

8961724 TEXAS INSTR (LIN/INTFC)

91D 75449 D

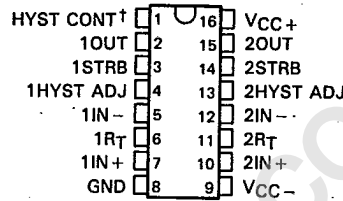
**SN55152, SN75152  
DUAL LINE RECEIVERS**

D1114, AUGUST 1972—REVISED SEPTEMBER 1986

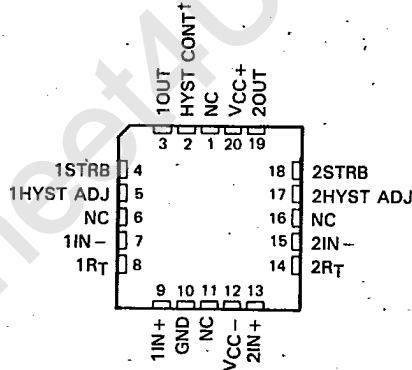
- Meets Specifications of EIA RS-232-C or MIL-STD-188C†
- Dual Differential Receiver with Independent Strobes
- Common-Mode Input Voltage Range . . .  $\pm 25$  V
- Differential Input Capability with One Input Grounded . . .  $\pm 25$  V
- Continuously Adjustable Hysteresis with External Resistors
- 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  $\pm 0.3$  volt typical and  $\pm 5$  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 ( $\pm 25$  volts) give the circuit added versatility. The SN55152 and SN75152 are designed for operation from standard  $\pm 12$ -volt supplies with  $\pm 10\%$  variation. Each receiver has an output strobe that is TTL compatible.

The SN55152 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN75152 is characterized for operation from  $0^\circ\text{C}$  to  $70^\circ\text{C}$ .

† To meet the specifications of EIA Standard RS-232-C, connect the hysteresis control pin, HYST CONT, to  $V_{CC-}$ . 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.

PRODUCTION DATA documents contain information 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  
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Line Drivers/Receivers

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**SN55152, SN75152  
DUAL LINE RECEIVERS**

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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.

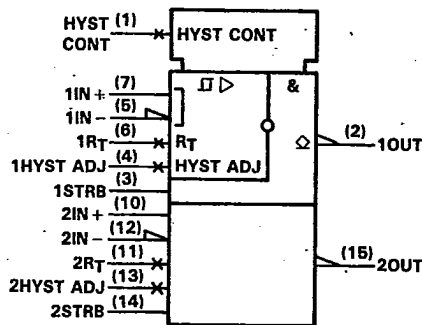
X (Irrelevant) is any input voltage permitted by maximum ratings.

<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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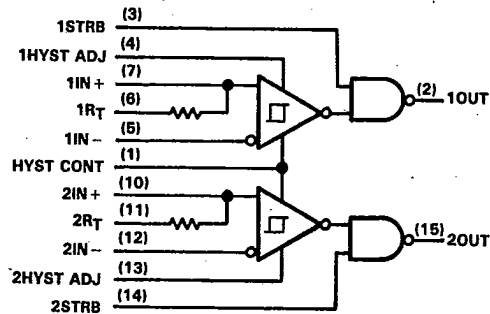
Line Drivers/Receivers

logic symbol<sup>†</sup>



<sup>†</sup>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)



