# PI90LV031A
# PI90LV027A
# PI90LV017A

## 3V LVDS High-Speed Differential Line Drivers

### Features

- Signaling Rates >400Mbps (200 MHz)
- Single 3.3V Power Supply Design
- ±350mV Differential Swing
- Maximum Differential Skew of 0.4ns
- Maximum Propagation Delay of 2.0ns
- Maximum Power Dissipation: 25mW @ 200 MHz/driver
- Low Voltage TTL (LVTTL) Inputs
- Industrial Temperature Operating Range: -40°C to 85°C
- Meets or Exceeds IEEE 1596.3 SCI LVDS Standard
- Meets or Exceeds ANSI/TIA/EIA-644 LVDS Standard
- Packaging (Pb-free & Green available):

  PI90LV017A & PI90LV027A
  - 8-pin SOIC (W)
  - 8-pin MSOP (U)

  PI90LV031A
  - 16-pin SOIC (W)
  - 16-pin TSSOP (L)

### Description

The PI90LV031A, PI90LV027A, and PI90LV017A are differential line drivers that use low-voltage differential signaling (LVDS) to support data rates in excess of 400 Mbps. These products are designed for applications requiring high-speed, low-power consumption and low noise generation.

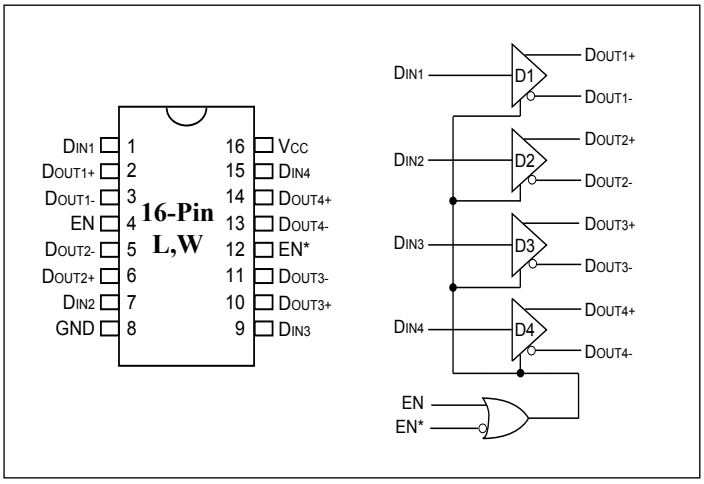
A low voltage TTL/CMOS input level is translated by the device into a low-voltage (350mV) differential output signal. Exclusive to the PI90LV031A quad driver is a power-down mode that 3-states the outputs and places the device in a low-power idle state (13mW typical).

### Applications

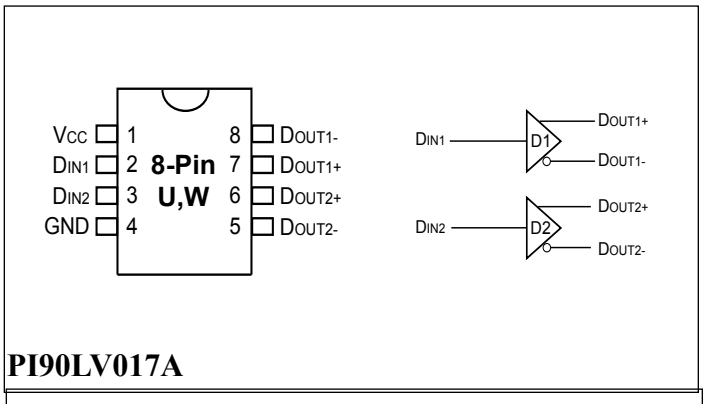
Applications include point-to-point and multidrop baseband data transmission over controlled impedance media of approximately 100 ohms. The transmission media can be printed circuit board traces, backplanes, or cables.

The PI90LV031A, PI90LV027A, PI90LV017A and companion line receivers (PI90LV032A, PI90LV028A, and PI90LV018A) provide new alternatives to RS-232, PECL, and ECL devices for high-speed, point-to-point interface applications.

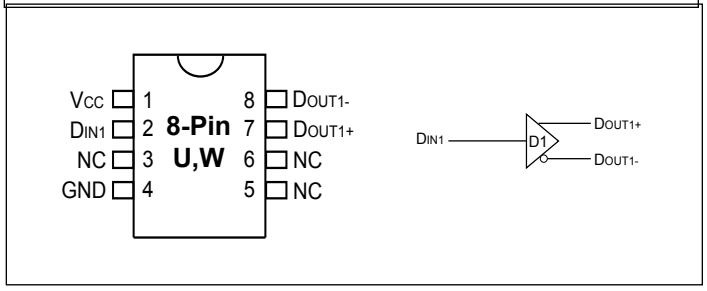
### PI90LV031A




### PI90LV027A




### PI90LV017A



## Function Tables

### PI90LV031A

| Enables | | Input | Outputs | |
|---|---|---|---|---|
| EN | $\overline{EN}$ | $D_{IN}$ | $D_{OUT+}$ | $D_{OUT-}$ |
| H | X | H | H | L |
| H | X | L | L | H |
| X | L | H | H | L |
| X | L | L | L | H |
| L | H | X | Z | Z |

