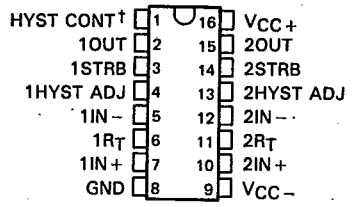
SN55152, SN75152
DUAL LINE RECEIVERS

D1114, AUGUST 1972—REVISED SEPTEMBER 1986

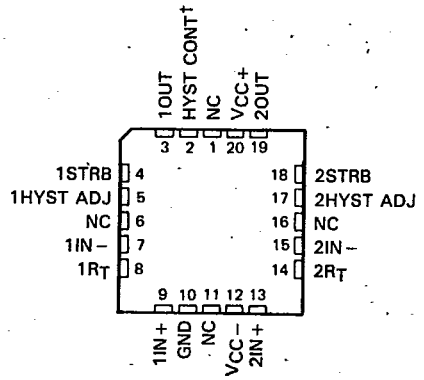
T-75-45-05

- **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)



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 V_{CC-}. Also, connect termination resistor pin $1R_T$ to inverting input 1IN−, and termination resistor pin $2R_T$ to inverting input 2IN−. To meet the specifications of MIL-STD-188, leave HYST CONT, $1R_T$, and $2R_T$ open.

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FUNCTION TABLE
(EACH RECEIVER)

LINE INPUT	STROBE	OUTPUT
H	H	H
L	H	L
X	L	H

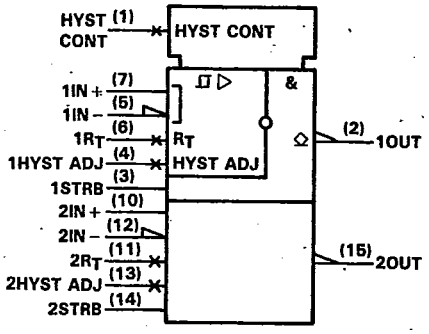
Definition of logic levels:

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.

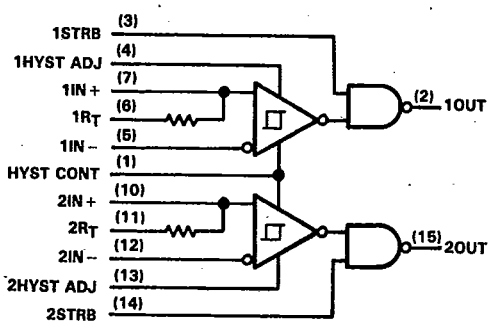
‡ Differential input voltages (V_T and V_{ID}) are at the noninverting input terminal IN+ with respect to the inverting input terminal IN−.

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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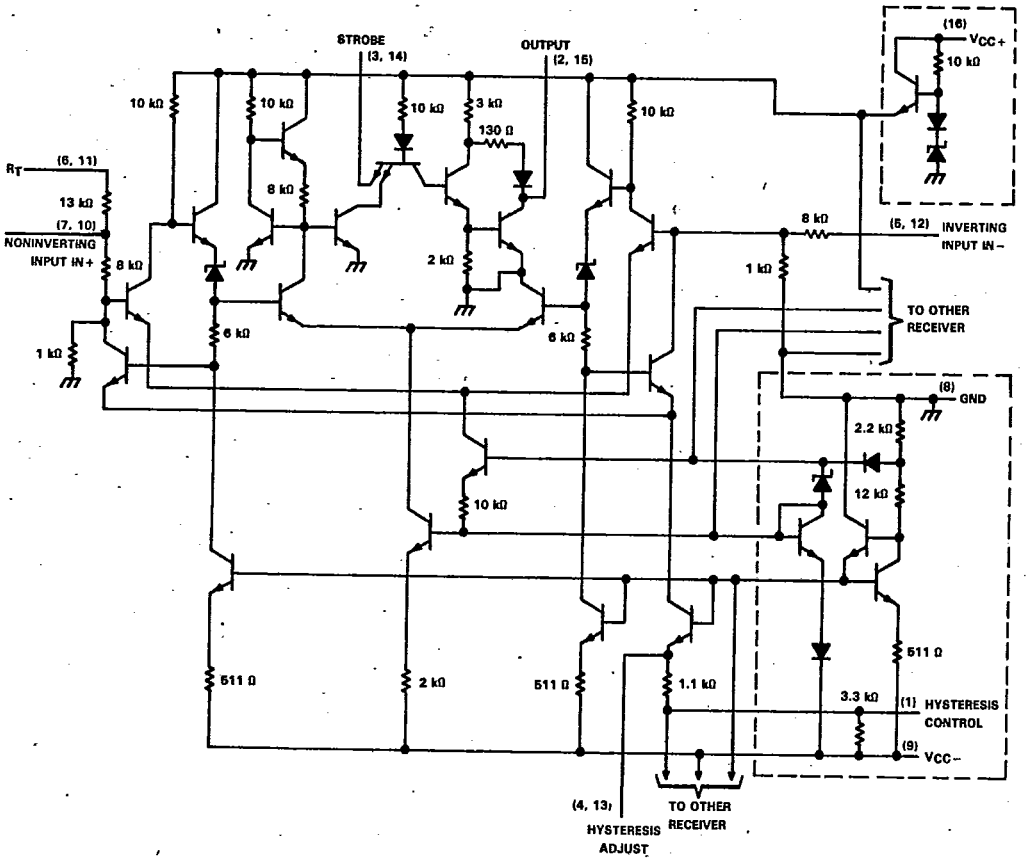
schematic (each receiver)



