

8961724 TEXAS INSTR (LIN/INTFC)

91D 75449 D

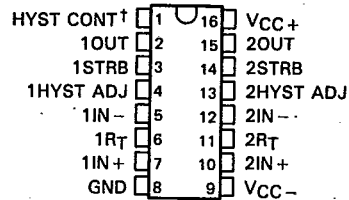
**SN55152, SN75152
DUAL LINE RECEIVERS**

D1114, AUGUST 1972—REVISED SEPTEMBER 1986

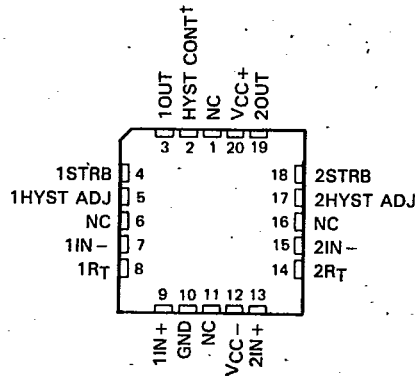
- Meets Specifications of EIA RS-232-C or MIL-STD-188C†
- Dual Differential Receiver with Independent Strobes
- Common-Mode Input Voltage Range . . . ±25 V
- Differential Input Capability with One Input Grounded . . . ±25 V
- Continuously Adjustable Hysteresis with External Resistors
- Standard Supply 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
(TOP VIEW)

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.

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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})[‡] more positive than V_{T-} , once the level of V_{T+} has been reached.

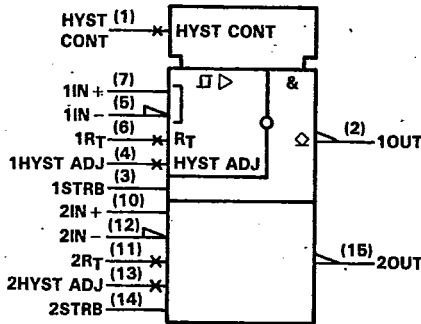
L (low) is any differential input voltage (V_{ID})[‡] more negative than V_{T+} , once the level of V_{T-} has been reached.

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

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

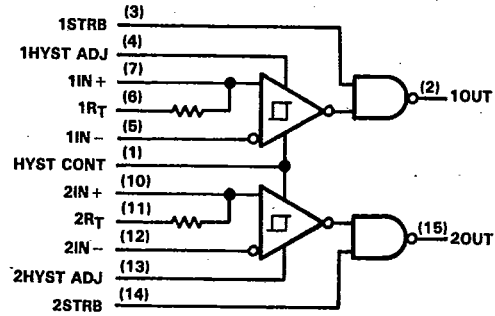
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logic symbol†



† 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)



