

# SN75ALS174A QUADRUPLE DIFFERENTIAL LINE DRIVER

SLLS122E – JULY 1991 – REVISED APRIL 1998

- Meets or Exceeds the Requirements of ANSI EIA/TIA-422-B and RS-485
- High-Speed Advanced Low-Power Schottky Circuitry
- Designed for up to 20-Mbit/s Operation in Both Serial and Parallel Applications
- Designed for Multipoint Transmission on Long Bus Lines in Noisy Environments
- Low Supply Current Requirements  
55 mA Max
- Wide Positive and Negative Input/Output Bus Voltage Ranges
- Driver Output Capacity . . .  $\pm 60$  mA
- Thermal-Shutdown Protection
- Driver Positive- and Negative-Current Limiting
- Functionally Interchangeable With SN75174

## description

The SN75ALS174A is a quadruple line driver with 3-state differential outputs. It is designed to meet the requirements of ANSI Standards EIA/TIA-422-B and RS-485. This device is optimized for balanced multipoint bus transmission at rates of up to 20 Mbit/s. Each driver features wide positive and negative common-mode output voltage ranges that make them suitable for party-line applications in noisy environments.

The SN75ALS174A provides positive- and negative-current limiting and thermal shutdown for protection from line fault conditions on the transmission bus line. Shutdown occurs at a junction temperature of approximately 150°C.

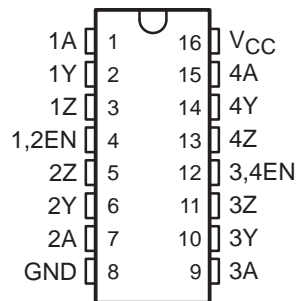
The SN75ALS174A is characterized for operation from 0°C to 70°C.

FUNCTION TABLE  
(each driver)

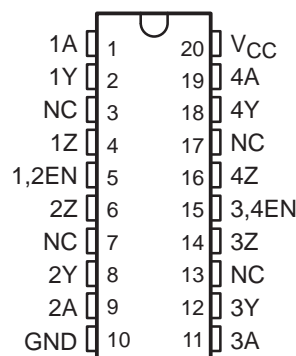
INPUT A	ENABLES	OUTPUTS	
		Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

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

N PACKAGE  
(TOP VIEW)



DW PACKAGE  
(TOP VIEW)



NC – No internal connection



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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.

 **TEXAS  
INSTRUMENTS**

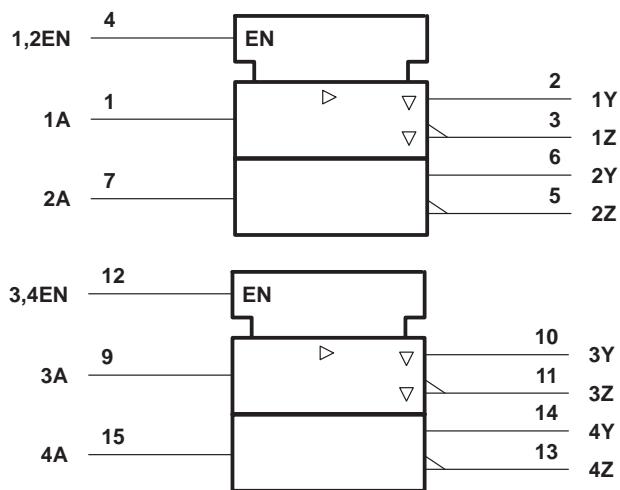
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# SN75ALS174A QUADRUPLE DIFFERENTIAL LINE DRIVER

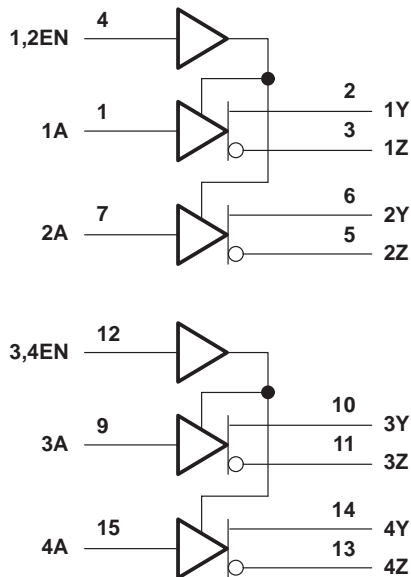
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## logic symbol†



