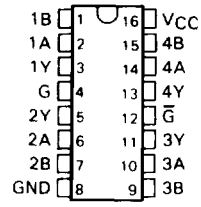
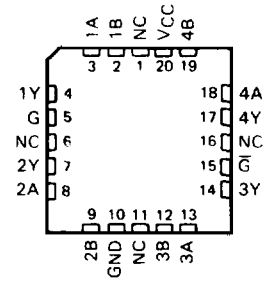
D2434, OCTOBER 1980 – REVISED SEPTEMBER 1986

- **AM26LS32A Meets EIA Standards RS-422-A and RS-423-A**
- **AM26LS32A Has ±7-V Common-Mode Range With ±200-mV Sensitivity**
- **AM26LS33A Has ±15-V Common-Mode Range With ±500 mV Sensitivity**
- **Input Hysteresis . . . 50 mV Typical**
- **Operates From a Single 5-V Supply**
- **Low-Power Schottky Circuitry**
- **3-State Outputs**
- **Complementary Output Enable Inputs**
- **Input Impedance . . . 12 kΩ Min**
- **Designed to Be Interchangeable With Advanced Micro Devices AM26LS32C and AM26LS33C**

AM26LS32AC, AM26LS33AC . . . D, J, OR N PACKAGE
AM26LS32AM, AM26LS33AM . . . J PACKAGE
(TOP VIEW)



AM26LS32AM, AM26LS33AM . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

The AM26LS32A and AM26LS33A are quadruple line receivers for balanced and unbalanced digital data transmission. The enable function is common to all four receivers and offers a choice of active-high or active-low input. Three-state outputs permit connection directly to a bus-organized system. Fail-safe design ensures that if the inputs are open, the outputs will always be high.

Compared to the AM26LS32C and the AM26LS33C, the AM26LS32A and AM26LS33A incorporate an additional stage of amplification to improve sensitivity. The input impedance has been increased resulting in less loading of the bus line. The additional stage has increased propagation delay; however, this will not affect interchangeability in most applications.

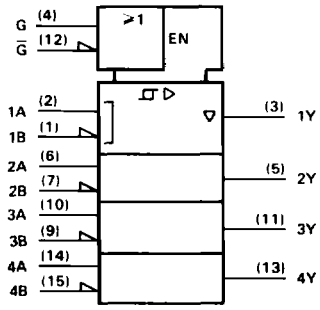
The AM26LS32AC and AM26LS33AC are characterized for operation from 0°C to 70°C. The AM26LS32AM and the AM26LS33AM are characterized for operation over the full military temperature range of −55°C to 125°C.

FUNCTION TABLE (EACH RECEIVER)

DIFFERENTIAL INPUT	ENABLES G	ENABLES $\overline{G}$	OUTPUT
$V_{ID} \geq V_{TH}$	H	X	H
	X	L	H
$V_{TL} \leq V_{ID} \leq V_{TH}$	H	X	?
	X	L	?
$V_{ID} \leq V_{TL}$	H	X	L
	X	L	L
X	L	H	Z

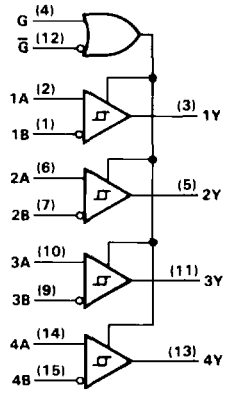
H = high level, L = low level, X = irrelevant
Z = high impedance (off), ? = indeterminate

logic symbol†

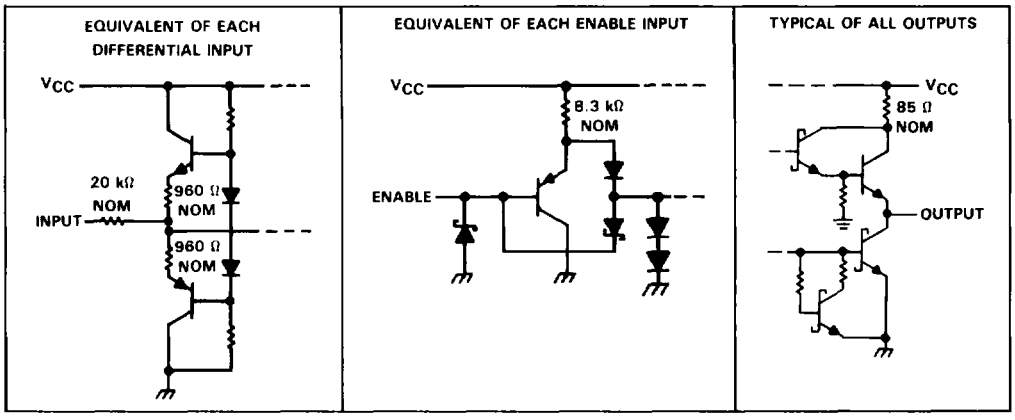


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, and N packages.