### PI90LV027A

| Input | Outputs | |
|---|---|---|
| $D_{IN}$ | $D_{OUT+}$ | $D_{OUT-}$ |
| H | H | L |
| L | L | H |

### PI90LV017A

| Input | Outputs | |
|---|---|---|
| $D_{IN}$ | $D_{OUT+}$ | $D_{OUT-}$ |
| H | H | L |
| L | L | H |

## Pin Descriptions

| Name | Description |
|---|---|
| $D_{IN}$ | TTL/CMOS driver input pins |
| $D_{O+}$ | Non-inverting driver output pins |
| $D_{O-}$ | Inverting driver output pins |
| GND | Ground pin |
| $V_{CC}$ | Positive power supply pin, +3.3V ±10% |

## Recommended Operating Conditions

| | Min. | Typ. | Max. | Units |
|---|---|---|---|---|
| Supply Voltage ($V_{CC}$) | +3.0 | +3.3 | +3.6 | V |
| Operating Free Air Temperature | –40 | +25 | +85 | °C |

## Absolute Maximum Ratings (see Note 1, Page 4)

Supply Voltage ($V_{CC}$) .....–0.3V to +4.0V
Input Voltage ($D_{IN}$).....–0.3V to ($V_{CC}$ +0.3V)
Enable Input Voltage (EN, EN*).....–0.3V to ($V_{CC}$ +0.3V)
Output Voltage ($D_{OUT+}$, $D_{OUT-}$).....–0.3V to +3.9V
Short Circuit Duration
($D_{OUT+}$, $D_{OUT-}$).....Continuous
S Package ..... 750mW
Derate S Package .....8.5mW/°C above +25°C
Storage Temperature Range.....-65°C to +150°C
Lead Temperature Range Soldering (4s).....+260°C
Maximum Junction Temperature .....+150°C
ESD Rating .....≥6kV

**Note:**
Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Electrical Characteristics

Over supply voltage and operating temperature ranges, unless otherwise specified. (Notes 2,3,4)

| Symbol | Parameter | Conditions | Pin | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{OD1}$ | Differential Output Voltage | $R_L$ = 100Ω (Fig.1) | $D_{OUT-}$ $D_{OUT+}$ | 250 | 350 | 450 | mV |
| $\Delta V_{OD1}$ | Change in Magnitude of $V_{OD1}$ for Complementary Output States | | | | 4 | 35 | lmVl |
| $V_{OS}$ | Offset Voltage | | | 1.125 | 1.25 | 1.375 | V |
| $\Delta V_{OS}$ | Change in Magnitude of $V_{OS}$ for Complementary Output States | | | | 5 | 25 | lmVl |
| $V_{OH}$ | Output Voltage High | | | | 1.38 | 1.6 | V |
| $V_{OL}$ | Output Voltage Low | | | 0.90 | 1.03 | | |
| $V_{IH}$ | Input Voltage High | | $D_{IN}$ EN EN* | 2.0 | | $V_{CC}$ | |
| $V_{IL}$ | Input Voltage Low | | | GND | | 0.8 | |
| $I_{IH}$ | Input Current | $V_{IN} = V_{CC}$ or 2.5V | | -10 | ±1 | +10 | µA |
| $I_{IL}$ | Input Current | $V_{IN}$ = GND or 0.4V | | -10 | ±1 | +10 | |
| $V_{CL}$ | Input Clamp Voltage | $I_{CL}$ = -18mA | | -1.5 | -0.8 | | V |
| $I_{OS}$ | Output Short Circuit Current | ENABLED,(10) $D_{IN} = V_{CC}$, $D_{OUT+}$ = 0V or $D_{IN}$ = GND, $D_{OUT-}$ = 0V | $D_{OUT-}$ $D_{OUT+}$ | | -6.0 | -9.0 | mA |
| $I_{OSD}$ | Differential Output Short Circuit Current | ENABLED, $V_{OD}$ = 0V(10) | | | -6.0 | -9.0 | |
| $I_{OFF}$ | Power-off Leakage | $V_{OUT}$ = 0V or 3.6V, $V_{CC}$ = 0V or Open | | -20 | ±1 | +20 | µA |
| $I_{OZ}$ | Output Three-State Current | EN = 0.8V and EN* = 2.0V $V_{OUT}$ = 0V or $V_{CC}$ | | -10 | ±1 | +10 | |
| $I_{CC}$ | No Load Supply Current Drivers Enable | $D_{IN} = V_{CC}$ or GND | $V_{CC}$ | | 5.0 | 8.0 | mA |
| $I_{CCL}$ | Loaded Supply Current Drivers Enabled | $R_L$ = 100Ω All Channels, $D_{IN} = V_{CC}$ or GND (all inputs) | | | 23 | 30 | |
| $I_{CCZ}$ | No Load Supply Current Drivers Disabled | $D_{IN} = V_{CC}$ or GND, EN = GND, EN* = $V_{CC}$ | | | 2.6 | 6.0 | |

