

8961724 TEXAS INSTR (LIN/INTFC)

91D 75449 D

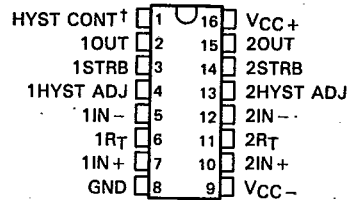
**SN55152, SN75152  
DUAL LINE RECEIVERS**

D1114, AUGUST 1972—REVISED SEPTEMBER 1986

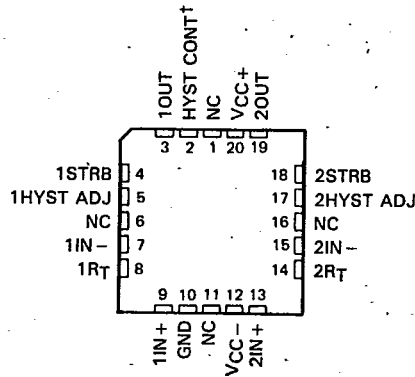
- Meets Specifications of EIA RS-232-C or MIL-STD-188C†
- Dual Differential Receiver with Independent Strobes
- Common-Mode Input Voltage Range . . . ±25 V
- Differential Input Capability with One Input Grounded . . . ±25 V
- Continuously Adjustable Hysteresis with External Resistors
- Standard Supply Voltages . . . +12 V and -12 V
- Input Hysteresis (Double Thresholds) Remain Approximately Fixed for Power Supply and/or Temperature Variations

SN55152 . . . J PACKAGE  
SN75152 . . . D, J, OR N PACKAGE

*T-75-45-05*



SN55152 . . . FK PACKAGE  
(TOP VIEW)



NC—No internal connection

**description**

The SN55152 and SN75152 are dual differential line receivers designed to meet the requirements of EIA Standard RS-232-C or MIL-STD-188 interfaces. A single control, HYST CONT, sets the input hysteresis for the required operation. An added feature is the capability of adjusting the hysteresis to any voltage between ±0.3 volt typical and ±5 volts typical by means of the hysteresis adjust terminals, 1HYST ADJ and 2HYST ADJ, making the SN55152 and SN75152 useful for a wide variety of line receiver and Schmitt trigger applications. The large common-mode input voltage range and differential input voltage (±25 volts) give the circuit added versatility. The SN55152 and SN75152 are designed for operation from standard ±12-volt supplies with ±10% variation. Each receiver has an output strobe that is TTL compatible.

The SN55152 is characterized for operation over the full military temperature range of -55°C to 125°C. The SN75152 is characterized for operation from 0°C to 70°C.

†To meet the specifications of EIA Standard RS-232-C, connect the hysteresis control pin, HYST CONT, to VCC-. Also, connect termination resistor pin 1RT to inverting input 1IN-, and termination resistor pin 2RT to inverting input 2IN-. To meet the specifications of MIL-STD-188, leave HYST CONT, 1RT, and 2RT open.

**4**  
Line Drivers/Receivers

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SN55152, SN75152  
DUAL LINE RECEIVERS

T-75-45-05

FUNCTION TABLE  
(EACH RECEIVER)

| LINE INPUT | STROBE | OUTPUT |
|------------|--------|--------|
| H          | H      | H      |
| L          | H      | L      |
| X          | L      | H      |

Definition of logic levels:

For the strobe: H (high) is any voltage between  $V_{IH}$  min and  $V_{CC}$ .

L (low) is any voltage between ground and  $V_{IL}$  max.

For the line input: H (high) is any differential input voltage ( $V_{ID}$ )<sup>‡</sup> more positive than  $V_{T-}$ , once the level of  $V_{T+}$  has been reached.

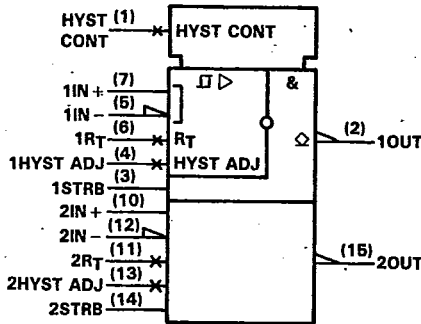
L (low) is any differential input voltage ( $V_{ID}$ )<sup>‡</sup> more negative than  $V_{T+}$ , once the level of  $V_{T-}$  has been reached.

