DS26LS32MQML Quad Differential Line Receivers

Check for Samples: DS26LS32MQML

FEATURES

- **High Differential or Common-Mode Input Voltage Ranges of ±7V on the DS26LS32.**
- **±0.2V Sensitivity Over the Input Voltage Range on the DS26LS32.**
- **DS26LS32 Meet All Requirements of RS-422 and RS-423**
- **6k Minimum Input Impedance**
- **100 mV Input Hysteresis on the DS26LS32**
- **Operation From a single 5V Supply**
- **TRI-STATE Outputs, with Choice of Complementary Output Enables for Receiving Directly onto a Data Bus**

DESCRIPTION

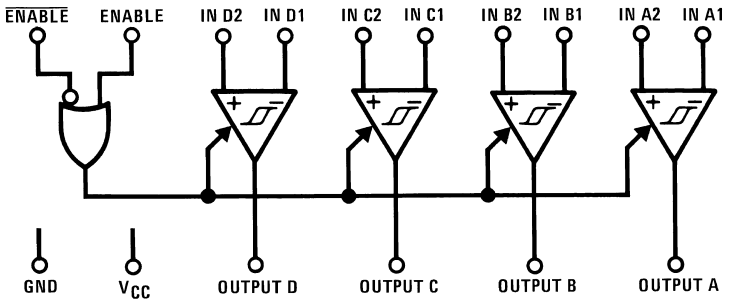
The DS26LS32 and DS26LS32A are quad differential line receivers designed to meet the RS-422, RS-423 and Federal Standards 1020 and 1030 for balanced and unbalanced digital data transmission.

The DS26LS32 and DS26LS32A have an input sensitivity of 200 mV over the input voltage range of ±7V. The DS26LS33 has an input sensitivity of 500 mV over the input voltage range of ±15V.

The DS26LS32A differs in function from the popular DS26LS32 and DS26LS33 in that input pull-up and pull-down resistors are included which prevent output oscillation on unused channels.

Each version provides an enable and disable function common to all four receivers and features TRI-STATE outputs with 8 mA sink capability. Constructed using low power Schottky processing, these devices are available over the full military and commercial operating temperature ranges.

Logic Diagram



Connection Diagram

Top View

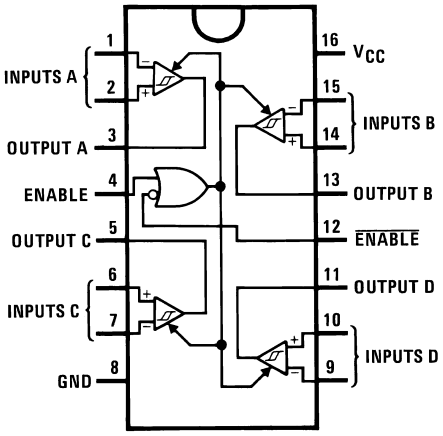


Figure 1. CDIP Package
See Package Numbers NFE0016A, NAD0016A

Top View

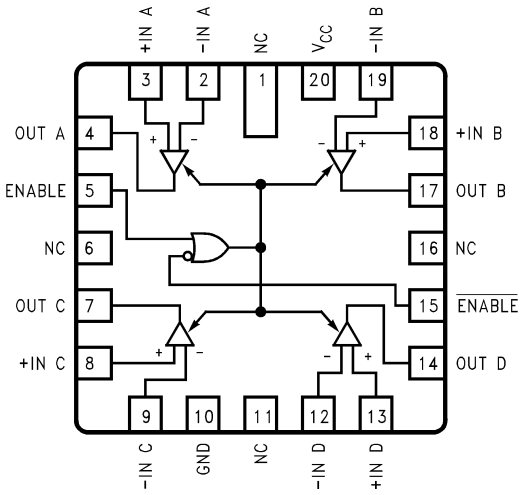


Figure 2. 20-Lead LCCC Package
See Package Number NAJ0020A

Truth Table(1)

ENABLE	$\overline{\text{ENABLE}}$	Input	Output
0	1	X	Hi-Z
See Note Below		$V_{ID} \geq V_{TH}$ (Max)	1
		$V_{ID} \leq V_{TH}$ (Min)	0

(1) Hi-Z = TRI-STATE
Note: Input conditions may be any combination not defined for ENABLE and $\overline{\text{ENABLE}}$.

