National Semiconductor

May 1999

DS26F32M
Quad Differential Line Receivers

General 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 ±7.0V. 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.

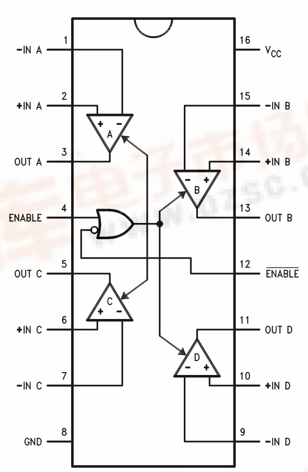
The DS26F32 offers optimum performance when used with the DS26F31 Quad Differential Line Driver.

Features

- Military temperature range
- Input voltage range of ±7.0V (differential or common mode) ±0.2V 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

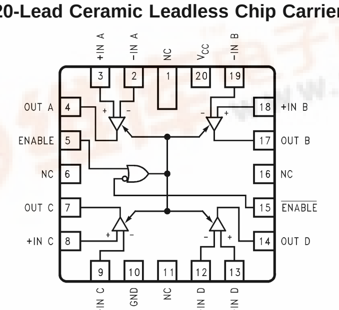
Connection Diagrams

16-Lead DIP



Top View
See NS Package Number J16A
For Complete Military Product Specifications, refer to the appropriate SMD or MDS.
Order Number DS26F32ME/883, DS26F32MJ/883 or DS26F32MW/883
See NS Package Number E20A, J16A or W16A

20-Lead Ceramic Leadless Chip Carrier



Function Table

(Each Receiver)

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

H = High Level
L = Low Level
X = Immaterial

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

Absolute Maximum Ratings (Note 2)

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

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 (Note 1) 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

Operating Range

DS26F32M	
Temperature	−55˚C to +125˚C
Supply Voltage	4.5V to 5.5V

Note 1: Derate cavity package 10 mW/˚C above 25˚C.

Electrical Characteristics (Notes 3, 4)

Over operating range, unless otherwise specified

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_{TH}	Differential Input Voltage	$-7.0V \le V_{CM} \le +7.0V$, $V_O = V_{OL}$ or V_{OH}		−0.2	±0.06	+0.2	V
R_I	Input Resistance	$-15V \le V_{CM} \le +15V$, One Input AC Ground		14	18		kΩ
I_I	Input Current (under Test)	$V_I = +15V$, Other Input $-15V \le V_I \le +15V$				2.3	mA
		$V_I = -15V$, Other Input $-15V \le V_I \le +15V$				−2.8	
V_{OH}	Output Voltage HIGH	V_{CC} = Min, $\Delta V_I = +1.0V$, $V_{\overline{ENABLE}} = 0.8V$, $I_{OH} = -440\ \mu A$	0˚C to +70˚C	2.8	3.4		V
			−55˚C to +125˚C	2.5	3.4		
V_{OL}	Output Voltage LOW	V_{CC} = Min, $\Delta V_I = -1.0V$, $V_{\overline{ENABLE}} = 0.8V$	I_{OL} = 4.0 mA			0.4	V
			I_{OL} = 8.0 mA			0.45	
V_{IL}	Enable Voltage LOW					0.8	V
V_{IH}	Enable Voltage HIGH			2.0			V
V_{IC}	Enable Clamp Voltage	V_{CC} = Min, I_I = −18 mA				−1.5	V
I_{OZ}	Off State (High Impedance) Output Current	V_{CC} = Max	V_O = 2.4V			20	µA
			V_O = 0.4V			−20	
I_{IL}	Enable Current LOW	V_I = 0.4V			−0.2	−0.36	mA
I_{IH}	Enable Current HIGH	V_I = 2.7V			0.5	10	µA
I_I	Enable Input High Current	V_I = 5.5V			1.0	50	µA
I_{OS}	Output Short Circuit Current	V_O = 0V, V_{CC} = Max, (Note 5) ΔV_I = +1.0V		−15	−50	−85	mA
I_{CC}	Supply Current	V_{CC} = Max, All V_I = GND, Outputs Disabled			30	50	mA
V_{HYST}	Input Hysteresis	T_A = 25˚C, V_{CC} = 5.0V, V_{CM} = 0V			30		mV

Note 2: "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 3: 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_{CC} = 5V and T_A = 25˚C.

Note 4: 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.

Note 5: Only one output at a time should be shorted.