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

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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, $V_{IL(S)}$			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+} = 12 V ±10%, V_{CC-} = −12 V ± 10% (unless otherwise noted)

PARAMETER			TEST FIGURE	TEST CONDITIONS†		MIN	TYP‡	MAX (SEE NOTE 3)	UNIT
V_{T+}	Positive-going threshold voltage	See Figure 8	1	MIL-STD-188 Conditions	'75152	0.1	0.3	0.5	V
					'55152	0.03	0.3	0.5	
V_{T-}	Negative-going threshold voltage				'75152	−0.5	−0.3	−0.1	V
					'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
V_{T-}	Negative-going threshold voltage					−3	−2.2	−1.5	
V_{OH}	High-level output voltage		1 and 2	V_{ID} = V_{T+} max, I_{OH} = −500 μA	$V_{I(strobe)}$ = 2 V,	3	4.1	6	V
			1 and 2	V_{ID} = V_{T-} min, I_{OH} = −500 μA	$V_{I(strobe)}$ = 0.8 V,	3	4.1	6	
V_{OL}	Low-level output voltage		1 and 2	V_{ID} = V_{T-} min, I_{OL} = 6.4 mA	$V_{I(strobe)}$ = 2 V,	0	0.15	0.4	V
I_I	Input current into strobe at maximum strobe voltage		3	$V_{I(strobe)}$ = 5.5 V			0.1	1	mA
I_{IH}	High-level strobe current		3	$V_{I(strobe)}$ = 2.4 V			30	80	μA
I_{IL}	Low-level strobe current		3	$V_{I(strobe)}$ = 0.4 V			−0.5	−1.5	mA
r_I	Input resistance	MIL-STD-188	4	$\|V_{ID}\|$ = 0 V to 25 V, R_T open, T_A = 25°C		6	9		kΩ
		EIA RS-232-C	4	$\|V_{ID}\|$ = 3 V to 25 V, R_T connected to inverting line input, T_A = 25°C		3	5	7	
$V_{I(open)}$	Open-circuit input voltage		5				+1	±2	V
I_{OS}	Short-circuit output current		6	V_{ID} = 3 V			−1.9	−4	mA
I_{CC+}	Supply current from V_{CC+}		1	V_{ID} = −3 V,	$V_{I(strobe)}$ = 2.4 V		10	16	mA
I_{CC-}	Supply current from V_{CC-}		1	V_{ID} = −3 V,	$V_{I(strobe)}$ = 2.4 V		−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 V, V_{CC-} = −12 V, T_A = 25°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 V, V_{CC-} = −12 V, T_A = 25°C