## Switching Characteristics

$V_{CC}$ = +3.3V ±10%, $T_A$ = -40°C to +85°C (Notes 3,9,11)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $t_{PHLD}$ | Differential Propagation Delay High to Low | $R_L$ = 100Ω, $C_L$ = 10pF (Figures 2 & 3) | 0.8 | 1.18 | 2.0 | ns |
| $t_{PLHD}$ | Differential Propagation Delay Low to High | | 0.8 | 1.25 | 2.0 | |
| $t_{SKD}1$ | Differential Pulse Skew $\lvert t_{PHLD} - t_{PLHD} \rvert$ (5) | | 0 | 0.07 | 0.4 | |
| $t_{SKD}2$ | Channel-to-Channel Skew(6) | | 0 | 0.1 | 0.5 | |
| $t_{SKD}3$ | Differential Part-to-Part Skew (7) | | 0 | | 1.0 | |
| $t_{SKD}4$ | Differential Part-to-Part Skew (8) | | 0 | | 1.2 | |
| $t_{TLH}$ | Rise Time | | | 0.38 | 1.5 | |
| $t_{THL}$ | Fall Time | | | 0.40 | 1.5 | |
| $t_{PHZ}$ | Disable Time High to Z | $R_L$ = 100Ω, $C_L$ = 10pF (Figures 4 & 5) | | | 5 | |
| $t_{PLZ}$ | Disable Time Low to Z | | | | 5 | |
| $t_{PZH}$ | Enable Time Z to High | | | | 7 | |
| $t_{PZL}$ | Enable Time Z to Low | | | | 7 | |
| $t_{MAX}$ | Maximum Operating Frequency(13) | | 200 | 250 | | MHz |

**Notes:**

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.
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: $V_{OD1}$ and $\Delta V_{OD1}$.
3. All typicals are given for: $V_{CC}$ = +3.3V, $T_A$ = +25°C.
4. The PI90LV031A/PI90LV027A/PI90LV017A are current mode devices and only functions within datasheet specifications when a resistive load is applied to the driver outputs typical range is (90Ω to 110Ω).
5. $t_{SKD}1$, $\lvert t_{PHLD} - t_{PLHD} \rvert$ is the magnitude difference in differential propagation delay time between the positive going edge and the negative going edge of the same channel.
6. $t_{SKD}2$ is the Differential Channel-to-Channel Skew of any event on the same device.
7. $t_{SKD}3$, Differential Part-to-Part Skew, is defined as the difference between the minimum and maximum specified differential propagation delays. This specification applies to devices at the same Vcc and with 5°C of each other within the operating temperature range.
8. $t_{SKD}4$, Part-to-Part Skew, is the differential Channel-to-Channel skew of any event between devices. This specification applies to devices over recommended operating temperature and voltage ranges, and across process distribution. $t_{SKD}4$ is defined as |Max - Min| differential propagation delay.
9. Generator waveform for all tests unless otherwise specified: f = 1 MHz, $Z_O$ = 50Ω, tr ≤ 1ns, and $t_f$ ≤ 1ns.
10. Output short circuit current ($I_{OS}$) is specified as magnitude only, minus sign indicates direction only.
11. $C_L$ includes probe and jig capacitance.
12. All input voltages are for one channel unless otherwise specified. Other inputs are set to GND.
13. $f_{MAX}$ generator input conditions: $t_R = t_F$ < 1ns, (0% to 100%), 50% duty cycle, 0V to 3V.
    Output Criteria: duty cycle = 45%/55%, $V_{OD}$ > 250mV, all channels switching.

