and specifications.
- (3) 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<sup>(1)(2)(3)</sup>

Parameter		Test 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

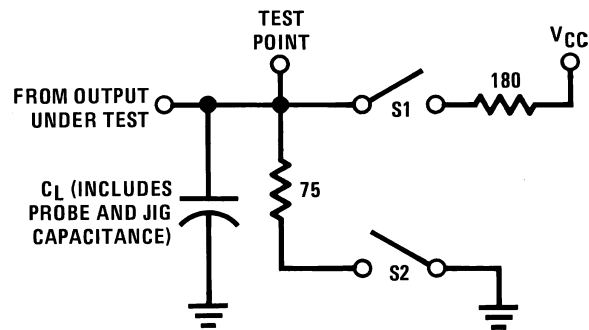
- (1) Unless otherwise specified min/max limits apply across the –55°C to +125°C temperature range for the DS26LS31M and across the 0°C to +70°C range for the DS26LS31. All typicals are given for  $V_{CC} = 5$  V and  $T_A = 25$ °C.
- (2) All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to ground unless otherwise specified.
- (3) Only one output at a time should be shorted.

## Switching Characteristics

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

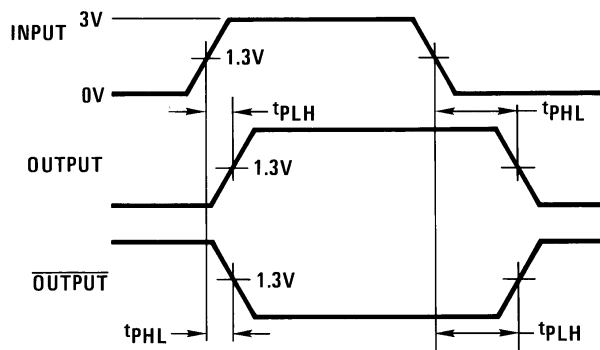
Parameter	Test Conditions	Min	Typ	Max	Units
$t_{PLH}$	Input to Output $C_L = 30\text{ pF}$		10	15	ns
$t_{PHL}$	Input to Output $C_L = 30\text{ pF}$		10	15	ns
Skew	Output to Output $C_L = 30\text{ pF}$		2.0	6.0	ns
$t_{LZ}$	Enable to Output $C_L = 10\text{ pF}$ , S2 Open		15	35	ns
$t_{HZ}$	Enable to Output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

## AC TEST CIRCUIT AND SWITCHING TIME WAVEFORMS



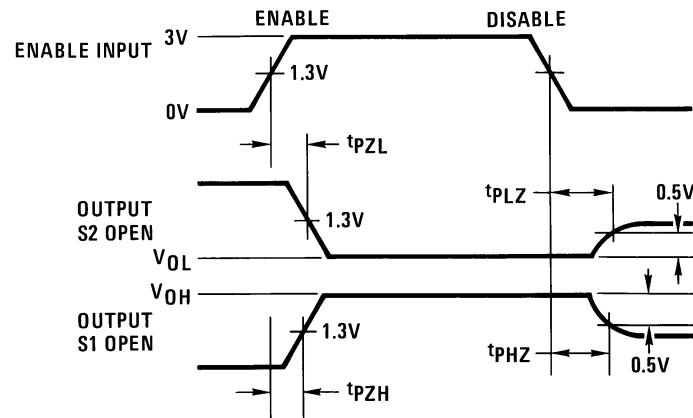
S1 and S2 of load circuit are closed except where shown.

**Figure 2. AC Test Circuit**



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

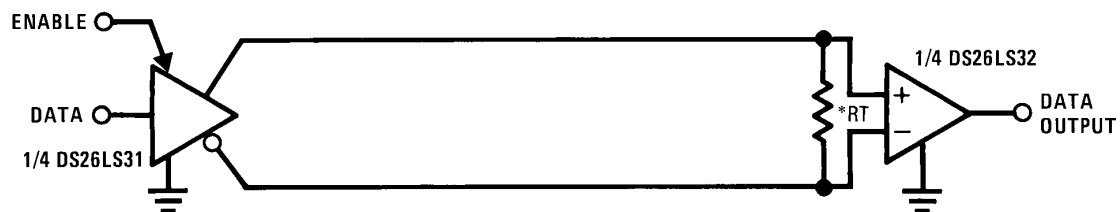
**Figure 3. Propagation Delays**



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

**Figure 4. Enable and Disable Times**

### TYPICAL APPLICATIONS



$R_T$  is optional although highly recommended to reduce reflection.

**Figure 5. Two-Wire Balanced System, RS-422**

## Typical Performance Characteristics

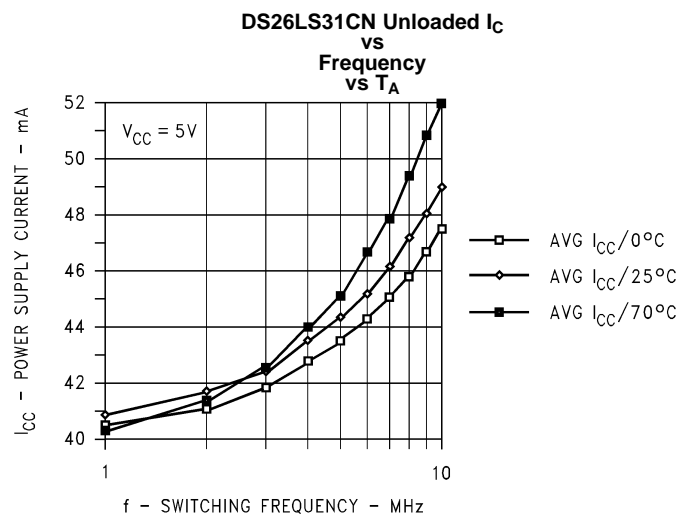


Figure 6.