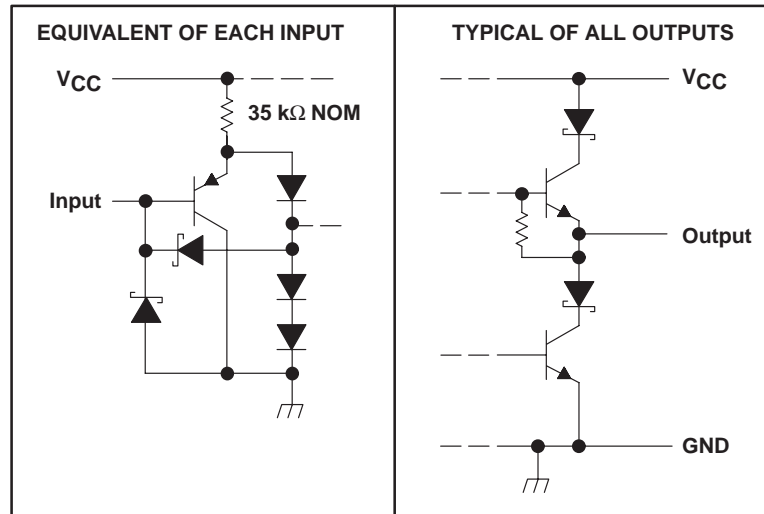
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the N package.

## logic diagram (positive logic)



Pin numbers shown are for the N package.

schematics of inputs and outputs



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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage, $V_I$	7 V
Output voltage range, $V_O$	-9 V to 14 V
Continuous total dissipation	See Dissipation Rating Table
Storage temperature range, $T_{stg}$	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°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.

NOTE 1: All voltage values are with respect to network GND.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
DW	1125 mW	9.0 mW/°C	720 mW	585 mW
N	1150 mW	9.2 mW/°C	736 mW	598 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, $V_{CC}$	4.75	5	5.25	V
High-level input voltage, $V_{IH}$	2			V
Low-level input voltage, $V_{IL}$			0.8	V
Common-mode output voltage, $V_{OC}$			12 -7	V
High-level output current, $I_{OH}$			-60	mA
Low-level output current, $I_{OL}$			60	mA
Operating free-air temperature, $T_A$	0		70	°C

# SN75ALS174A

## QUADRUPLE DIFFERENTIAL LINE DRIVER

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### electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V <sub>IK</sub>	Input clamp voltage	I <sub>I</sub> = -18 mA				-1.5	V
V <sub>O</sub>	Output voltage	I <sub>O</sub> = 0		0		6	V
V <sub>OD1</sub>	Differential output voltage	I <sub>O</sub> = 0		1.5		6	V
V <sub>OD2</sub>	Differential output voltage	R <sub>L</sub> = 100 Ω	See Figure 1	1/2V <sub>OD1</sub> or 2‡			V
		R <sub>L</sub> = 54 Ω		1.5	2.5	5	
V <sub>OD3</sub>	Differential output voltage	See Note 2		1.5		5	V
Δ V <sub>OD</sub>	Change in magnitude of differential output voltage§	R <sub>L</sub> = 54 Ω or 100 Ω,	See Figure 1			±0.2	V
V <sub>OC</sub>	Common-mode output voltage¶	R <sub>L</sub> = 54 Ω or 100 Ω,	See Figure 1			3 -1	V
Δ V <sub>OC</sub>	Change in magnitude of common-mode output voltage§	R <sub>L</sub> = 54 Ω or 100 Ω,	See Figure 1			±0.2	V
I <sub>O</sub>	Output current with power off	V <sub>CC</sub> = 0,	V <sub>O</sub> = -7 V to 12 V			±100	μA
I <sub>OZ</sub>	High-impedance-state output current	V <sub>O</sub> = -7 V to 12 V				±100	μA
I <sub>IH</sub>	High-level input current	V <sub>I</sub> = 2.7 V				20	μA
I <sub>IL</sub>	Low-level input current	V <sub>I</sub> = 0.4 V				-100	μA
I <sub>OS</sub>	Short-circuit output current	V <sub>O</sub> = -7 V to 12 V				±250	mA
I <sub>CC</sub>	Supply current (all drivers)	No load	Outputs enabled		36	55	mA
			Outputs disabled		16	30	

