

## DS26F32M Quad Differential Line Receivers

Check for Samples: [DS26F32M](#)

### FEATURES

- Military temperature range
- Input voltage range of  $\pm 7.0\text{V}$  (differential or common mode)  $\pm 0.2\text{V}$  sensitivity over the input voltage range
- Meets all the requirements of EIA standards RS-422 and RS-423
- High input impedance (18k typical)
- 30 mV input hysteresis
- Operation from single +5.0V supply
- Input pull-down resistor prevents output oscillation on unused channels
- TRI-STATE outputs, with choice of complementary enables, for receiving directly onto a data bus
- Propagation delay 15 ns typical

### DESCRIPTION

The DS26F32 is a quad differential line receiver designed to meet the requirements of EIA Standards RS-422 and RS-423, and Federal Standards 1020 and 1030 for balanced and unbalanced digital data transmission.

The DS26F32 offers improved performance due to the use of state-of-the-art L-FAST bipolar technology. The L-FAST technology allows for higher speeds and lower currents by utilizing extremely short gate delay times. Thus, the DS26F32 features lower power, extended temperature range, and improved specifications.

The device features an input sensitivity of 200 mV over the input common mode range of  $\pm 7.0\text{V}$ . The DS26F32 provides an enable function common to all four receivers and TRI-STATE outputs with 8.0 mA sink capability. Also, a fail-safe input/output relationship keeps the outputs high when the inputs are open.

The DS26F32 offers optimum performance when used with the DS26F31 Quad Differential Line Driver.

### Connection Diagram

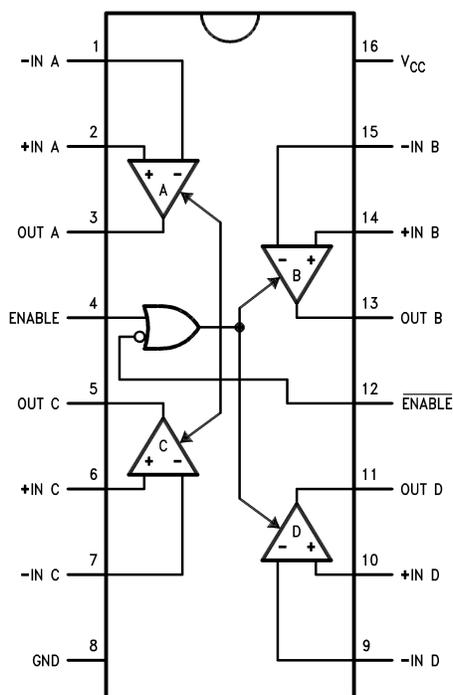


Figure 1. 16-Lead DIP Top View



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.

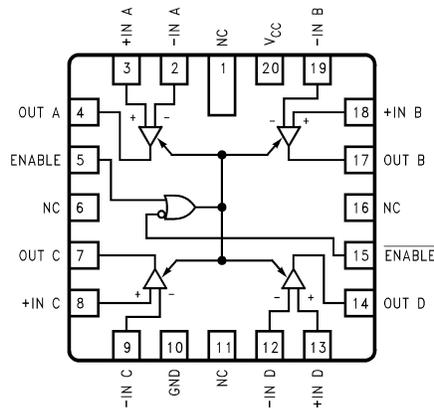


Figure 2. 20-Lead Ceramic Leadless Chip Carrier

Function Table <sup>(1)</sup>

Table 1. (Each Receiver)

Differential Inputs	Enables		Outputs
	E	$\bar{E}$	OUT
$V_{ID} = (V_{IN+}) - (V_{IN-})$	H	X	H
$V_{ID} \geq 0.2V$	X	L	H
$V_{ID} \leq -0.2V$	H	X	L
	X	L	L
X	L	H	Z

- (1) H = High Level  
L = Low Level  
X = Immaterial



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)</sup>

Storage Temperature Range	
Ceramic DIP	-65°C + to 175°C
Operating Temperature Range	
DS26F32M	-55°C to +125°C
DS26F32C	0°C to +70°C
Lead Temperature	
Ceramic DIP (soldering, 60 sec)	300°C
Maximum Power Dissipation <sup>(2)</sup> at 25°C	
Cavity Package	1500 mW
Supply Voltage	7.0V
Common Mode Voltage Range	±25V
Differential Input Voltage	±25V
Enable Voltage	7.0V
Output Sink Current	50 mA

- (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 [Electrical Characteristics](#) provide conditions for actual device operation.  
(2) Derate cavity package 10 mW/°C above 25°C.

