

# AM26C32 QUADRUPLE DIFFERENTIAL LINE RECEIVER

SLLS104H – DECEMBER 1990 – REVISED FEBRUARY 2002

- Meets or Exceeds the Requirements of ANSI TIA/EIA-422-B, TIA/EIA-423-B, and ITU Recommendation V.10 and V.11
- Low Power,  $I_{CC} = 10 \text{ mA Typ}$
- $\pm 7\text{-V}$  Common-Mode Range With  $\pm 200\text{-mV}$  Sensitivity
- Input Hysteresis . . . 60 mV Typ
- $t_{pd} = 17 \text{ ns Typ}$
- Operates From a Single 5-V Supply
- 3-State Outputs
- Input Fail-Safe Circuitry
- Improved Replacements for AM26LS32
- Available in Q-Temp Automotive
  - High Reliability Automotive Applications
  - Configuration Control/Print Support
  - Qualification to Automotive Standards

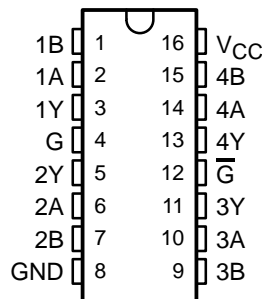
## description

The AM26C32 is a quadruple differential line receiver for balanced or unbalanced digital data transmission. The enable function is common to all four receivers and offers a choice of active-high or active-low input. The 3-state outputs permit connection directly to a bus-organized system. Fail-safe design specifies that if the inputs are open, the outputs are always high.

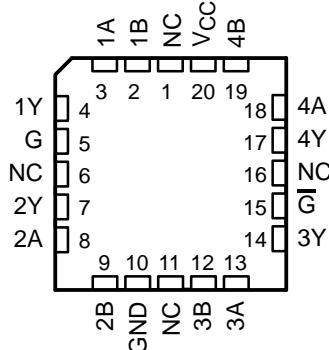
The AM26C32 devices are manufactured using a BiCMOS process, which is a combination of bipolar and CMOS transistors. This process provides the high voltage and current of bipolar with the low power of CMOS to reduce the power consumption to about one-fifth that of the standard AM26LS32, while maintaining ac and dc performance.

The AM26C32C is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ . The AM26C32I is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ . The AM26C32Q is characterized for operation from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The AM26C32M is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

AM26C32C, AM26C32I, AM26C32Q . . . D, N, OR NS PACKAGE  
AM26C32M . . . J OR W PACKAGE  
(TOP VIEW)



AM26C32M . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

# AM26C32

## QUADRUPLE DIFFERENTIAL LINE RECEIVER

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AVAILABLE OPTIONS

T <sub>A</sub>	PACKAGED DEVICES				
	SMALL OUTLINE (D, NS)	PLASTIC DIP (N)	CERAMIC CHIP CARRIER (FK)	CERAMIC DIP (J)	CERAMIC FLATPACK (W)
0°C to 70°C	AM26C32CD AM26C32CNS	AM26C32CN —	—	—	—
–40°C to 85°C	AM26C32ID AM26C32INS	AM26C32IN —	—	—	—
–40°C to 125°C	AM26C32QD	AM26C32QN	—	—	—
–55°C to 125°C	—	—	AM26C32MFK	AM26C32MJ	AM26C32MW

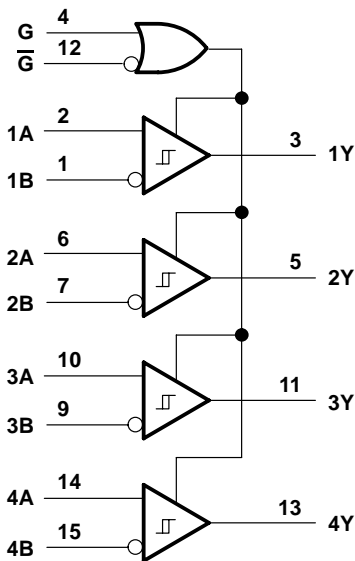
The D package is available taped and reeled. Add the suffix R to the device type (e.g., AM26C32CDR). The NS package is only available taped and reeled.