Switching Characteristics

V_{CC} = 5.0V, T_A = 25˚C

Symbol	Parameter	Conditions		Min	Typ	Max	Units
t_{PLH}	Input to Output	(*Figures 2, 3*)	C_L = 15 pF		15	22	ns
t_{PHL}	Input to Output				15	22	ns
t_{LZ}	Enable to Output		C_L = 5 pF		14	18	ns
t_{HZ}	Enable to Output	(*Figures 2, 4*)			15	20	ns
t_{ZL}	Enable to Output		C_L = 15 pF		13	18	ns
t_{ZH}	Enable to Output				12	16	ns

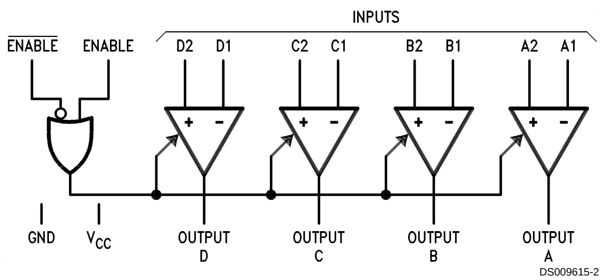


FIGURE 1. Logic Symbol

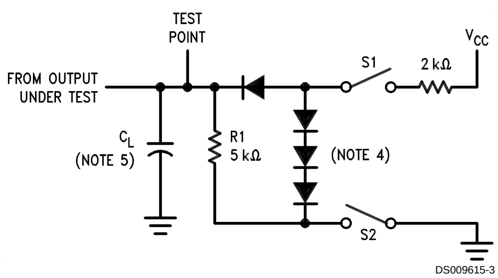


FIGURE 2. Load Test Circuit for Three-State Outputs

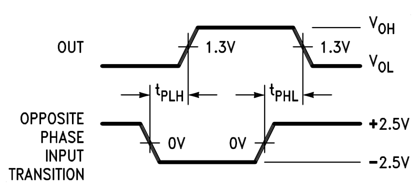
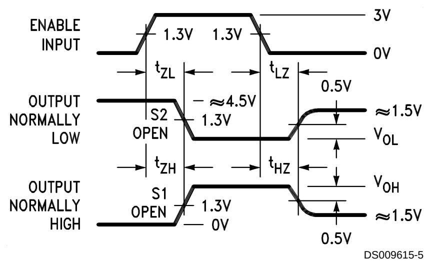


FIGURE 3. Propagation Delay (Notes 6, 7, 8)

Switching Characteristics (Continued)



Note 6: Diagram shown for $\overline{\text{ENABLE}}$ Low.

Note 7: S1 and S2 of Load Circuit are closed except where shown.

Note 8: Pulse Generator of all Pulses: Rate ≤ 1.0 MHz, $Z_O = 50\Omega$, $t_r \leq 6.0$ ns, $t_f \leq 6.0$ ns.

Note 9: All diodes are IN916 or IN3064.

Note 10: C_L includes probe and jig capacitance.

FIGURE 4. Enable and Disable Times (Notes 6, 7, 8)

Typical Application

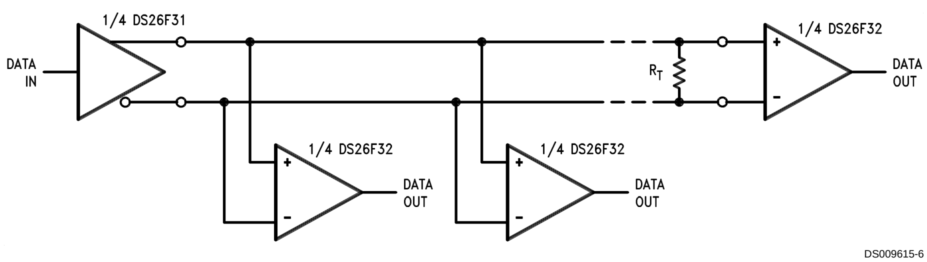
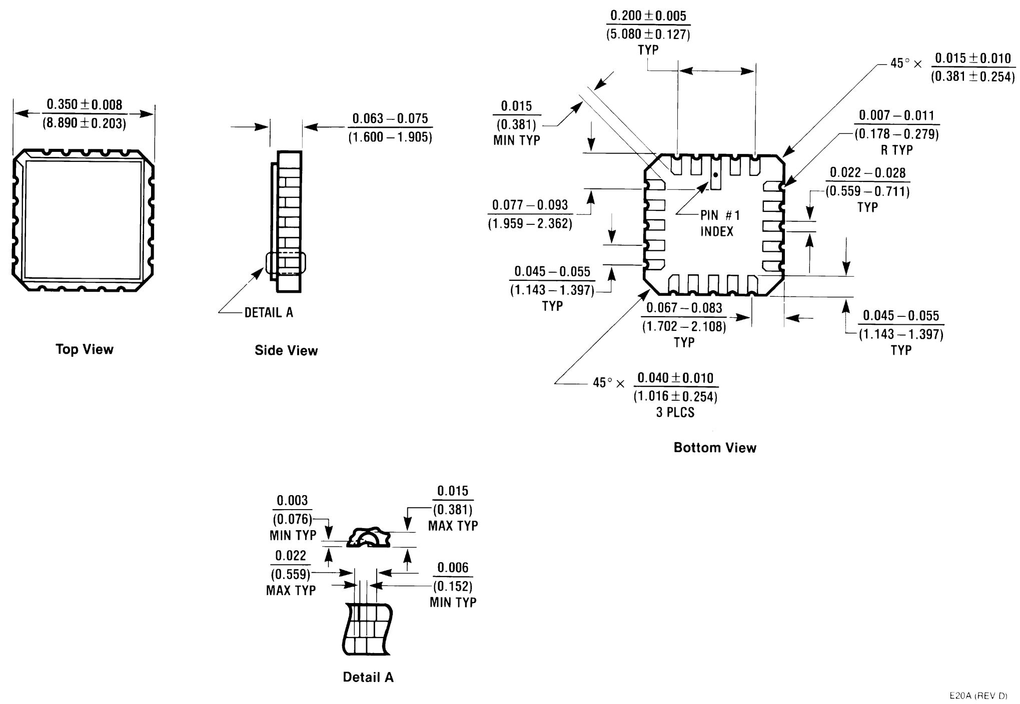
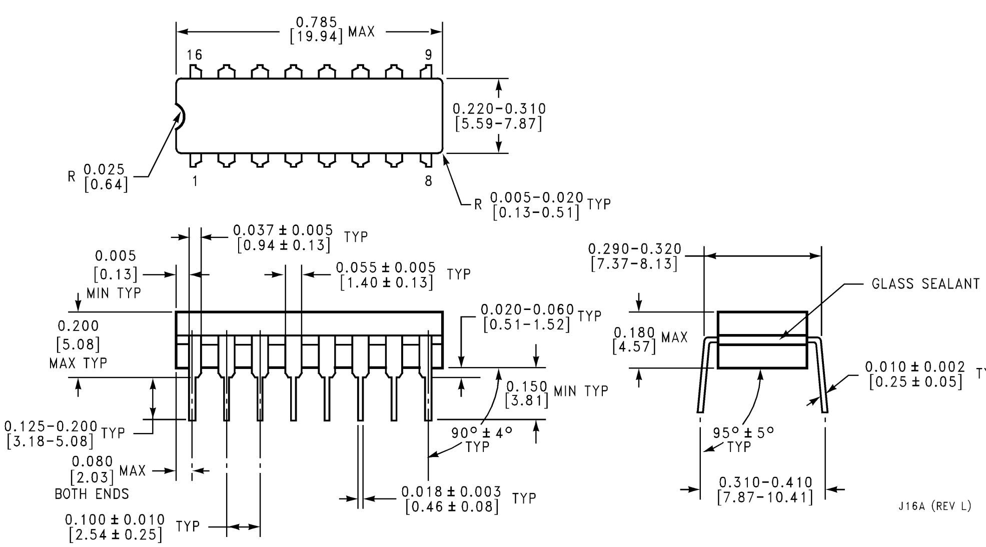


