

# DS90LV017

## LVDS Single High Speed Differential Driver

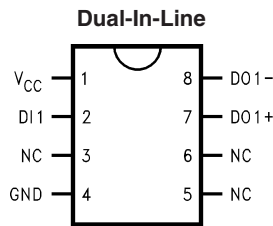
### General Description

The DS90LV017 is a single LVDS driver device optimized for high data rate and low power applications. The DS90LV017 is a current mode driver allowing power dissipation to remain low even at high frequency. In addition, the short circuit fault current is also minimized. The device is in a 8-lead small Outline Package. The DS90LV017 has a flow-through design for easy PCB layout. The differential driver outputs provides low EMI with its low output swings typically 340 mV.

### Features

- Ultra Low Power Dissipation
- Operating Range above 155 Mbps
- Flow-through pinout simplifies PCB layout
- Conforms to TIA/EIA-644 Standard
- 8-Lead SOIC Package Saves Space
- $V_{CM} \pm 1V$  center around 1.2V
- Low Differential Output Swing Typical 340 mV
- Power Off Protection (outputs in high impedance)

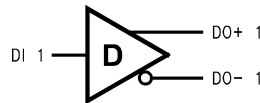
### Connection Diagram



01290001

**Order Number DS90LV017M**  
**See NS Package Number M08A**

### Functional Diagram



01290002

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

|   |                              |
|---|------------------------------|
| Supply Voltage ( $V_{CC}$ )               | -0.3V to +6V                 |
| Input Voltage (DI)                        | -0.3V to ( $V_{CC} + 0.3V$ ) |
| Output Voltage (DO±)                      | -0.3V to +3.9V               |
| Maximum Package Power Dissipation @ +25°C |                              |
| M Package                                 | 1190 mW                      |
| Derate M Package                          | 9.5 mW/°C above +25°C        |
| Storage Temperature Range                 | -65°C to +150°C              |

Lead Temperature Range

Soldering (4 sec.)

+260°C

ESD Rating (Note 4)

(HBM 1.5 kΩ, 100 pF)

≥ 4.5 kV

## Recommended Operating Conditions

|                             | Min | Typ | Max | Units |
|-----------------------------|-----|-----|-----|-------|
| Supply Voltage ( $V_{CC}$ ) | 3.0 | 3.3 | 3.6 | V     |
| Temperature ( $T_A$ )       | 0   | 25  | 70  | °C    |

## Electrical Characteristics

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified. (Notes 2, 3, 7)

| Symbol                                     | Parameter                    | Conditions                             | Pin                      | Min                       | Typ  | Max      | Units |     |
|--|------------------------------|--|--------------------------|---------------------------|------|----------|-------|-----|
| <b>DIFFERENTIAL DRIVER CHARACTERISTICS</b> |                              |  |                          |                           |      |          |       |     |
| $V_{OD}$                                   | Output Differential Voltage  | $R_L = 100\Omega$ (Figure 1)           | DO+,<br>DO-              | 250                       | 340  | 450      | mV    |     |
| $\Delta V_{OD}$                            | $V_{OD}$ Magnitude Change    |  |                          | 0                         | 10   | 35       | mV    |     |
| $V_{OH}$                                   | Output High Voltage          |  |                          |                           | 1.43 | 1.6      | V     |     |
| $V_{OL}$                                   | Output Low Voltage           |  |                          |                           | 0.9  | 1.09     | V     |     |
| $V_{OS}$                                   | Offset Voltage               |  |                          |                           | 0.9  | 1.25     | 1.6   | V   |
| $\Delta V_{OS}$                            | Offset Magnitude Change      |  |                          |                           | 0    | 5        | 25    | mV  |
| $I_{OZD}$                                  | TRI-STATE® Leakage           |  |                          | $V_{OUT} = V_{CC}$ or GND |      | 0        | ±1    | ±10 |
| $I_{OXD}$                                  | Power-off Leakage            | $V_{OUT} = 3.6V$ or GND, $V_{CC} = 0V$ |                          | 0                         | ±1   | ±10      | μA    |     |
| $I_{OSD}$                                  | Output Short Circuit Current |  |                          |                           | -4   | -6       | mA    |     |
| $V_{IH}$                                   | Input High Voltage           |  | DI                       | 2.0                       |      | $V_{CC}$ | V     |     |
| $V_{IL}$                                   | Input Low Voltage            |  |                          |                           | GND  |          | 0.8   | V   |
| $I_{IH}$                                   | Input High Current           | $V_{IN} = 3.6V$ or 2.4V                |                          |                           |      | ±1       | ±10   | μA  |
| $I_{IL}$                                   | Input Low Current            | $V_{IN} = GND$ or 0.5V                 |                          |                           |      | ±1       | ±10   | μA  |
| $V_{CL}$                                   | Input Clamp Voltage          | $I_{CL} = -18$ mA                      |                          |                           | -1.5 | -0.8     |       | V   |
| $I_{CC}$                                   | Power Supply Current         | No Load                                | $V_{IN} = V_{CC}$ or GND | $V_{CC}$                  |      | 1        | 4     | mA  |
|  |                              | $R_L = 100\Omega$                      |                          |                           |      | 4.5      | 7     | mA  |