logic diagram (positive logic)



schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

		AM26LS32AC AM26LS33AC	AM26LS32AM AM26LS33AM	UNIT
Supply voltage, V_{CC} (see Note 1)		7	7	V
Input voltage, any differential input		±25	±25	V
Differential input voltage (see Note 2)		±25	±25	V
Continuous total power dissipation		See Dissipation Rating Table		
Operating free-air temperature range		0 to 70	−55 to 125	°C
Storage temperature range		−65 to 150	−65 to 150	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	D or N package	260		°C
Case temperature for 60 seconds	FK package		260	°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J package	300	300	°C

NOTES: 1. All voltage values, except differential voltages, are with respect to the network ground terminal.
2. Differential voltage values are at the noninverting (A) input terminals with respect to the inverting (B) input terminals.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW	—
FK	1375 mW	11.0 mW/°C	880 mW	275 mW
J (C-SUFFIX)	1025 mW	8.2 mW/°C	656 mW	—
J (M-SUFFIX)	1375 mW	11.0 mW/°C	880 mW	275 mW
N	1150 mW	9.2 mW/°C	736 mW	—

recommended operating conditions

		AM26LS32AC AM26LS33AC			AM26LS32AM AM26LS33AM			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}		4.75	5	5.25	4.5	5	5.5	V
High-level input voltage, V_{IH}		2			2			V
Low-level input voltage, V_{IL}				0.8			0.8	V
Common-mode input voltage, V_{IC}	AM26LS32AC, AM26LS32AM			±7			±7	V
	AM26LS33AC, AM26LS33AM			±15			±15	
High-level output current, I_{OH}				−440			−440	μA
Low-level output current, I_{OL}				8			8	mA
Operating free-air temperature, T_A		0		70	−55		125	°C

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_{TH}	Differential input high-threshold voltage	V_O = V_{OH}min,	I_{OH} = −440 μA	AM26LS32A			0.2	V
				AM26LS33A			0.5	
V_{TL}	Differential input low-threshold voltage	V_O = 0.45 V,	I_{OL} = 8 mA	AM26LS32A	−0.2‡			V
				AM26LS33A	−0.5‡			
V_{hys}	Hysteresis, $V_{T+} - V_{T-}$§					50		mV
V_{IK}	Enable input clamp voltage	V_{CC} = MIN,	I_I = −18 mA				−1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, $V_{I(\overline{G})}$ = 0.8 V,	V_{ID} = 1 V, I_{OH} = −440 μA	'32AC, '33AC	2.7			V
				'32AM, '33AM	2.5			
V_{OL}	Low-level output voltage	V_{CC} = MIN, $V_{I(\overline{G})}$ = 0.8 V	V_{ID} = −1 V,	I_{OL} = 4 mA			0.4	V
				I_{OL} = 8 mA			0.45	
I_{OZ}	Off-state (high-impedance-state) output current	V_{CC} = MAX		V_O = 2.4 V			20	μA
				V_O = 0.4 V			−20	
I_I	Line input current	V_I = 15 V,	Other input at −10 V to 15 V				1.2	mA
		V_I = −15 V,	Other input at −15 V to 10 V				−1.7	
$I_{I(EN)}$	Enable input current	V_I = 5.5 V					100	μA
I_{IH}	High-level enable current	V_I = 2.7 V					20	μA
I_{IL}	Low-level enable current	V_I = 0.4 V					−0.36	mA
r_i	Input resistance	V_{IC} = −15 V to 15 V, One input to AC ground			12	15		kΩ
I_{OS}	Short-circuit output current¶	V_{CC} = MAX			−15		−85	mA
I_{CC}	Supply current	V_{CC} = MAX,	All outputs disabled			52	70	mA

