

AM26LS32AC, AM26LS32AI, AM26LS33AC,
AM26LS32AM, AM26LS33AM
QUADRUPLE DIFFERENTIAL LINE RECEIVERS

SLLS115D – OCTOBER 1980 – REVISED MARCH 2002

- AM26LS32A Devices Meet or Exceed the Requirements of ANSI TIA/EIA-422-B, TIA/EIA-423-B, and ITU Recommendations V.10 and V.11
- AM26LS32A Devices Have $\pm 7\text{-V}$ Common-Mode Range With $\pm 200\text{-mV}$ Sensitivity
- AM26LS33A Devices Have $\pm 15\text{-V}$ Common-Mode Range With $\pm 500\text{-mV}$ Sensitivity
- Input Hysteresis . . . 50 mV Typical
- Operate From a Single 5-V Supply
- Low-Power Schottky Circuitry
- 3-State Outputs
- Complementary Output-Enable Inputs
- Input Impedance . . . 12 k Ω Min
- Designed to Be Interchangeable With Advanced Micro Devices AM26LS32TM and AM26LS33TM

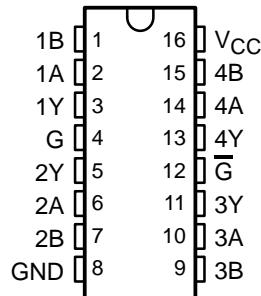
description

The AM26LS32A and AM26LS33A devices are quadruple differential 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. The 3-state outputs permit connection directly to a bus-organized system. Fail-safe design ensures that, if the inputs are open, the outputs always are high.

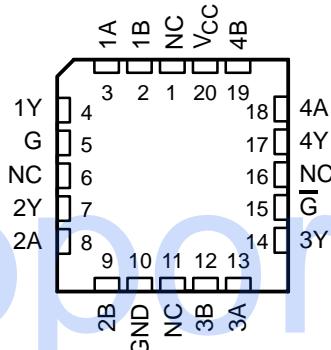
Compared to the AM26LS32 and the AM26LS33, the AM26LS32A and AM26LS33A incorporate an additional stage of amplification to improve sensitivity. The input impedance has been increased, resulting in less loading of the bus line. The additional stage has increased propagation delay; however, this does not affect interchangeability in most applications.

The AM26LS32AC and AM26LS33AC are characterized for operation from 0°C to 70°C. The AM26LS32AI is characterized for operation from -40°C to 85°C. The AM26LS32AM and AM26LS33AM are characterized for operation over the full military temperature range of -55°C to 125°C.

AM26LS32AC . . . D, N, OR NS PACKAGE
AM26LS32AI, AM26LS33AC . . . D OR N PACKAGE
AM26LS32AM, AM26LS33AM . . . J PACKAGE
(TOP VIEW)



AM26LS32AM, AM26LS33AM . . . 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.

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**TEXAS
INSTRUMENTS**

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**AM26LS32AC, AM26LS32AI, AM26LS33AC,
AM26LS32AM, AM26LS33AM
QUADRUPLE DIFFERENTIAL LINE RECEIVERS**

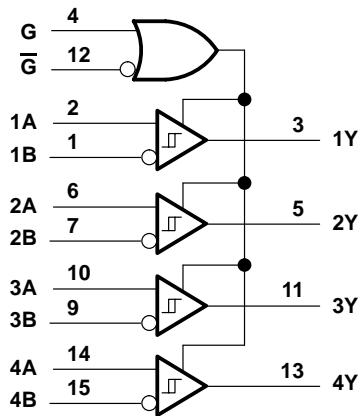
SLLS115D – OCTOBER 1980 – REVISED MARCH 2002

FUNCTION TABLE
(each receiver)