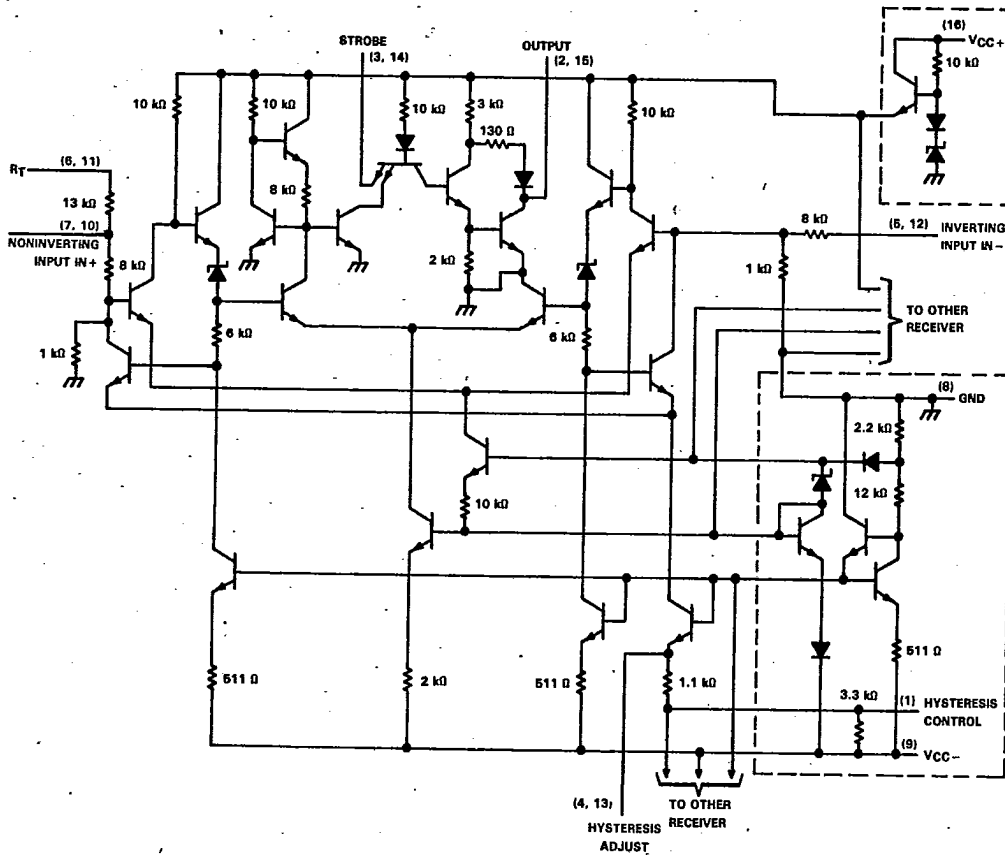
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DUAL LINE RECEIVERS

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schematic (each receiver)



Portions of circuit within dashed lines are common to both receivers.  
Resistor values shown are nominal.

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Line Drivers/Receivers

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**SN55152, SN75152  
DUAL LINE RECEIVERS**

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**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) 25°C free-air temperature (see Note 2)	D package	950	mW
	FK package	1375	
	J package	1375	
	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, $V_{IL(S)}$	0.8			0.8			V		
Operating free-air temperature, $T_A$	-55			125			0	70	°C

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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	'75152	0.1	0.3	0.5
			'55152	0.03	0.3	0.5
$V_{T-}$ Negative-going threshold voltage			'75152	-0.5	-0.3	-0.1
			'55152	-0.5	-0.3	-0.03
$V_{T+}$ Positive-going threshold voltage	2	EIA RS-232-C Conditions	1.5	2.2	3	
$V_{T-}$ Negative-going threshold voltage			-3	-2.2	-1.5	
$V_{OH}$ High-level output voltage	1 and 2	$V_{ID} = V_{T+} \text{ max,}$ $I_{OH} = -500 \mu\text{A}$	$V_{I(strobe)} = 2 \text{ V,}$	3	4.1	6
	1 and 2	$I_{OH} = V_{T-} \text{ min,}$ $I_{OH} = -500 \mu\text{A}$	$V_{I(strobe)} = 0.8 \text{ V,}$	3	4.1	6
$V_{OL}$ Low-level output voltage	1 and 2	$V_{ID} = V_{T-} \text{ min,}$ $I_{OL} = 6.4 \text{ mA}$	$V_{I(strobe)} = 2 \text{ V,}$	0	0.15	0.4
	3	$V_{I(strobe)} = 5.5 \text{ V}$		0.1	1	mA
$I_I$ Input current into strobe at maximum strobe voltage	3	$V_{I(strobe)} = 2.4 \text{ V}$		30	80	$\mu\text{A}$
$I_{IH}$ High-level strobe current	3	$V_{I(strobe)} = 0.4 \text{ V}$		-0.5	-1.5	mA
				8	9	
$I_{IL}$ Low-level strobe current	4	MIL-STD-188	$ V_{ID}  = 0 \text{ V to } 25 \text{ V, } R_T \text{ open, } T_A = 25^\circ\text{C}$	3	5	7
			$ V_{ID}  = 3 \text{ V to } 25 \text{ V,}$ $R_T \text{ connected to inverting line input,}$ $T_A = 25^\circ\text{C}$			
$r_I$ Input resistance	4	EIA RS-232-C				k $\Omega$
$V_{I(open)}$ Open-circuit input voltage	5			+1	+2	V
$I_{OS}$ Short-circuit output current	6			-1.9	-4	mA
$I_{CC+}$ Supply current from $V_{CC+}$	1			10	16	mA
$I_{CC-}$ Supply current from $V_{CC-}$	1			-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  $V_{CC+} = 12 \text{ V, } V_{CC-} = -12 \text{ V, } T_A = 25^\circ\text{C}$ .