## Parameter Measurement Information

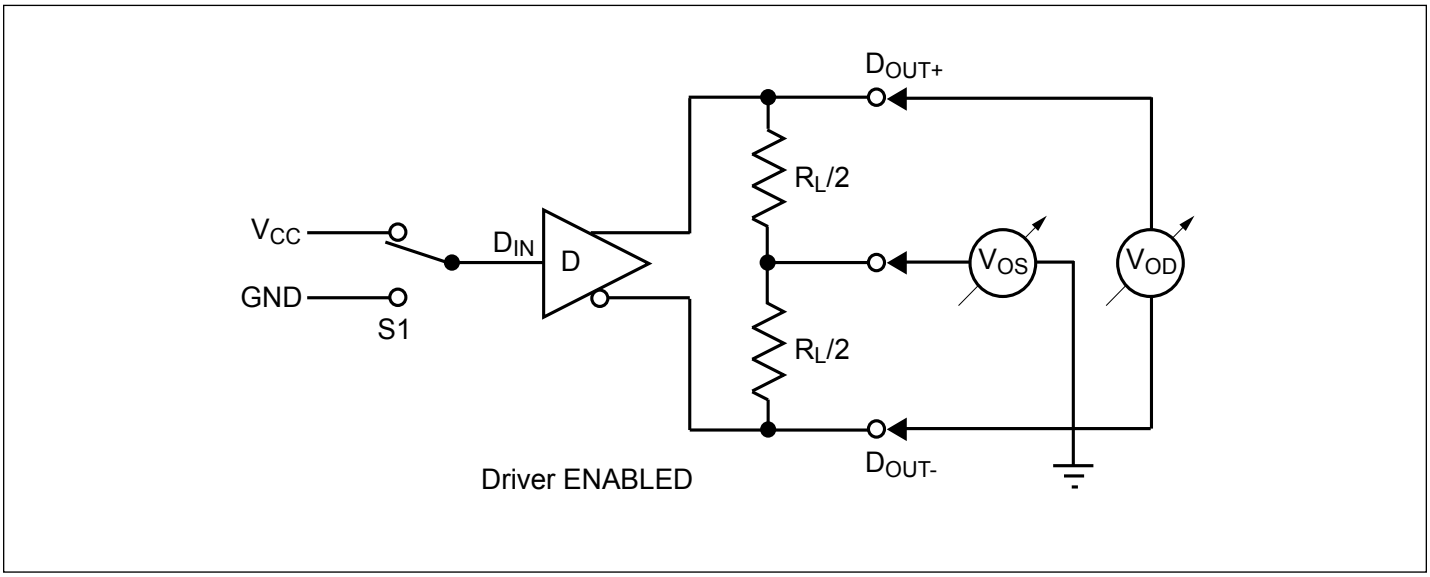



**Figure 1. Driver $V_{OD}$ and $V_{OS}$ Test Circuit**

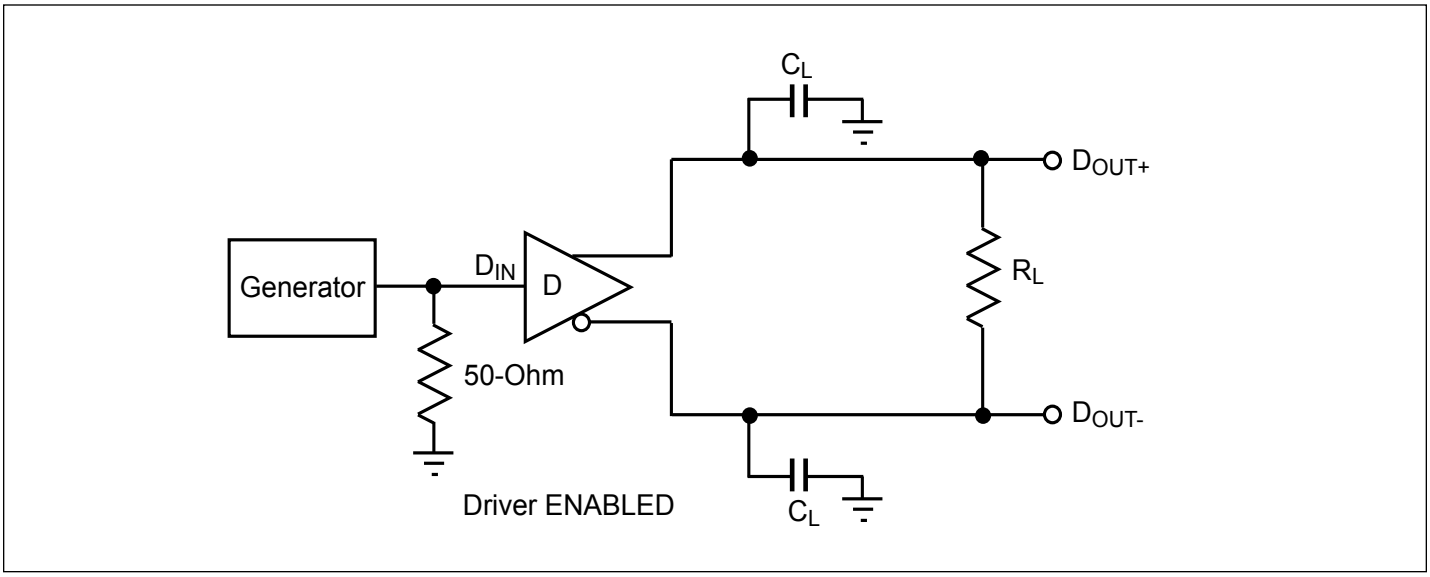



**Figure 2. Driver Propagation Delay and Transition Time Test Circuit**

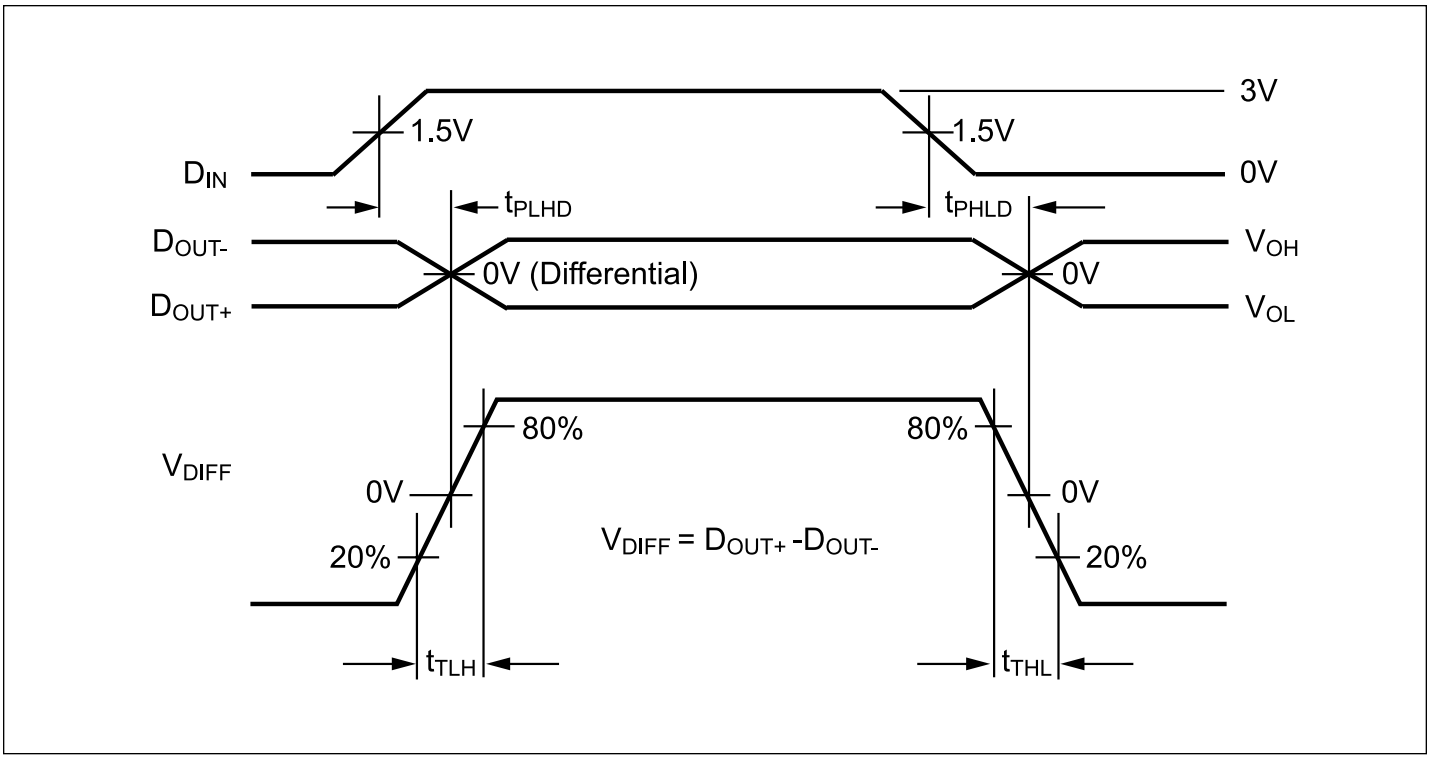