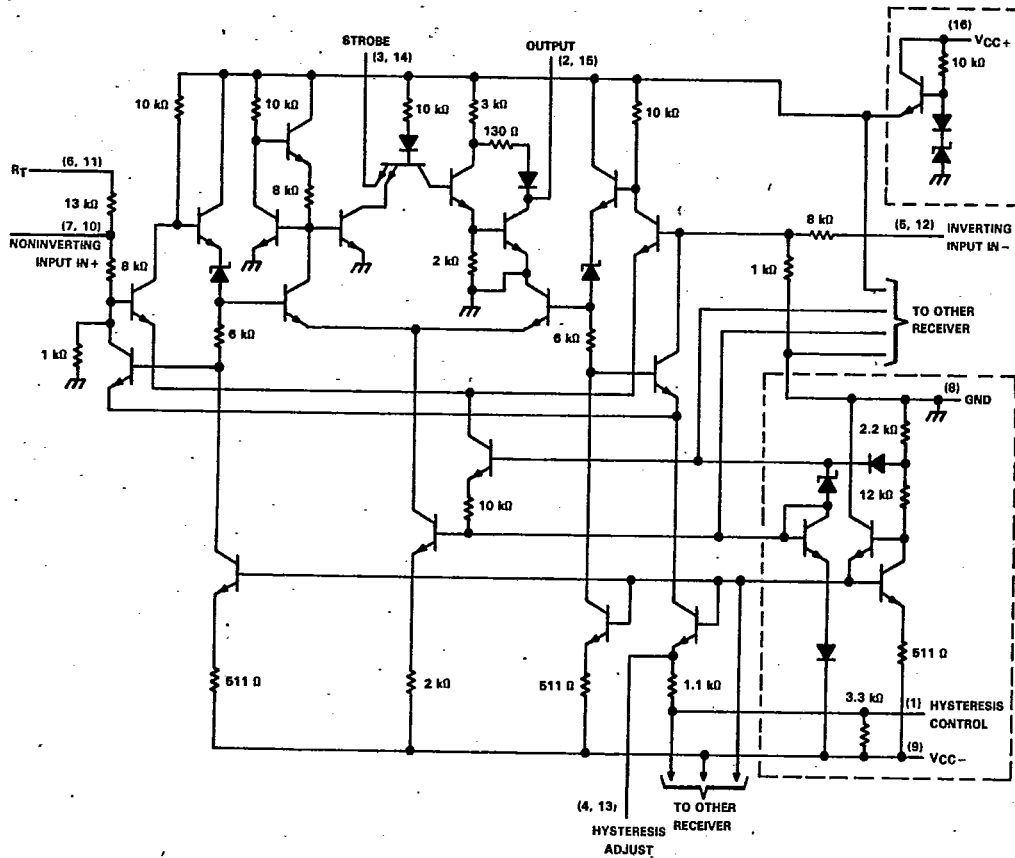
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schematic (each receiver)



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

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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		± 25	± 25	V
R_T terminal voltage (see Note 1)		± 25	± 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	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	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

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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	$V_{ID} = V_{T+} \text{ max.}$ $I_{OH} = -500 \mu\text{A}$	3	4.1	6	V
			$V_{ID} = V_{T-} \text{ min.}$ $I_{OH} = -500 \mu\text{A}$	3	4.1	6
V_{OL} Low-level output voltage	1 and 2	$V_{ID} = V_{T-} \text{ min.}$ $I_{OL} = 6.4 \text{ mA}$	0	0.15	0.4	V
			$V_{ID} = V_{T+} \text{ max.}$ $I_{OL} = -500 \mu\text{A}$	0.1	1	mA
I_{IH} High-level strobe current	3	$V_{I(strobe)} = 2.4 \text{ V}$	30	80	μA	
I_{IL} Low-level strobe current	3	$V_{I(strobe)} = 0.4 \text{ V}$	-0.5	-1.5	mA	
r_I Input resistance	4	MIL-STD-188 $V_{ID} = 0 \text{ V to } 25 \text{ V}$, $R_T \text{ open}$, $T_A = 25^\circ\text{C}$ $V_{ID} = 3 \text{ V to } 25 \text{ V}$, $R_T \text{ connected to inverting line input}$, $T_A = 25^\circ\text{C}$	8	9	9	k Ω
			3	5	7	k Ω
$V_{I(open)}$ Open-circuit input voltage	5			+1	± 2	V
I_{OS} Short-circuit output current	6	$V_{ID} = 3 \text{ V}$	-1.9	-4	-4	mA
I_{CC+} Supply current from V_{CC+}	1	$V_{ID} = -3 \text{ V}$, $V_{I(strobe)} = 2.4 \text{ V}$	10	18	18	mA
I_{CC-} Supply current from V_{CC-}	1	$V_{ID} = -3 \text{ V}$, $V_{I(strobe)} = 2.4 \text{ V}$	-7	-13	-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 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			ns

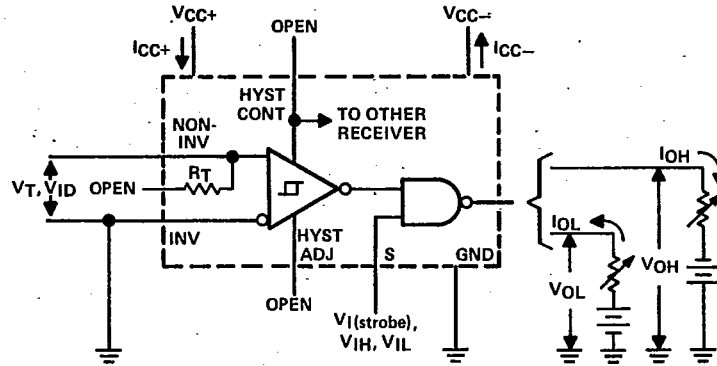
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PARAMETER MEASUREMENT INFORMATION