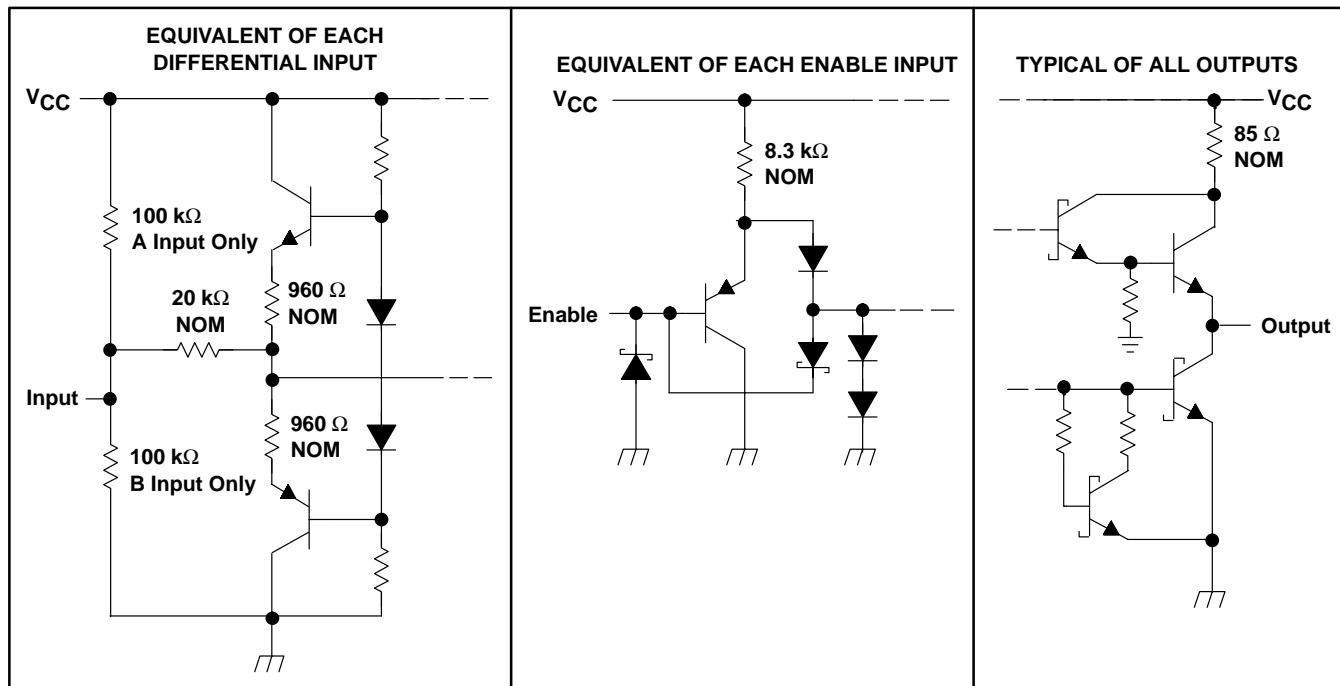
| DIFFERENTIAL A - B | ENABLES | | OUTPUT Y |
|------------------------------------|---------|-----------|-------------|
| | G | \bar{G} | |
| $V_{ID} \geq V_{IT+}$ | H | X | H |
| | X | L | H |
| $V_{IT-} \leq V_{ID} \leq V_{IT+}$ | H | X | ? |
| | X | L | ? |
| $V_{ID} \leq V_{IT-}$ | H | X | L |
| | X | L | L |
| X | L | H | Z |
| Open | H | X | H |
| | X | L | H |

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

logic diagram (positive logic)



schematics of inputs and outputs



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

| | |
|--|------------------------------|
| Supply voltage, V_{CC} (see Note 1) | 7 V |
| Input voltage, V_I : Any differential input | +25 V |
| Other inputs | 7 V |
| Differential input voltage, V_{ID} (see Note 2) | +25 V |
| Continuous total power dissipation | See Dissipation Rating Table |
| Package thermal impedance, θ_{JA} (see Note 3): D package | 73°C/W |
| N package | 67°C/W |
| NS package | 64°C/W |
| Case temperature for 60 seconds, T_C : FK package | 260°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package | 260°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package | 300°C |
| Storage temperature range, T_{Stg} | -65°C to 150°C |

[†] 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 voltages, are with respect to the network ground terminal.

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.
 3. The package thermal impedance is calculated in accordance with JESD 51-7.

DISSIPATION RATING TABLE

| PACKAGE | T _A ≤ 25°C POWER RATING | DERATING FACTOR ABOVE T _A = 25°C | T _A = 70°C POWER RATING | T _A = 125°C POWER RATING |
|---------|---------------------------------------|--|---------------------------------------|--|
| FK | 1375 mW | 11.0 mW/°C | 880 mW | 275 mW |
| J | 1375 mW | 11.0 mW/°C | 880 mW | 275 mW |

**AM26LS32AC, AM26LS32AI, AM26LS33AC,
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recommended operating conditions

| | | | MIN | NOM | MAX | UNIT |
|-----------------|--------------------------------|------------------------------------|------|-----|------|------|
| V _{CC} | Supply voltage | AM26LS32AC, AM26LS32AI, AM26LS33AC | 4.75 | 5 | 5.25 | V |
| | | AM26LS32AM, AM26LS33AM | 4.5 | 5 | 5.5 | |
| V _{IH} | High-level input voltage | | 2 | | | V |
| V _{IL} | Low-level input voltage | | | 0.8 | | V |
| V _{IC} | Common-mode input voltage | AM26LS32A | | ±7 | | V |
| | | AM26LS33A | | | ±15 | |
| I _{OH} | High-level output current | | | | -440 | µA |
| I _{OL} | Low-level output current | | | 8 | | mA |
| T _A | Operating free-air temperature | AM26LS32AC, AM26LS33AC | 0 | 70 | | °C |
| | | AM26LS32AI | -40 | 85 | | |
| | | AM26LS32AM, AM26LS33AM | -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+} | Positive-going input threshold voltage V _O = V _{OHmin} , I _{OH} = -440 µA | AM26LS32A | 0.2 | | V |
| | | AM26LS33A | 0.5 | | |
| V _{IT-} | Negative-going input threshold voltage V _O = 0.45 V, I _{OL} = 8 mA | AM26LS32A | -0.2‡ | | V |
| | | AM26LS33A | -0.5‡ | | |
| V _{hys} | Hysteresis voltage (V _{IT+} - V _{IT-}) | | 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 _{ID} = 1 V, V _{I(G)} = 0.8 V, I _{OH} = -440 µA | AM26LS32AC AM26LS33AC | 2.7 | | V |
| | | AM26LS32AM, AM26LS32AI, AM26LS33AM | 2.5 | | |
| V _{OL} | Low-level output voltage V _{CC} = MIN, V _{ID} = -1 V, V _{I(G)} = 0.8 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, in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for threshold levels only.