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

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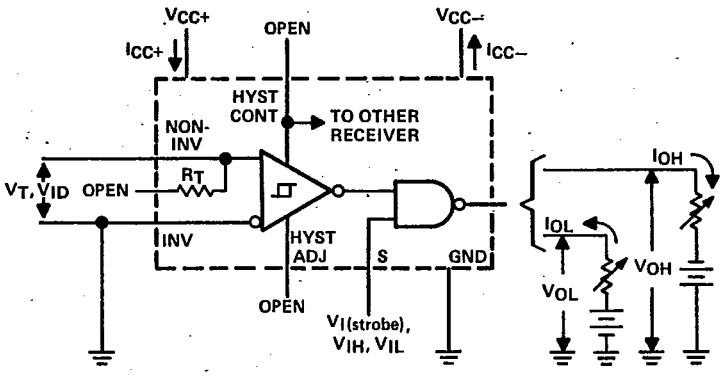
PARAMETER MEASUREMENT INFORMATION



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

FIGURE 1. MIL-STD-188 CONDITION

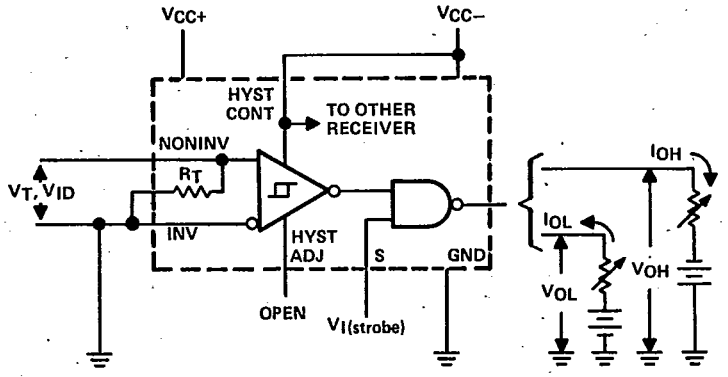


FIGURE 2. EIA RS-232-C CONDITION

4 Line Drivers/Receivers

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PARAMETER MEASUREMENT INFORMATION

