

SEPTEMBER 2008

GENERAL DESCRIPTION

The SP26LV432 is a guad differential line receiver with three-state outputs designed to meet the EIA specifications of the RS-422 serial protocol. The SP26LV432 features Exar's BiCMOS process allowing low power operational characteristics of CMOS technology while meeting all of the demands of the RS-422 serial protocol at 50Mbps under load. The RS-422 protocol allows up to 10 receivers to be connected to a multipoint bus transmission line. The SP26LV432 features a receiver enable control common to all four receivers and a high-Z output with 6mA source and sink capability. Since the cabling can be as long as 4,000 feet, the RS-422 receivers of the SP26LV432 are equipped with a wide (-7.0V to +7.0V) common-mode input voltage range to accommodate ground potential differences.

FEATURES

- Quad Differential Line Receivers
- Compatible with the EIA standard for RS-422 serial protocol
- High-Z Output Control
- Switching Rates Up to 50Mbps
- 14ns Typical Receiver Propagation Delays
- 60mV Typical Input Hysteresis
- Single +3.3V Supply Operation
- Common Receiver Enable Control
- 26LV32 industry standard footprint compatible
- Ideal For Use with SP26LV431, Quad Drivers
- -7.0V to +7.0V Common-Mode Input Voltage range

ENABLE	ENABLE	INPUT	OUTPUT	
LOW	HIGH	don't care	High - Z	
HIGH	don't care	$V_{ID} \ge V_{TH} (max)$	HIGH	
HIGH	don't care	$V_{\text{ID}} \leq V_{\text{TH}} (\text{min})$	LOW	
don't care	LOW	$V_{ID} \ge V_{TH} (max)$	HIGH	
don't care	LOW	$V_{ID} \leq V_{TH} \left(min \right)$	LOW	
HIGH	don't care	OPEN	HIGH	RÕ ₄ RÕ ₃ RÕ ₂ RÕ ₁
don't care	LOW	OPEN	HIGH	GND OUTPUTS

FIGURE 1. TYPICAL APPLICATION CIRCUIT

REV. 1.0.0

HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER

FIGURE 2. PIN OUT ASSIGNMENT



ORDERING INFORMATION

PART NUMBER	Package	Operating Temperature Range	DEVICE STATUS
SP26LV432CP-L	16-pin Plastic DIP	0°C to +70°C	Active
SP26LV432CN-L	16-pin Narrow SOIC	0°C to +70°C	Active
SP26LV432CN-L/TR	16-pin Narrow SOIC	0°C to +70°C	Active
SP26LV432EN-L	16-pin Narrow SOIC	-40°C to +85°C	Active
SP26LV432EN-L/TR	16-pin Narrow SOIC	-40°C to +85°C	Active





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SP26LV432

PIN DESCRIPTIONS

Pin Assignments

PIN NUMBER	PIN NAME	Түре	DESCRIPTION	
1	RI ₁ B	I	Inverted RS-422 receiver input.	
2	R ₁ A	I	Non-inverted RS-422 Receiver input.	
3	RO ₁	0	TTL receiver output.	
4	ENABLE	I	Receiver input enable, active HIGH.	
5	RO ₂	0	TTL receiver output.	
6	RI ₂ A	I	Non-inverted RS-422 Receiver input.	
7	RI ₂ B	I	Inverted RS-422 receiver input.	
8	GND	Pwr	Ground.	
9	RI ₃ B	I	Inverted RS-422 receiver input.	
10	RI ₃ A	I	Non-inverted RS-422 Receiver input.	
11	RO ₃	0	TTL receiver output.	
12	ENABLE	I	Receiver input enable, active LOW.	
13	RO ₄	0	TTL receiver output.	
14	RI ₄ A	I	Non-inverted RS-422 Receiver input.	
15	RI ₄ B	I	Inverted RS-422 receiver input.	
16	Vcc	Pwr	+3.0V to +3.6V power supply.	

Pin type: I=Input, O=Output.



ABSOLUTE MAXIMUM RATINGS

These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections to the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability and cause permanent damage to the device.