FUNCTION TABLE  
(each receiver)

DIFFERENTIAL INPUT	ENABLES		OUTPUT Y
	G	$\overline{G}$	
$V_{ID} \geq V_{IT+}$	H	X	H
	X	L	H
$V_{IT-} < V_{ID} < V_{IT+}$	H	X	?
	X	L	?
$V_{ID} \leq V_{IT-}$	H	X	L
	X	L	L
X	L	H	Z

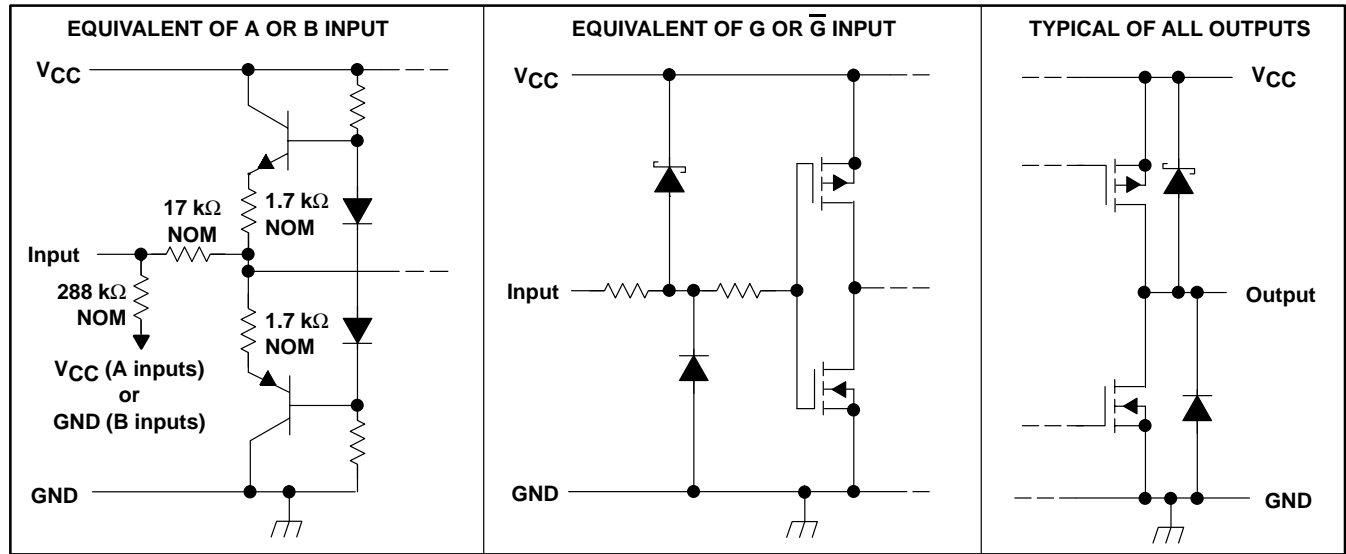
H = high level, L = low level, X = irrelevant  
Z = high impedance (off), ? = indeterminate

### logic diagram (positive logic)



Pin numbers shown are for the D, J, N, NS, and W packages.

### schematics



### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage range, $V_I$ : A or B inputs	–11 V to 14 V
G or $\bar{G}$ inputs	–0.5 V to $V_{CC} + 0.5$ V
Differential input voltage range, $V_{ID}$	–14 V to 14 V
Output voltage range, $V_O$	–0.5 V to $V_{CC} + 0.5$ V
Output current, $I_O$	±25 mA
Package thermal impedance, $\theta_{JA}$ (see Notes 2 and 3): D package	73°C/W
N package	67°C/W
NS package	64°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, $T_{stg}$	–65°C to 150°C

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values, except differential output voltage,  $V_{OD}$ , are with respect to network GND. Currents into the device are positive and currents out of the device are negative.
  2. Maximum power dissipation is a function of  $T_J(\max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\max) - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  of 150°C can affect reliability.
  3. The package thermal impedance is calculated in accordance with JESD 51-7.