## Operating Range

DS26F32M	
Temperature	-55°C to +125°C
Supply Voltage	4.5V to 5.5V

## Electrical Characteristics <sup>(1) (2)</sup>

Over operating range, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>TH</sub>	Differential Input Voltage	-7.0V ≤ V <sub>CM</sub> ≤ +7.0V, V <sub>O</sub> = V <sub>OL</sub> or V <sub>OH</sub>	-0.2	±0.06	+0.2	V
R <sub>I</sub>	Input Resistance	-15V ≤ V <sub>CM</sub> ≤ +15V, One Input AC Ground	14	18		kΩ
I <sub>I</sub>	Input Current (under Test)	V <sub>I</sub> = +15V, Other Input -15V ≤ V <sub>I</sub> ≤ +15V			2.3	mA
		V <sub>I</sub> = -15V, Other Input -15V ≤ V <sub>I</sub> ≤ +15V			-2.8	
V <sub>OH</sub>	Output Voltage HIGH	V <sub>CC</sub> = Min, ΔV <sub>I</sub> = +1.0V, V <sub>ENABLE</sub> = 0.8V, I <sub>OH</sub> = -440 μA	0°C to +70°C 2.8	3.4		V
			-55°C to +125°C 2.5	3.4		
V <sub>OL</sub>	Output Voltage LOW	V <sub>CC</sub> = Min, ΔV <sub>I</sub> = -1.0V, V <sub>ENABLE</sub> = 0.8V	I <sub>OL</sub> = 4.0 mA I <sub>OL</sub> = 8.0 mA		0.4 0.45	V
V <sub>IL</sub>	Enable Voltage LOW				0.8	
V <sub>IH</sub>	Enable Voltage HIGH		2.0			V
V <sub>IC</sub>	Enable Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = -18 mA			-1.5	V
I <sub>OZ</sub>	Off State (High Impedance) Output Current	V <sub>CC</sub> = Max	V <sub>O</sub> = 2.4V V <sub>O</sub> = 0.4V		20 -20	μA
I <sub>IL</sub>	Enable Current LOW	V <sub>I</sub> = 0.4V		-0.2	-0.36	
I <sub>IH</sub>	Enable Current HIGH	V <sub>I</sub> = 2.7V		0.5	10	μA
I <sub>I</sub>	Enable Input High Current	V <sub>I</sub> = 5.5V		1.0	50	μA
I <sub>OS</sub>	Output Short Circuit Current	V <sub>O</sub> = 0V, V <sub>CC</sub> = Max, <sup>(3)</sup> ΔV <sub>I</sub> = +1.0V	-15	-50	-85	mA
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max, All V <sub>I</sub> = GND, Outputs Disabled		30	50	mA
V <sub>HYST</sub>	Input Hysteresis	T <sub>A</sub> = 25°C, V <sub>CC</sub> = 5.0V, V <sub>CM</sub> = 0V		30		mV

(1) Unless otherwise specified min/max limits apply across the -55°C to +125°C temperature range for the DS26F32M and across the 0°C to +70°C range for the DS26F32C. All typicals are given for V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C.

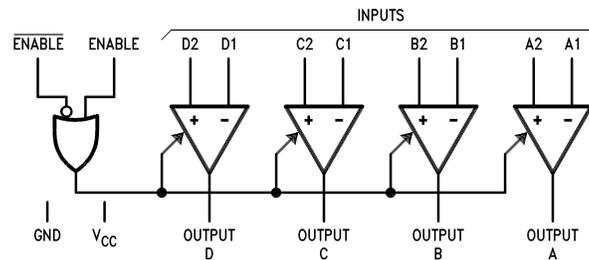
(2) All currents into the device pins are positive; all currents out of the device pins are negative. All voltages are reference to ground unless otherwise specified.