† All typical values are at V<sub>CC</sub> = 5 V and T<sub>A</sub> = 25°C.

‡ The minimum V<sub>OD2</sub> with a 100-Ω load is either 1/2 V<sub>OD1</sub> or 2 V, whichever is greater.

§ Δ|V<sub>OD</sub>| and Δ|V<sub>OC</sub>| are the changes in magnitude of V<sub>OD</sub> and V<sub>OC</sub>, respectively, that occur when the input is changed from a high level to a low level.

¶ In ANSI Standard EIA/TIA-422-B, V<sub>OC</sub>, which is the average of the two output voltages with respect to ground, is called output offset voltage, V<sub>OS</sub>.

NOTE 2: See EIA Standard RS-485, Figure 3-5, Test Termination Measurement 2.

### switching characteristics over recommended ranges of supply voltage and operating free-air temperature, C<sub>L</sub> = 50 pF

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
t <sub>d(OD)</sub>	Differential output delay time	R <sub>L</sub> = 54 Ω,	See Figure 2	9	15	22	ns
t <sub>PZH</sub>	Output enable time to high level	R <sub>L</sub> = 110 Ω,	See Figure 3	30	45	70	ns
t <sub>PZL</sub>	Output enable time to low level	R <sub>L</sub> = 110 Ω,	See Figure 4	25	40	65	ns
t <sub>PHZ</sub>	Output disable time from high level	R <sub>L</sub> = 110 Ω,	See Figure 3	10	20	35	ns
t <sub>PLZ</sub>	Output disable time from low level	R <sub>L</sub> = 110 Ω,	See Figure 4	10	30	45	ns

† All typical values are at V<sub>CC</sub> = 5 V and T<sub>A</sub> = 25°C.



PARAMETER MEASUREMENT INFORMATION

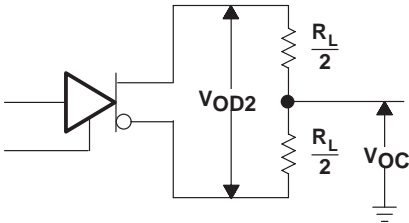
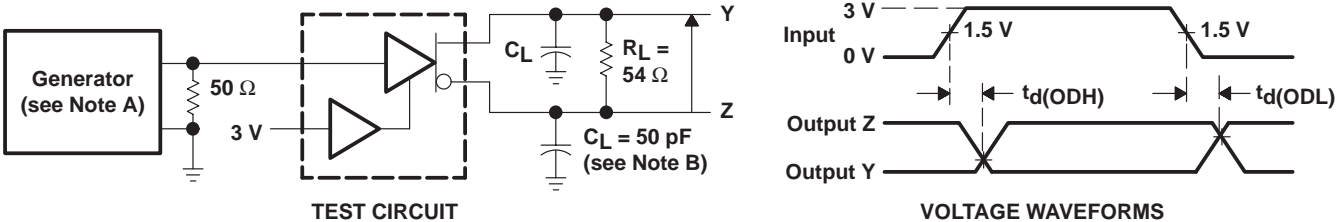
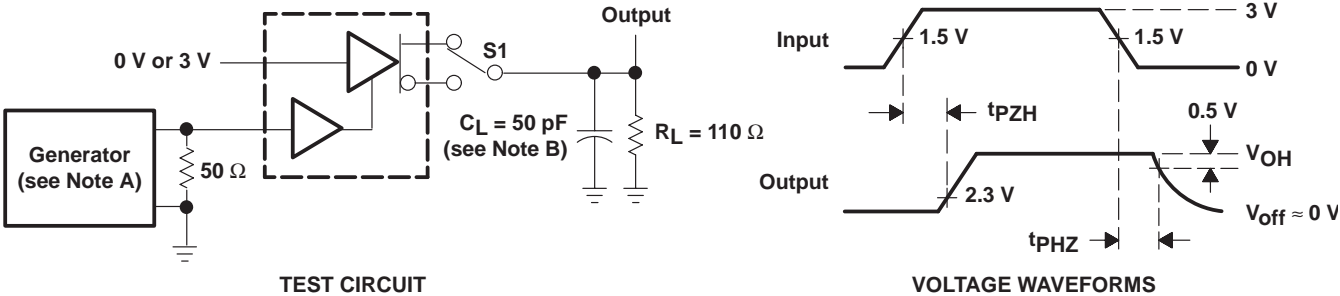