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### recommended operating conditions

		MIN	NOM	MAX	UNIT
$V_{CC}$	Supply voltage	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			V
$V_{IL}$	Low-level input voltage			0.8	V
$V_{IC}$	Common-mode input voltage			$\pm 7$	V
$I_{OH}$	High-level output current			-6	mA
$I_{OL}$	Low-level output current			6	mA
$T_A$	Operating free-air temperature	AM26C32C	0	70	$^{\circ}\text{C}$
		AM26C32I	-40	85	
		AM26C32Q	-40	125	
		AM26C32M	-55	125	

### electrical characteristics over recommended ranges of $V_{CC}$ , $V_{IC}$ , and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{IT+}$	Differential input high-threshold voltage	$V_O = V_{OH}(\text{min})$ , $I_{OH} = -440 \mu\text{A}$	$V_{IC} = -7 \text{ V to } 7 \text{ V}$		0.2	V
			$V_{IC} = 0 \text{ to } 5.5 \text{ V}$		0.1	
$V_{IT-}$	Differential input low-threshold voltage	$V_O = 0.45 \text{ V}$ , $I_{OL} = 8 \text{ mA}$	$V_{IC} = -7 \text{ V to } 7 \text{ V}$	-0.2‡		V
			$V_{IC} = 0 \text{ to } 5.5 \text{ V}$	-0.1‡		
$V_{hys}$	Hysteresis voltage ( $V_{IT+} - V_{IT-}$ )			60		mV
$V_{IK}$	Enable input clamp voltage	$V_{CC} = 4.5 \text{ V}$ , $I_I = -18 \text{ mA}$			-1.5	V
$V_{OH}$	High-level output voltage	$V_{ID} = 200 \text{ mV}$ , $I_{OH} = -6 \text{ mA}$	3.8			V
$V_{OL}$	Low-level output voltage	$V_{ID} = -200 \text{ mV}$ , $I_{OL} = 6 \text{ mA}$		0.2	0.3	V
$I_{OZ}$	Off-state (high-impedance state) output current	$V_O = V_{CC} \text{ or GND}$		$\pm 0.5$	$\pm 5$	$\mu\text{A}$
$I_I$	Line input current	$V_I = 10 \text{ V}$ , Other input at 0 V			1.5	mA
		$V_I = -10 \text{ V}$ , Other input at 0 V			-2.5	
$I_{IH}$	High-level enable current	$V_I = 2.7 \text{ V}$			20	$\mu\text{A}$
$I_{IL}$	Low-level enable current	$V_I = 0.4 \text{ V}$			-100	$\mu\text{A}$
$r_i$	Input resistance	One input to ground	12	17		$\text{k}\Omega$
$I_{CC}$	Supply current	$V_{CC} = 5.5 \text{ V}$		10	15	mA

† All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $V_{IC} = 0$ , and  $T_A = 25^{\circ}\text{C}$ .

‡ The algebraic convention, in which the less positive (more negative) limit is designated minimum, is used in this data sheet for common-mode input voltage.

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switching characteristics over recommended ranges of operation conditions,  $C_L = 50$  pF (unless otherwise noted)

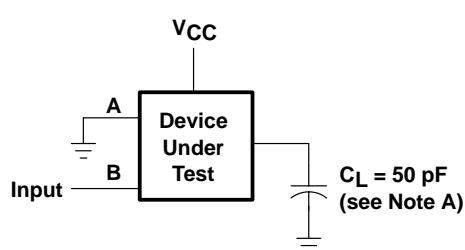
PARAMETER	TEST CONDITIONS	AM26C32C AM26C32I			AM26C32Q AM26C32M			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
$t_{PLH}$ Propagation delay time, low- to high-level output	See Figure 1	9	17	27	9	17	27	ns
$t_{PHL}$ Propagation delay time, high- to low-level output		9	17	27	9	17	27	ns
$t_{TLH}$ Output transition time, low- to high-level output	See Figure 1		4	9		4	10	ns
$t_{THL}$ Output transition time, high- to low-level output			4	9		4	9	ns
$t_{PZH}$ Output enable time to high level	See Figure 2		13	22		13	22	ns
$t_{PZL}$ Output enable time to low level			13	22		13	22	ns
$t_{PHZ}$ Output disable time from high level	See Figure 2		13	22		13	26	ns
$t_{PLZ}$ Output disable time from low level			13	22		13	25	ns

† All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .

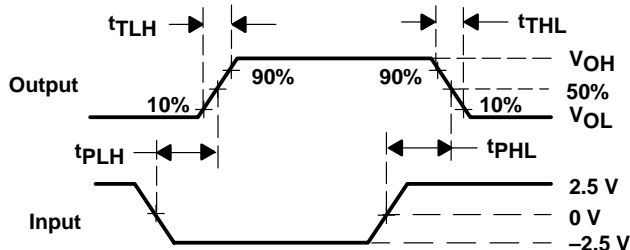
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## PARAMETER MEASUREMENT INFORMATION



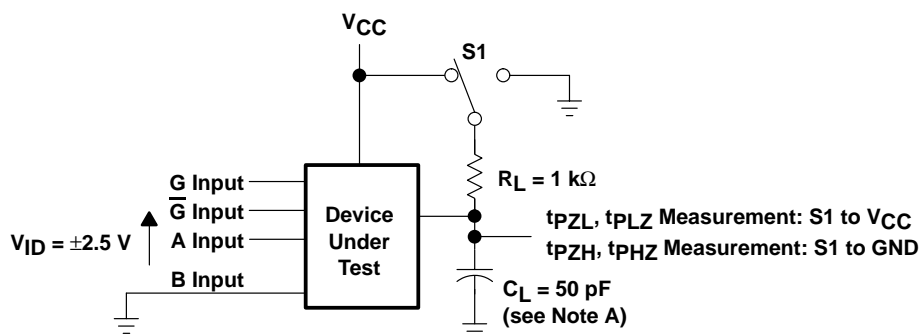
TEST CIRCUIT



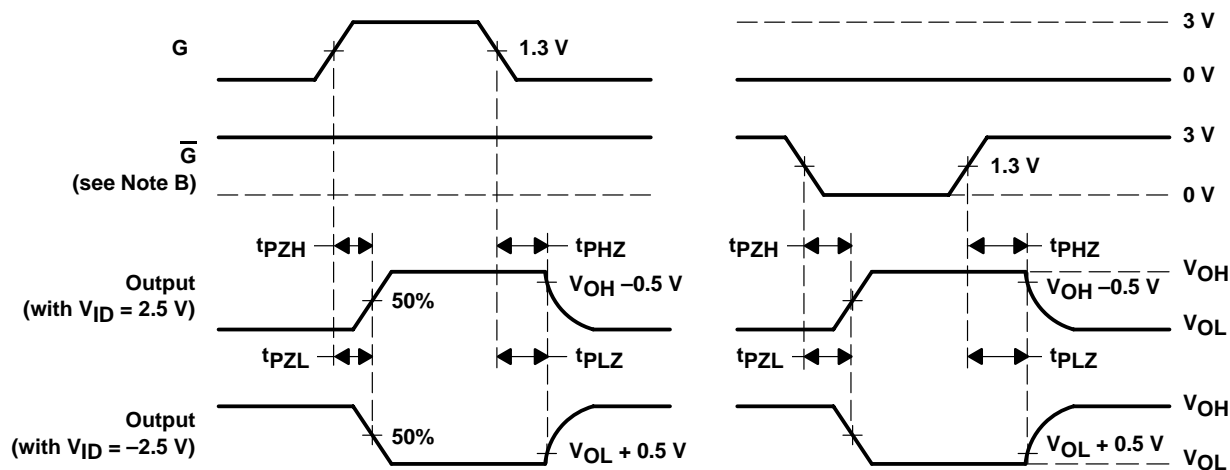
VOLTAGE WAVEFORMS

NOTE A:  $C_L$  includes probe and jig capacitance.

Figure 1. Switching Test Circuit and Voltage Waveforms



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle ≤ 50%,  $t_r = t_f = 6$  ns.

Figure 2. Enable/Disable Time Test Circuit and Output Voltage Waveforms

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