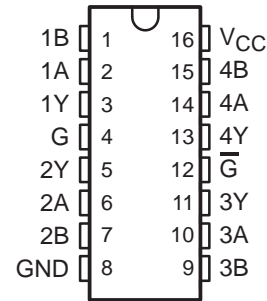


# SN75ALS197 QUADRUPLE DIFFERENTIAL LINE RECEIVER

SLLS045B – JANUARY 1989 – REVISED MAY 1995

- Meets or Exceeds the Requirements of ITU Recommendations V.10, V.11, X.26, and X.27
- Designed for Multipoint Bus Transmission on Long Bus Lines in Noisy Environments
- Designed to Operate Up to 20 Mbaud
- 3-State Outputs
- Common-Mode Input Voltage Range – 7 V to 7 V
- Input Sensitivity . . .  $\pm 300$  mV
- Input Hysteresis . . . 120 mV Typ
- High-Input Impedance . . . 12 k $\Omega$  Min
- Operates from Single 5-V Supply
- Low Supply-Current Requirement 35 mA Max
- Improved Speed and Power Consumption Compared to AM26LS32A

D OR N PACKAGE  
(TOP VIEW)



## description

The SN75ALS197 is a monolithic, quadruple line receiver with 3-state outputs designed using advanced, low-power, Schottky technology. This technology provides combined improvements in bar design, tooling production, and wafer fabrication. This, in turn, provides significantly lower power requirements and permits much higher data throughput than other designs. The device meets the specifications of ITU Recommendations V.10, V.11, X.26, and X.27. It features 3-state outputs that permit direct connection to a bus-organized system with a fail-safe design that ensures the outputs will always be high if the inputs are open.

The device is optimized for balanced, multipoint bus transmission at rates up to 20 megabits per second. The input features high-input impedance, input hysteresis for increased noise immunity, and an input sensitivity of  $\pm 300$  mV over a common-mode input voltage range of –7 V to 7 V. It also features active-high and active-low enable functions that are common to the four channels. The SN75ALS197 is designed for optimum performance when used with the SN75ALS192 quadruple differential line driver.

The SN75ALS197 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE  
(each receiver)

DIFFERENTIAL INPUTS A–B	ENABLES		OUTPUT Y
	G	$\overline{G}$	
$V_{ID} \geq 0.3$ V	H	X	H
	X	L	H
$-0.3$ V < $V_{ID}$ < 0.3 V	H	X	?
	X	L	?
$V_{ID} \leq -0.3$ V	H	X	L
	X	L	L
X	L	H	Z
Open	H	X	H
	X	L	H

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



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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**

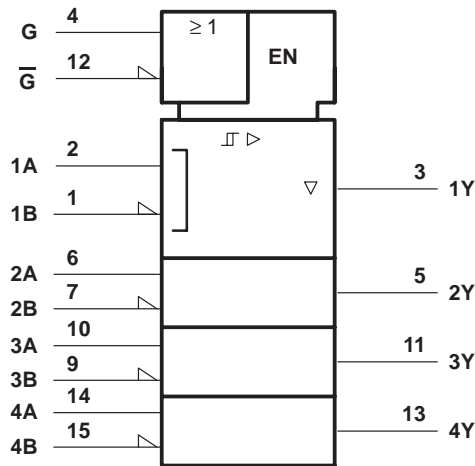
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# SN75ALS197 QUADRUPLE DIFFERENTIAL LINE RECEIVER

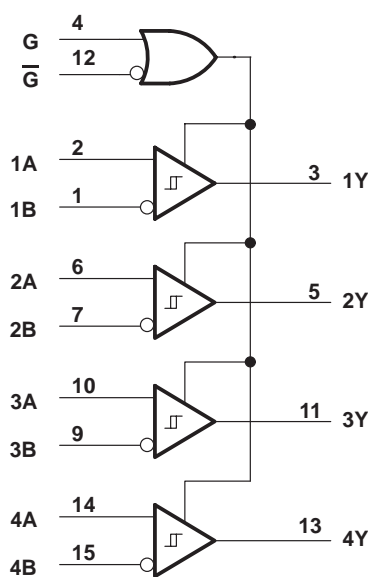
SLLS045B – JANUARY 1989 – REVISED MAY 1995