§ Not more than one output should be shorted to ground at a time, and duration of the short circuit should not exceed one second.



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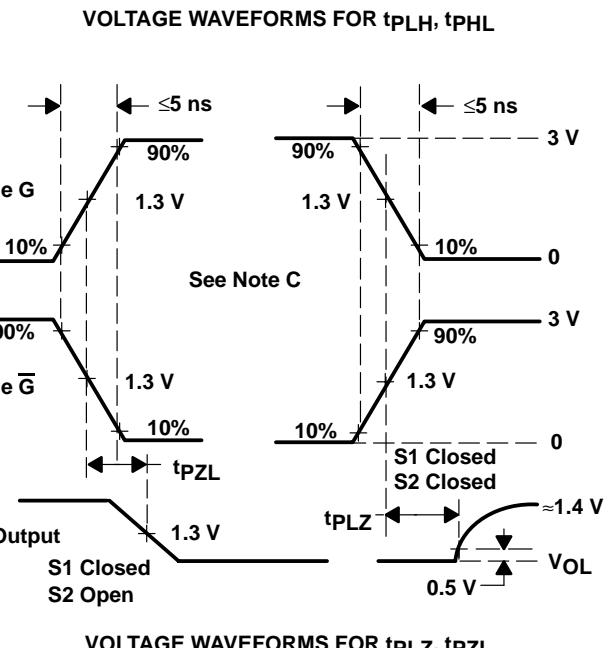
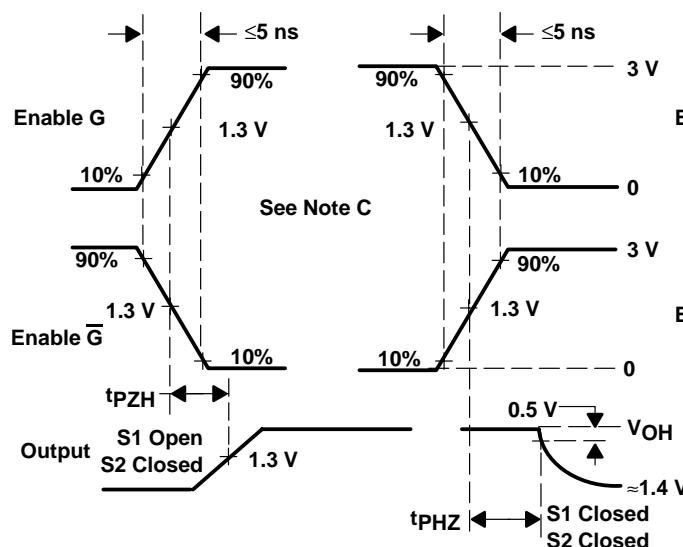
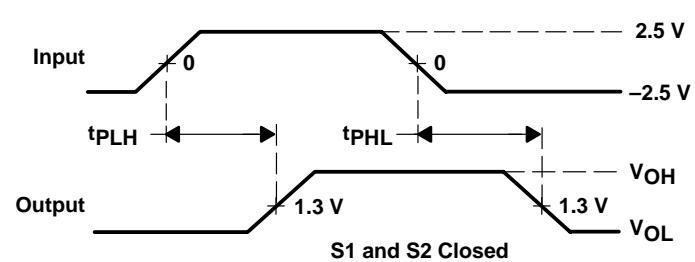
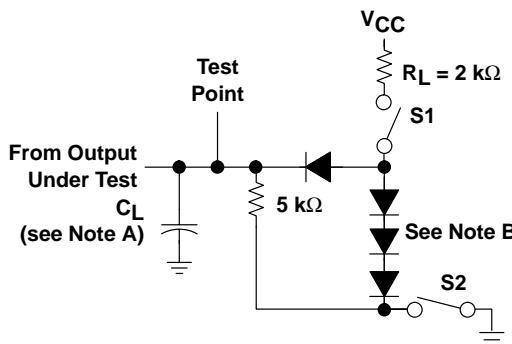
AM26LS32AC, AM26LS32AI, AM26LS33AC,
AM26LS32AM, AM26LS33AM
QUADRUPLE DIFFERENTIAL LINE RECEIVERS

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switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|--------------------------------------|-----|-----|-----|------|
| t_{PLH} | $C_L = 15 \text{ pF}$, See Figure 1 | 20 | 35 | | ns |
| t_{PHL} | | 22 | 35 | | |
| t_{PZH} | $C_L = 15 \text{ pF}$, See Figure 1 | 17 | 22 | | ns |
| t_{PZL} | | 20 | 25 | | |
| t_{PHZ} | $C_L = 5 \text{ pF}$, See Figure 1 | 21 | 30 | | ns |
| t_{PLZ} | | 30 | 40 | | |

