

## DS26LV31QML 3V Enhanced CMOS Quad Differential Line Driver

Check for Samples: [DS26LV31QML](#)

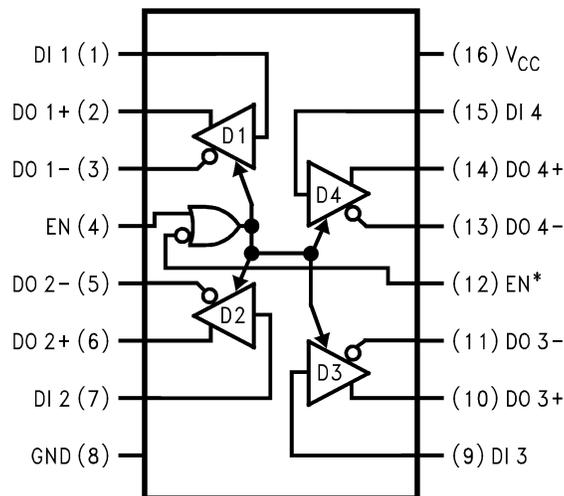
### FEATURES

- Comparable to Both TIA/EIA-422 and ITU-T V.11 Standards.
- Interoperable with Existing 5V RS-422 Networks
- Low Quiescent Current
- Pin Compatible with DS26C31

### DESCRIPTION

The DS26LV31 is a high-speed quad differential CMOS driver that is comparable to the TIA/EIA-422-B and ITU-T V.11 standards. The CMOS DS26LV31 features low static  $I_{CC}$  of 125  $\mu$ A Max which makes it ideal for battery powered and power conscious applications. Differential outputs have the same  $V_{OD}$  specification ( $\geq 2V$ ) as the 5V version. The EN and  $\overline{EN}$  inputs allow active Low or active High control of the TRI-STATE outputs. The enables are common to all four drivers. Protection diodes protect all the driver inputs against electrostatic discharge. The driver and enable inputs (DI, EN,  $\overline{EN}$ ) are compatible with low voltage LVTTTL and LVCMOS devices.

### Connection Diagram



**Figure 1. CLGA Package- Top View**  
See Package Number NAD0016A



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.



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 ( $V_{CC}$ )	-0.5V to 7.0V
DC Input Voltage ( $V_I$ )	-0.5V to $V_{CC}+0.5V$
DC Output Voltage ( $V_O$ ) Power off	-0.5V to 7V
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20mA$
DC Output Current, per Pin ( $I_O$ )	$\pm 150mA$
Storage Temperature Range ( $T_{Stg}$ )	$-65^{\circ}C \leq T_A \leq +150^{\circ}C$
Lead Temperature ( $T_L$ ) Soldering, 4 seconds	260°C
Maximum Power Dissipation +25°C <sup>(3)</sup>	1119mW
Thermal Resistance	
$\theta_{JA}$	134°C/W
$\theta_{JC}$	12.5°C/W

- (1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not verify specific performance limits. For verified specifications and test conditions, see the Electrical Characteristics. The verified specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
- (2) Unless otherwise specified, all voltages are referenced to ground. All currents into device pins are positive, all currents out of device pins are negative.
- (3) Derate W package 7.5mW/°C above +25°C.

### Recommended Operating Conditions

Supply Voltage ( $v_{CC}$ )	3.0V to 3.6V
DC input or Output Voltage ( $V_I, V_O$ )	0V to $V_{CC}$
Operating Temperature Range ( $T_A$ )	$-55^{\circ}C \leq T_A \leq +125^{\circ}C$

**Table 1. Quality Conformance Inspection Mil-Std-883, Method 5005 - Group A**

Subgroup	Description	Temp °C
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55
4	Dynamic tests at	25
5	Dynamic tests at	125
6	Dynamic tests at	-55
7	Functional tests at	25
8A	Functional tests at	125
8B	Functional tests at	-55
9	Switching tests at	25
10	Switching tests at	125
11	Switching tests at	-55
12	Settling time at	25
13	Settling time at	125
14	Settling time at	-55