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

FIGURE 1. MIL-STD-188 CONDITION

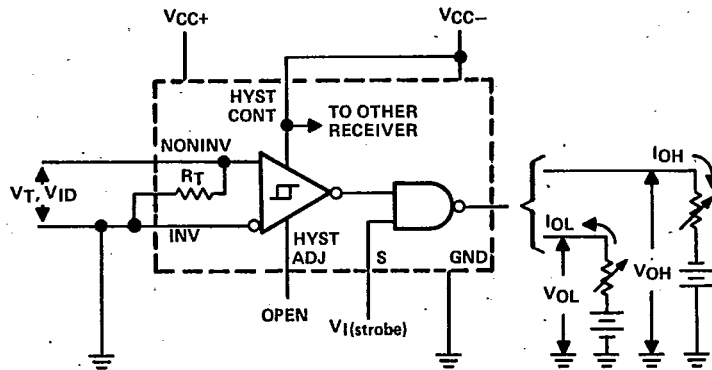


FIGURE 2. EIA RS-232-C CONDITION

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PARAMETER MEASUREMENT INFORMATION

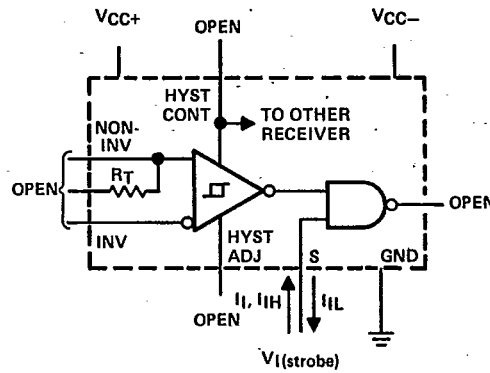


FIGURE 3

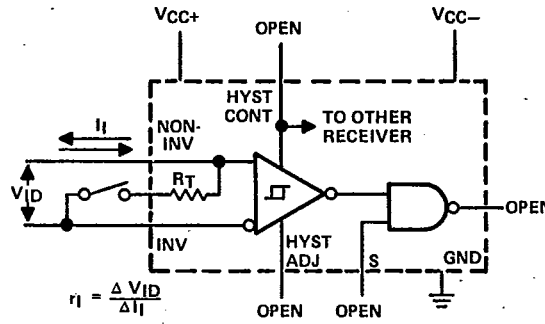


FIGURE 4

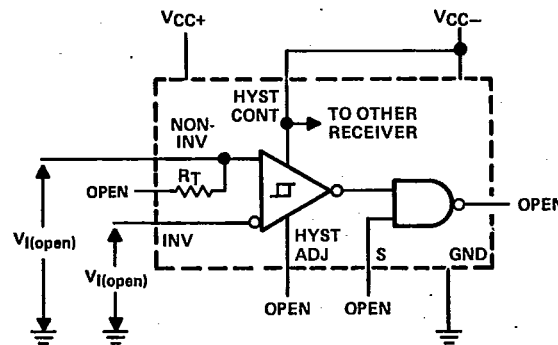


FIGURE 5

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DUAL LINE RECEIVERS

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PARAMETER MEASUREMENT INFORMATION