FIGURE 5.

Physical Dimensions inches (millimeters) unless otherwise noted

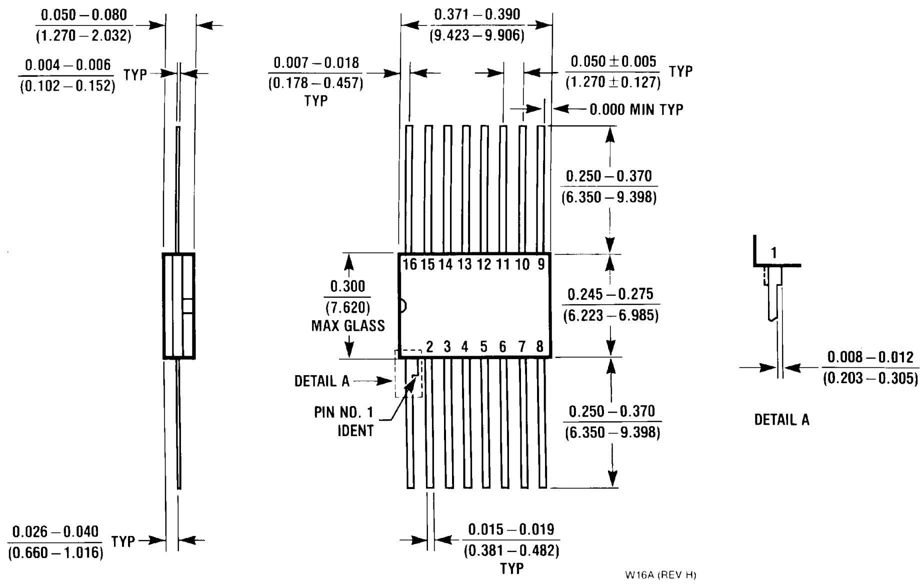


Order Number DS26F32ME/883
NS Package Number E20A



Ceramic Dual-In-Line Package (J)
Order Number DS26F32MJ/883
NS Package Number J16A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Order Number DS26F32MW/883
NS Package Number W16A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

National Semiconductor Corporation
Americas
Tel: 1-800-272-9959
Fax: 1-800-737-7018
Email: support@nsc.com

www.national.com

National Semiconductor Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 1 80-530 85 85
English Tel: +49 (0) 1 80-532 78 32
Français Tel: +49 (0) 1 80-532 93 58
Italiano Tel: +49 (0) 1 80-534 16 80

National Semiconductor Asia Pacific Customer Response Group
Tel: 65-2544466
Fax: 65-2504466
Email: sea.support@nsc.com

National Semiconductor Japan Ltd.
Tel: 81-3-5639-7560
Fax: 81-3-5639-7507