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 (1)

Supply Voltage	7V
Common-Mode Range	±25V
Differential Input Voltage	±25V
Enable Voltage	7V
Output Sink Current	50 mA
Maximum Power Dissipation at 25°C (2)	
NFE0016A Package	1666.5 mW
NAJ0020A Package	1875 mW
NAD0016A Package	967.74 mW
Junction Temperature (T_J)	+150°C
Thermal Resistance, Junction-to-Ambient θ_{JA}	
NFE0016A Package	100°C/W
NAJ0020A Package	130°C/W
NAD0016A Package	140°C/W
Thermal Resistance, Junction-to-Ambient θ_{JC}	See MIL-STD-1835
Storage Temperature Range	−65°C to +165°C
Lead Temperature (Soldering, 4 seconds)	260°C
ESD Tolerance (3)	500V

(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 device should be operated at these limits. The table of “Electrical Characteristics” provides conditions for actual device operation.
(2) Derate NFE0016A, package 11.11 mW/°C above 25°C; derate NAJ0020A package 12.5 mW/°C above 25°C; derate NAD0016A Package 6.4516 mW/°C for above 25°C.
(3) Human body model, 1.5kΩ in series with 100pF.

Recommended Operating Conditions

Supply Voltage, V_{CC}	4.5 V to 5.5 V
Temperature, T_A	−55°C to +125°C

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

DS26LS32M 883 Electrical Characteristics DC Parameters

The following conditions apply, unless otherwise specified. V_{CC} = 5V

Parameter		Test Conditions	Notes	Min	Max	Unit	Sub-groups
I_{IN}	Input Current	V_{CC} = 5.5V, V_{IN} = 15V (Pin under test), other inputs -15V, ≤ V_{IN} ≤ +15V	(1)		2.3	mA	1, 2, 3
		V_{CC} = 5.5V, V_{IN} = -15V (Pin under test), other inputs -15V, ≤ V_{IN} ≤ +15V	(1)		-2.8	mA	1, 2, 3
I_{IL}	Logical "0" ENABLE Current	V_{CC} = 5.5V, V_{IN} = 0.4V	(1)		-360	uA	1, 2, 3
I_{IH}	Logical "1" ENABLE Current	V_{CC} = 5.5V, V_{IN} = 2.7V	(1)		20	uA	1, 2, 3
I_I	Logical "1" ENABLE Current	V_{CC} =5.5V, V_{IN} = 5.5V	(1)		100	uA	1, 2, 3
V_{IC}	Input Clamp Voltage (ENABLE)	V_{CC} = 4.5V, I_{IN} = -18mA	(1)		-1.5	V	1, 2, 3
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, I_{OH} = -440uA, ΔV_{IN} = 1V, V $\overline{\text{ENABLE}}$ = 0.8V	(1)	2.5		V	1, 2, 3
V_{OL}	Logical "0" Output Voltage	V_{CC} = 4.5V, I_{OL} = 4mA, ΔV_{IN} = -1V, V $\overline{\text{ENABLE}}$ = 0.8V	(1)		.4	V	1, 2, 3
		V_{CC} = 4.5V, I_{OL} = 8mA, ΔV_{IN} = -1V, V $\overline{\text{ENABLE}}$ = 0.8V	(1)		.45	V	1, 2, 3
I_{OS} (MIN)	Output Short Circuit Current	V_{CC} = 5.5V, V_O = 0V, ΔV_{IN} = 1V	(1)	-15		mA	1, 2, 3
I_{OS} (MAX)	Output Short Circuit Current	V_{CC} = 5.5V, V_O = 0V, ΔV_{IN} = 1V	(1)		-85	mA	1, 2, 3
I_{CC}	Supply Current	V_{CC} = 5.5V, All V_{IN} = GND, Outputs Disabled	(1)		70	mA	1, 2, 3
I_O	Off-State Output Current	V_{CC} = 5.5V, V_O = 0.4V	(1)		-20	uA	1, 2, 3
		V_{CC} = 5.5V, V_O = 2.4V	(1)		20	uA	1, 2, 3
V_{TH}	Differential Input Voltage	-7V ≤ V_{CM} ≤ 7V	(1) (2)	-0.2	0.2	V	1, 2, 3
R_{IN}	Input Resistance	-15V ≤ V_{CM} ≤ 15V	(1)	6		kohm	1, 2, 3
V_{IL}	Logical "0" Input Voltage (ENABLE)	V_{CC} = 4.5V	(1) (2)		0.8	V	1, 2, 3
V_{IH}	Logical "1" Input Voltage (ENABLE)	V_{CC} = 4.5V	(1) (2)	2		V	1, 2, 3

(1) For Subgroups 1 and 2, power dissipation must be externally controlled at elevated temperatures.
(2) Parameter tested go-no-go only.

