

# SN75ALS175 QUADRUPLE DIFFERENTIAL LINE RECEIVER

SLLS131C – SEPTEMBER 1991 – REVISED MAY 1995

- Meets or Exceeds the Requirements of ANSI EIA/TIA-422-B, EIA/TIA-423-B, and RS-485
- Meets ITU Recommendations V.10, V.11, X.26, and X.27
- Designed for Multipoint Bus Transmission on Long Bus Lines in Noisy Environments
- Low Supply Current Requirement  
27 mA Max
- Common-Mode Input Voltage Range of -12 V to 12 V
- Input Sensitivity . . .  $\pm 200$  mV
- Input Hysteresis . . . 50 mV Typ
- High Input Impedance . . . 12 k $\Omega$  Min
- Operates From Single 5-V Supply

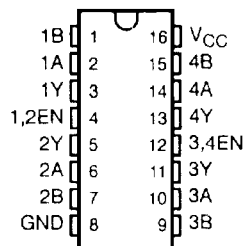
## description

The SN75ALS175 is a monolithic quadruple differential line receiver with 3-state outputs. It is designed to meet the requirements of ANSI Standards EIA/TIA-422-B, EIA/TIA-423-B, and RS-485 and several ITU recommendations. Advanced low-power Schottky technology

provides high speed without the usual power penalty. Each of the two pairs of receivers has a common active-high enable. The device features high input impedance, input hysteresis for increased noise immunity, and input sensitivity of  $\pm 200$  mV over a common-mode input voltage range of -12 V to 12 V.

The SN75ALS175 is characterized for operation from 0°C to 70°C.

N OR NS† PACKAGE  
(TOP VIEW)



† The NS package is only available left-ended taped and reeled (order device SN75ALS175NSLE).

FUNCTION TABLE (EACH RECEIVER)

DIFFERENTIAL INPUTS A – B	ENABLE EN	OUTPUT Y
$V_{ID} \geq 0.2$ V	H	H
$-0.2$ V $< V_{ID} < 0.2$ V	H	?
$V_{ID} \leq -0.2$ V	H	L
X	L	Z
Open Circuit	H	H

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

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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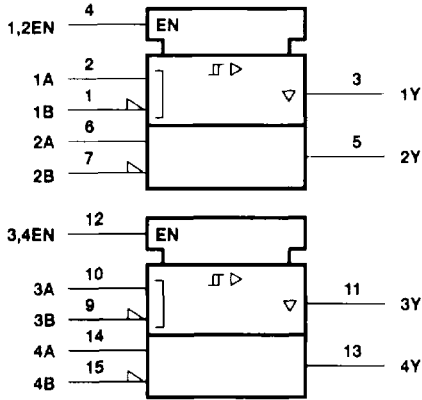
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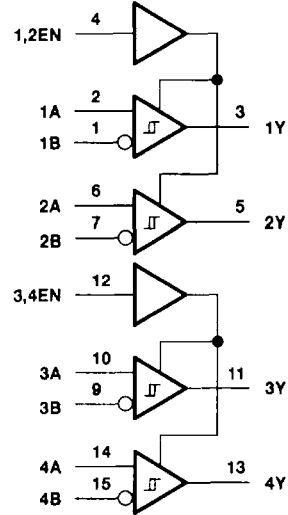
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## logic symbol†