PARAMETER MEASUREMENT INFORMATION



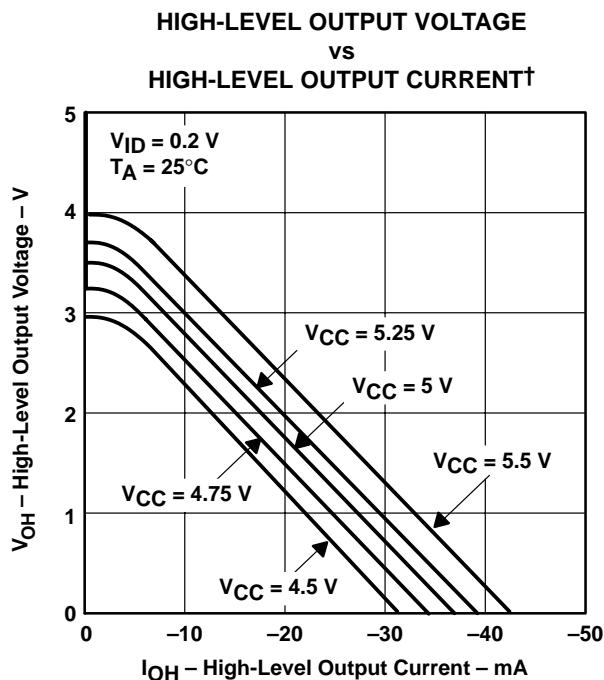
- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. All diodes are 1N3064 or equivalent.
 - C. Enable G is tested with \bar{G} high; \bar{G} is tested with G low.

Figure 1

**AM26LS32AC, AM26LS32AI, AM26LS33AC,
AM26LS32AM, AM26LS33AM
QUADRUPLE DIFFERENTIAL LINE RECEIVERS**

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TYPICAL CHARACTERISTICS



† $V_{CC} = 5.5\text{ V}$ and $V_{CC} = 4.5\text{ V}$ applies to M-suffix devices only.