**DS26LV31M Electrical Characteristics DC Parameters**

Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
V <sub>IH</sub>	Logical "1" Input Voltage		(1)	2.0		V	1, 2, 3
V <sub>IL</sub>	Logical "0" Input Voltage		(1)		0.8	V	1, 2, 3
V <sub>OD1</sub>	Differential Output Voltage	R <sub>L</sub> = No Load, V <sub>CC</sub> = 3.0/3.6V	(2)		4.0	V	1, 2, 3
V <sub>OD2</sub>	Differential Output Voltage	R <sub>L</sub> = 100Ω, V <sub>CC</sub> = 3.0/3.6V	(2)	2.0		V	1, 2, 3
V <sub>OD2</sub> - $\overline{V_{OD2}}$	Difference in Differential Output	R <sub>L</sub> = 100Ω, V <sub>CC</sub> = 3.0/3.6V	(2)	-0.4	0.4	V	1, 2, 3
V <sub>OD3</sub>	Differential Output Voltage	R <sub>L</sub> = 3900Ω, V <sub>CC</sub> = 3.0/3.6V	(2)		3.6	V	1, 2, 3
V <sub>OC</sub>	Common Mode Output Voltage	R <sub>L</sub> = 100Ω, V <sub>CC</sub> = 3.0/3.6V	(2)		2.0	V	1, 2, 3
V <sub>OC</sub> - $\overline{V_{OC}}$	Difference in Common Mode Output	R <sub>L</sub> = 100Ω, V <sub>CC</sub> = 3.0/3.6V	(2)	-0.4	0.4	V	1, 2, 3
I <sub>IL</sub>	Low Level Input Current	V <sub>I</sub> = Gnd, V <sub>CC</sub> = 3.6V		-10		μA	1, 2, 3
I <sub>IH</sub>	High Level Input Current	V <sub>I</sub> = V <sub>CC</sub> , V <sub>CC</sub> = 3.6V			10	μA	1, 2, 3
V <sub>CL</sub>	Input Clamp Voltage	I <sub>I</sub> = -18mA, V <sub>CC</sub> = 3.0V			-1.5	V	1, 2, 3
I <sub>CC</sub>	Quiescent Power Supply Current	I <sub>O</sub> = 0uA, V <sub>I</sub> = V <sub>CC</sub> or Gnd, V <sub>CC</sub> = 3.6V			125	μA	1, 2, 3
I <sub>OZ</sub>	TRI-STATE Output Leakage Current	V <sub>O</sub> = V <sub>CC</sub> or Gnd, Enable = V <sub>IL</sub> , V <sub>CC</sub> = 3.6V, Enable = V <sub>IH</sub>			±20	μA	1, 2, 3
I <sub>SC</sub>	Output Short Circuit Current	V <sub>I</sub> = V <sub>CC</sub> or Gnd, V <sub>CC</sub> = 3.0/3.6V, V <sub>O</sub> = 0.0V	(2), (3)	-30	-160	mA	1, 2, 3
I <sub>Off</sub>	Output Leakage Current "Power Off"	V <sub>CC</sub> = 0V, V <sub>O</sub> = 6.0V or 3.0V			100	μA	1, 2, 3
		V <sub>CC</sub> = 0V, V <sub>O</sub> = -0.25V			-200	μA	1, 2, 3

(1) Parameter tested Go-No-Go only.

(2) See EIA specification RS-422 for exact test condition.

(3) This is a current sourced when a high output is shorted to Gnd. Only one output at a time should be shorted.

**DS26LV31M Electrical Characteristics AC Parameters - Propagation Delay Time**

The following conditions apply to all the following parameters, unless otherwise specified. AC: V<sub>CC</sub> = 3.0/3.6V

Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
t <sub>PLHD</sub>	Differential Propagation Delay (Low to High)	R <sub>L</sub> = 100Ω, C <sub>L</sub> = 50pF	(1)	5.0	25	ns	9, 10, 11
t <sub>PHLD</sub>	Differential Propagation Delay (High to Low)	R <sub>L</sub> = 100Ω, C <sub>L</sub> = 50pF	(1)	5.0	25	ns	9, 10, 11
t <sub>SKD</sub>	Differential Skew t <sub>PHLD</sub> -t <sub>PLHD</sub> (same channel)	R <sub>L</sub> = 100Ω, C <sub>L</sub> = 50pF	(1)		5.0	ns	9, 10, 11
t <sub>SK1</sub>	Pin to Pin Skew (same device)	R <sub>L</sub> = 100Ω, C <sub>L</sub> = 50pF	(1)		5.0	ns	9, 10, 11
t <sub>PZH</sub>	Output Enable Time	R <sub>L</sub> = 110Ω to Gnd, C <sub>L</sub> = 50pF	(2)		40	ns	9, 10, 11
t <sub>PZL</sub>	Output Enable Time	R <sub>L</sub> = 110Ω to V <sub>CC</sub> , C <sub>L</sub> = 50pF	(2)		40	ns	9, 10, 11
t <sub>PHZ</sub>	Output Disable Time	R <sub>L</sub> = 110Ω to Gnd, C <sub>L</sub> = 50pF	(2)		35	ns	9, 10, 11
t <sub>PLZ</sub>	Output Disable Time	R <sub>L</sub> = 110Ω to V <sub>CC</sub> , C <sub>L</sub> = 50pF	(2)		35	ns	9, 10, 11

(1) Generator waveform is specified as follows: f = 1MHz, Duty Cycle = 50%, Z<sub>O</sub> = 50Ω, t<sub>R</sub> = t<sub>F</sub> ≤ 6nS. Driver input = 0V to 3V with measure points equal to 1.5V. Differential output V<sub>Diff</sub> = D<sub>O</sub> -  $\overline{D^O}$  with measure point equal to 0V.

(2) Generator waveform is specified as follows: f = 1MHz, Duty Cycle = 50%, Z<sub>O</sub> = 50Ω, t<sub>R</sub> = t<sub>F</sub> ≤ 6nS. En/ $\overline{En}$  inputs = 0V to 3V with measure points equal to 1.5V on the inputs, to 1.3V on the outputs for L<sub>Z</sub> and Z<sub>H</sub>, and (V<sub>OL</sub> + 0.3V) for L<sub>Z</sub>, and (V<sub>OH</sub> - 0.3V) for H<sub>Z</sub>.

**REVISION HISTORY**

Released	Revision	Section	Originator	Changes
3/01/06	*	New Release, Corporate format	L. Lytle	1 MDS data sheets converted into one Corp. data sheet format. MNDS26LV31-X Rev 1A0 will be archived.
4/15/2013	A		TIS	Changed layout of National Data Sheet to TI format

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9858401QFA	ACTIVE	CFP	NAD	16	19	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26LV31W- QML Q 5962-98584 01QFA ACO 01QFA >T	
DS26LV31W-QML	ACTIVE	CFP	NAD	16	19	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS26LV31W- QML Q 5962-98584 01QFA ACO 01QFA >T	

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

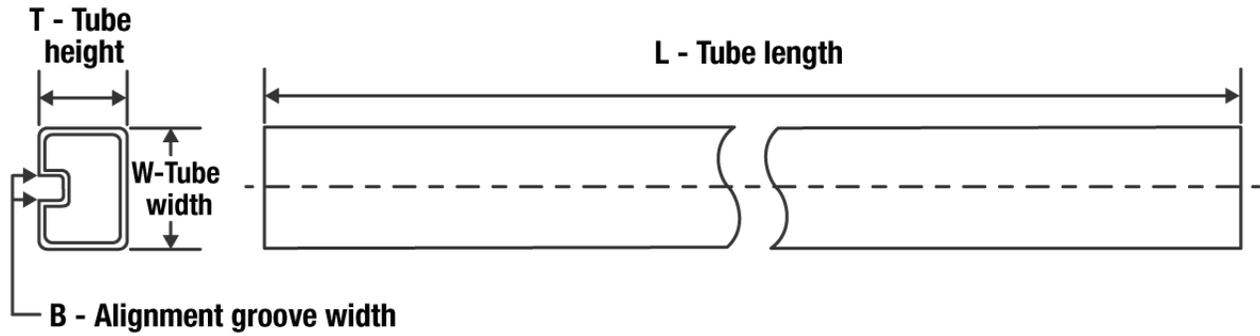
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