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  $-0.1 \text{ V}$  is the maximum, the minimum limit is a more negative voltage.

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

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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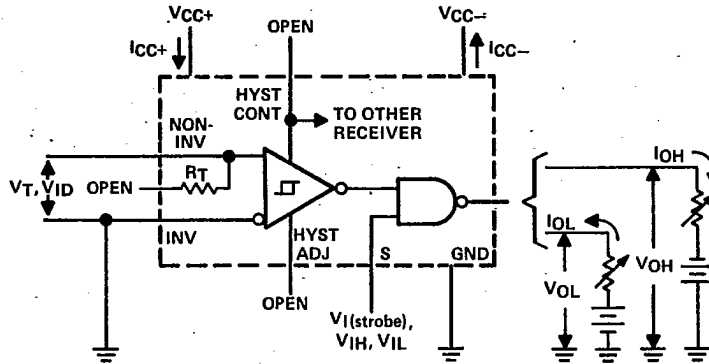
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DUAL LINE RECEIVERS

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PARAMETER MEASUREMENT INFORMATION



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

FIGURE 1. MIL-STD-188 CONDITION

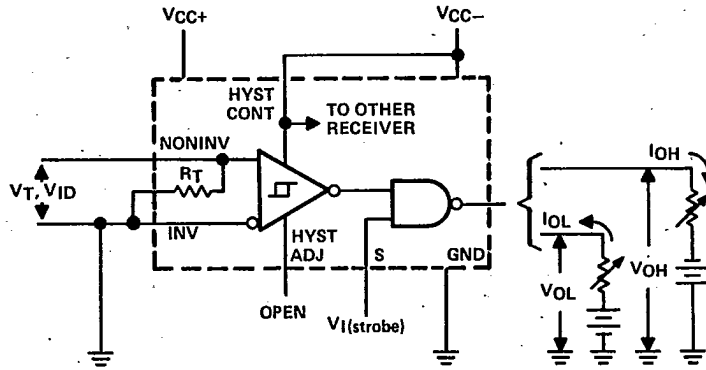


FIGURE 2. EIA RS-232-C CONDITION

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PARAMETER MEASUREMENT INFORMATION

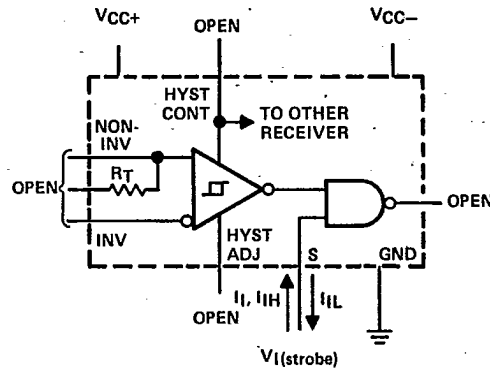
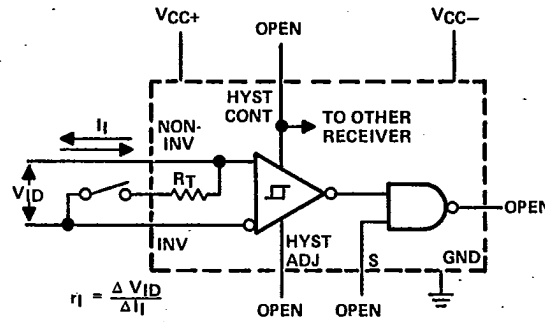


FIGURE 3



$$r_i = \frac{\Delta V_{ID}}{\Delta I_I}$$

FIGURE 4

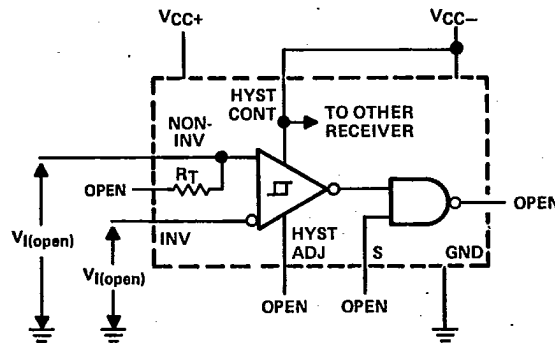


FIGURE 5

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Line Drivers/Receivers

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PARAMETER MEASUREMENT INFORMATION