DS26LS32M 883 Electrical Characteristics AC Parameters - Propagation Delay Time

The following conditions apply, unless otherwise specified. V_{CC} = 5V

Parameter		Test Conditions	Notes	Min	Max	Unit	Sub-groups
t_{PLH}	Propagation Delay Time	C_L = 15pF	(1)		30	nS	9,11,
t_{PLH}	Propagation Delay Time	C_L = 15pF	(1)		120	nS	10
t_{PHL}	Propagation Delay Time	C_L = 15pF	(1)		30	nS	9,11,
t_{PHL}	Propagation Delay Time	C_L = 15pF	(1)		120	nS	10
t_{PLZ}	Enable to Output	$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		34	nS	9
		$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		64	nS	10
		$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		27	nS	11
t_{PHZ}	Enable to Output	$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		32	nS	9,11,
		$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		35	nS	10
t_{PZL}	Enable to Output	$\overline{\text{ENABLE}}$ C_L = 15pF	(1)		34	nS	9
		$\overline{\text{ENABLE}}$ C_L = 15pF	(1)		65	nS	10
		$\overline{\text{ENABLE}}$ C_L = 15pF	(1)		27	nS	11

(1) Tested at 25°C, guaranteed but not tested at +125°C & −55°C

DS26LS32M 883 Electrical Characteristics AC Parameters - Propagation Delay Time (continued)

The following conditions apply, unless otherwise specified. V_{CC} = 5V

Parameter		Test Conditions	Notes	Min	Max	Unit	Sub-groups
t_{PZH}	Enable to Output	$\overline{ENABLE}$ C_L = 15pF	(1)		35	nS	9, 11
		$\overline{ENABLE}$ C_L = 15pF	(1)		65	nS	10

AC TEST CIRCUIT AND SWITCHING TIME WAVEFORMS

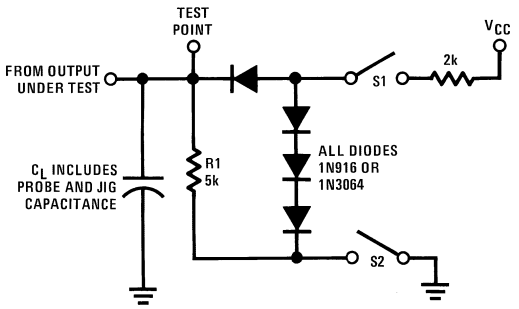
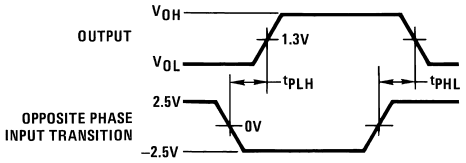


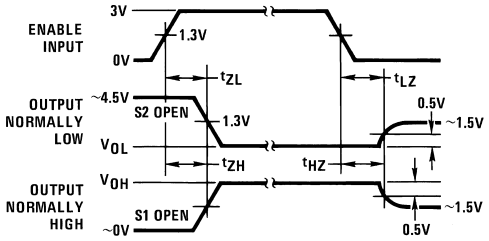
Figure 3. Load Test Circuit for TRI-STATE Outputs



(1) Diagram shown for $\overline{ENABLE}$ low.

(2) Pulse generator for all pulses: Rate = 1.0 MHz; Z_O = 50Ω; t_r ≤ 6 ns; t_f ≤ 6.0 ns.

Figure 4. Propagation Delay



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

(2) Pulse generator for all pulses: Rate = 1.0 MHz; Z_O = 50Ω; t_r ≤ 6 ns; t_f ≤ 6.0 ns.