X (irrelevant) is any input voltage permitted by maximum ratings.

<sup>‡</sup>Differential input voltages ( $V_T$  and  $V_{ID}$ ) are at the noninverting input terminal  $IN+$  with respect to the inverting input terminal  $IN-$ .

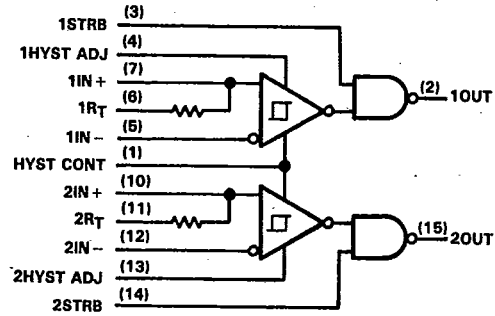
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Line Drivers/Receivers

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)



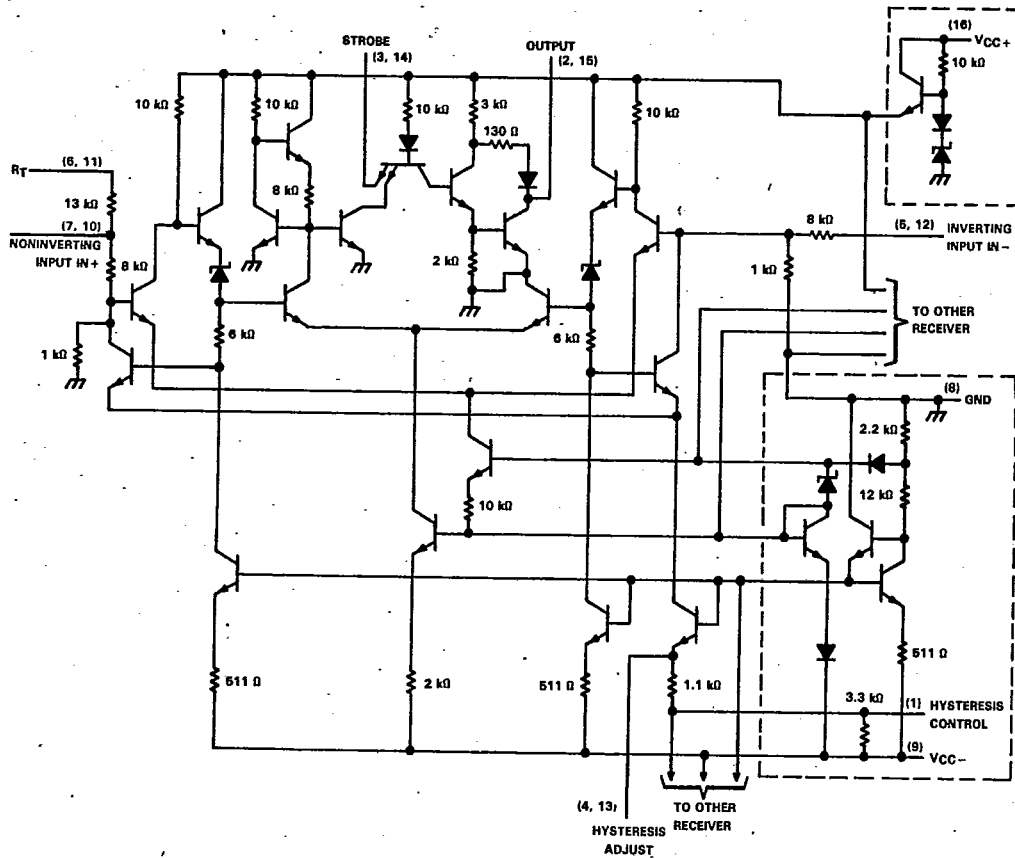
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SN55152, SN75152  
DUAL LINE RECEIVERS

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schematic (each receiver)