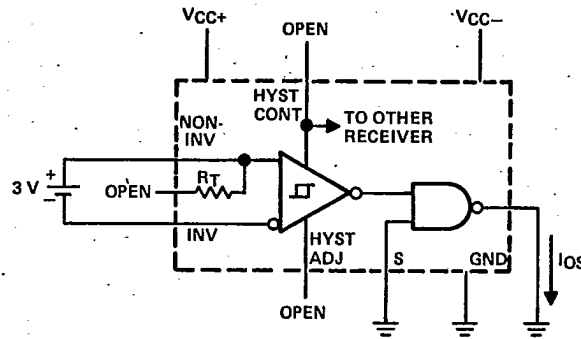
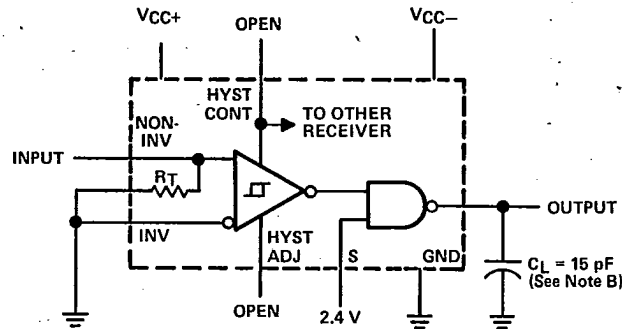
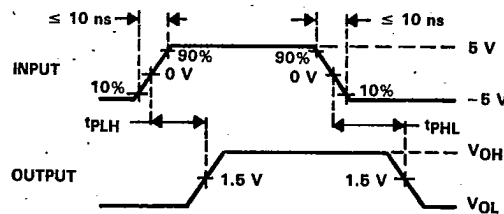