(3) Only one output at a time should be shorted.

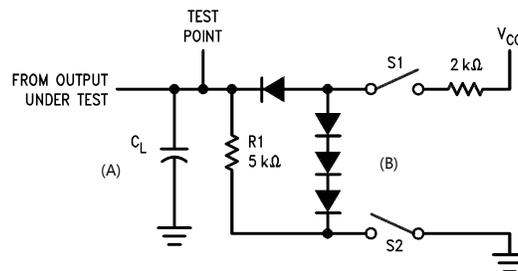
## Switching Characteristics

V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
t <sub>PLH</sub>	Input to Output	(Figure 4, Figure 5)	C <sub>L</sub> = 15 pF		15	22	ns
t <sub>PHL</sub>	Input to Output				15	22	ns
t <sub>LZ</sub>	Enable to Output	(Figure 4, Figure 6)	C <sub>L</sub> = 5 pF		14	18	ns
t <sub>HZ</sub>	Enable to Output				15	20	ns
t <sub>ZL</sub>	Enable to Output		C <sub>L</sub> = 15 pF		13	18	ns
t <sub>ZH</sub>	Enable to Output				12	16	ns

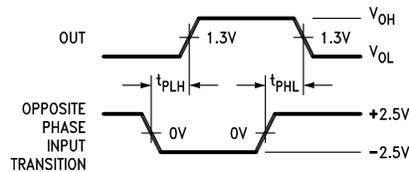


**Figure 3. Logic Symbol**



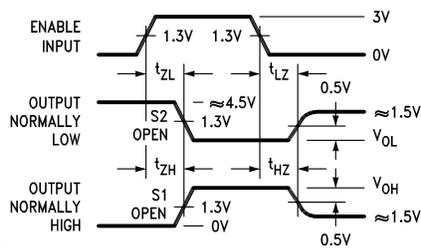
- A. All currents into the device pins are positive; all currents out of the device pins are negative. All voltages are reference to ground unless otherwise specified.
- B. Only one output at a time should be shorted.

**Figure 4. Load Test Circuit for Three-State Outputs**



- (1) Diagram shown for  $\overline{\text{ENABLE}}$  Low.
- (2) S1 and S2 of Load Circuit are closed except where shown.
- (3) Pulse Generator of all Pulses: Rate  $\leq 1.0$  MHz,  $Z_O = 50\Omega$ ,  $t_r \leq 6.0$  ns,  $t_f \leq 6.0$  ns.
- (4) All diodes are IN916 or IN3064.
- (5)  $C_L$  includes probe and jig capacitance.

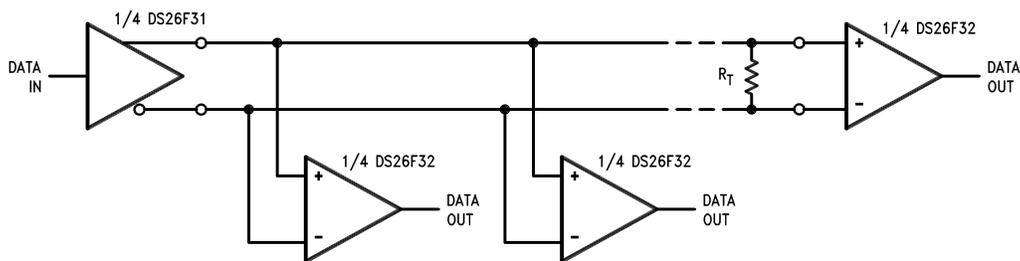
**Figure 5. Propagation Delay (see notes)**



- (1) Diagram shown for  $\overline{\text{ENABLE}}$  Low.
- (2) S1 and S2 of Load Circuit are closed except where shown.
- (3) Pulse Generator of all Pulses: Rate  $\leq 1.0$  MHz,  $Z_O = 50\Omega$ ,  $t_r \leq 6.0$  ns,  $t_f \leq 6.0$  ns.
- (4) All diodes are IN916 or IN3064.
- (5)  $C_L$  includes probe and jig capacitance.

Figure 6. Enable and Disable Times (see notes)

### Typical Application



## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)