Figure 2

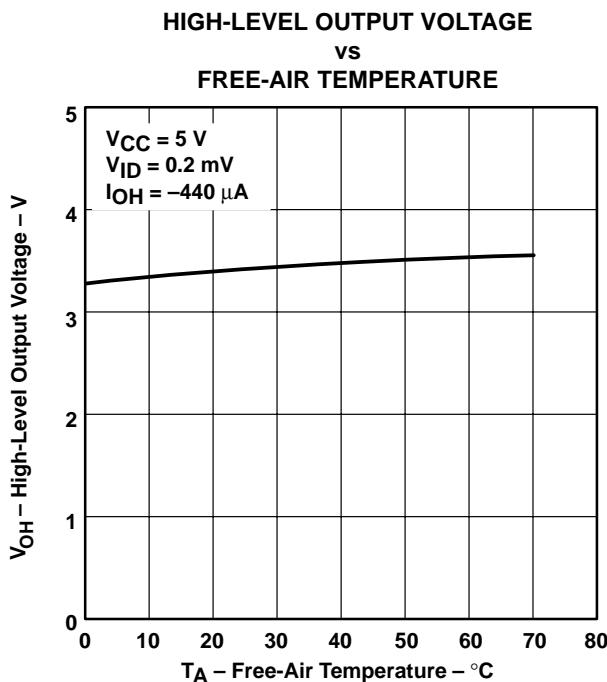


Figure 3

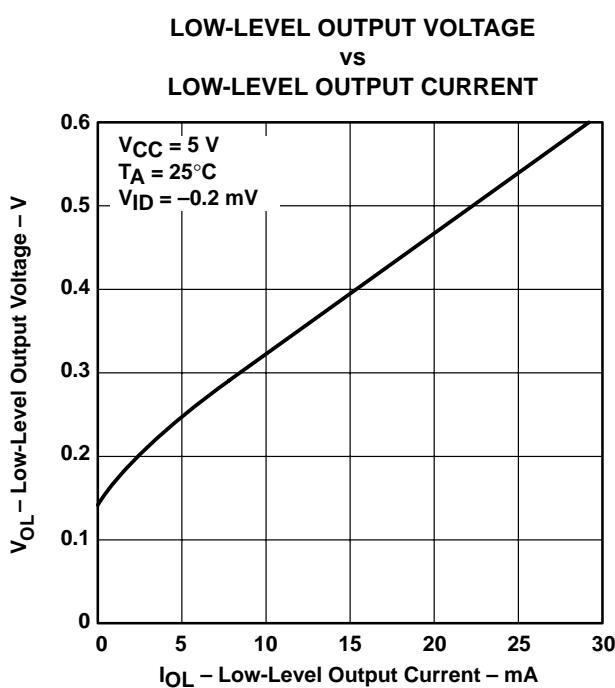


Figure 4

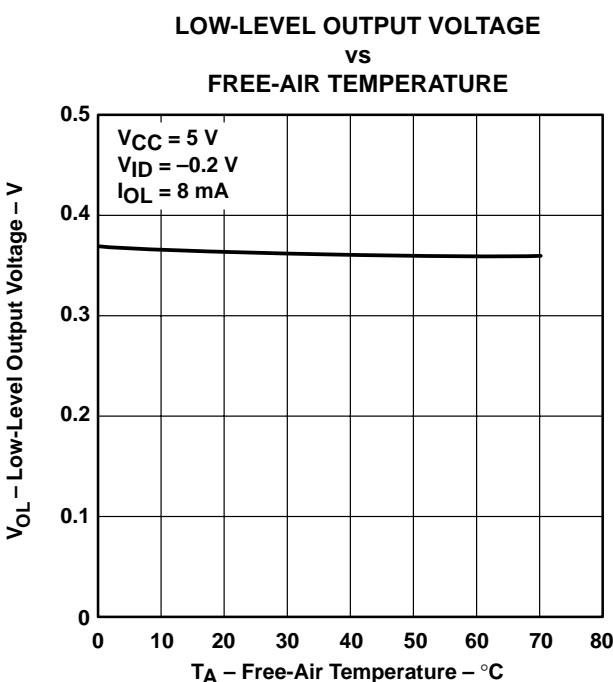


Figure 5

TYPICAL CHARACTERISTICS

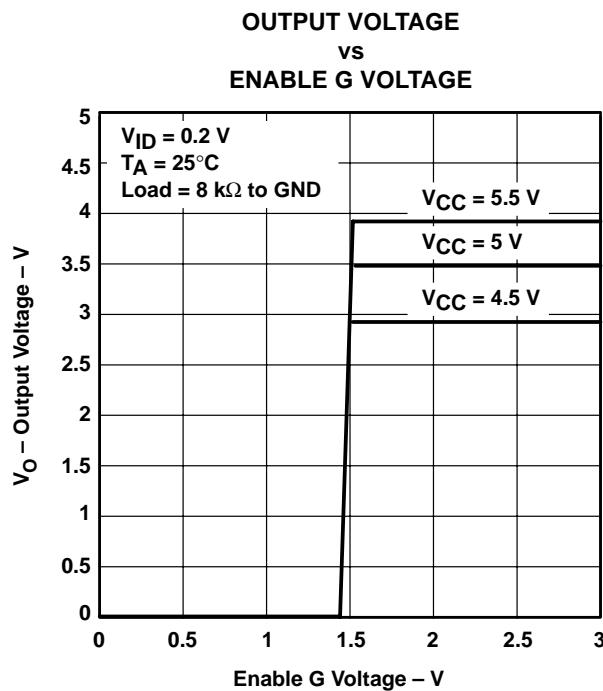


Figure 6

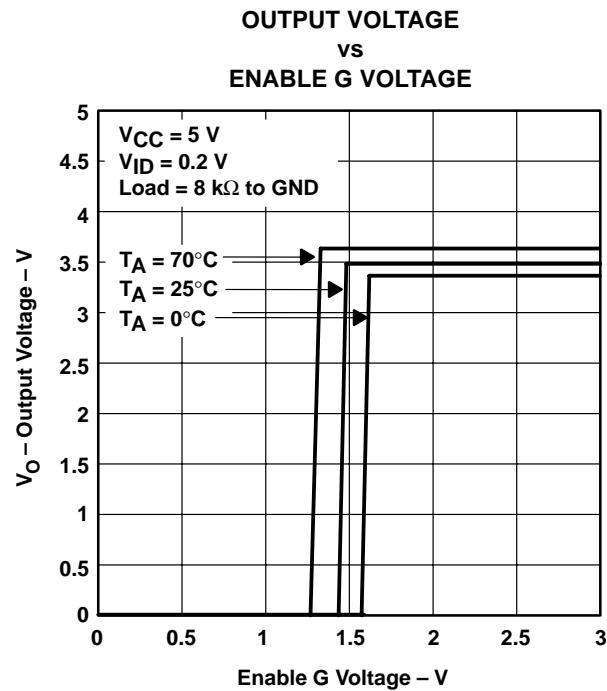


Figure 7

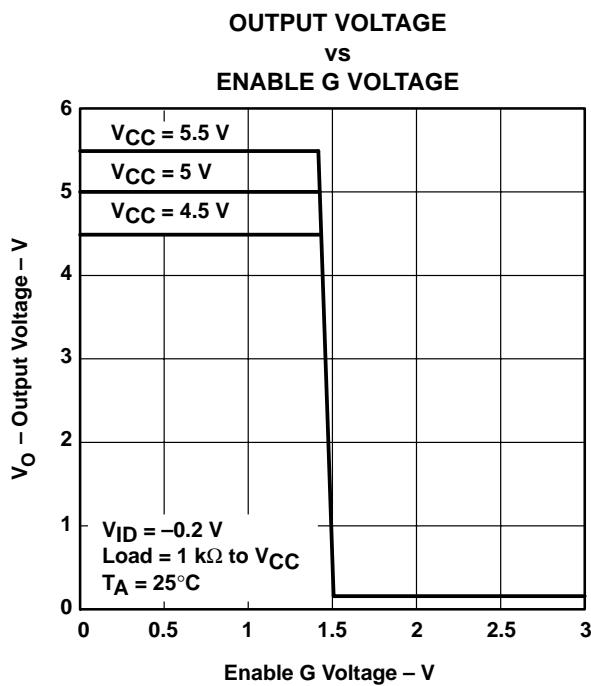


Figure 8

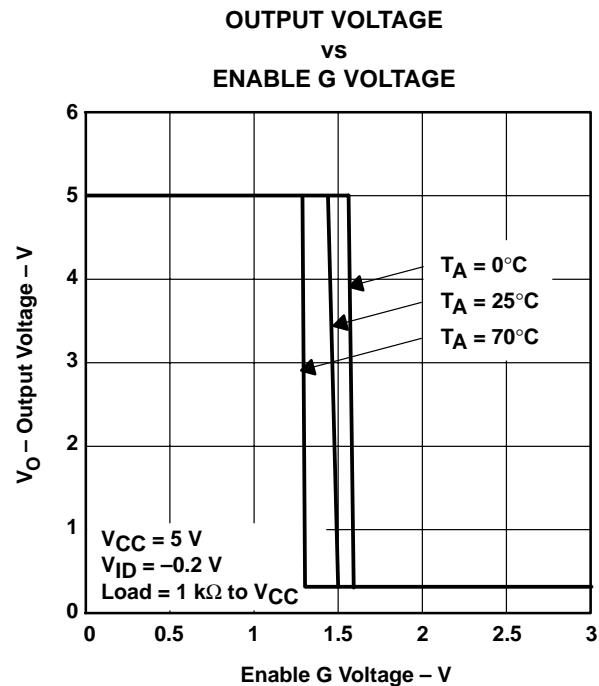


Figure 9

**AM26LS32AC, AM26LS32AI, AM26LS33AC,
AM26LS32AM, AM26LS33AM
QUADRUPLE DIFFERENTIAL LINE RECEIVERS**

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TYPICAL CHARACTERISTICS

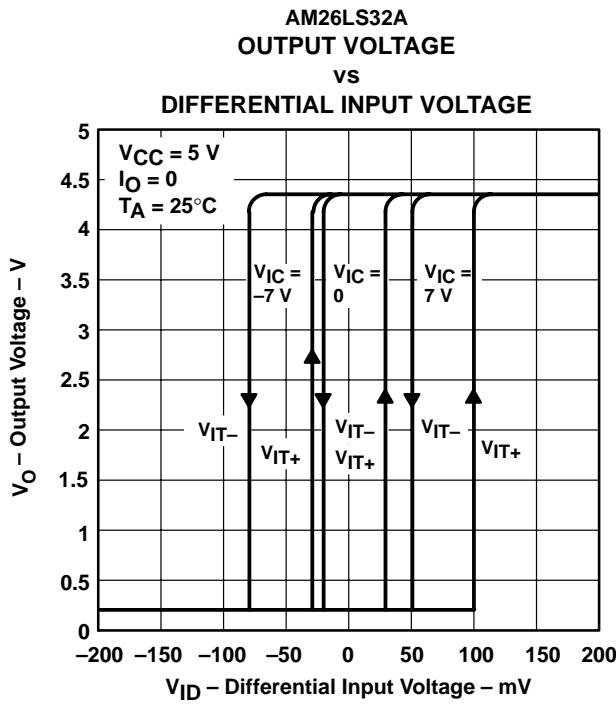


Figure 10

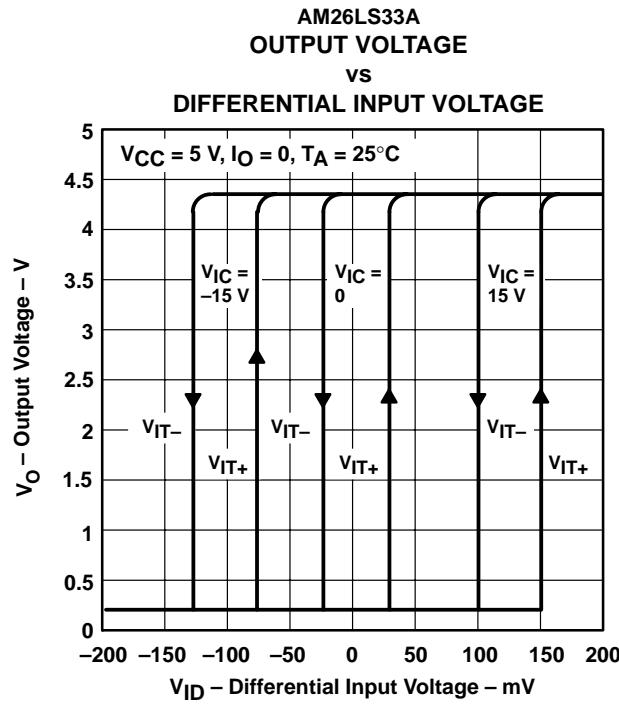


Figure 11

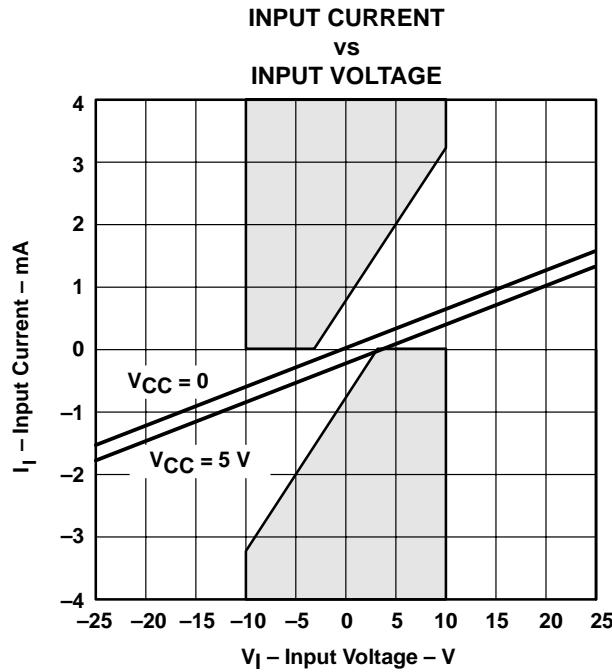
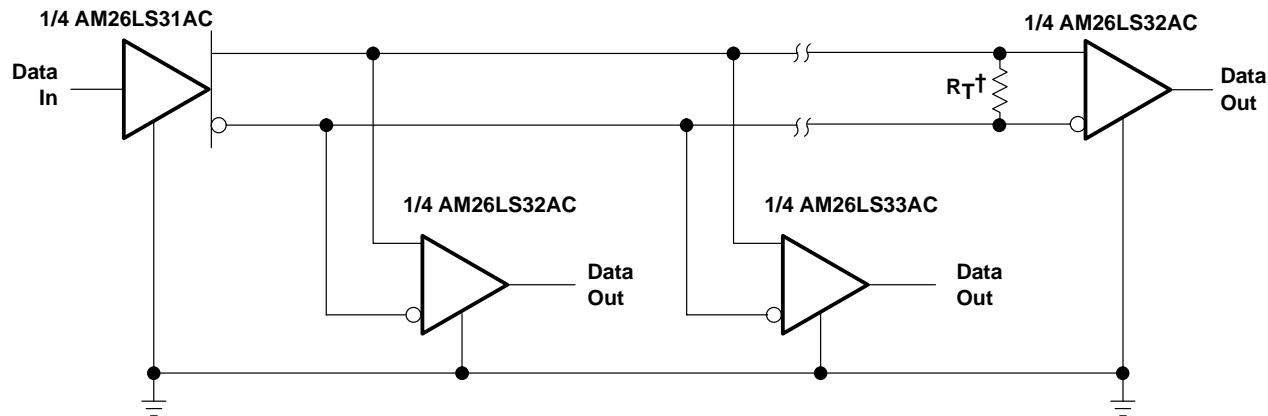


Figure 12

APPLICATION INFORMATION



$\dagger R_T$ equals the characteristic impedance of the line.