Figure 5. Enable and Disable Times

TYPICAL APPLICATIONS

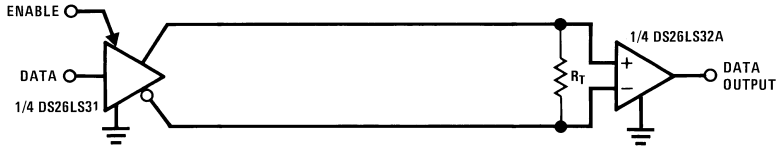


Figure 6. Two-Wire Balanced Interface—RS-422

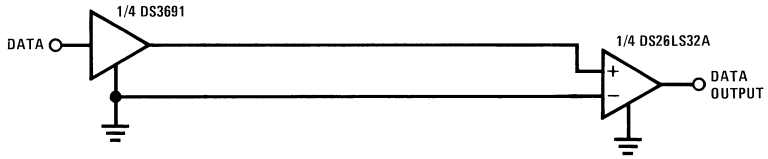


Figure 7. Single Wire with Driver Ground Reference—RS-423

REVISION HISTORY

Date Released	Revision	Section	Originator	Changes
10/20/05	A	New Release, Corporate format. Changes made in conversion: Ordering Info. Table, Absolute Ratings, Maximum Operating Conditions, Typos in QMLV & RH, 883 AC Electrical Characteristics Parameters Column.	R. Malone	1 MDS data sheet converted into Corporate data sheet format. **Added:** SMD reference for 883 NSID's, Juction temp., Thermal Resistance θ_{JA} and θ_{JC}. **Changed:** Maximum Operating Conditions to Recommended Operating Conditions, Enable and Disable Time to Enable to Output. Deleted max limit: 27nS for t_{PZH} and added subgroup 11 to max limit 35nS. MDS data sheet MNDS26LS32–X, Rev. 2B0 will be Archived.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
5962-7802006QEA	ACTIVE	CDIP	NFE	16	25	TBD	A42 SNPB	Level-1-NA-UNLIM	-55 to 125	DS26LS32MJ/883 5962-7802006QEA Q	Samples
AM26LS32DMB	ACTIVE	CDIP	NFE	16	25	TBD	A42 SNPB	Level-1-NA-UNLIM	-55 to 125	DS26LS32MJ/883 5962-7802006QEA Q	Samples
DS26LS32MJ/883	ACTIVE	CDIP	NFE	16	25	TBD	A42 SNPB	Level-1-NA-UNLIM	-55 to 125	DS26LS32MJ/883 5962-7802006QEA Q	Samples

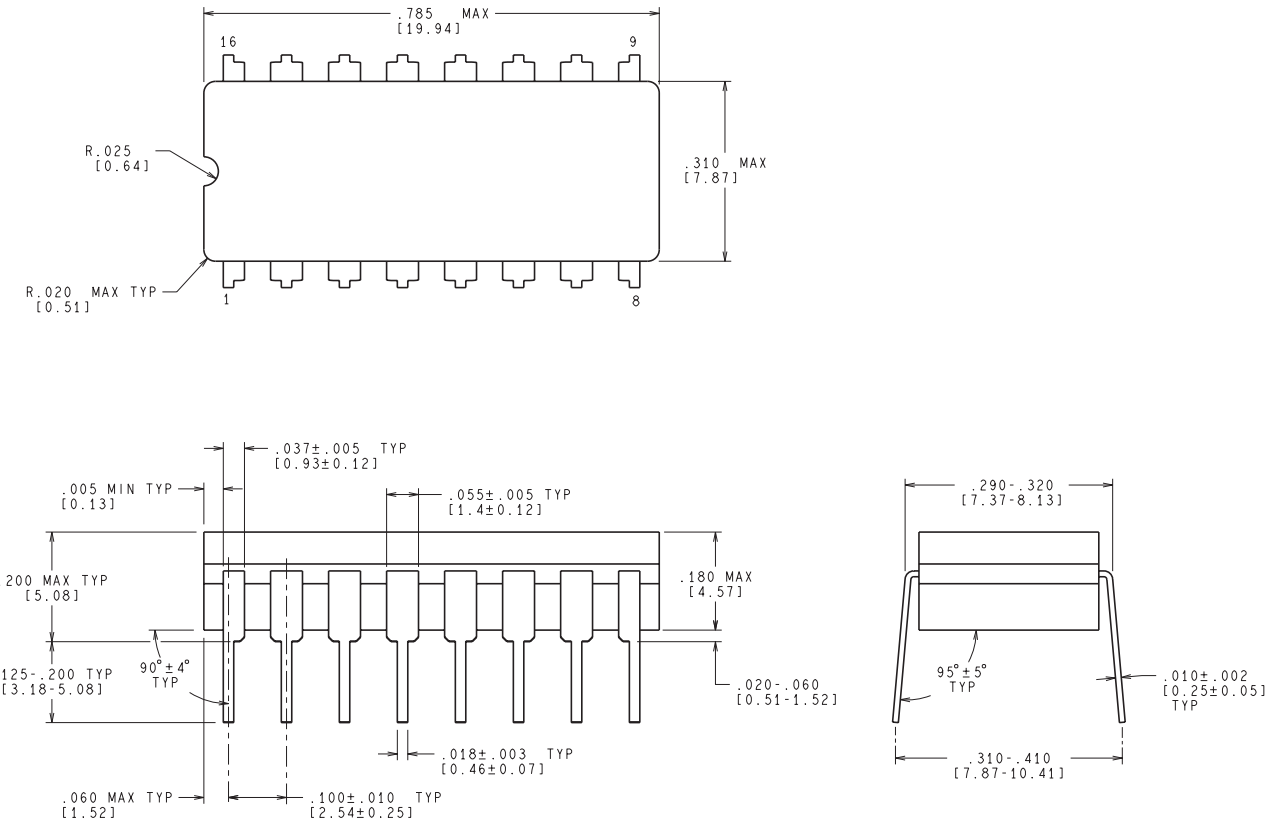
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, 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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

(4) Only one of markings shown within the brackets will appear on the physical device.

NFE0016A



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