**Figure 3. Driver Propagation Delay and Transition Time Waveforms**

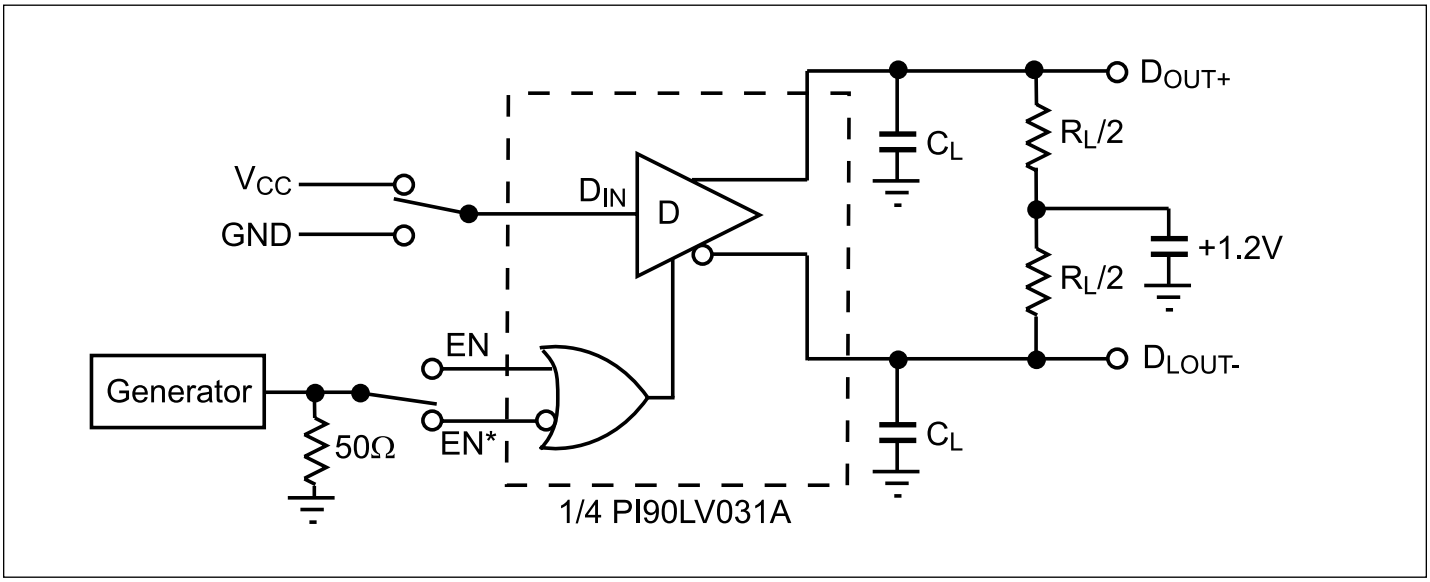



**Figure 4. Driver Three-State Delay Test Circuit**

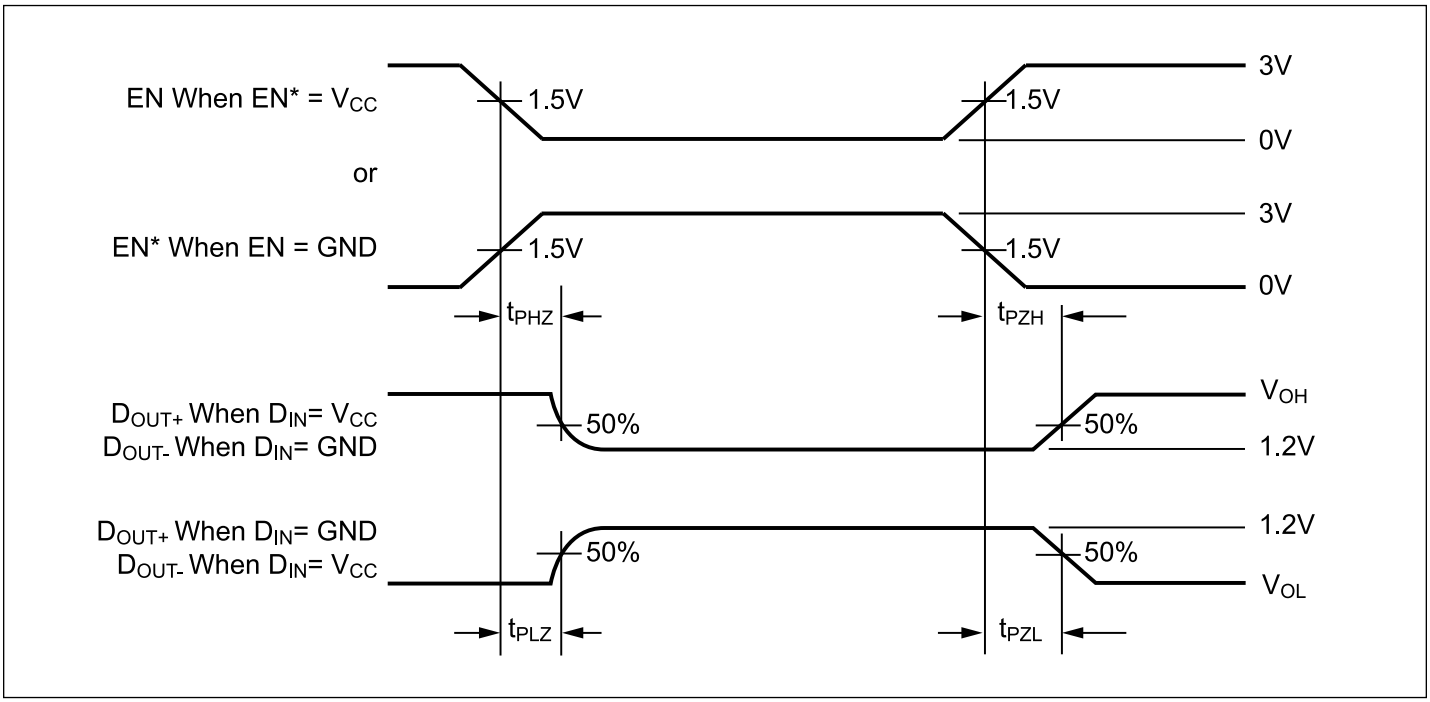



**Figure 5. Driver 3-State Delay Waveform**

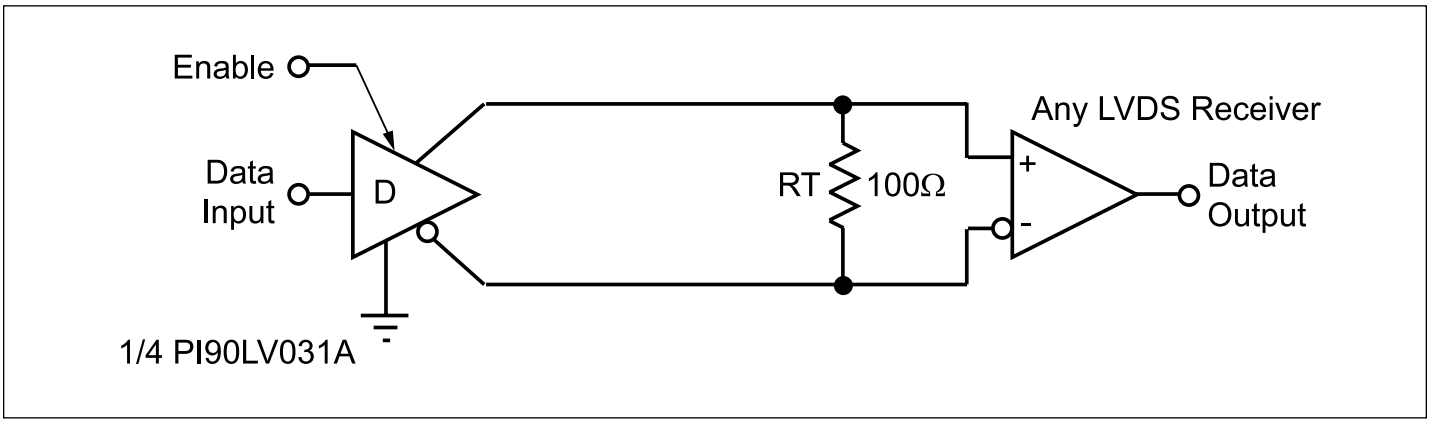
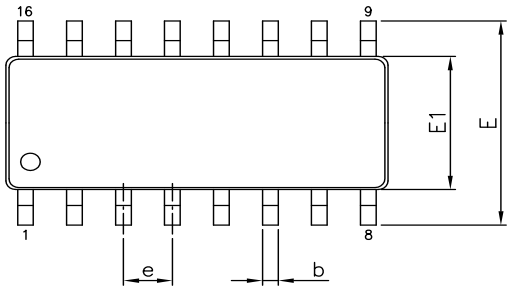
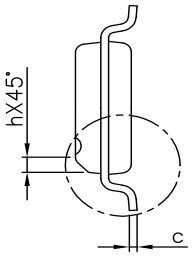