## logic symbol†

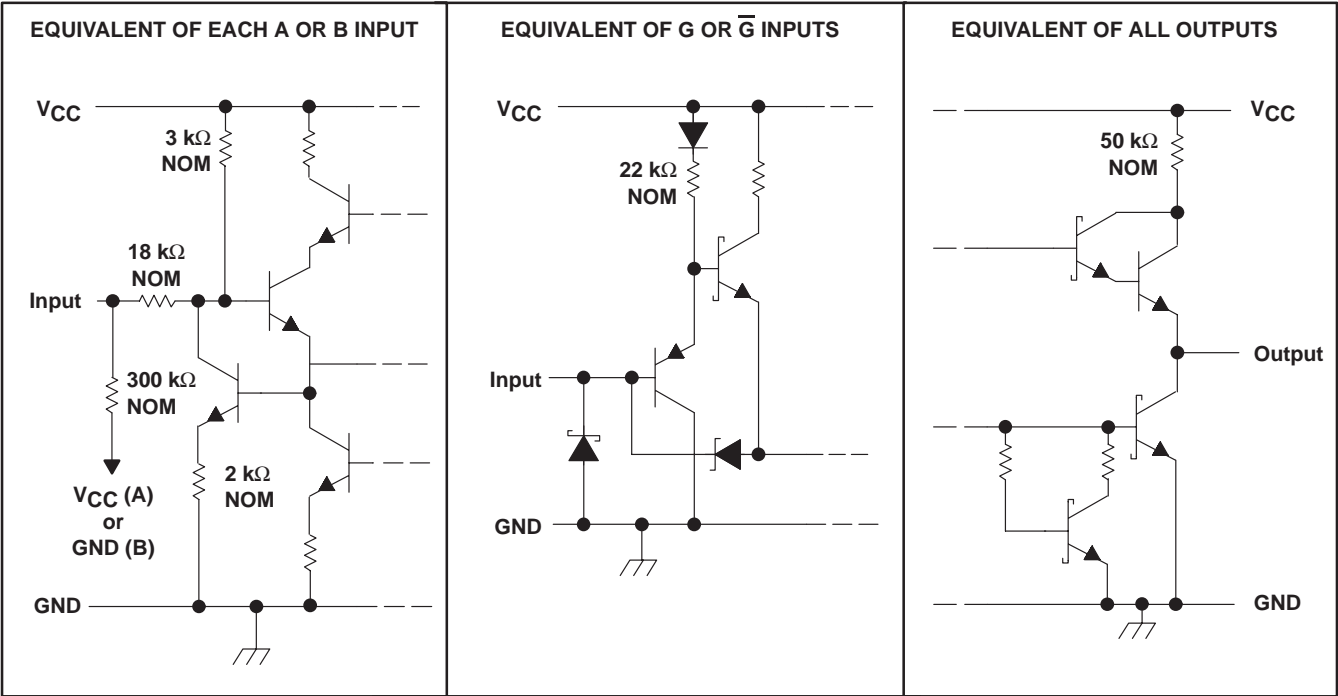


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## logic diagram (positive logic)



## 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, $V_I$ (A or B inputs)	$\pm 15$ V
Differential input voltage, $V_{ID}$ (see Note 2)	$\pm 15$ 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°C to 70°C
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.

- 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	$T_A = 70^\circ\text{C}$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW
N	1150 mW	9.2 mW/°C	736 mW

**recommended operating conditions**

	MIN	NOM	MAX	UNIT
Supply voltage, $V_{CC}$	4.75	5	5.25	V
Common-mode input voltage, $V_{IC}$			$\pm 7$	V
Differential input voltage, $V_{ID}$			$\pm 12$	V
High-level input voltage, $V_{IH}$	2			V
Low-level input voltage, $V_{IL}$			0.8	V
High-level output current, $I_{OH}$			–400	$\mu\text{A}$
Low-level output current, $I_{OL}$			16	mA
Operating free-air temperature, $T_A$	0		70	°C

# SN75ALS197

## QUADRUPLE DIFFERENTIAL LINE RECEIVER

SLLS045B – JANUARY 1989 – REVISED MAY 1995

**electrical characteristics over recommended range of common-mode input voltage, supply voltage, and operating free-air temperature (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
$V_{IT+}$ Positive-going input threshold voltage				300	mV
$V_{IT-}$ Negative-going input threshold voltage		-300‡			mV
$V_{hys}$ Hysteresis voltage ( $V_{IT+} - V_{IT-}$ )	See Figure 4		120		mV
$V_{IK}$ Enable-input clamp voltage	$I_I = -18$ mA			-1.5	V
$V_{OH}$ High-level output voltage	$V_{ID} = 300$ mV, $I_{OH} = -400$ $\mu$ A	2.7	3.6		V
$V_{OL}$ Low-level output voltage	$V_{ID} = -300$ mV			0.45	V
				0.5	
$I_{OZ}$ High-impedance-state output current	$V_{CC} = 5.25$ V			20	$\mu$ A
				-20	
$I_I$ Line input current	Other input at 0 V, See Note 3			0.7	mA
				-1.0	
$I_H$ High-level enable-input current				20	$\mu$ A
				100	
$I_{IL}$ Low-level enable-input current	$V_{IL} = 0.4$ V			-100	$\mu$ A
	Input resistance	12	18		k $\Omega$
$I_{OS}$ Short-circuit output current§	$V_{ID} = 3$ V, $V_O = 0$	-15	-78	-130	mA
$I_{CC}$ Supply current	Outputs disabled		22	35	mA

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

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

§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

NOTE 3: Refer to ANSI Standard EIA/TIA-422-B and EIA/TIA-423-B for exact conditions.

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$ Propagation delay time, low- to high-level output	$V_{ID} = -2.5$ V to 2.5 V, $C_L = 15$ pF,		15	22	ns
$t_{PHL}$ Propagation delay time, high- to low-level output	See Figure 2		15	22	ns
$t_{PZH}$ Output enable time to high level	$C_L = 15$ pF, See Figure 3			13	ns
$t_{PZL}$ Output enable time to low level				11	
$t_{PHZ}$ Output disable time from high level	$C_L = 15$ pF, See Figure 3			13	ns
$t_{PLZ}$ Output disable time from low level				15	



## PARAMETER MEASUREMENT INFORMATION

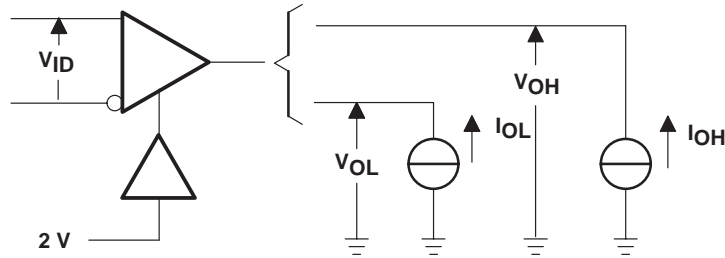
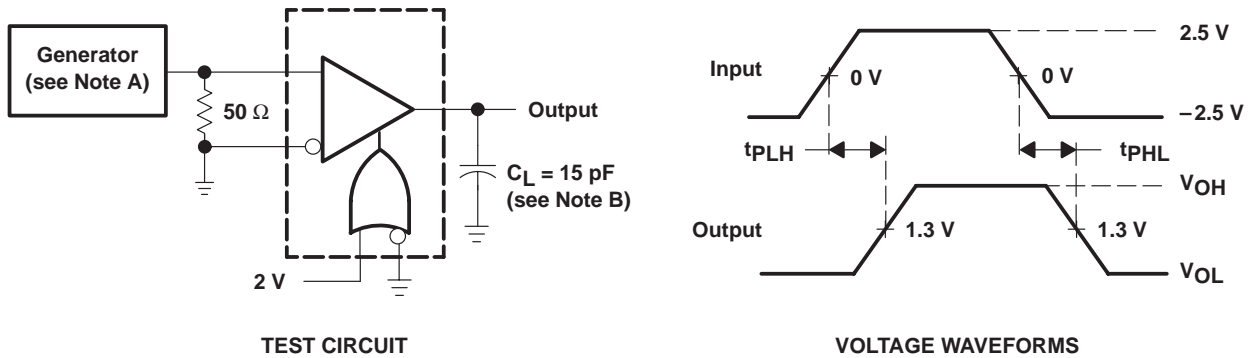