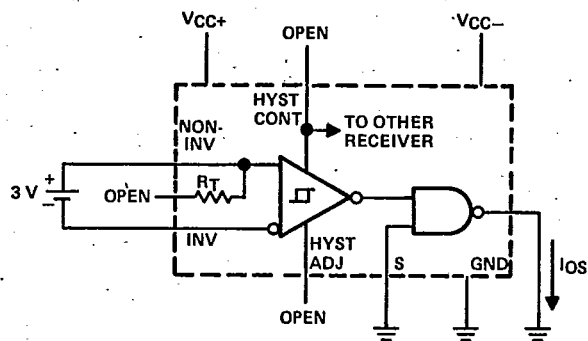
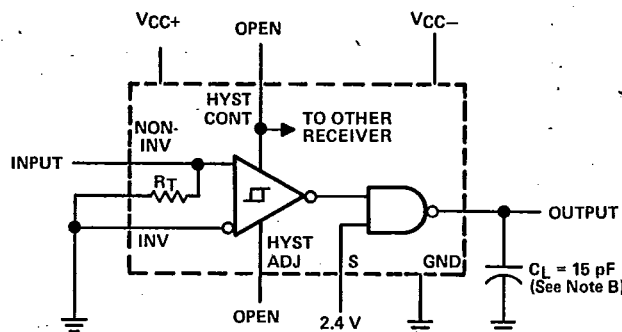
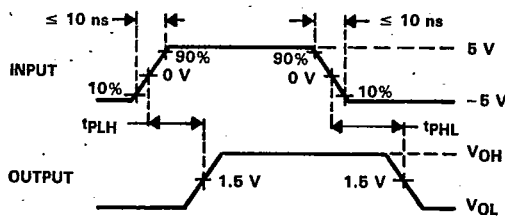


FIGURE 6



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 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