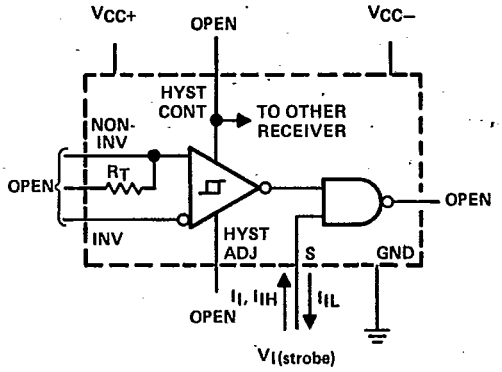


FIGURE 3

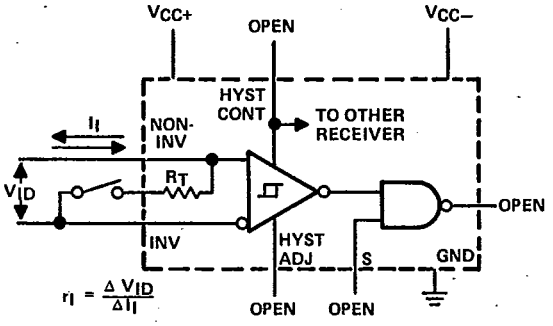


FIGURE 4

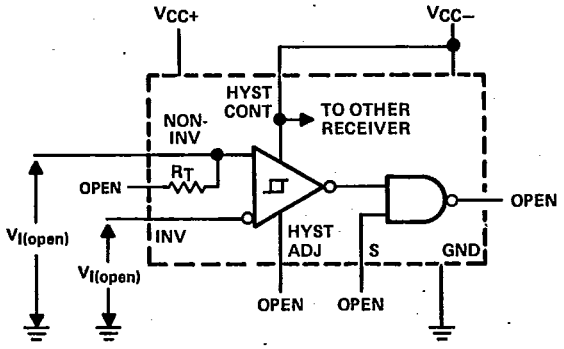


FIGURE 5

PARAMETER MEASUREMENT INFORMATION

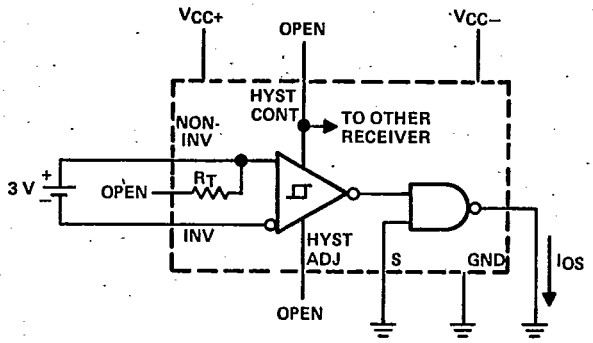
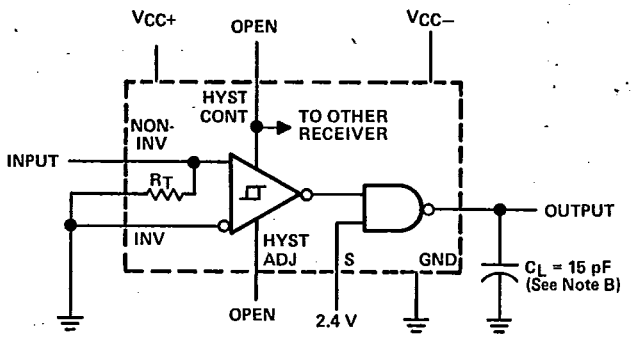
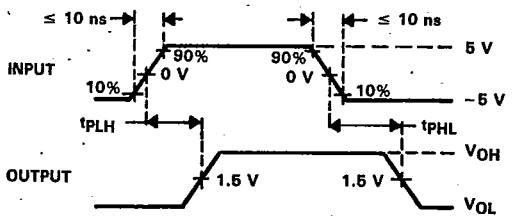


FIGURE 6



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} ≈ 50 Ω.
B. C_L includes probe and jig capacitance.

FIGURE 7. PROPAGATION DELAY TIMES

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TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE
vs
DIFFERENTIAL INPUT VOLTAGE