Figure 1.  $V_{OH}$  and  $V_{OL}$  Test Circuit



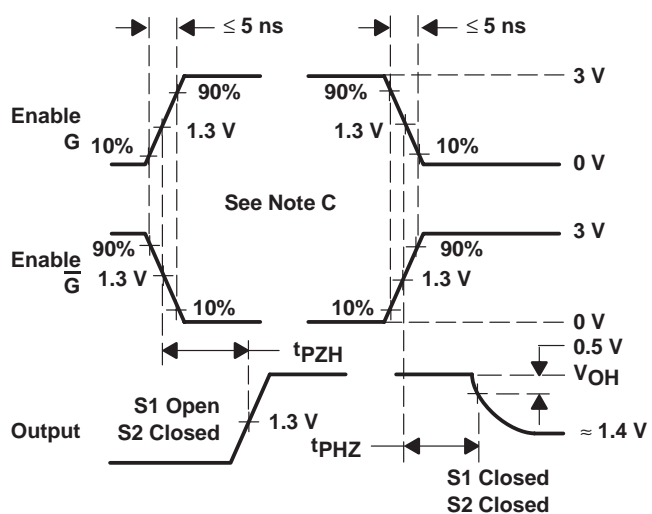
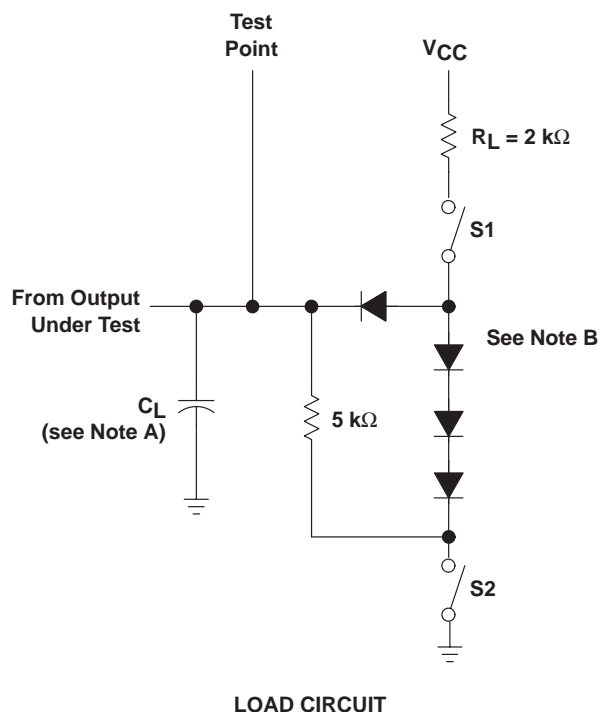
- NOTES: A. The input pulse is supplied by a generator having the following characteristics:  $PRR \leq 1 \text{ MHz}$ , duty cycle  $\leq 50\%$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$ .  
B.  $C_L$  includes probe and jig capacitance.