4

Line Drivers/Receivers

TEXAS  
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**SN55152, SN75152  
DUAL LINE RECEIVERS**

**T-75-45-05**

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

|  |            | SN55152        | SN75152    | UNIT |    |
|--|------------|----------------|------------|------|----|
| Supply voltage, $V_{CC+}$ (see Note 1)   |            | 15             | 15         | V    |    |
| Supply voltage, $V_{CC-}$ (see Note 1)   |            | -15            | -15        | V    |    |
| Voltage at any line input with respect to other line input, ground, or $R_T$         |            | $\pm 25$       | $\pm 25$   | V    |    |
| $R_T$ terminal voltage (see Note 1)  |            | $\pm 25$       | $\pm 25$   | V    |    |
| Continuous total dissipation at (or below)<br>25°C free-air temperature (see Note 2) | D package  |                | 950        | mW   |    |
|  | FK package | 1375           |            |      |    |
|  | J package  | 1375           | 1025       |      |    |
|  | N package  |                | 1150       |      |    |
| Operating free-air temperature range   |            | -55 to 125     | 0 to 70    | °C   |    |
| Storage temperature range  |            | -65 to 150     | -65 to 150 | °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  | °C |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds                         |            | D or N package |            | 260  | °C |

- NOTES: 1. These voltage values are with respect to network ground terminal.  
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in Appendix A. In the J package, SN55152 chips are alloy mounted and SN75152 chips are glass mounted. In the N package, use the 9.2-mW/°C curve for these devices.

recommended operating conditions

|   | SN55152 |     |       | SN75152 |     |       | UNIT |
|---|---------|-----|-------|---------|-----|-------|------|
|   | MIN     | NOM | MAX   | MIN     | NOM | MAX   |      |
| Supply voltage, $V_{CC+}$                       | 10.8    | 12  | 13.2  | 10.8    | 12  | 13.2  | V    |
| Supply voltage, $V_{CC-}$                       | -10.8   | -12 | -13.2 | -10.8   | -12 | -13.2 | V    |
| High-level input voltage at strobe, $V_{IH(S)}$ | 2       |     |       | 2       |     |       | V    |
| Low-level input voltage at strobe, $V_{L(S)}$   |         |     | 0.8   |         |     | 0.8   | V    |
| Operating free-air temperature, $T_A$           | -55     |     | 125   | 0       |     | 70    | °C   |

Line Drivers/Receivers

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91D 75453 D

SN55152, SN75152  
DUAL LINE RECEIVERS

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electrical characteristics over operating free-air temperature range,  $V_{CC+} = 12V \pm 10\%$ ,  $V_{CC-} = -12V \pm 10\%$  (unless otherwise noted)

| PARAMETER                                 | TEST FIGURE | TEST CONDITIONS†   | MIN  | TYP‡ | MAX     | UNIT       |
|---|-------------|--|--|------|---------|------------|
| $V_{T+}$ Positive-going threshold voltage | 1           | MIL-STD-188 Conditions   | 0.1  | 0.3  | 0.5     | V          |
| $V_{T-}$ Negative-going threshold voltage |             |  | 0.03   | 0.3  | 0.5     | V          |
| $V_{T+}$ Positive-going threshold voltage | 2           | EIA RS-232-C Conditions  | -0.5   | -0.3 | -0.1    | V          |
| $V_{T-}$ Negative-going threshold voltage |             |  | -0.5   | -0.3 | -0.03   | V          |
| $V_{OH}$ High-level output voltage        | 1 and 2     | $V_{ID} = V_{T+} \text{ max, } V_{I(strobe)} = 2V,$<br>$I_{OH} = -500 \mu A$   | 3  | 4.1  | 6       | V          |
|   |             |  | $V_{ID} = V_{T-} \text{ min, } V_{I(strobe)} = 0.8V,$<br>$I_{OH} = -500 \mu A$ | 3    | 4.1     | 6          |
| $V_{OL}$ Low-level output voltage         | 1 and 2     | $V_{ID} = V_{T-} \text{ min, } V_{I(strobe)} = 2V,$<br>$I_{OL} = 6.4 \text{ mA}$   | 0  | 0.15 | 0.4     | V          |
|   |             |  | $V_{I(strobe)} = 5.5V$   | 0.1  | 1       | mA         |
| $I_{IH}$ High-level strobe current        | 3           | $V_{I(strobe)} = 2.4V$   |  | 30   | 80      | $\mu A$    |
| $I_{IL}$ Low-level strobe current         | 3           | $V_{I(strobe)} = 0.4V$   |  | -0.5 | -1.5    | mA         |
| $r_I$ Input resistance                    | 4           | MIL-STD-188<br>$V_{ID} = 0V \text{ to } 25V, R_T \text{ open, } T_A = 25^\circ C,$<br>$ V_{ID}  = 3V \text{ to } 25V,$<br>$R_T \text{ connected to inverting line input, } T_A = 25^\circ C$ | 8  | 9    |         | k $\Omega$ |
|   |             |  | 3  | 5    | 7       |            |
| $V_{I(open)}$ Open-circuit input voltage  | 5           |  |  | +1   | $\pm 2$ | V          |
| $I_{OS}$ Short-circuit output current     | 6           | $V_{ID} = 3V$  |  | -1.9 | -4      | mA         |
| $I_{CC+}$ Supply current from $V_{CC+}$   | 1           | $V_{ID} = -3V, V_{I(strobe)} = 2.4V$   |  | 10   | 18      | mA         |
| $I_{CC-}$ Supply current from $V_{CC-}$   | 1           | $V_{ID} = -3V, V_{I(strobe)} = 2.4V$   |  | -7   | -13     | mA         |