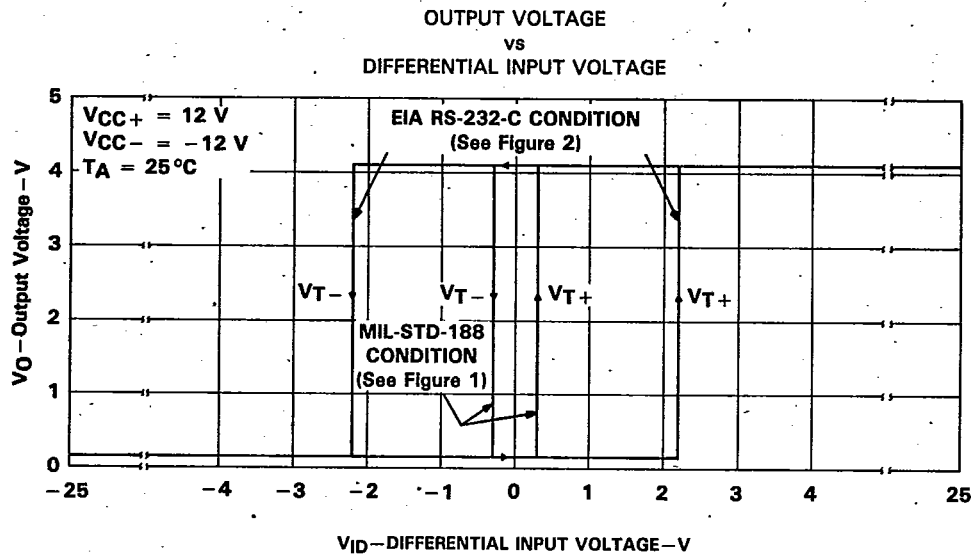


FIGURE 8

THRESHOLD VOLTAGE VARIATION
vs
POSITIVE SUPPLY VOLTAGE

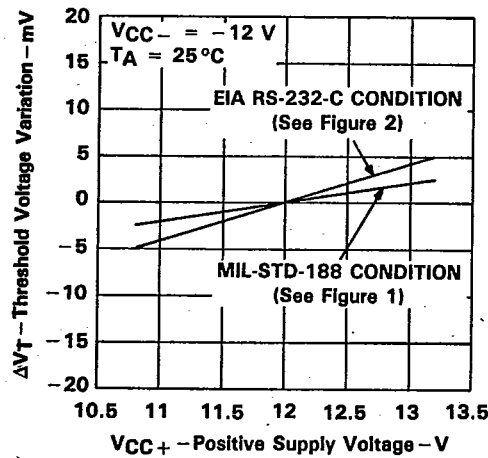


FIGURE 9

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DUAL LINE RECEIVERS

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TYPICAL CHARACTERISTICS

THRESHOLD VOLTAGE VARIATION
vs
NEGATIVE POWER SUPPLY

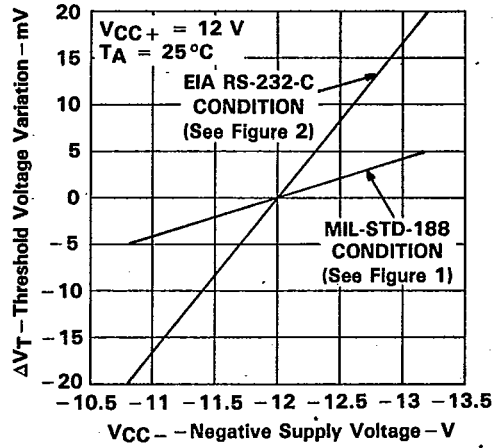
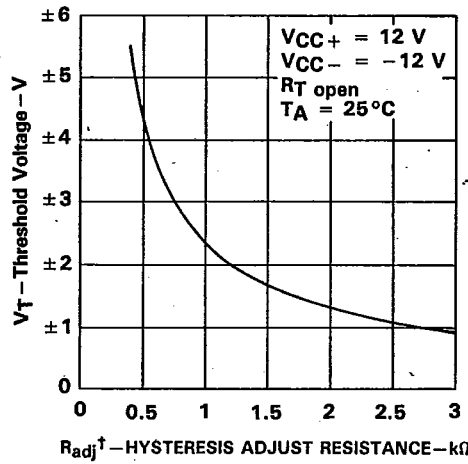


FIGURE 10

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

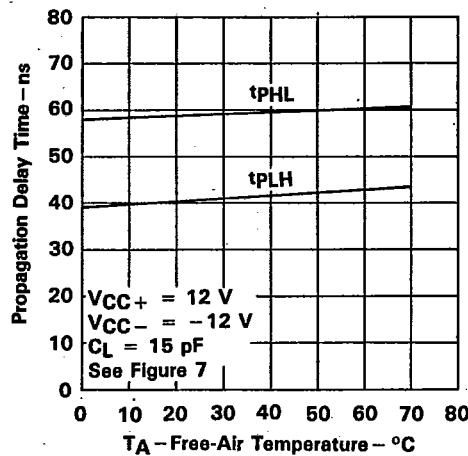


FIGURE 12

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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TEXAS
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TYPICAL APPLICATIONS

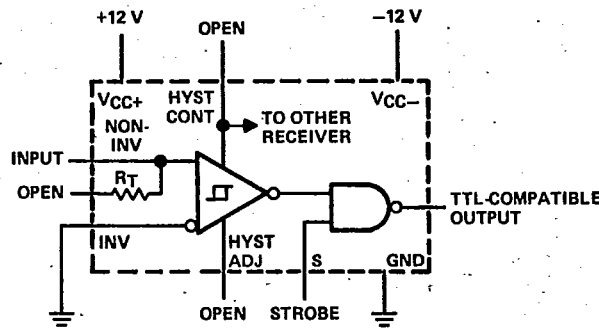
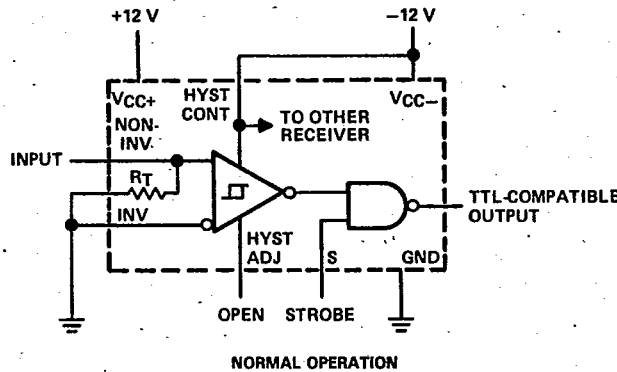
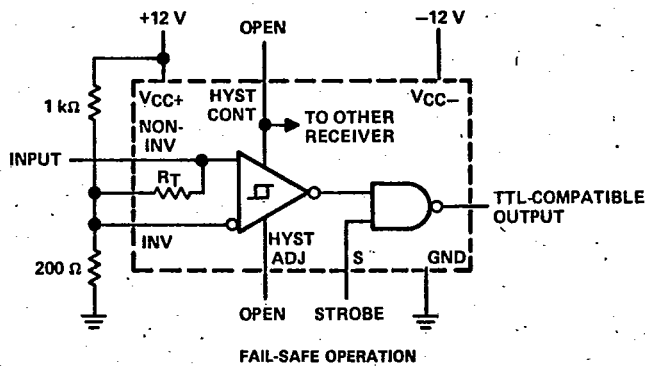