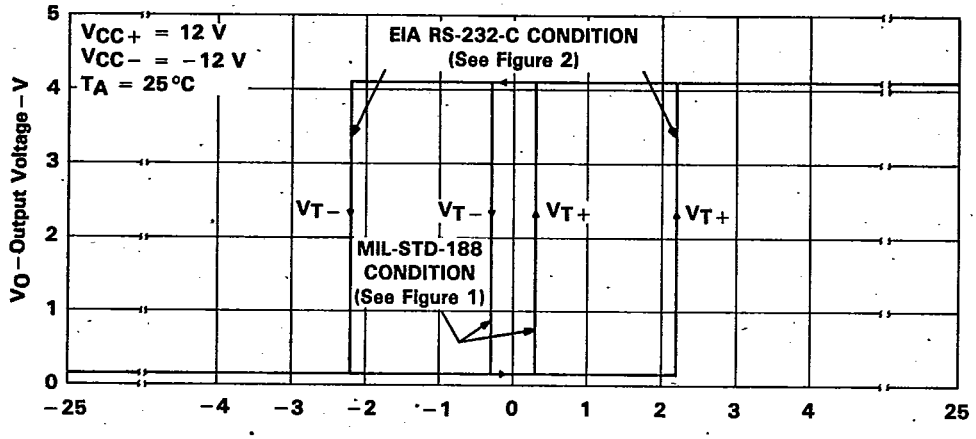


FIGURE 8

THRESHOLD VOLTAGE VARIATION
vs
POSITIVE SUPPLY VOLTAGE

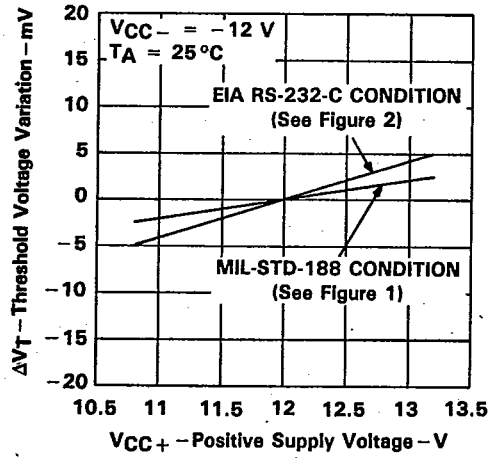


FIGURE 9

TYPICAL CHARACTERISTICS

THRESHOLD VOLTAGE VARIATION
vs
NEGATIVE POWER SUPPLY

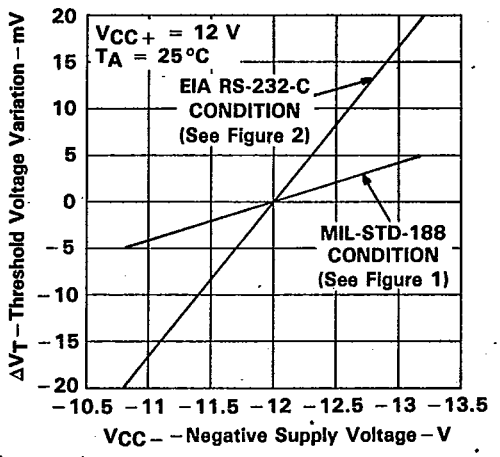
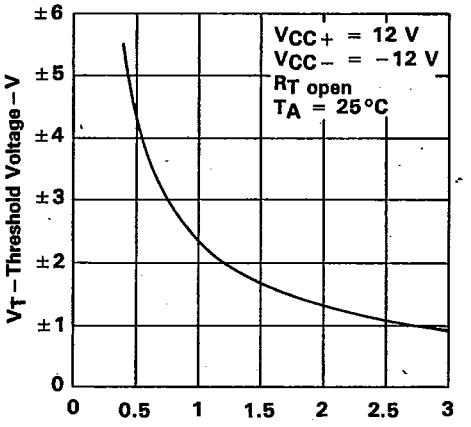


FIGURE 10

THRESHOLD VOLTAGE
vs
HYSTERESIS ADJUST RESISTANCE



†R_{adj} is connected between Hysteresis Adjust terminal and V_{CC-}.

FIGURE 11

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TYPICAL CHARACTERISTICS

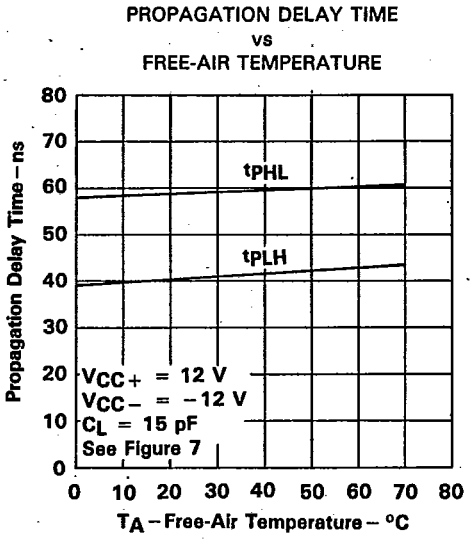


FIGURE 12

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

TYPICAL APPLICATIONS

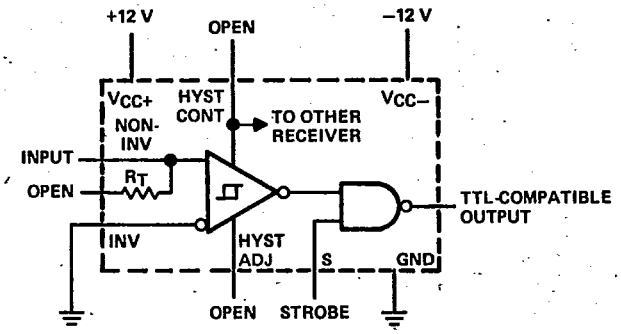
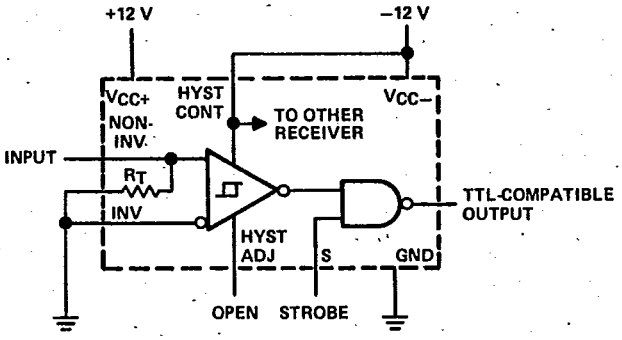
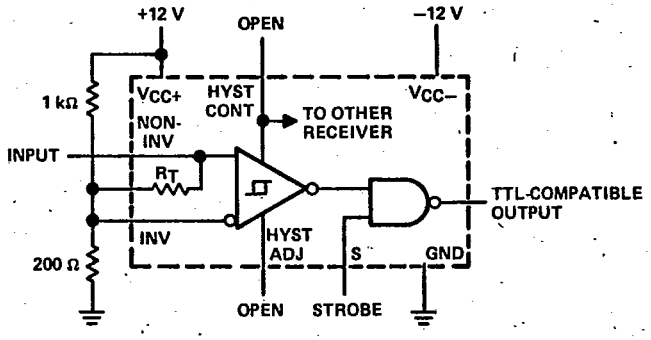