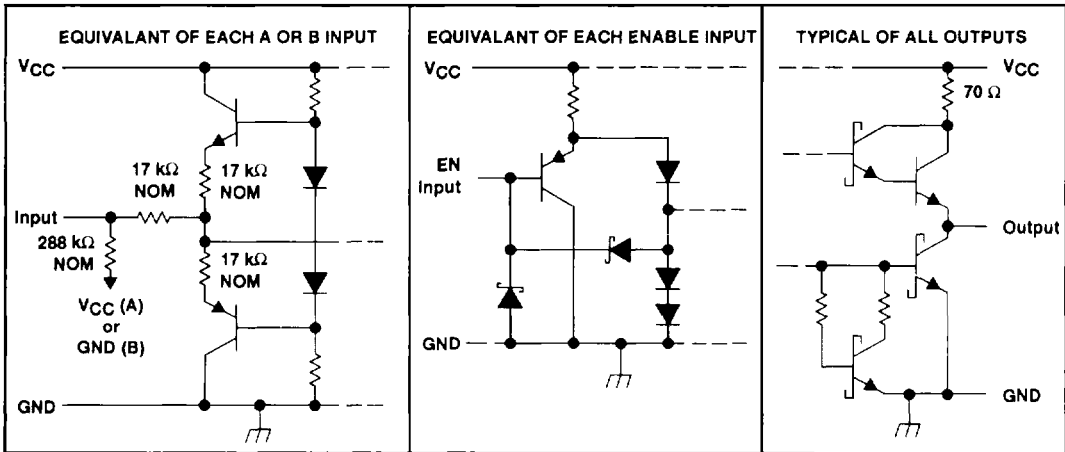


## logic diagram (positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## schematics of Inputs and outputs



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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage, $V_I$ (A or B inputs)	$\pm 14$ V
Differential input voltage, $V_{ID}$ (see Note 2)	$\pm 14$ V
Enable input voltage, $V_I$	7 V
Low-level output current, $I_{OL}$	50 mA
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range, $T_A$	$0^\circ\text{C}$ to $70^\circ\text{C}$
Storage temperature range, $T_{stg}$	$-65^\circ\text{C}$ to $150^\circ\text{C}$
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	$260^\circ\text{C}$

† 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 input voltage, are with respect to network ground terminal.  
2. Differential-input voltage is measured at the noninverting input with respect to the corresponding inverting input.

**DISSIPATION RATING TABLE**

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING
N	1150 mW	9.2 mW/ $^\circ\text{C}$	736 mW
NS	625 mW	5.0 mW/ $^\circ\text{C}$	400 mW

## recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, $V_{CC}$	4.75	5	5.25	V
Common-mode input voltage, $V_{IC}$			$\pm 12$	V
Differential input voltage, $V_{ID}$			$\pm 12$	V
High-level enable-input voltage, $V_{IH}$	2			V
Low-level enable-input voltage, $V_{IL}$			0.8	V
High-level output current, $I_{OH}$			-400	$\mu\text{A}$
Low-level output current, $I_{OL}$			8	mA
Operating free-air temperature, $T_A$	0		70	$^\circ\text{C}$



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electrical characteristics over recommended ranges of common-mode input voltage, supply voltage and operating free-air temperature (unless otherwise noted) (see Note 3)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
$V_{IT+}$	Positive-going input threshold voltage			200	mV
$V_{IT-}$	Negative-going input threshold voltage	-200‡			mV
$V_{Hys}$	Hysteresis voltage ( $V_{IT+} - V_{IT-}$ )		50		mV
$V_{IK}$	Enable-input clamp voltage	$I_I = -18$ mA		-1.5	V
$V_{OH}$	High-level output voltage	$V_{ID} = 200$ mV, $I_{OH} = -400$ $\mu$ A, See Figure 1	2.7		V
$V_{OL}$	Low-level output voltage	$V_{ID} = -200$ mV, $I_{OL} = 8$ mA, See Figure 1		0.45	V
$I_{OZ}$	High-impedance-state output current	$V_O = 0.4$ V to 2.4 V		$\pm 20$	$\mu$ A
$I_I$	Line input current	Other input at 0 V, See Note 3	$V_I = 12$ V $V_I = -7$ V	1 -0.8	mA
$I_{IH}$	High-level enable-input current	$V_{IH(E)} = 2.7$ V		20	$\mu$ A
$I_{IL}$	Low-level enable-input current	$V_{IL(E)} = 0.4$ V		-100	$\mu$ A
$r_i$	Input resistance		12		k $\Omega$
$I_{OS}$	Short-circuit output current	$V_O = 0$	-15	-85	mA
$I_{CC}$	Supply current (total package)	No load, Outputs enabled	16	24	mA
		No load, Outputs disabled	18	27	

† All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .

‡ The algebraic convention, in which the less positive (more negative) limit is designated as minimum, is used in this data sheet for threshold voltage levels only.

NOTE 3: Refer to ANSI Standards RS-485 for exact conditions.

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

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT	
$t_{PHL}$	Propagation delay time, high- to low-level output	$V_{ID} = -2.5$ V to 2.5 V, $C_L = 15$ pF, See Figure 2	9	18	27	ns
$t_{PLH}$	Propagation delay time, low- to high-level output		9	18	27	ns
$t_{pZH}$	Output enable time to high level	$C_L = 15$ pF, See Figure 3	4	12	18	ns
$t_{pZL}$	Output enable time to low level		6	13	21	ns
$t_{pHZ}$	Output disable time from high level	$C_L = 15$ pF, See Figure 3	10	21	27	ns
$t_{pLZ}$	Output disable time from low level		8	15	25	ns

† All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .



PARAMETER MEASUREMENT INFORMATION

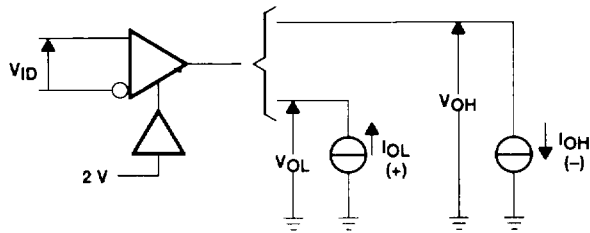
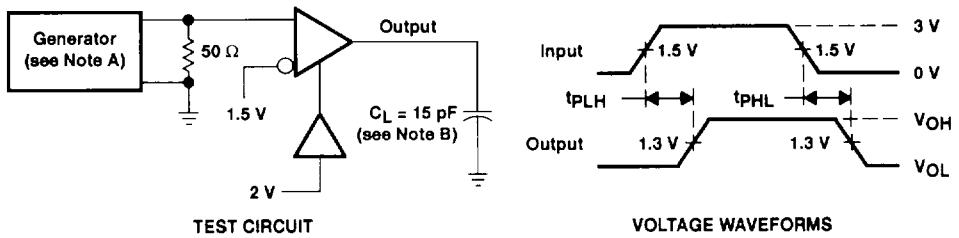


Figure 1.  $V_{OH}$ ,  $V_{OL}$



TEST CIRCUIT

VOLTAGE WAVEFORMS

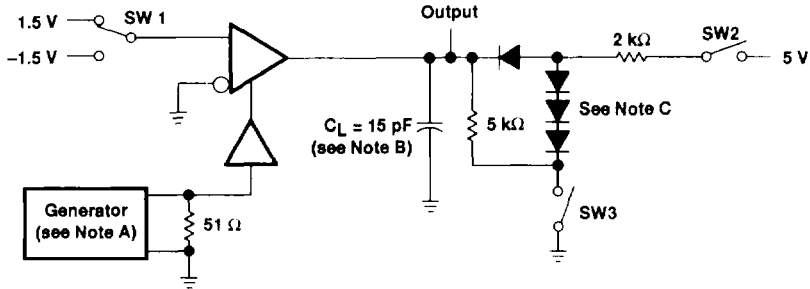
- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle = 50%,  $t_r = t_f = 6$  ns.  
 B.  $C_L$  includes probe and jig capacitance.

Figure 2. Propagation Delay Times

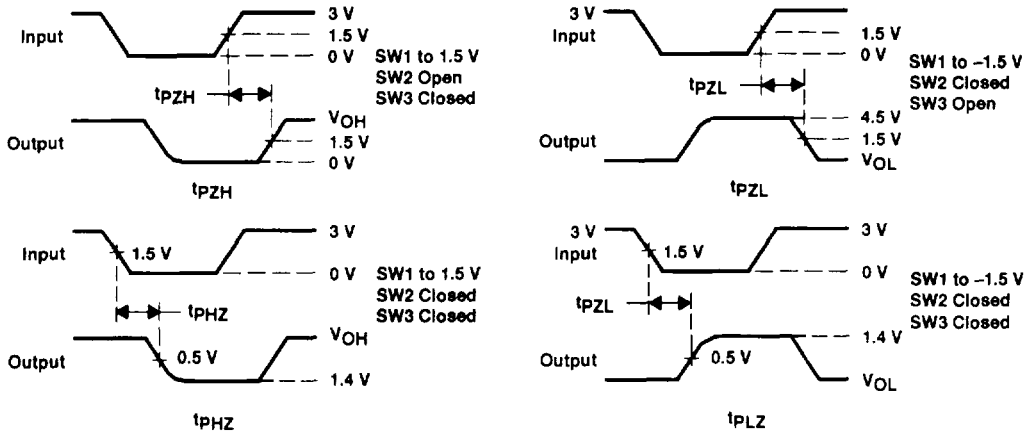
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## PARAMETER MEASUREMENT INFORMATION



### TEST CIRCUIT



### VOLTAGE WAVEFORMS

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle = 50%,  $t_r = t_f = 6$  ns.  
 B.  $C_L$  includes probe and jig capacitance.  
 C. All diodes are 1N916 or equivalent.

Figure 3. Enable and Disable Times



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