†All typical values are at V_{CC} = 5 V, T_A = 25°C, and V_{IC} = 0.
‡The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for threshold levels only.
§Hysteresis is the difference between the positive-going input threshold voltage, V_{T+}, and the negative-going input threshold voltage, V_{T-}. See Figures 10 and 11.
¶Not more than one output should be shorted to ground at a time, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	C_L = 15 pF, See Figure 1		20	35	ns
t_{PHL}	Propagation delay time, high-to-low-level output			22	35	ns
t_{PZH}	Output enable time to high level	C_L = 15 pF, See Figure 1		17	22	ns
t_{PZL}	Output enable time to low level			20	25	ns
t_{PHZ}	Output disable time from high level	C_L = 5 pF, See Figure 1		21	30	ns
t_{PLZ}	Output disable time from low level			30	40	ns

TEXAS INSTRUMENTS
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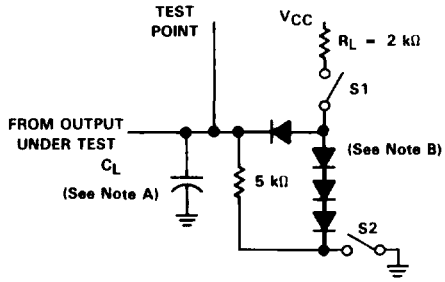
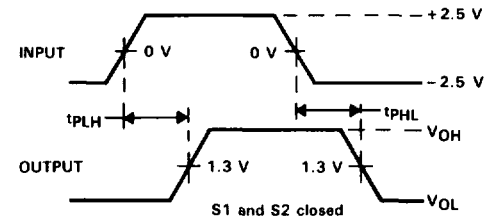
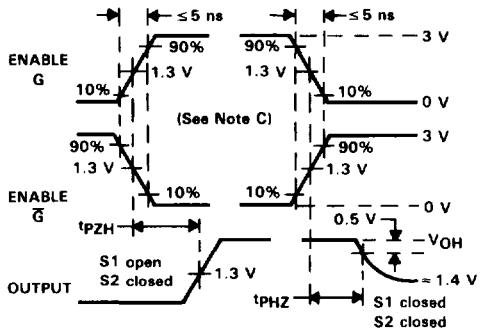
PARAMETER MEASUREMENT INFORMATION



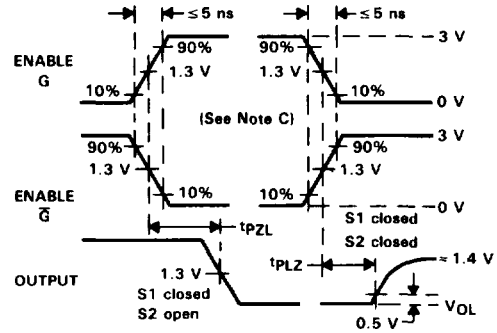
TEST CIRCUIT



VOLTAGE WAVEFORMS FOR t_{PLH}, t_{PHL}



VOLTAGE WAVEFORMS FOR t_{PHZ}, t_{PZH}



VOLTAGE WAVEFORMS FOR t_{PLZ}, t_{PZL}

NOTES: A. C_L includes probe and jig capacitance.
B. All diodes are 1N3064 or equivalent.
C. Enable G is tested with $\overline{G}$ high; $\overline{G}$ is tested with G low.