† Differential input voltages ( $V_T$  and  $V_{ID}$ ) are at the noninverting line input terminal with respect to the inverting line input terminal.

‡ Typical values are at  $V_{CC+} = 12V, V_{CC-} = -12V, T_A = 25^\circ C$ .

NOTE 3: 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, e.g., when  $-0.1V$  is the maximum, the minimum limit is a more negative voltage.

switching characteristics,  $V_{CC+} = 12V, V_{CC-} = -12V, T_A = 25^\circ C$

| PARAMETER  | TEST FIGURE | TEST CONDITIONS       | MIN | TYP | MAX | UNIT |
|--|-------------|-----------------------|-----|-----|-----|------|
| $t_{PLH}$ Propagation delay time, low-to-high-level output | 7           | $C_L = 15 \text{ pF}$ |     | 40  |     | ns   |
| $t_{PHL}$ Propagation delay time, high-to-low-level output |             |                       |     | 60  |     |      |

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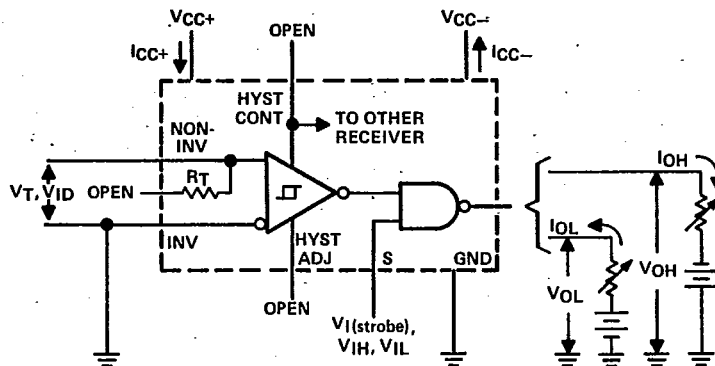
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DUAL LINE RECEIVERS

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PARAMETER MEASUREMENT INFORMATION



NOTE: Output is open for testing  $I_{CC+}$  and  $I_{CC-}$

FIGURE 1. MIL-STD-188 CONDITION

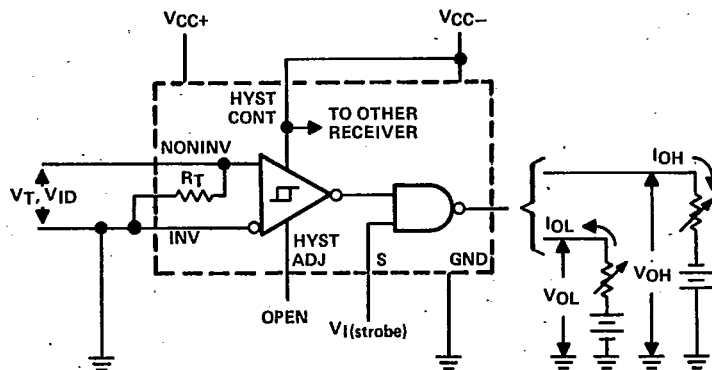


FIGURE 2. EIA RS-232-C CONDITION

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PARAMETER MEASUREMENT INFORMATION