FIGURE 13. MIL-STD-188 SINGLE-ENDED LINE RECEIVER



NORMAL OPERATION



FAIL-SAFE OPERATION

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

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TYPICAL APPLICATIONS

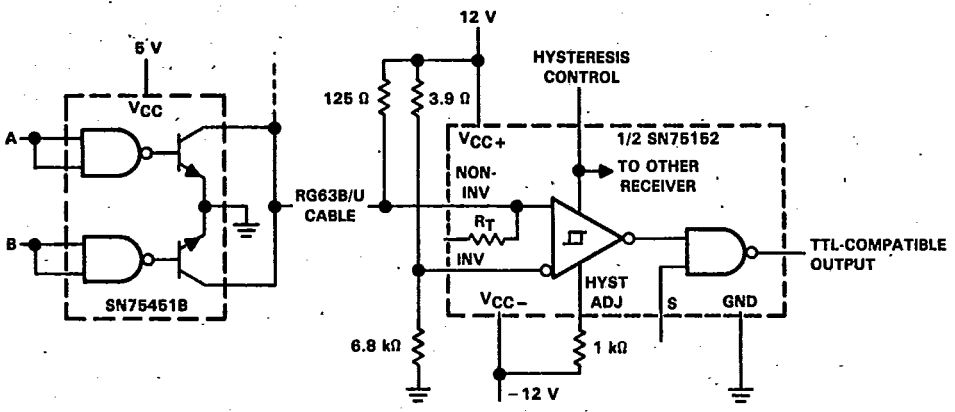
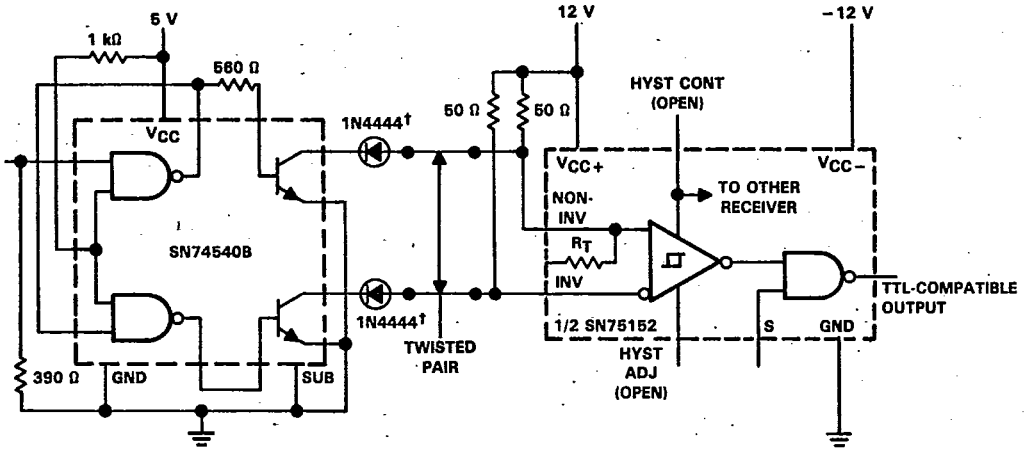


FIGURE 15. SINGLE-ENDED TRANSMITTER WITH DRIVER "OR" CAPABILITY AND RECEIVER WITH ADJUSTABLE NOISE IMMUNITY



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