## Switching Characteristics

Over Supply Voltage and Operating Temperature Ranges, unless otherwise specified. (Notes 5, 6)

| Symbol                                     | Parameter                                  | Conditions  | Min | Typ | Max | Units |
|--|--|---|-----|-----|-----|-------|
| <b>DIFFERENTIAL DRIVER CHARACTERISTICS</b> |  |   |     |     |     |       |
| $t_{PHLD}$                                 | Differential Propagation Delay High to Low | $R_L = 100\Omega$ , $C_L = 5$ pF<br>(Figure 2 and Figure 3) | 1.5 | 3.4 | 6   | ns    |
| $t_{PLHD}$                                 | Differential Propagation Delay Low to High |   | 1.5 | 3.5 | 6   | ns    |
| $t_{SKD}$                                  | Differential Skew $ t_{PHLD} - t_{PLHD} $  |   | 0   | 0.1 | 1.9 | ns    |
| $t_{TLH}$                                  | Transition Low to High Time                |   | 0   | 1   | 3   | ns    |
| $t_{THL}$                                  | Transition High to Low Time                |   | 0   | 1   | 3   | ns    |

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" specifies conditions of device operation.

**Note 2:** Current into device pins is defined as positive. Current out of device pins is defined as negative. All voltages are referenced to ground except  $V_{OD}$ .

**Note 3:** All typicals are given for:  $V_{CC} = +3.3V$  and  $T_A = +25^\circ C$ .

**Note 4:** ESD Rating: HBM (1.5 kΩ, 100 pF) ≥ 4.5 kV

**Note 5:**  $C_L$  includes probe and fixture capacitance.

**Note 6:** Generator waveform for all tests unless otherwise specified:  $f = 1$  MHz,  $Z_O = 50\Omega$ ,  $t_r \leq 6$  ns,  $t_f \leq 6$  ns (10%-90%).

**Note 7:** The DS90LV017 is a current mode device and only function with datasheet specification when a resistive load is applied to the drivers outputs.