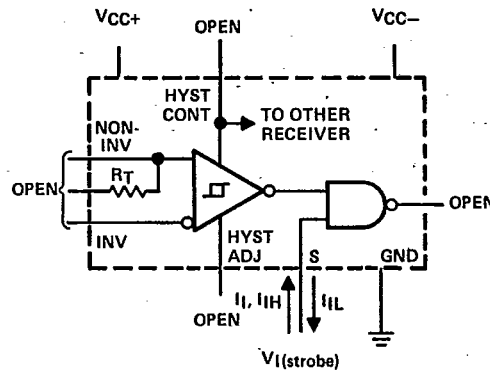


FIGURE 3

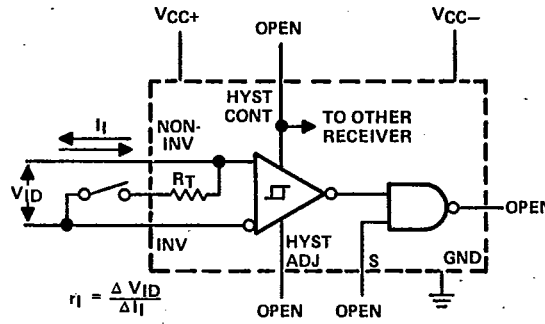


FIGURE 4

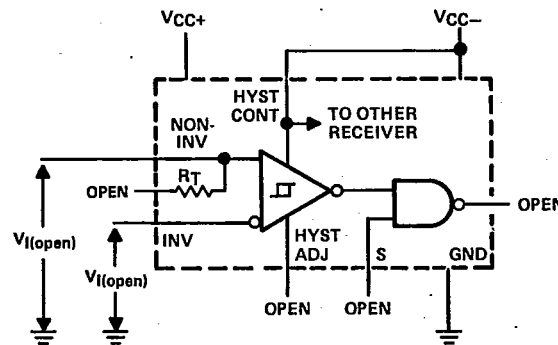


FIGURE 5

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Line Drivers/Receivers

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DUAL LINE RECEIVERS

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PARAMETER MEASUREMENT INFORMATION

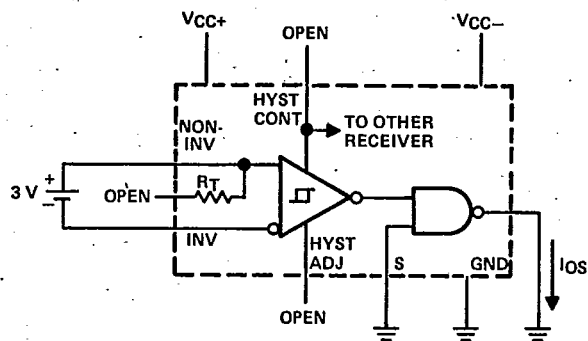
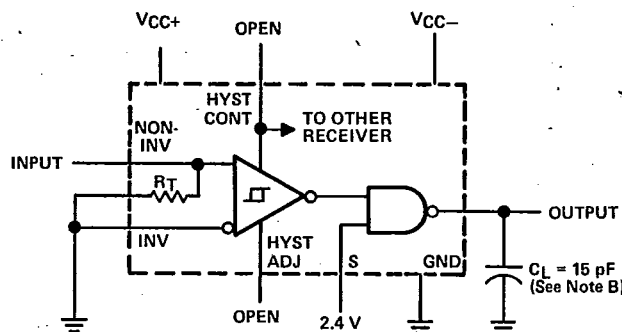
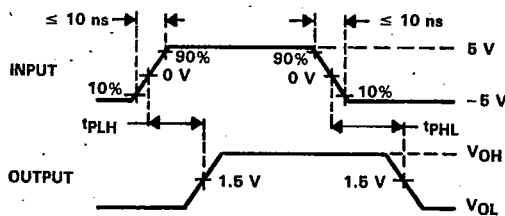


FIGURE 6



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR  $\le 1$  MHz, duty cycle = 50%,  $Z_{out} \approx 50 \Omega$ .  
B.  $C_L$  includes probe and jig capacitance.