V _{CC} (Supply Voltage)	7.0V			
V _{CM} (Common Mode Range)	±14V			
V _{DIFF} (Differential Input Voltage)	±14V			
V _{IN} (Enable Input Voltage)	Vcc + 1.5V			
T _{STG} (Storage Temperature Range)	-65°C to +150°C			
I _O (Maximum Current Per Output)	±25mA			
Storage Temperature Range	-65°C to + 150°C			
Power Dissipation 16-pin PDIP (derate 14.3mW/°C above +70°C)	1150mW			
Power Dissipation 16-pin NSOIC (derate 8.95mW/°C above +70°C)	725mW			

CAUTION:

ESD (Electrostatic Discharge) sensitive device. Permanent damage may occur on unconnected devices subject to high energy electrostatic fields. Unused devices must be stored in conductive foam or shunts. Personnel should be properly grounded prior to handling this device. The protective foam should be discharged to the destination socket before devices are removed.

ELECTRICAL CHARACTERISTICS

UNLESS OTHERWISE NOTED: THE FOLLOWING SPECIFICATIONS APPLY FOR VCC = +3.0V TO +3.6V WITH TA = +25°C AND ALL MIN AND MAX LIMITS APPLY ACROSS THE RECOMMENDED OPERATING TEMPERATURE RANGE.

SYMBOL	PARAMETERS	MIN.	TYP.	Max.	UNITS	CONDITIONS
V _{CC}	Supply Voltage	3.0		3.6	V	
	Enable Input Rise or Fall Times		3		ns	
Input Electric	cal Characteristics					
V _{TH}	Minimum Differential Input Voltage	-200	50	+200	mV	$V_{OUT} = V_{OH} \text{ or } V_{OL},$ -7V < V_{CM} < +7V
R _{IN}	Input Resistance	5.0			kΩ	V _{IN} = -7V, +7V, +10V Other input = GND
I _{IN}	Input Current		+1.25	+1.5	mA	V _{IN} = +10V, Other input = GND
I _{IN}	Input Current		-1.5V	-2.5V	mA	V _{IN} = -10V, Other input = GND
V _{IH(EN)}	Minimum Enable HIGH Input Level Voltage	2.0			V	
V _{IL(EN)}	Maximum Enable LOW Input Level Voltage			0.8	V	
I _{EN}	Maximum Enable Input Current		±1.0		μΑ	$V_{IN} = V_{CC}$ or GND
V _{HYST}	Input Hysteresis		60		mV	V _{CM} = 0V
I _{CC}	Quiescent Supply Current		5	15	mA	V _{CC} = +3.3V, V _{DIFF} = +1V



REV. 1.0.0

HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER

Unless otherwise noted: The following specifications apply for VCC = +3.0V to +3.6V with TA = $+25^{\circ}C$ and all MIN and MAX limits apply across the recommended operating temperature range.

SYMBOL	PARAMETERS	Min.	TYP.	MAX.	UNITS	CONDITIONS	
Output Elect	rical Characteristics				·		
V _{OH}	Minimum HIGH Level Output Voltage	2.4	2.8		V	V _{CC} = +3.0V, V _{DIFF} = +1V, I _{OUT} = -6mA	
V _{OL}	Maximum LOW Level Output Voltage		0.2	0.5	V	V _{CC} = +3.0V, V _{DIFF} = -1V, I _{OUT} = +6mA	
l _{ozq}	Maximum Tri-State Output Leakage Current		±0.5	±5.0	μA	$V_{OUT} = V_{CC} \text{ or GND},$ ENABLE = V_{IL} , ENABLE = V_{IH}	
Switching Ch	Switching Characteristics						
t _{PLH} , t _{PHL}	Propagation Delays		14	35	ns	$C_{L} = 50$ pF, $V_{DIFF} = 2.5$ V, $V_{CM} = 0$ V, $V_{CC} = +3.3$ V	
t _{RISE} , t _{FALL}	Output Rise and Fall Times		5	10	ns	$C_{L} = 50$ pF, $V_{DIFF} = 2.5$ V, $V_{CM} = 0$ V, $V_{CC} = +3.3$ V	
t _{PZH,} t _{PZL}	Output Enable Time			40	ns	$C_{L} = 50 \text{pF}, R_{L} = 1000 \Omega,$ $V_{DIFF} = 2.5 \text{V}, V_{CC} = +3.3 \text{V}$	
t _{PHZ} , t _{PLZ}	Output Disable Time			40	ns	$C_L = 50 \text{pF}, R_L = 1000\Omega,$ $V_{\text{DIFF}} = 2.5 \text{V}, V_{\text{CC}} = +3.3 \text{V}$	

HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER



FIGURE 3. SP26LV432 BLOCK DIAGRAM



FIGURE 4. PROPAGATION DELAY





FIGURE 5. TEST CIRCUIT FOR HIGH-Z OUTPUT TIMING



FIGURE 6. HIGH IMPEDANCE OUTPUT ENABLE AND DISABLE WAVEFORMS



SP26LV432 HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER



FIGURE 7. DIFFERENTIAL PROPAGATION DELAY VS TEMPERATURE



FIGURE 8. DIFFERENTIAL PROPAGATION DELAY VS SUPPLY VOLTAGE





FIGURE 9. DIFFERENTIAL SKEW VS TEMPERATURE



FIGURE 10. DIFFERENTIAL SKEW VS SUPPLY VOLTAGE



HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER

















FIGURE 14. LOW OUTPUT VOLTAGE VS CURRENT OVER SUPPLY VOLTAGE



HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER



FIGURE 15. INPUT RESISTANCE VS INPUT VOLTAGE



FIGURE 16. INPUT CURRENT VS SUPPLY VOLTAGE





FIGURE 17. TRANSITION VOLTAGE VS TEMPERATURE



FIGURE 18. TRANSITION VOLTAGE VS SUPPLY VOLTAGE



HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER



FIGURE 19. SUPPLY CURRENT VS TEMPERATURE



FIGURE 20. DISABLED SUPPLY CURRENT VS SUPPLY VOLTAGE





FIGURE 21. SUPPLY CURRENT VS DATA RATE



HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER



1.0 PRODUCT DESCRIPTION

The **SP26LV432** is a low-power quad differential line receiver designed for digital data transmission meeting the specifications of the EIA standard RS-422 serial protocol. The **SP26LV432** features Exar's BiCMOS process allowing low power operational characteristics of CMOS technology while meeting all of the demands of the RS-422 serial protocol up to 50Mbps under load in harsh environments.

The RS-422 standard is ideal for multi-drop applications and for long-distance communication. The RS-422 protocol allows up to 10 receivers to be connected to a data bus, making it an ideal choice for multi-drop applications. Since the cabling can be as long as 4,000 feet, RS-422 Receivers have an input sensitivity of 200mV over the wide (-7.0V to +7.0V) common mode range to accommodate ground potential differences. Internal pull-up and pull-down resistors prevent output oscillation on unused channels. Because the RS-422 is a differential interface, data is virtually immune to noise in the transmission line.

The **SP26LV432** accepts RS-422 levels and translates these into TTL or CMOS output levels. The **SP26LV432** features active HIGH and active LOW receiver enable controls common to all four receiver channels see **Table 1**. A logic HIGH on the ENABLE pin (pin 4) or a logic LOW on the ENABLE pin (pin 12) will enable the receiver outputs. A logic LOW on the ENABLE pin (pin 4) and a logic HIGH on the ENABLE pin (pin 12) will force the receiver outputs into high impedance (high-Z). Refer to the truth table in **Table 1**.

The RS-422 line receivers feature high source and sink current capability. All receivers are internally protected against short circuits on their inputs. The receivers feature tri-state outputs with 6mA source and sink capability. The typical receiver propagation delay is 14ns (35ns max). To minimize reflections, the multipoint bus transmission line should be terminated at both ends in its characteristic impedance, and stub lenghts off the main line should be kept as short as possible.



FIGURE 22. TWO-WIRE BALANCED SYSTEM, RS-422



TABLE 1: TRUTH TABLE	E, ENABLE/DISABLE FUNCTION C	COMMON TO ALL FOUR RS-422 RECEIVERS
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ENABLE	ENABLE	Ινρυτ	Ουτρυτ
LOW	HIGH	don't care	high-Z
HIGH	don't care	$V_{ID} \ge V_{TH} (max)$	HIGH
HIGH	don't care	$V_{ID} \leq V_{TH}$ (min)	LOW
don't care	LOW	$V_{ID} \ge V_{TH}$ (max)	HIGH
don't care	LOW	$V_{\text{ID}} \leq V_{\text{TH}}$ (min)	LOW
HIGH	don't care	Open	HIGH
don't care	LOW	Open	HIGH

SP26LV432 HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER



PACKAGE DIMENSIONS (16 PIN NSOIC)





HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER

PACKAGE DIMENSIONS (16 PIN PDIP)





HIGH SPEED +3.3V QUAD RS-422 DIFFERENTIAL LINE RECEIVER

REVISION HISTORY

DATE	REVISION	DESCRIPTION
3/08/04	А	Production Release.
3/08/04	В	Include tape and reel p/n's.
4/17/06	С	Fixed Truth Table typo page 1
9/05/08	1.0.0	Converted to Exar standard datasheet format. Added Ordering Information for -40C to +85C operating temperature range NSOIC package. Changed revision to 1.0.0.

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