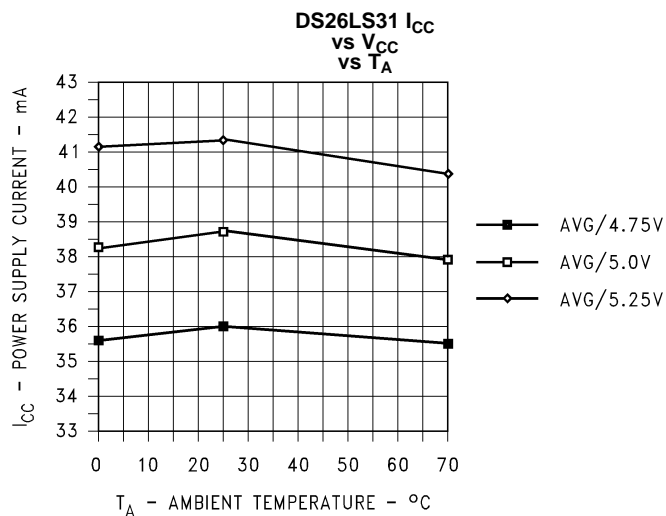


Figure 7.

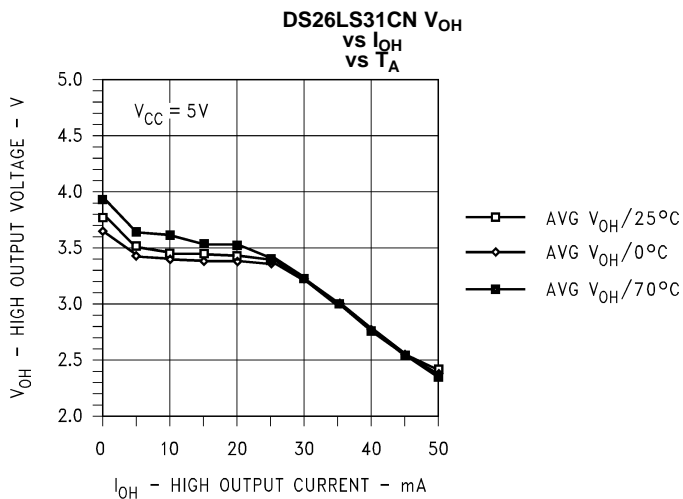


Figure 8.

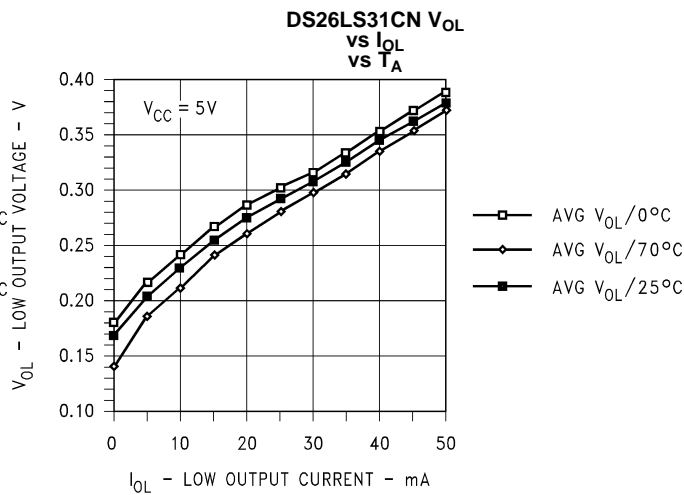


Figure 9.

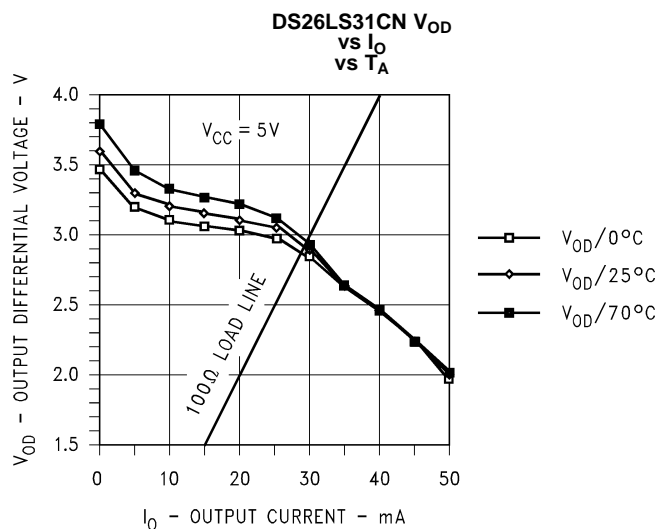


Figure 10.

REVISION HISTORY

Changes from Revision B (April 2013) to Revision C	Page
• Changed layout of National Data Sheet to TI format .....	<a href="#">5</a>

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">DS26LS31CM/NOPB</a>	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	0 to 70	DS26LS31CM

- (1) **Status:** For more details on status, see our [product life cycle](#).
- (2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
- (3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.
- (4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
- (5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
- (6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



## NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.



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