- **Meets or Exceeds the Requirements of ANSI Standard EIA/TIA-422-B and ITU Recommendation V.11**
- **Designed to Operate at 20 Mbaud or Higher**
- **TTL-and CMOS-Input Compatibility**
- **Single 5-V Supply Operation**
- **Output Short-Circuit Protection**
- **Improved Replacement for the μA9638**

**D OR P PACKAGE
(TOP VIEW)**

| | | |
|---|---|---|
| $V_{CC}$ | 1 | 8 | 1Y |
| 1A | 2 | 7 | 1Z |
| 2A | 3 | 6 | 2Y |
| GND | 4 | 5 | 2Z |
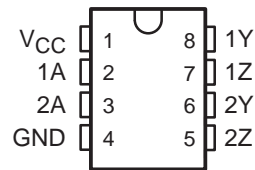
## description

The SN75ALS191 is a dual, high-speed, differential line driver designed to meet ANSI Standard EIA/TIA-422-B and ITU Recommendation V.11. The inputs are TTL- and CMOS-compatible and have input clamp diodes. Schottky-diode-clamped transistors minimize propagation delay time. This device operates from a single 5-V power supply and is supplied in eight-pin packages.

The SN75ALS191 is characterized for operation from 0°C to 70°C.
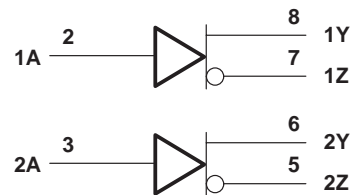
**FUNCTION TABLE
(each driver)**

| INPUTS | OUTPUTS | |
|---|---|---|
| A | Y | Z |
| H | H | L |
| L | L | H |

H = high level,     L = low level,
Z = high impedance

## logic symbol†



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

## logic diagram (positive logic)



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.

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**TEXAS INSTRUMENTS**

# SN75ALS191
# DUAL DIFFERENTIAL LINE DRIVER

## schematics of inputs and outputs



EQUIVALENT OF EACH INPUT



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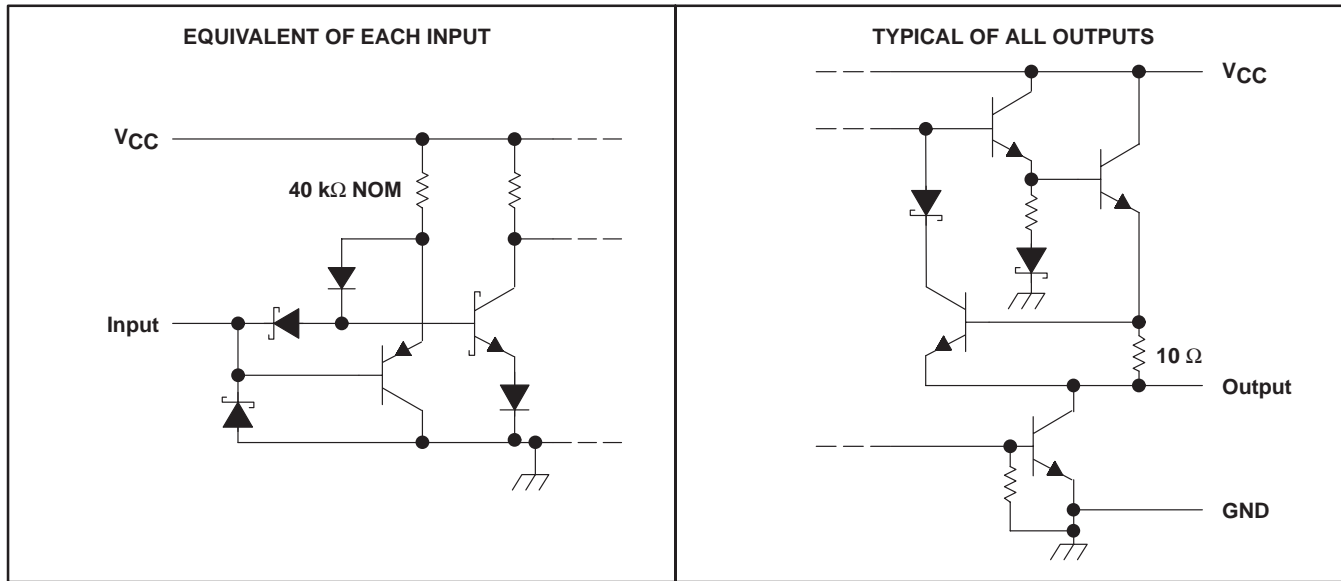
## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, $V_{CC}$ (see Note 1) ........................................................ 7 V
Input voltage, $V_I$ ................................................................................ 7 V
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 output voltage ($V_{OD}$) are with respect to network ground terminal.