FIGURE 7. PROPAGATION DELAY TIMES



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TYPICAL CHARACTERISTICS

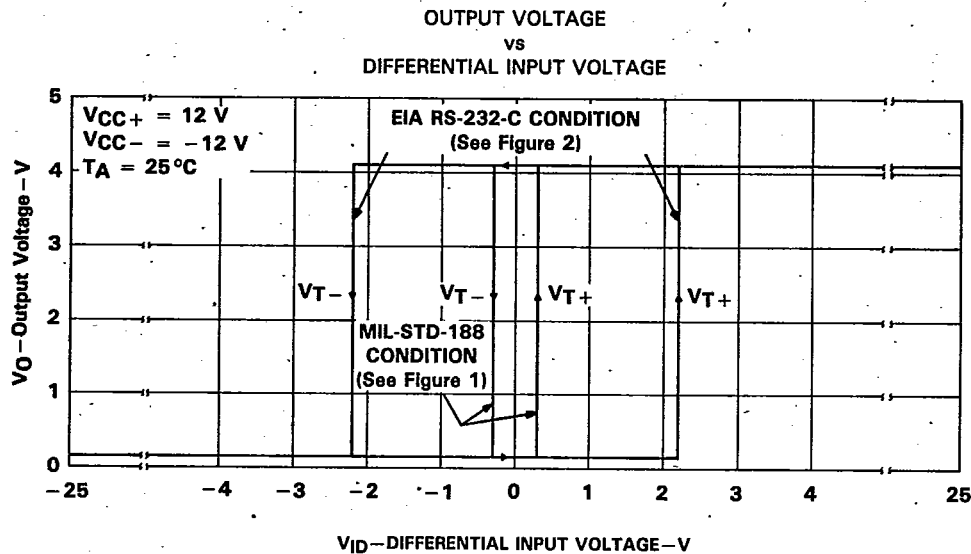


FIGURE 8

THRESHOLD VOLTAGE VARIATION  
vs  
POSITIVE SUPPLY VOLTAGE

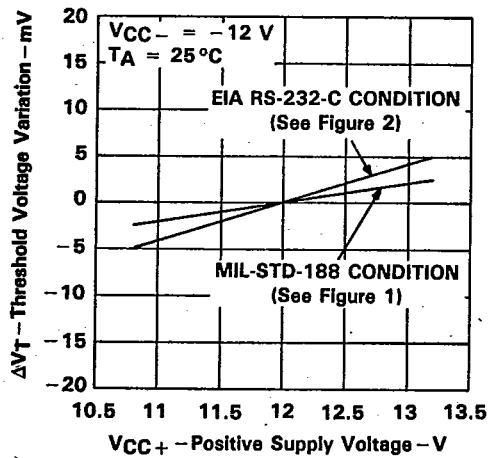


FIGURE 9

4  
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DUAL LINE RECEIVERS

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TYPICAL CHARACTERISTICS

THRESHOLD VOLTAGE VARIATION  
vs  
NEGATIVE POWER SUPPLY

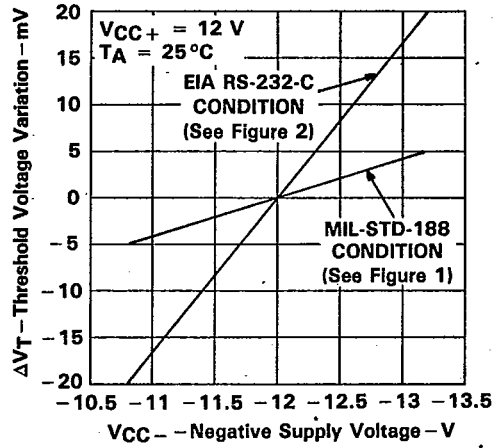
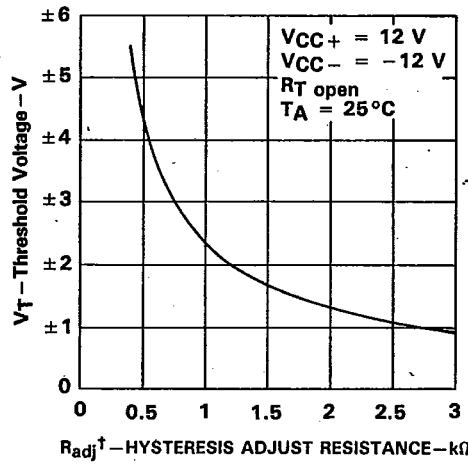


FIGURE 10

THRESHOLD VOLTAGE  
vs  
HYSTERESIS ADJUST RESISTANCE



$\dagger R_{adj}$  is connected between Hysteresis Adjust terminal and  $V_{CC-}$ .

FIGURE 11

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TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME  