FIGURE 1

TYPICAL CHARACTERISTICS

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

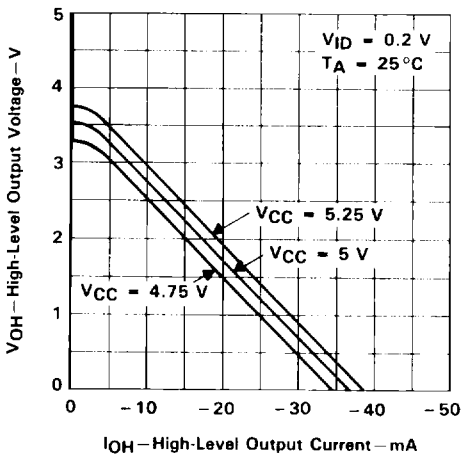


FIGURE 2

HIGH-LEVEL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

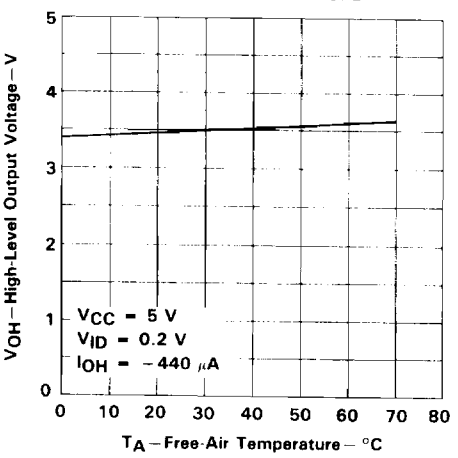


FIGURE 3

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

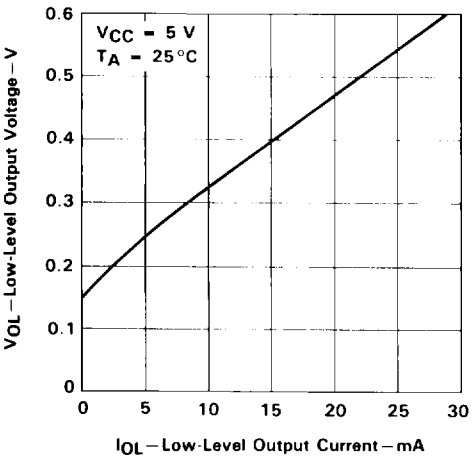


FIGURE 4

LOW-LEVEL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

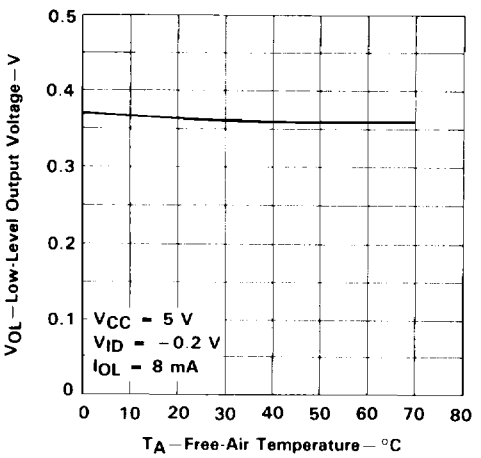


FIGURE 5

TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE
vs
ENABLE G VOLTAGE

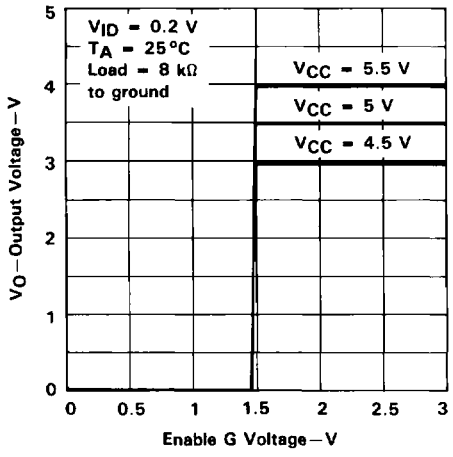


FIGURE 6

OUTPUT VOLTAGE
vs
ENABLE G VOLTAGE

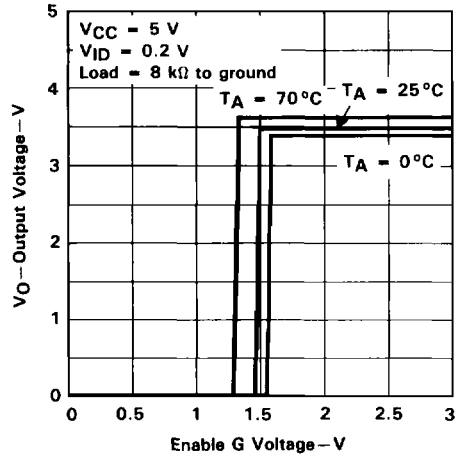