### DISSIPATION RATING TABLE

| PACKAGE | $T_A \leq 25°C$ POWER RATING | DERATING FACTOR ABOVE $T_A = 25°C$ | $T_A = 70°C$ POWER RATING |
|---------|---------|---------|---------|
| D | 725 mW | 5.8 mW/°C | 464 mW |
| P | 1000 mW | 8.0 mW/°C | 640 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 |
| High-level output current, $I_{OH}$ | | | – 50 | mA |
| Low-level output current, $I_{OL}$ | | | 50 | mA |
| Operating free-air temperature, $T_A$ | 0 | | 70 | °C |

## electrical characteristics over operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP[†] | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_{IK}$ | Input clamp voltage | $V_{CC} = 4.75$ V, | $I_I = -18$ mA | | | $-1$ | $-1.2$ | V |
| $V_{OH}$ | High-level output voltage | $V_{CC} = 4.75$ V, $V_{IL} = 0.8$ V | $V_{IH} = 2$ V, | $I_{OH} = -10$ mA | 2.5 | 3.3 | | V |
| | | | | $I_{OH} = -40$ mA | 2 | | | |
| $V_{OL}$ | Low-level output voltage | $V_{CC} = 4.75$ V, $I_{OL} = 40$ mA | $V_{IH} = 2$ V, | $V_{IL} = 0.8$ V, | | | 0.5 | V |
| $|V_{OD1}|$ | Differential output voltage | $V_{CC} = 5.25$ V, | $I_O = 0$ | | | | 2 $V_{OD2}$ | V |
| $|V_{OD2}|$ | Differential output voltage | | | | 2 | | | V |
| $\Delta |V_{OD}|$ | Change in magnitude of differential output voltage[‡] | $V_{CC} = 4.75$ V to 5.25 V, See Figure 1 | $R_L = 100$ Ω, | | | | $\pm 0.4$ | V |
| $V_{OC}$ | Common-mode output voltage[§] | | | | | | 3 | V |
| $\Delta |V_{OC}|$ | Change in magnitude of common-mode output voltage[‡] | | | | | | $\pm 0.4$ | V |
| $I_O$ | Output current with power off | $V_{CC} = 0$ | $V_O = 6$ V | | | 0.1 | 100 | μA |
| | | | $V_O = -0.25$ V | | | $-0.1$ | $-100$ | |
| | | | $V_O = -0.25$ V to 6 V | | | | $\pm 100$ | |
| $I_I$ | Input current | $V_{CC} = 5.25$ V, | $V_I = 5.5$ V | | | | 50 | μA |
| $I_{IH}$ | High-level input current | $V_{CC} = 5.25$ V, | $V_I = 2.7$ V | | | | 25 | μA |
| $I_{IL}$ | Low-level input current | $V_{CC} = 5.25$ V, | $V_I = 0.5$ V | | | | 200 | μA |
| $I_{OS}$ | Short-circuit output current[¶] | $V_{CC} = 5.25$ V, | $V_O = 0$ | | $-50$ | | $-150$ | mA |
| $I_{CC}$ | Supply current (all drivers) | $V_{CC} = 5.25$ V, | No load, | All inputs at 0 V | | 32 | 40 | mA |

[†] All typical values are at $V_{CC} = 5$ V and $T_A = 25°C$.

[‡] $|V_{OD}|$ and $|V_{OC}|$ are the changes in magnitude of $V_{OD}$ and $V_{OC}$, respectively, that occur when the input is changed from a high level to a low level.

[§] In ANSI Standard EIA/TIA-422-B, $V_{OC}$, which is the average of the two output voltages with respect to ground, is called output offset voltage, $V_{OS}$.

[¶] Only one output at a time should be shorted, and duration of the short circuit should not exceed one second.

## switching characteristics over recommended operating free-air temperature range, $V_{CC} = 5$ V

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP[#] | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $t_{d(OD)}$ | Differential-output delay time | $C_L = 15$ pF, | $R_L = 100$ Ω, | See Figure 2 | | 3.5 | 7 | ns |
| $t_{t(OD)}$ | Differential-output transition time | | | | | 3.5 | 7 | ns |
| | Skew | | | | | 1.5 | 4 | ns |

[#] Typical values are at $T_A = 25°C$.