Figure 1. Differential and Common-Mode Output Voltages



NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz,  $Z_O = 50 \Omega$ , duty cycle = 50%,  $t_f \leq 5 \text{ ns}$ ,  $t_r \leq 5 \text{ ns}$ .  
 B.  $C_L$  includes probe and stray capacitance.

Figure 2. Differential-Output Test Circuit and Delay and Transition Times Voltage Waveforms



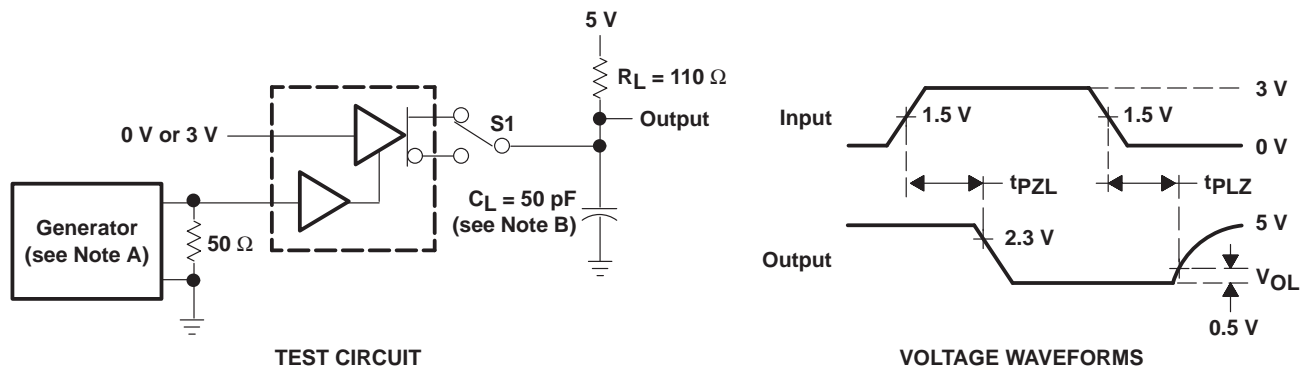
NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz,  $Z_O = 50 \Omega$ , duty cycle = 50%,  $t_f \leq 5 \text{ ns}$ ,  $t_r \leq 5 \text{ ns}$ .  
 B.  $C_L$  includes probe and stray capacitance.

Figure 3. Test Circuit and Voltage Waveforms,  $t_{pZH}$  and  $t_{pHZ}$

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## PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, Z<sub>O</sub> = 50 Ω, duty cycle = 50%, t<sub>f</sub> ≤ 5 ns, t<sub>r</sub> ≤ 5 ns.  
 B. C<sub>L</sub> includes probe and stray capacitance.

Figure 4. Test Circuit and Voltage Waveforms, t<sub>pZL</sub> and t<sub>pLZ</sub>

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