Figure 2.  $t_{PLH}$  and  $t_{PHL}$  Test Circuit and Voltage Waveforms

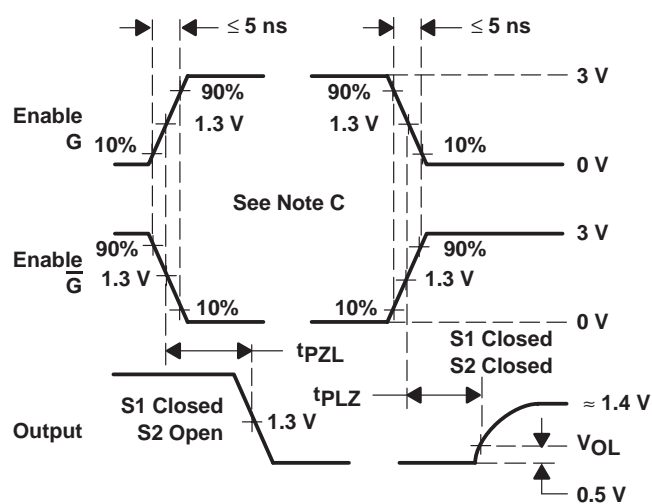
# SN75ALS197 QUADRUPLE DIFFERENTIAL LINE RECEIVER

SLLS045B – JANUARY 1989 – REVISED MAY 1995

## PARAMETER MEASUREMENT INFORMATION



VOLTAGE WAVEFORMS FOR  $t_{PHZ}$  and  $t_{PHZ}$

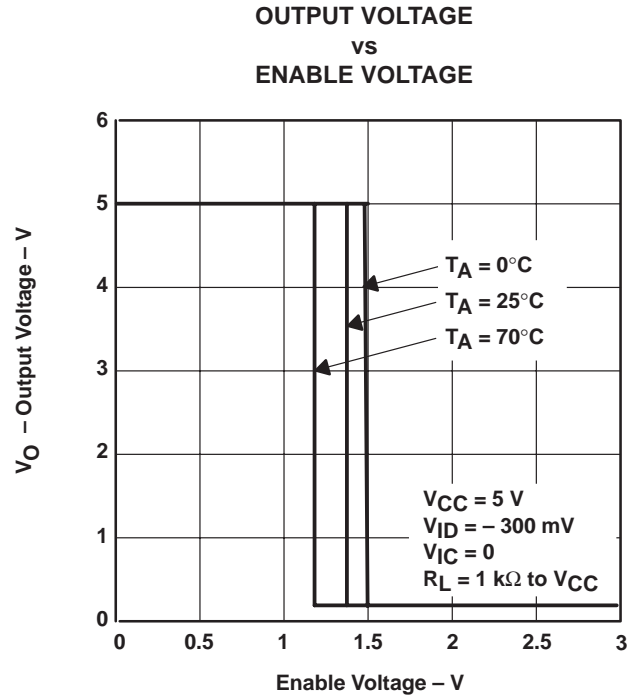
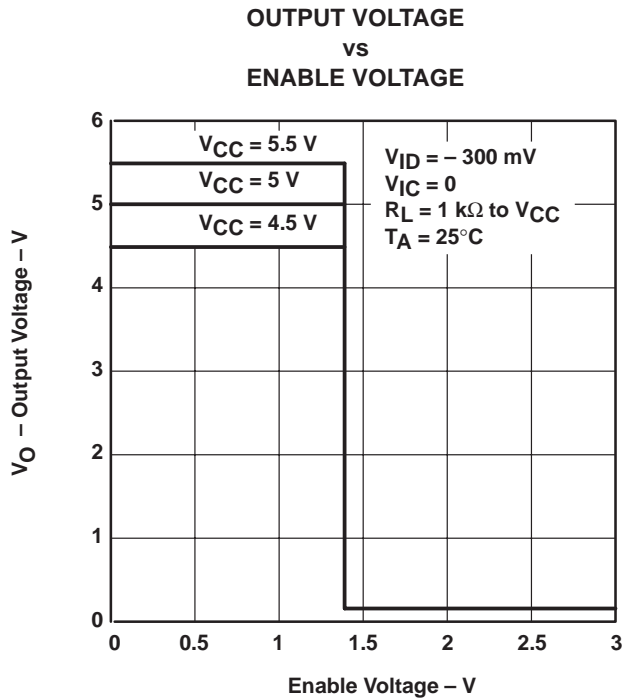
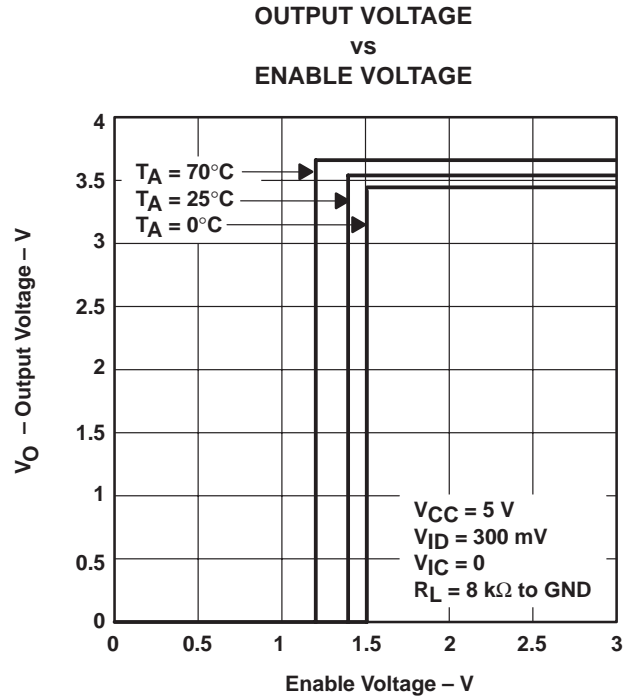
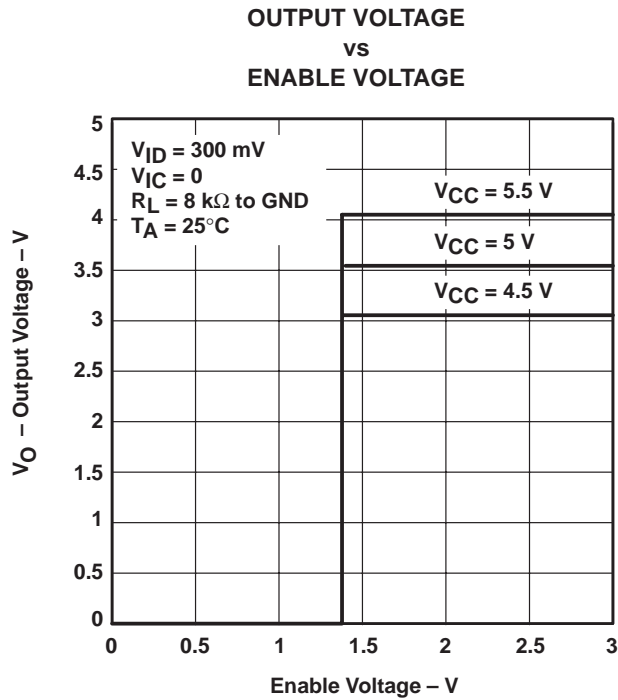


VOLTAGE WAVEFORMS FOR  $t_{PLZ}$  and  $t_{PLZ}$

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. All diodes are 1N3064 or equivalent.  
C. Enable G is tested with G high; G is tested with G low.

Figure 3.  $t_{PHZ}$ ,  $t_{PHZ}$ ,  $t_{PLZ}$ , and  $t_{PLZ}$  Load Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS



SN75ALS197  
QUADRUPLE DIFFERENTIAL LINE RECEIVER

SLLS045B – JANUARY 1989 – REVISED MAY 1995

TYPICAL CHARACTERISTICS

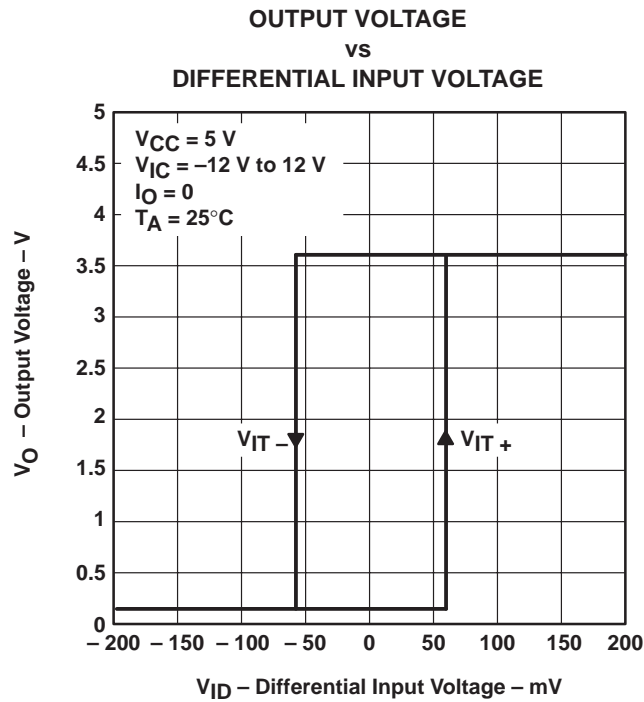


Figure 8

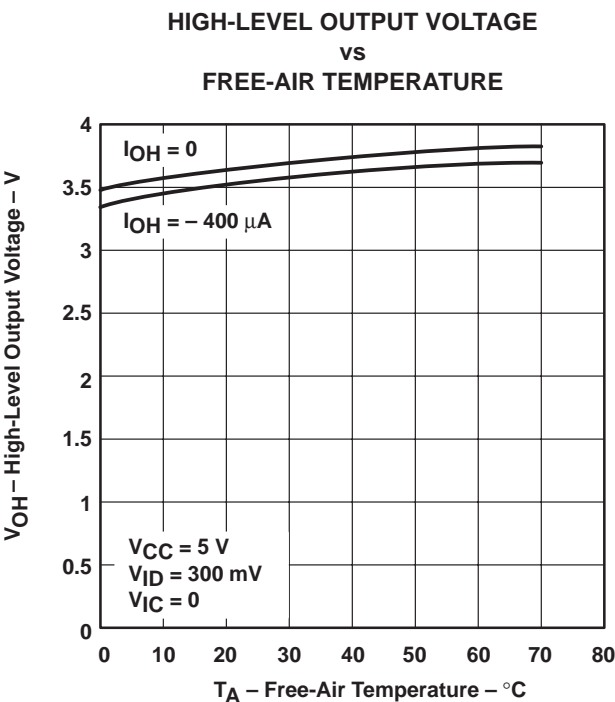


Figure 9

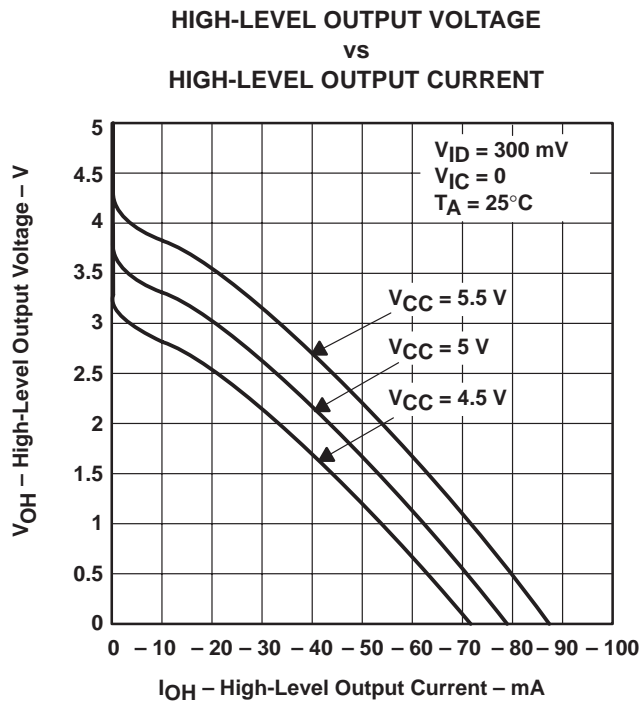


Figure 10

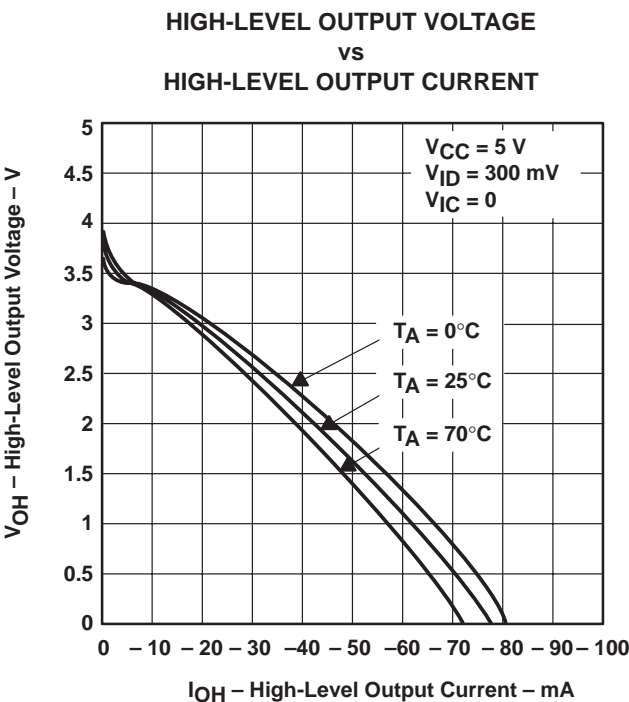


Figure 11



## TYPICAL CHARACTERISTICS

### LOW-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

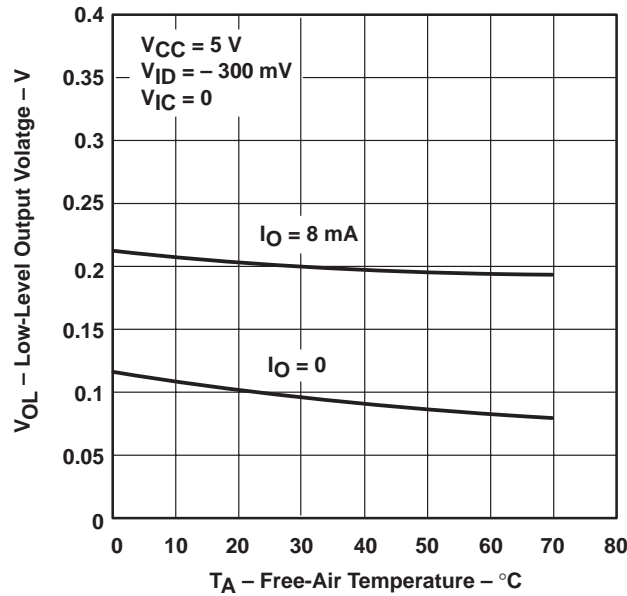


Figure 12

### LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT

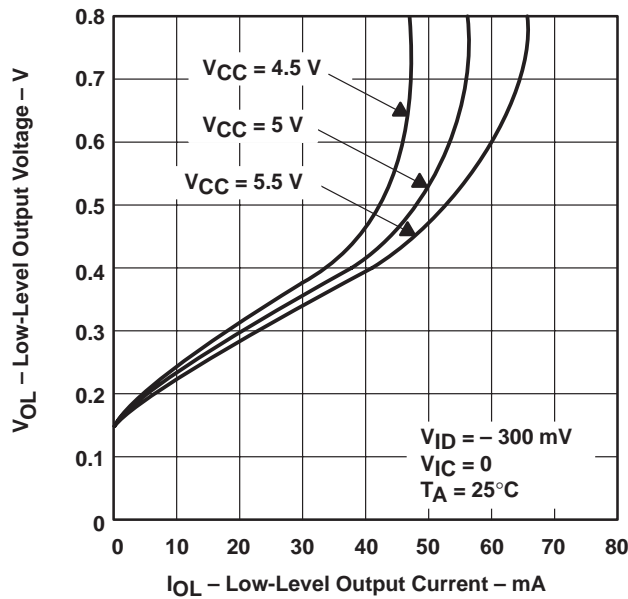


Figure 13

### LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT

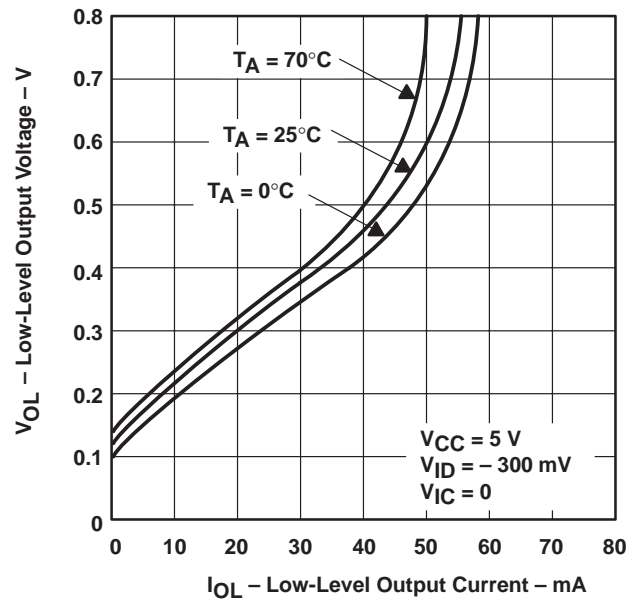