FIGURE 6



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

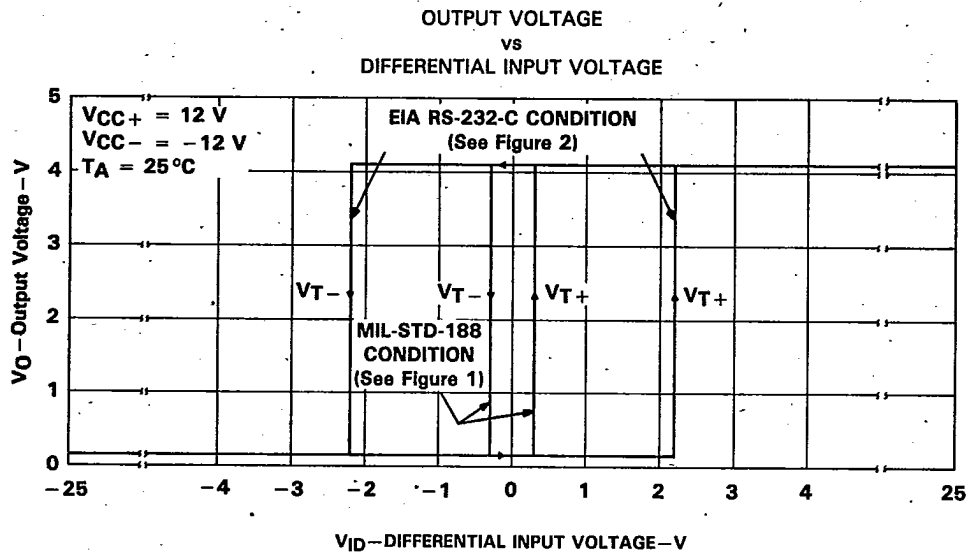


FIGURE 8

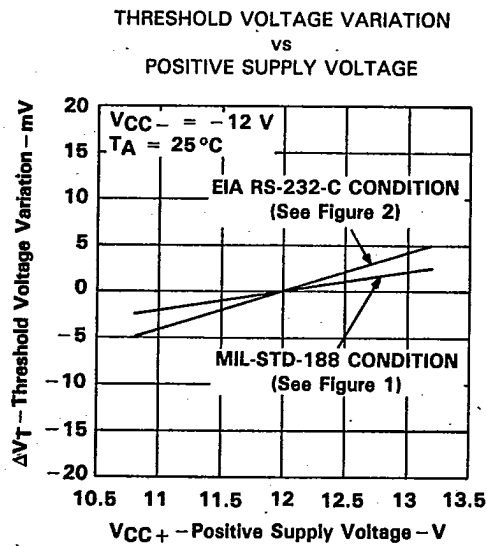


FIGURE 9

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TYPICAL CHARACTERISTICS

THRESHOLD VOLTAGE VARIATION  
vs  
NEGATIVE POWER SUPPLY

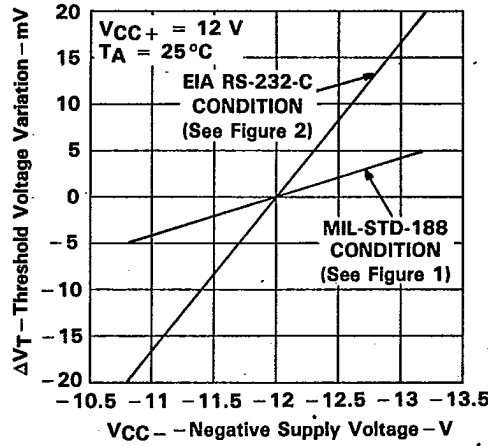
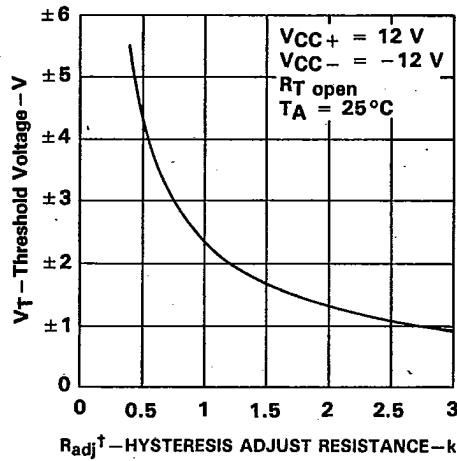


FIGURE 10

THRESHOLD VOLTAGE  
vs  
HYSTERESIS ADJUST RESISTANCE



$R_{adj}^\dagger$  - HYSTERESIS ADJUST RESISTANCE -  $k\Omega$   
 $^\dagger R_{adj}$  is connected between Hysteresis Adjust terminal and  $V_{CC-}$ .

FIGURE 11

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SN55152, SN75152  
DUAL LINE RECEIVERS

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TYPICAL CHARACTERISTICS

PROPAGATION DELAY TIME  
vs  
FREE-AIR TEMPERATURE

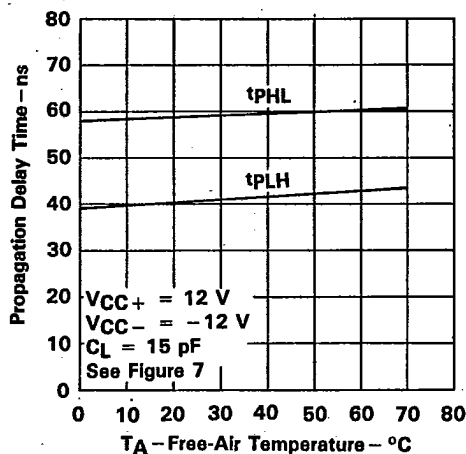


FIGURE 12

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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TYPICAL APPLICATIONS