# Parameter Measurement Information

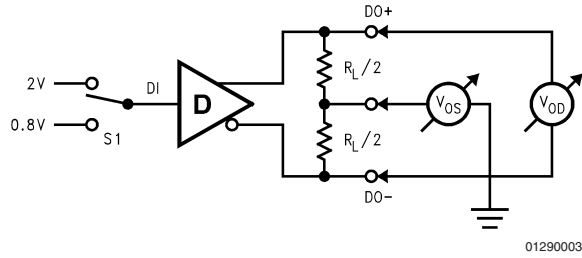


FIGURE 1. Differential Driver DC Test Circuit

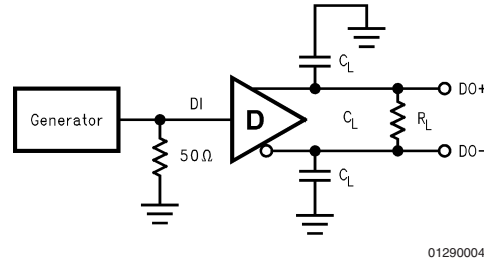


FIGURE 2. Differential Driver Propagation Delay and Transition Time Test Circuit

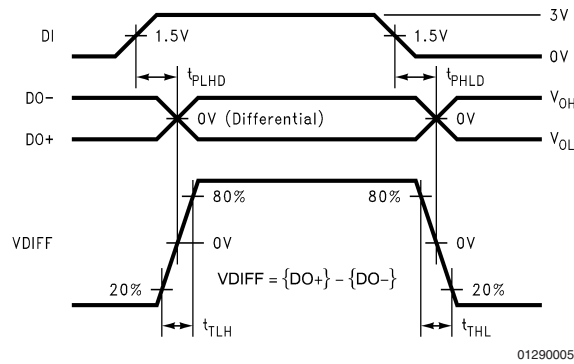


FIGURE 3. Differential Driver Propagation Delay and Transition Time Waveforms

## Application Information

### Truth Table

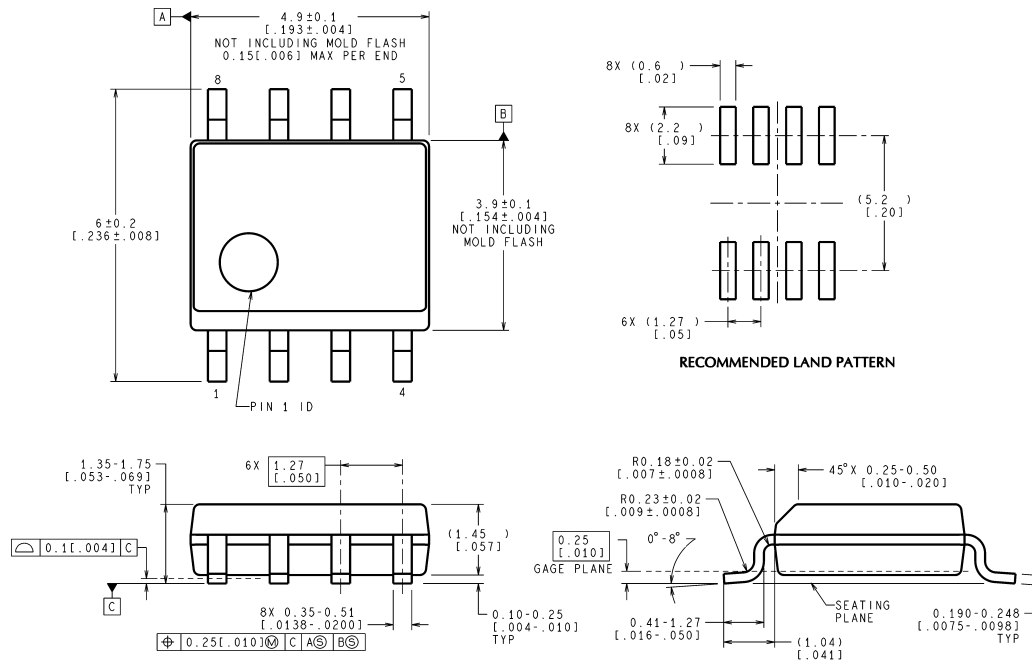
| Input/Output            |     |     |
|-------------------------|-----|-----|
| DI                      | DO+ | DO- |
| L                       | L   | H   |
| H                       | H   | L   |
| DI > 0.8V and DI < 2.0V | X   | X   |

H = Logic high level  
 L = Logic low level  
 X = indeterminant

TABLE 1. Device Pin Descriptions

| Pin #   | Name            | Description                             |
|---------|-----------------|---|
| 2       | DI              | TTL/CMOS driver input pins              |
| 7       | DO+             | Non-inverting driver output pin         |
| 8       | DO-             | Inverting driver output pin             |
| 4       | GND             | Ground pin                              |
| 1       | V <sub>CC</sub> | Positive power supply pin, +3.3V ± 0.3V |
| 3, 5, 6 | NC              | No connect                              |

**Physical Dimensions** inches (millimeters) unless otherwise noted



CONTROLLING DIMENSION IS MILLIMETER  
VALUES IN [ ] ARE INCHES  
DIMENSIONS IN ( ) FOR REFERENCE ONLY

M08A (Rev K)

**Order Number DS90LV017M**  
**NS Package Number M08A**

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

For the most current product information visit us at [www.national.com](http://www.national.com).

**LIFE SUPPORT POLICY**


NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**BANNED SUBSTANCE COMPLIANCE**

National Semiconductor manufactures products and uses packing materials that meet the provisions of the Customer Products Stewardship Specification (CSP-9-111C2) and the Banned Substances and Materials of Interest Specification (CSP-9-111S2) and contain no "Banned Substances" as defined in CSP-9-111S2.

Leadfree products are RoHS compliant.

 **National Semiconductor**  
Americas Customer  
Support Center  
Email: [new.feedback@nsc.com](mailto:new.feedback@nsc.com)  
Tel: 1-800-272-9959

**National Semiconductor**  
Europe Customer Support Center  
Fax: +49 (0) 180-530 85 86  
Email: [europe.support@nsc.com](mailto:europe.support@nsc.com)  
Deutsch Tel: +49 (0) 69 9508 6208  
English Tel: +44 (0) 870 24 0 2171  
Français Tel: +33 (0) 1 41 91 8790

**National Semiconductor**  
Asia Pacific Customer  
Support Center  
Email: [ap.support@nsc.com](mailto:ap.support@nsc.com)

**National Semiconductor**  
Japan Customer Support Center  
Fax: 81-3-5639-7507  
Email: [jpn.feedback@nsc.com](mailto:jpn.feedback@nsc.com)  
Tel: 81-3-5639-7560