Figure 14

# SN75ALS197 QUADRUPLE DIFFERENTIAL LINE RECEIVER

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## TYPICAL CHARACTERISTICS

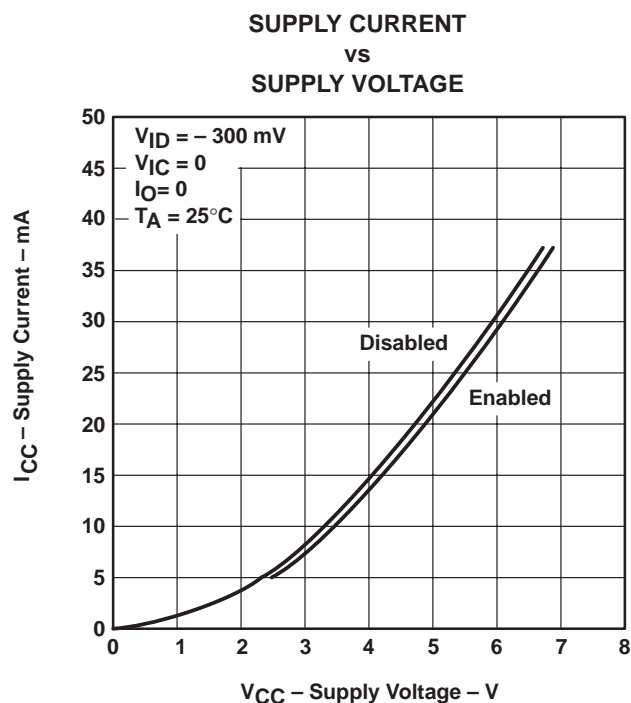


Figure 15

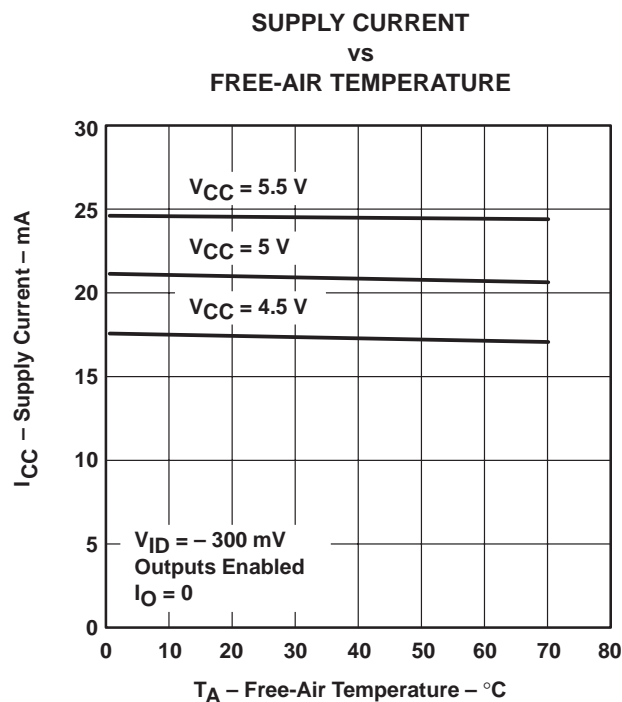


Figure 16

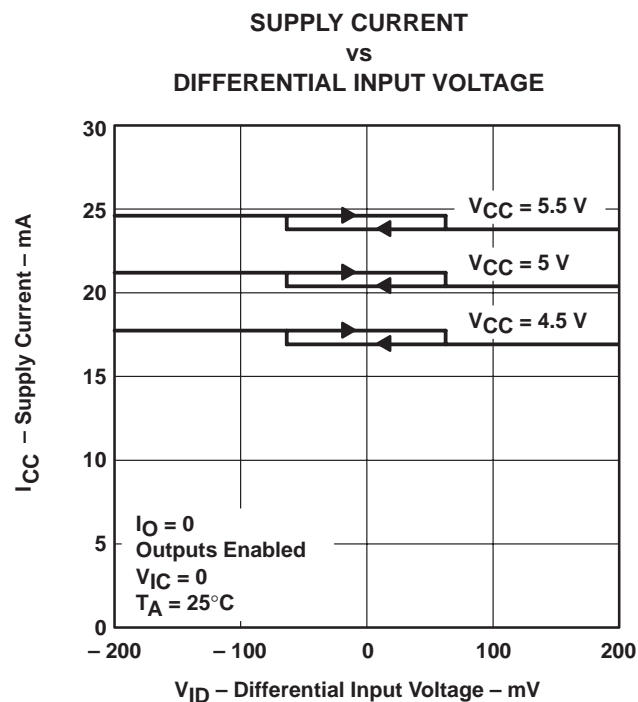


Figure 17

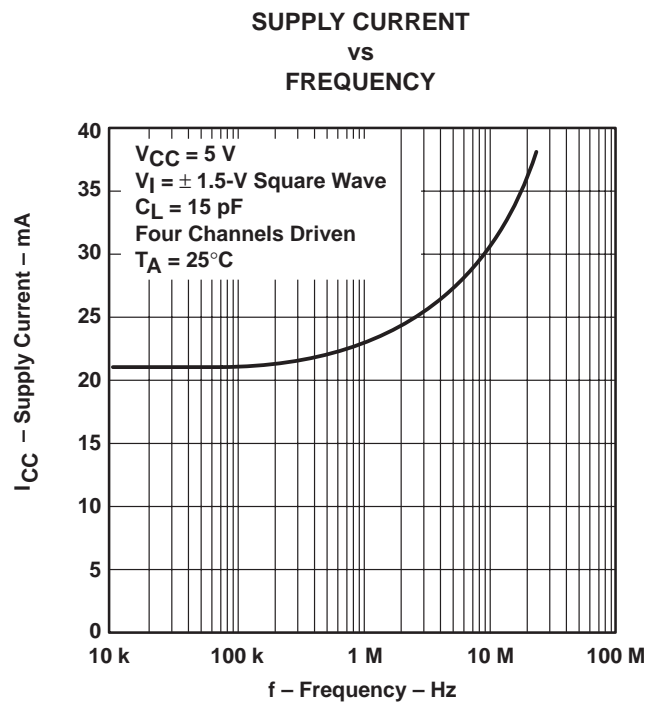


Figure 18

TYPICAL CHARACTERISTICS

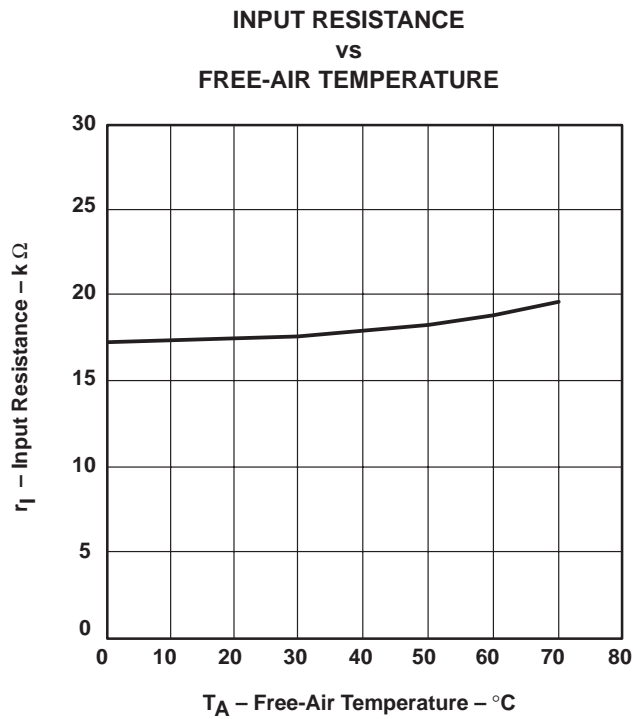


Figure 19

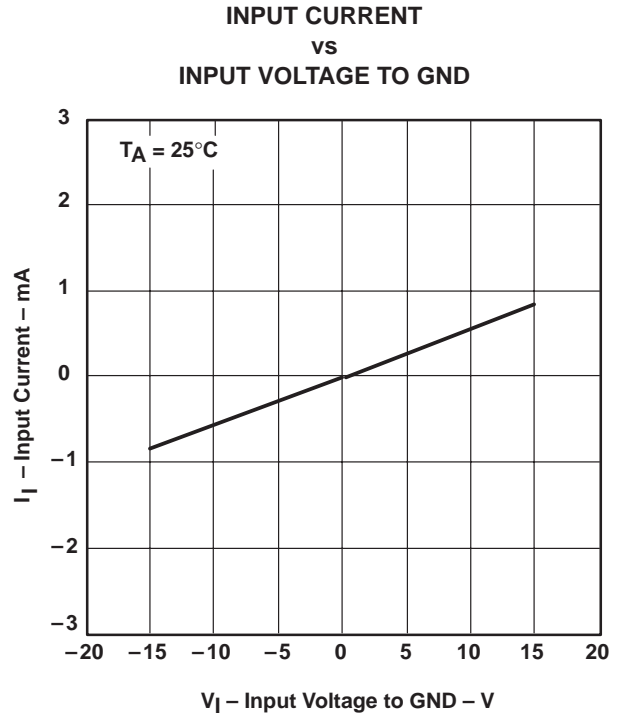


Figure 20

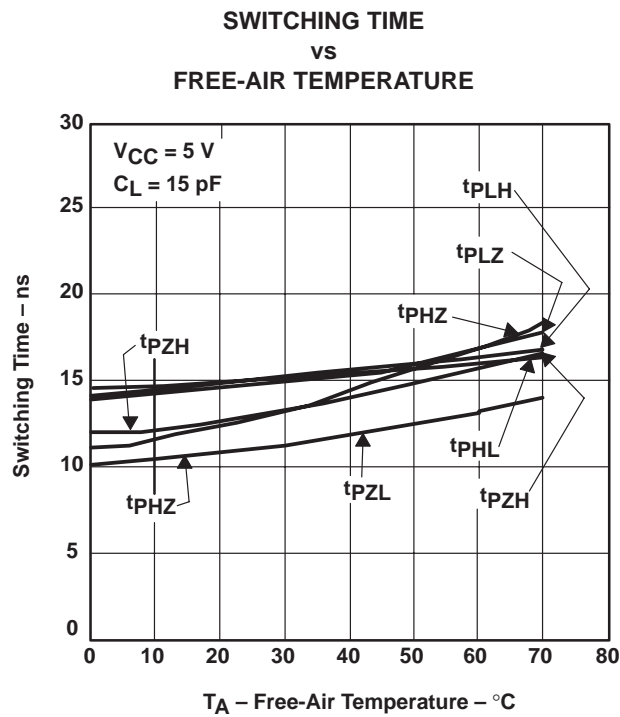


Figure 21

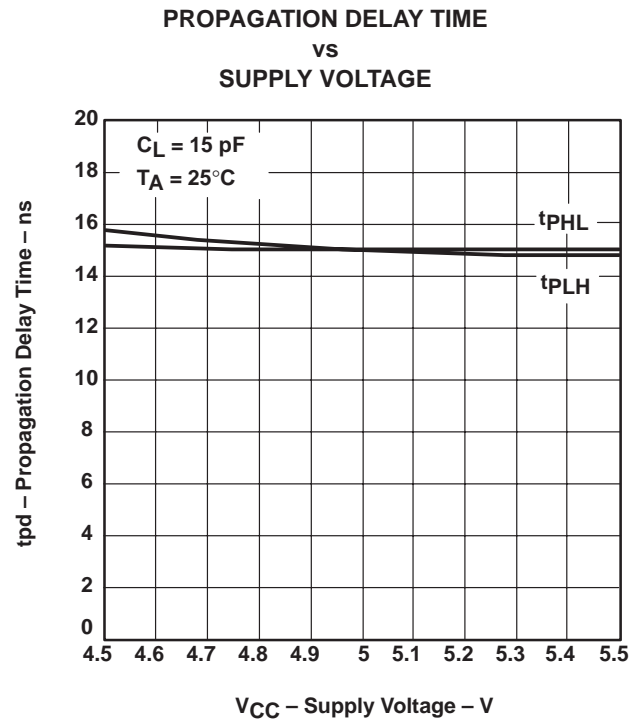


Figure 22

## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN75ALS197D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75ALS197	<a href="#">Samples</a>
SN75ALS197DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75ALS197	<a href="#">Samples</a>
SN75ALS197DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75ALS197	<a href="#">Samples</a>
SN75ALS197N	ACTIVE	PDIP	N	16	25	Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN75ALS197N	<a href="#">Samples</a>
SN75ALS197NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75ALS197	<a href="#">Samples</a>

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**TAPE AND REEL INFORMATION**

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN75ALS197DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN75ALS197NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

## TAPE AND REEL BOX DIMENSIONS

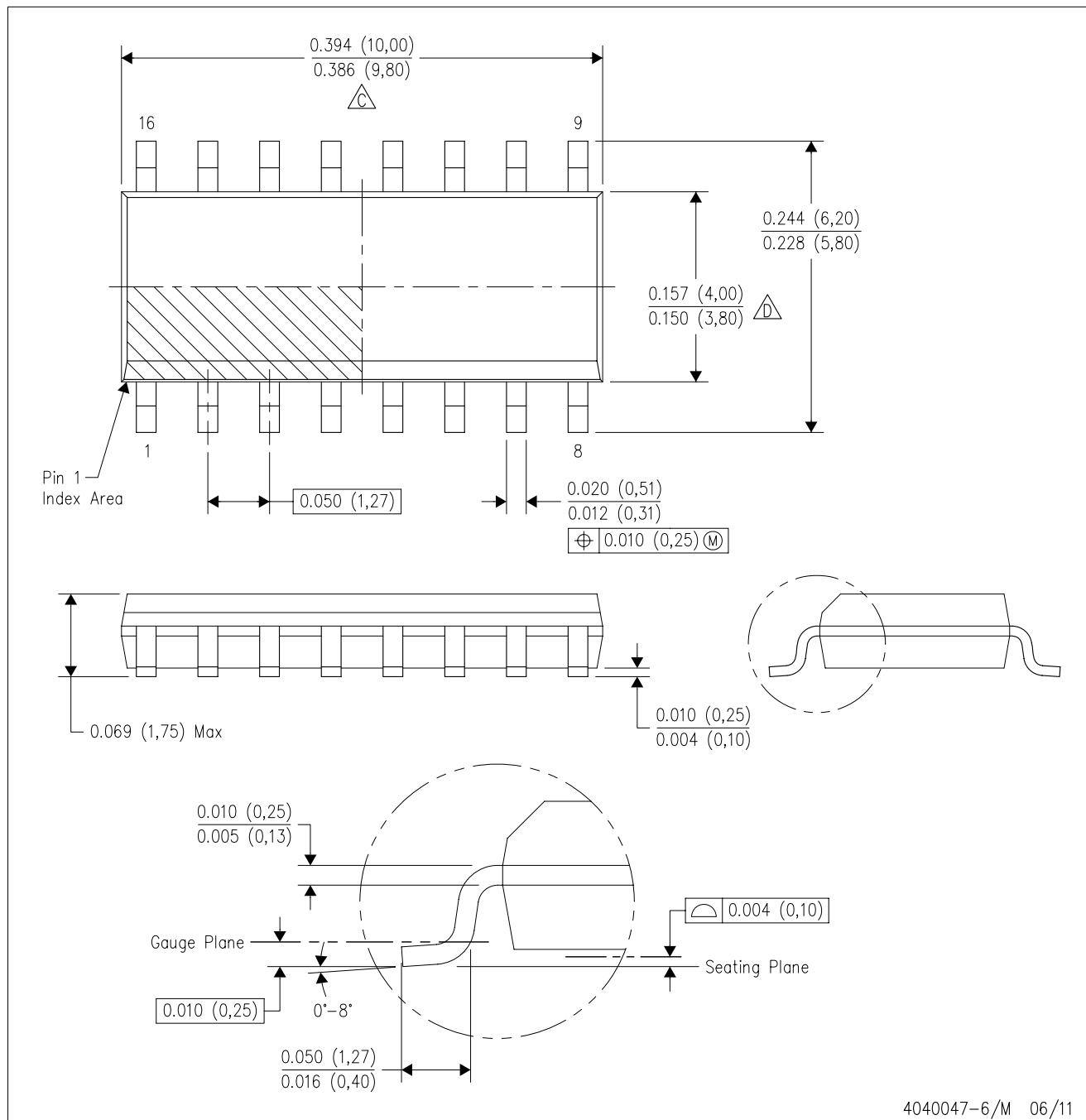


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN75ALS197DR	SOIC	D	16	2500	333.2	345.9	28.6
SN75ALS197NSR	SO	NS	16	2000	367.0	367.0	38.0

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040047-6/M 06/11



D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  -  The 20 pin end lead shoulder width is a vendor option, either half or full width.

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