vs  
FREE-AIR TEMPERATURE

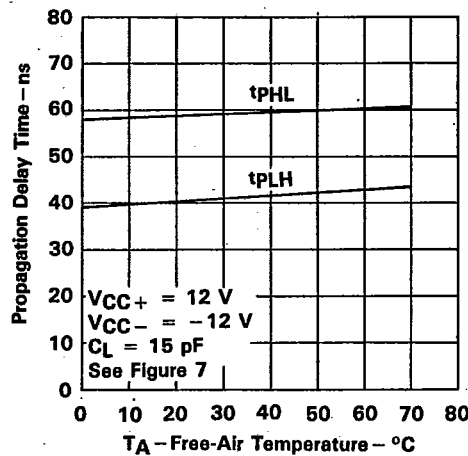


FIGURE 12

TYPICAL APPLICATIONS

Some typical applications of the SN55152 and SN75152 are as follows:

- MIL-STD-188 Interface Receiver
- EIA RS-232-C Interface Receiver
- Single-Ended Line Receiver
- Differential Line Receiver
- High-Noise-Immunity Line Receiver
- Schmitt Trigger
- High-Voltage-Logic-to-TTL Translator
- MOS-to-TTL Converter
- Pulse Generator
- Threshold Detector
- Pulse Shaper

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Line Drivers/Receivers

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TYPICAL APPLICATIONS

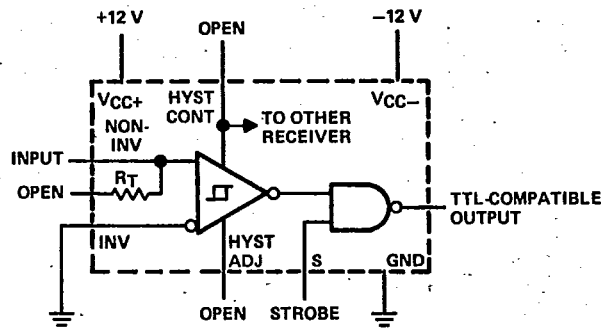
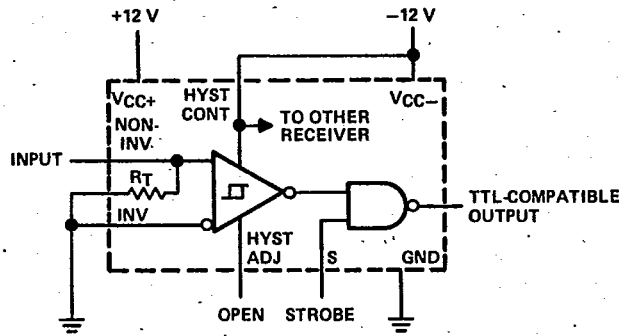
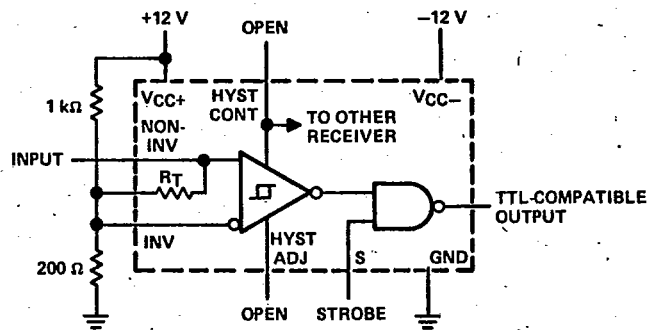