FIGURE 7

OUTPUT VOLTAGE
vs
ENABLE G VOLTAGE

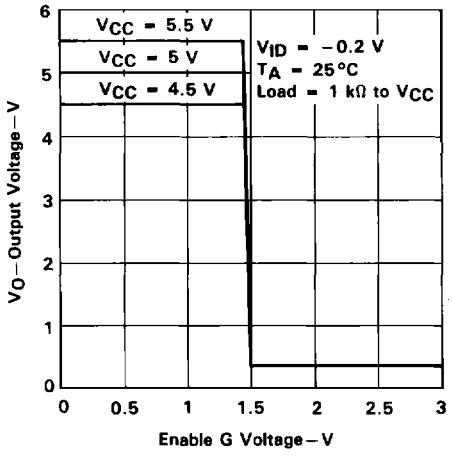


FIGURE 8

OUTPUT VOLTAGE
vs
ENABLE G VOLTAGE

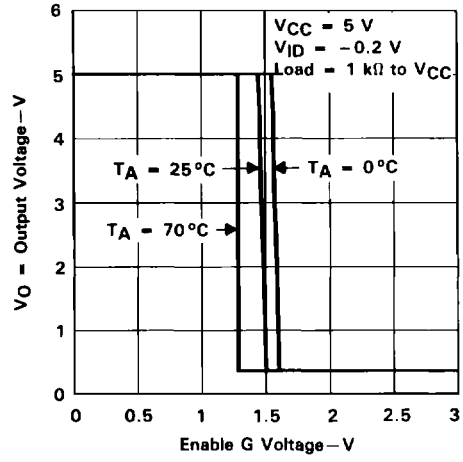


FIGURE 9

TYPICAL CHARACTERISTICS

AM26LS32A
OUTPUT VOLTAGE
vs
DIFFERENTIAL INPUT VOLTAGE

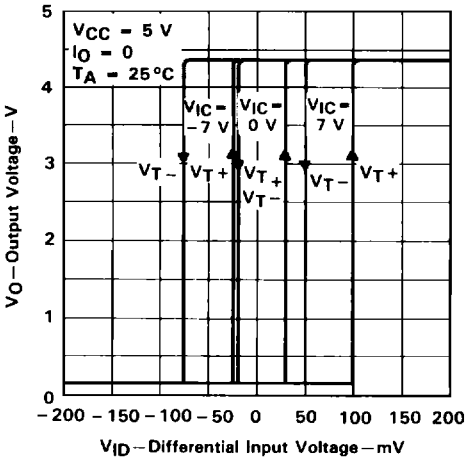


FIGURE 10

AM26LS33A
OUTPUT VOLTAGE
vs
DIFFERENTIAL INPUT VOLTAGE

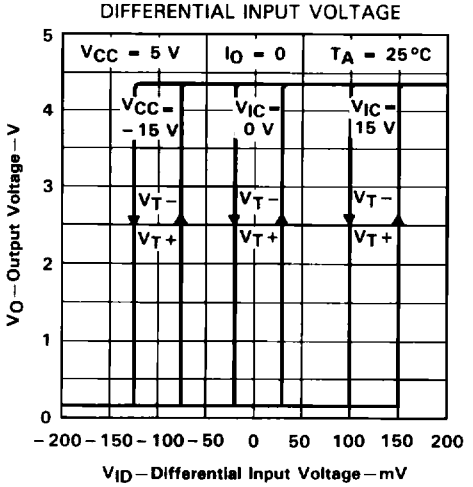


FIGURE 11

INPUT CURRENT
vs
INPUT VOLTAGE

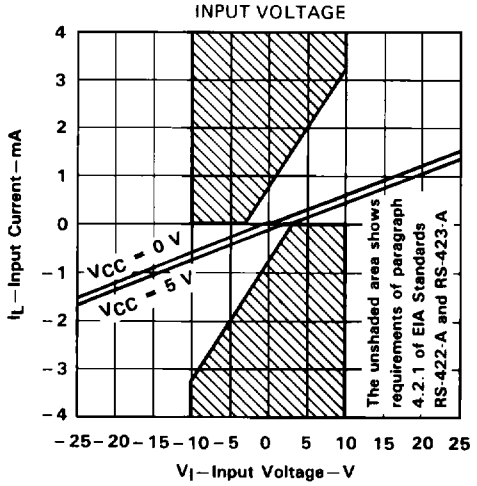
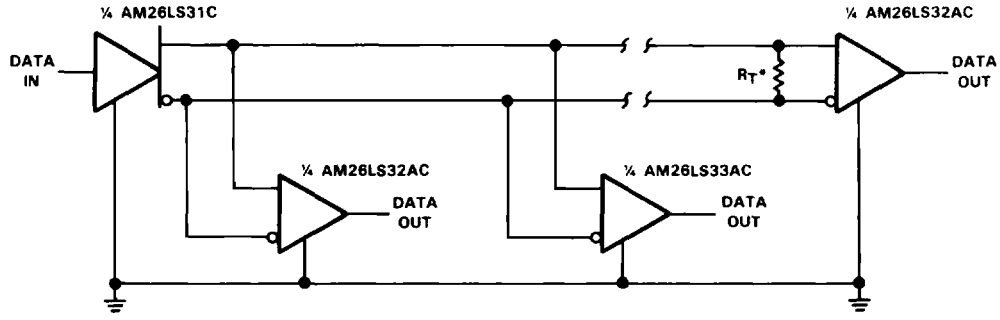


FIGURE 12

APPLICATION INFORMATION



*R_T equals the characteristic impedance of the line.

FIGURE 13. CIRCUIT WITH MULTIPLE RECEIVERS