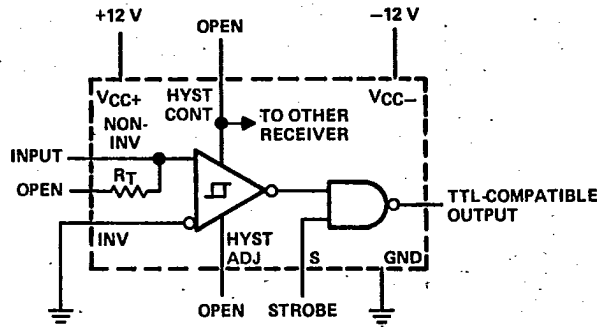
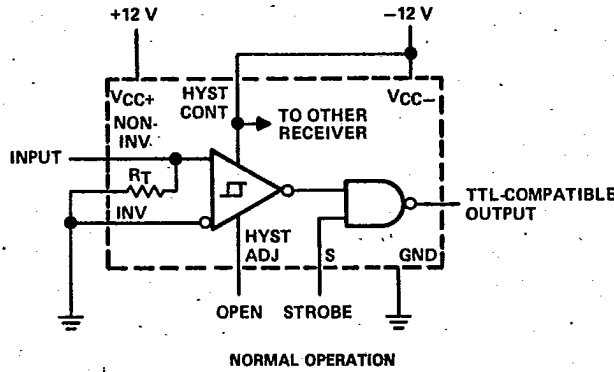
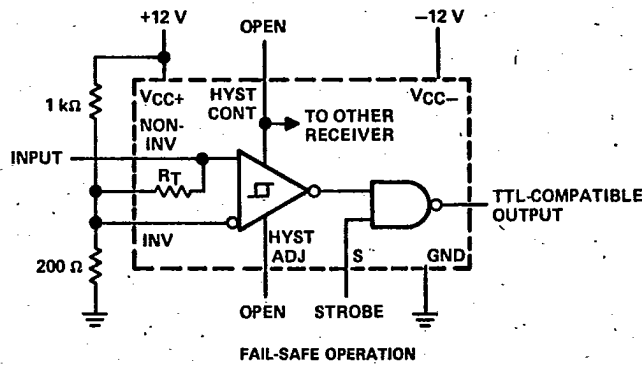


FIGURE 13. MIL-STD-188 SINGLE-ENDED LINE RECEIVER



NORMAL OPERATION



FAIL-SAFE OPERATION

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

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TYPICAL APPLICATIONS

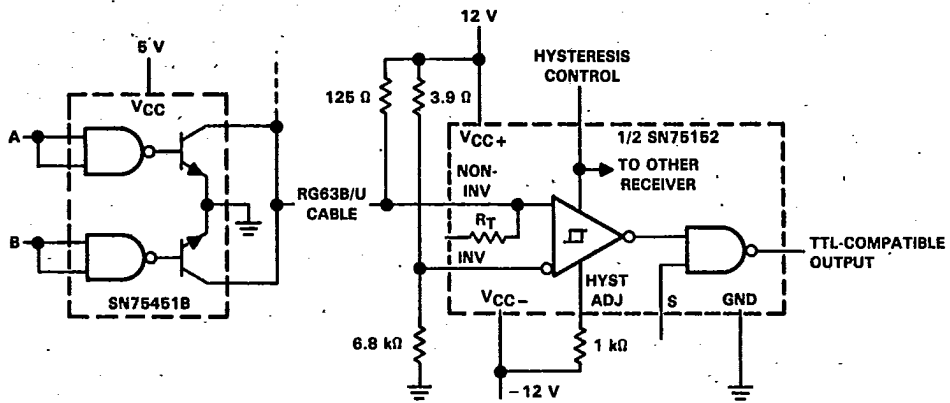
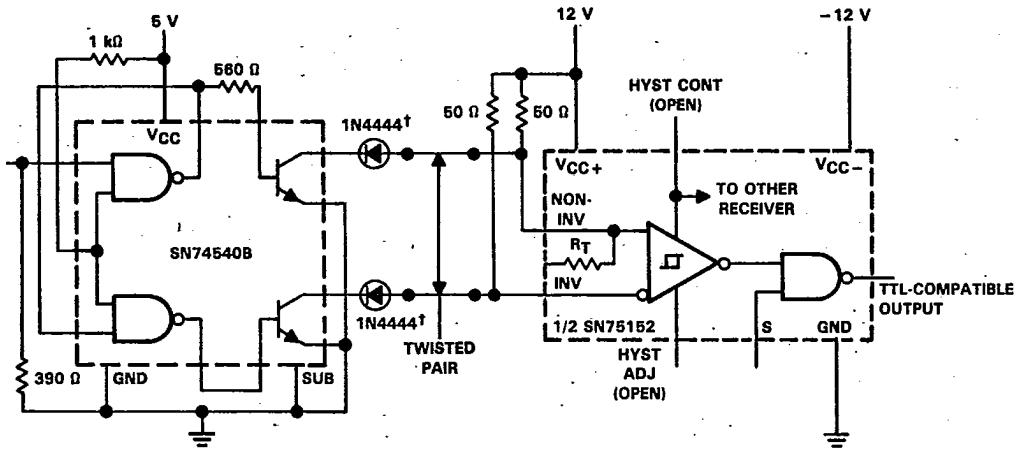


FIGURE 15. SINGLE-ENDED TRANSMITTER WITH DRIVER "OR" CAPABILITY AND RECEIVER WITH ADJUSTABLE NOISE IMMUNITY



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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