## PARAMETER MEASUREMENT INFORMATION
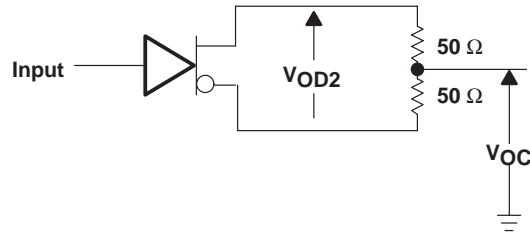


**Figure 1. Differential and Common-Mode Output Voltages**



**TEST CIRCUIT**
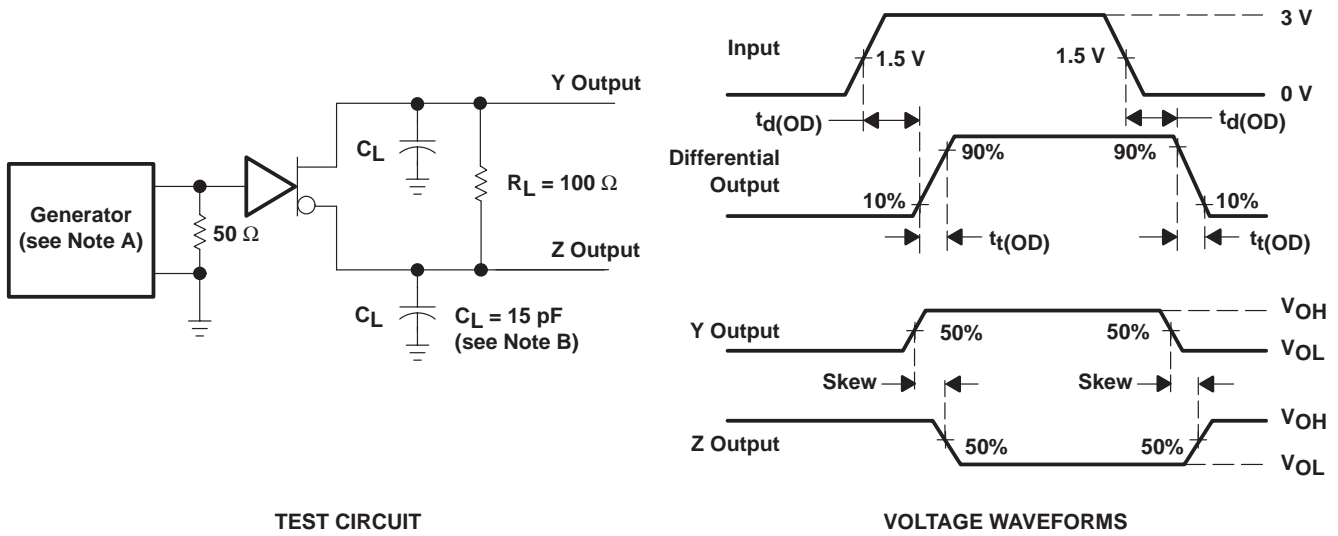
**VOLTAGE WAVEFORMS**

NOTES: A. The input pulse generator has the following characteristics: $Z_O$ = 50 Ω, PRR ≤ 500 kHz, $t_w$ = 100 ns, $t_r$ = ≤ 5 ns.
       B. $C_L$ includes probe and jig capacitance.

**Figure 2. Test Circuit and Voltage Waveforms**

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**PRODUCT FOLDER** | PRODUCT INFO: FEATURES | DESCRIPTION | DATASHEETS | PRICING/AVAILABILITY | APPLICATION NOTES

PRODUCT SUPPORT: APPLICATIONS

## SN75ALS191, Dual Differential Line Driver

DEVICE STATUS: **ACTIVE**

| PARAMETER NAME | SN75ALS191 |
|---|---|
| Drivers Per Package | 2 |
| Driver tpd (ns) | 7 |
| Supply Voltage(s) (V) | 5 |
| ICC (max) (mA) | 40 |
| Footprint | uA9638 |

**FEATURES**                                                                 ▲Back to Top

- Meets or Exceeds the Requirements of ANSI Standard EIA/TIA-422-B and ITU Recommendation V.11
- Designed to Operate at 20 Mbaud or Higher
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**DESCRIPTION**                                                              ▲Back to Top

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The SN75ALS191 is characterized for operation from 0°C to 70°C.

**TECHNICAL DOCUMENTS**                                                      ▲Back to Top

To view the following documents, Acrobat Reader 3.x is required.
To download a document to your hard drive, right-click on the link and choose 'Save'.

**DATASHEET**                                                                ▲Back to Top

Full datasheet in Acrobat PDF: slls032b.pdf (76 KB) (Updated: 05/01/1995)
Full datasheet in Zipped PostScript: slls032b.psz (71 KB)

## APPLICATION NOTES          ▲Back to Top

- 422 and 485 Standards Overview and System Configurations (SLLA070A - Updated: 05/25/2000)
- A Statistical Survey of Common-Mode Noise (SLLA057 - Updated: 12/22/1999)
- Comparing Bus Solutions (SLLA067 - Updated: 03/02/2000)
- Jitter Analysis (SLLA075 - Updated: 03/30/2000)
- Skew Definitions (SLLA060 - Updated: 08/03/1999)

## PRICING/AVAILABILITY          ▲Back to Top

| ORDERABLE DEVICE | PACKAGE | PINS | TEMP (°C) | STATUS | BUDGETARY PRICE US$/UNIT QTY=1000+ | PACK QTY | PRICING/AVAILABILITY |
|---|---|---|---|---|---|---|---|
| SN75ALS191D | D | 8 | 0 TO 70 | ACTIVE | 1.84 | 75 | Check stock or order |
| SN75ALS191DR | D | 8 | 0 TO 70 | ACTIVE | 1.87 | 2500 | Check stock or order |
| SN75ALS191P | P | 8 | 0 TO 70 | ACTIVE | 1.50 | 50 | Check stock or order |
| SN75ALS191PS | PS | 8 | 0 TO 70 | OBSOLETE | | | |

**Table Data Updated on: 11/19/2000**