Figure 13. Circuit With Multiple Receivers

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[APPLICATION NOTES](#) | [MORE LITERATURE](#)

AM26LS33A, Quadruple Differential Line ReceiverDEVICE STATUS: **ACTIVE**

| PARAMETER NAME | AM26LS33A |
|----------------------------------|-----------|
| Receivers Per Package | 4 |
| Receiver (V _{th}) (mV) | 500 |
| Supply Voltage(s) (V) | 5 |
| Receiver tpd (ns) | 35 |
| ICC (max) (mA) | 70 |
| Footprint | AM26LS32 |

FEATURES[▲ Back to Top](#)

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DESCRIPTION[▲ Back to Top](#)

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DATASHEET[▲ Back to Top](#)Full datasheet in Acrobat PDF: [am26ls33a.pdf](#) (145 KB, Rev.D) (Updated: 03/13/2002)**APPLICATION NOTES**[▲ Back to Top](#)

- [Analog Applications Journal \(Rev. A\)](#) (SLYT010A - Updated: 03/17/2000)

MORE LITERATURE[▲Back to Top](#)

- [Enhanced Plastic Portfolio Brochure](#) (SGZB004, 387 KB - Updated: 08/19/2002)
- [QML Class V Space Products Military Brief \(Rev. A\)](#) (SGZN001A, 257 KB - Updated: 10/07/2002)

| SAMPLES | | ▲Back to Top | | | | | |
|-------------------------|--------------------------|------------------------------|------------------|---------------|--------------------|--------------------------------------|---------------------------------|
| <u>ORDERABLE DEVICE</u> | <u>PACKAGE TYPE (TI)</u> | <u>PINS</u> | <u>TEMP (°C)</u> | <u>STATUS</u> | <u>DSCC NUMBER</u> | <u>PRODUCT CONTENT</u> | <u>SAMPLES</u> |
| AM26LS33ACD | SOIC (D) | 16 | 0 TO 70 | ACTIVE | | View Product Content | Request Samples |
| AM26LS33ACN | PDIP (N) | 16 | 0 TO 70 | ACTIVE | | View Product Content | Request Samples |