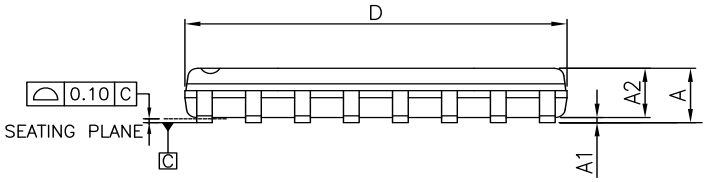

**Figure 6. Point-to-Point Application**

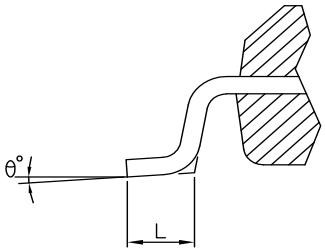
**Packaging Mechanical: 16-Pin SOIC (W)**




| SYMBOLS | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | — | — | 1.75 |
| A1 | 0.10 | — | 0.25 |
| A2 | 1.25 | — | — |
| b | 0.31 | — | 0.51 |
| c | 0.10 | — | 0.25 |
| D | 9.80 | 9.90 | 10.0 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | | 1.27 BSC | |
| L | 0.40 | — | 1.27 |
| h | 0.25 | — | 0.50 |
| θ° | 0 | — | 8 |




NOTES:
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. JEDEC OUTLINE : MS–012 AC
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