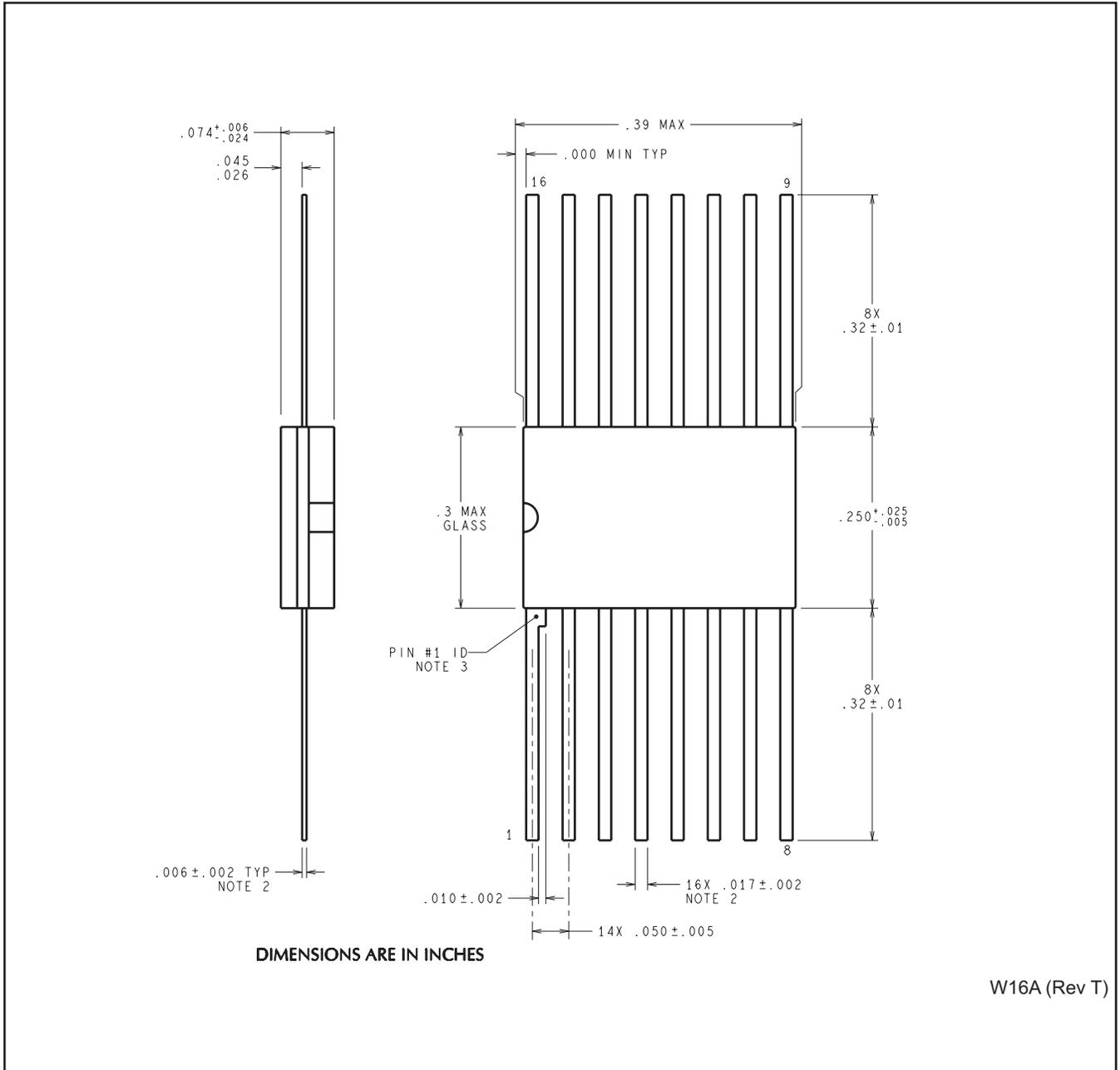
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-9858401QFA	NAD	CFP	16	19	502	23	9398	9.78
DS26LV31W-QML	NAD	CFP	16	19	502	23	9398	9.78

NAD0016A



W16A (Rev T)

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](http://ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2022, Texas Instruments Incorporated