PRICING/AVAILABILITY/PKG[▲Back to Top](#)**DEVICE INFORMATION**

Updated Daily

| <u>ORDERABLE DEVICE</u> | <u>STATUS</u> | <u>PACKAGE TYPE PINS</u> | <u>TEMP (°C)</u> | <u>DSCC NUMBER</u> | <u>PRODUCT CONTENT</u> | <u>BUDGETARY PRICING QTY \$US</u> | <u>STD PACK QTY</u> |
|-------------------------|---------------|----------------------------|------------------|--------------------|-------------------------------|-------------------------------------|---------------------|
| 5962-7802004M2A | ACTIVE | LCCC (FK) 20 | -55 TO 125 | | View Contents | 1KU 12.37 | 1 |
| 5962-7802004MEA | ACTIVE | CDIP (J) 16 | -55 TO 125 | | View Contents | 1KU 5.01 | 1 |
| 5962-7802004MFA | ACTIVE | CFP (W) 16 | -55 TO 125 | | View Contents | 1KU 10.01 | 1 |
| AM26LS33ACD | ACTIVE | SOIC (D) 16 | 0 TO 70 | | View Contents | 1KU 0.50 | 40 |
| AM26LS33ACDR | ACTIVE | SOIC (D) 16 | 0 TO 70 | | View Contents | 1KU 0.50 | 2500 |
| AM26LS33ACN | ACTIVE | PDIP (N) 16 | 0 TO 70 | | View Contents | 1KU 0.50 | 25 |

TI INVENTORY STATUS
As Of 08:00 AM GMT, 17 Apr 2003

| <u>IN STOCK</u> | <u>IN PROGRESS QTY DATE</u> | <u>LEAD TIME</u> |
|-----------------|-------------------------------|------------------|
| 1426* | | 7 WKS |
| 188* | 312 27 May | 7 WKS |
| 0* | 450 27 May | 7 WKS |
| 1839* | >10k 13 May | 4 WKS |
| 7500* | 410 28 Apr | 2 WKS |
| | >10k 13 May | |
| 0* | 6482 30 Apr | 4 WKS |
| | >10k 10 Jun | |

REPORTED DISTRIBUTOR INVENTORY
As Of 08:00 AM GMT, 17 Apr 2003

| <u>DISTRIBUTOR COMPANY REGION</u> | <u>IN STOCK</u> | <u>PURCHASE</u> |
|--|-----------------|-------------------------|
| Avnet Americas | 520 | BUY NOW |
| Avnet-SILICA Europe | 16 | BUY NOW |
| None Reported View Distributors | | |
| Avnet Americas | 433 | BUY NOW |
| EBV Electronik Europe | 13 | BUY NOW |
| EBV Electronik Europe | >1k | BUY NOW |
| Avnet Americas | >1k | BUY NOW |
| Insight Americas | >1k | BUY NOW |
| Arrow Americas | >1k | BUY NOW |
| DigiKey Americas | 340 | BUY NOW |
| Arrow Americas | >1k | BUY NOW |
| DigiKey Americas | >1k | BUY NOW |
| EBV Electronik Europe | >1k | BUY NOW |
| Avnet Americas | >1k | BUY NOW |
| Arrow Americas | >1k | BUY NOW |
| DigiKey Americas | >1k | BUY NOW |

| | | | | | | | | |
|---------------|--------|----------------------|----|------------|---------------------|-------------------------------|-------------|---|
| | | | | | | | | |
| | | | | | | | | |
| AM26LS33AMFKB | ACTIVE | <u>LCCC (FK)</u> | 20 | -55 TO 125 | 5962- 7802004M2A | View Contents | 1KU 12.37 | 1 |
| AM26LS33AMJ | ACTIVE | <u>CDIP (J)</u> | 16 | -55 TO 125 | | View Contents | 1KU 4.29 | 1 |
| AM26LS33AMJB | ACTIVE | <u>CDIP (J)</u> | 16 | -55 TO 125 | 5962- 7802004MEA | View Contents | 1KU 5.01 | 1 |
| AM26LS33AMWB | ACTIVE | <u>CFP (W)</u> | 16 | -55 TO 125 | 5962- 7802004MFA | View Contents | 1KU 10.01 | 1 |

| | | |
|-------------|--------------|-------|
| | | |
| <u>138*</u> | | 7 WKS |
| <u>99*</u> | 901 27 May | 7 WKS |
| <u>80*</u> | | 7 WKS |
| <u>46*</u> | | 7 WKS |

| | | |
|--|-----|-------------------------|
| Insight Americas | 575 | BUY NOW |
| Newark Electronics Americas | 188 | BUY NOW |
| None Reported View Distributors | | |
| Avnet Americas | 373 | BUY NOW |
| Avnet-SILICA Europe | 24 | BUY NOW |
| EBV Electronik Europe | 25 | BUY NOW |
| Avnet-SILICA Europe | 4 | BUY NOW |
| None Reported View Distributors | | |

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