FIGURE 13. MIL-STD-188 SINGLE-ENDED LINE RECEIVER



NORMAL OPERATION



FAIL-SAFE OPERATION

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

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TYPICAL APPLICATIONS

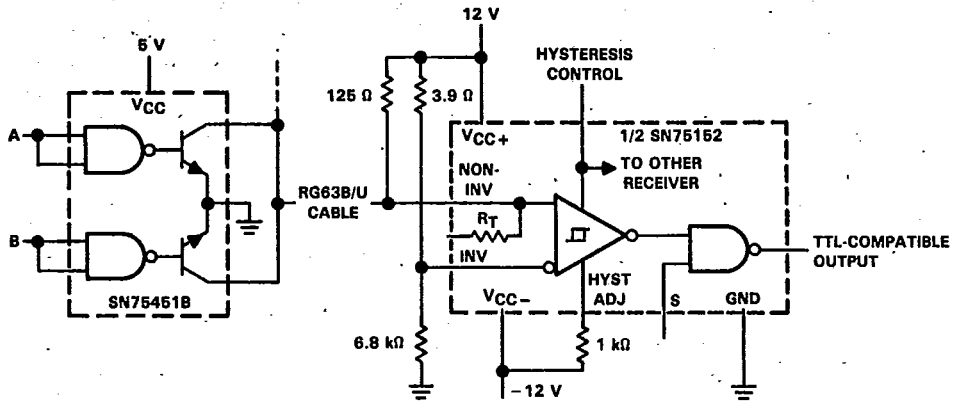
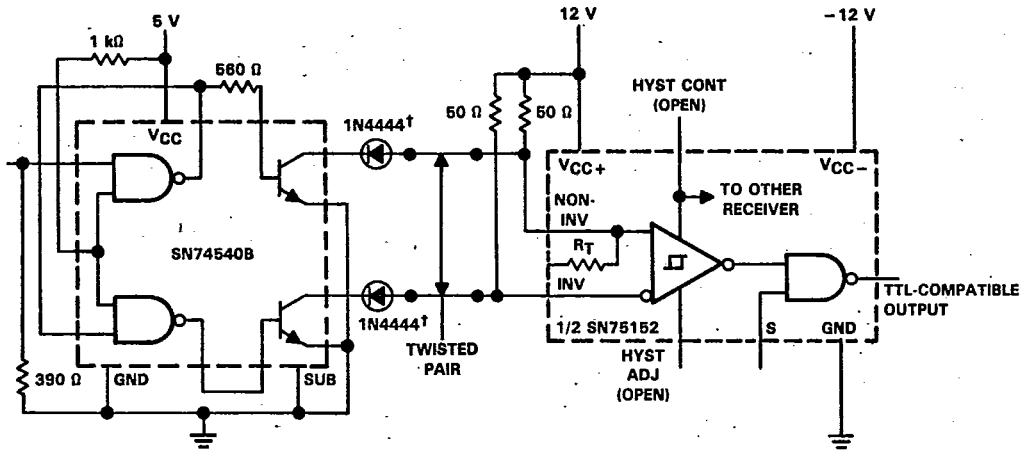


FIGURE 15. SINGLE-ENDED TRANSMITTER WITH DRIVER "OR" CAPABILITY AND RECEIVER WITH ADJUSTABLE NOISE IMMUNITY



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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