FIGURE 13. MIL-STD-188 SINGLE-ENDED LINE RECEIVER



NORMAL OPERATION



FAIL-SAFE OPERATION

FIGURE 14. EIA RS-232-C SINGLE-ENDED RECEIVER

4  
Line Drivers/Receivers

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TYPICAL APPLICATIONS

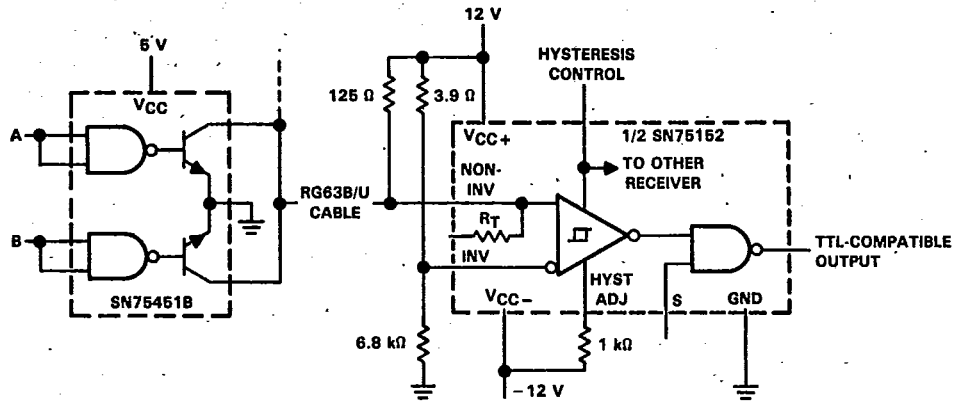
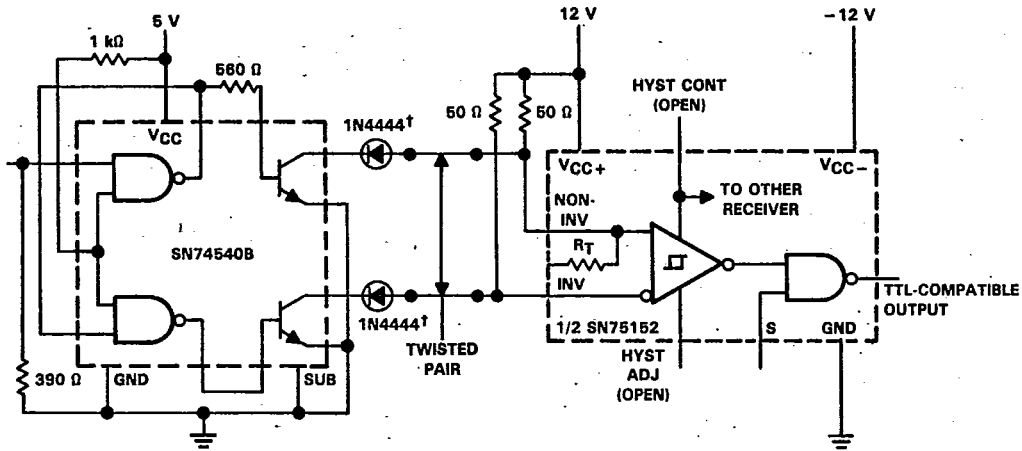


FIGURE 15. SINGLE-ENDED TRANSMITTER WITH DRIVER "OR" CAPABILITY AND RECEIVER WITH ADJUSTABLE NOISE IMMUNITY



Frequency to 0.5 MHz  
Common-Mode Voltage . . . -12 V to +10 V

†The 1N4444 diodes are required only for negative common-mode protection at the driver outputs.

FIGURE 16. BALANCED LINE OPERATION WITH HIGH COMMON-MODE-VOLTAGE CAPABILITY

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