PERICOM Enabling Serial Connectivity

**DATE: 06/15/12**

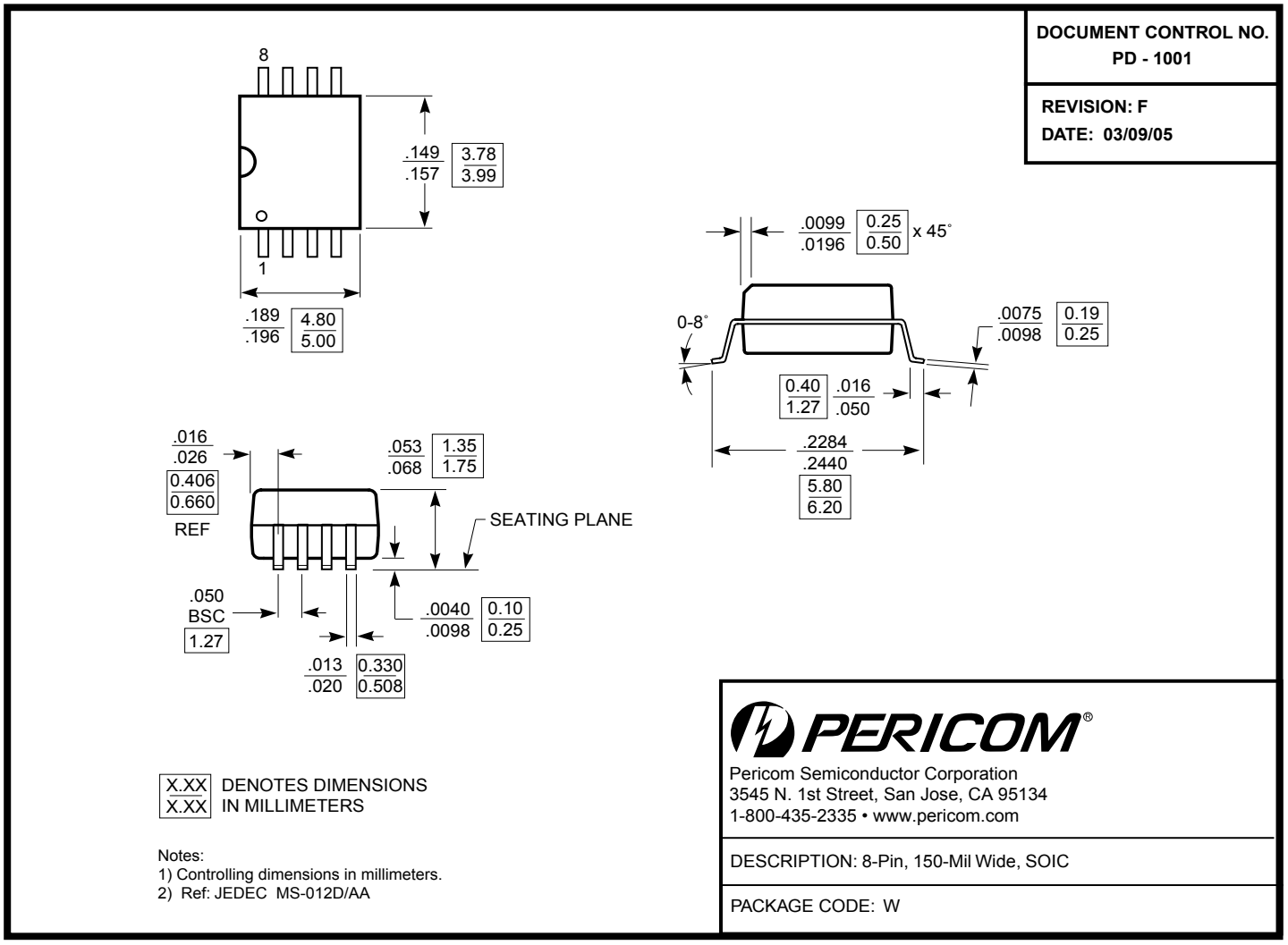
**DESCRIPTION: 16-Pin, 150mil Wide SOIC**

**PACKAGE CODE: W**

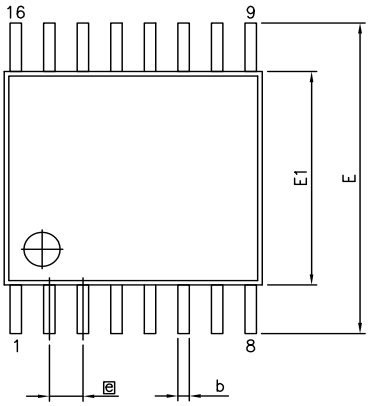
**DOCUMENT CONTROL #: PD-1004** **REVISION: F**

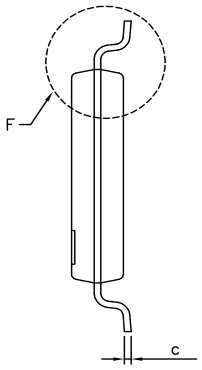
2012-0398

**Packaging Mechanical: 8-Pin SOIC (W)**



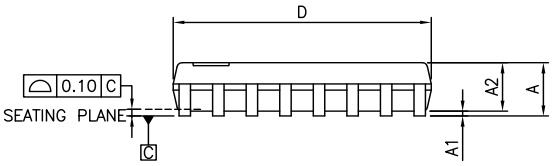
## Packaging Mechanical: 16-Pin TSSOP (L)

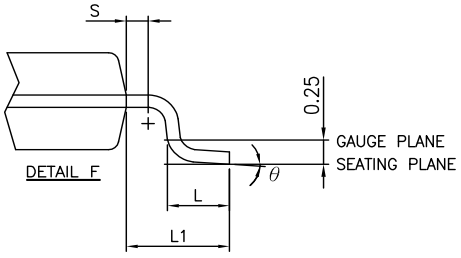



VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

| SYMBOLS | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | – | – | 1.20 |
| A1 | 0.05 | – | 0.15 |
| A2 | 0.80 | – | 1.05 |
| b | 0.19 | – | 0.30 |
| c | 0.09 | – | 0.20 |
| D | 4.90 | 5.00 | 5.10 |
| E1 | 4.30 | 4.40 | 4.50 |
| E | | 6.40 BSC | |
| e | | 0.65 BSC | |
| L1 | | 1.00 REF | |
| L | 0.45 | 0.60 | 0.75 |
| S | 0.20 | – | – |
| θ | 0° | – | 8° |




**Notes:**
1. Refer JEDEC MO-153F/AB
2. Controlling dimensions in millimeters
3. Package outline exclusive of mold flash and metal burr

PERICOM Enabling Serial Connectivity

**DATE: 05/03/12**

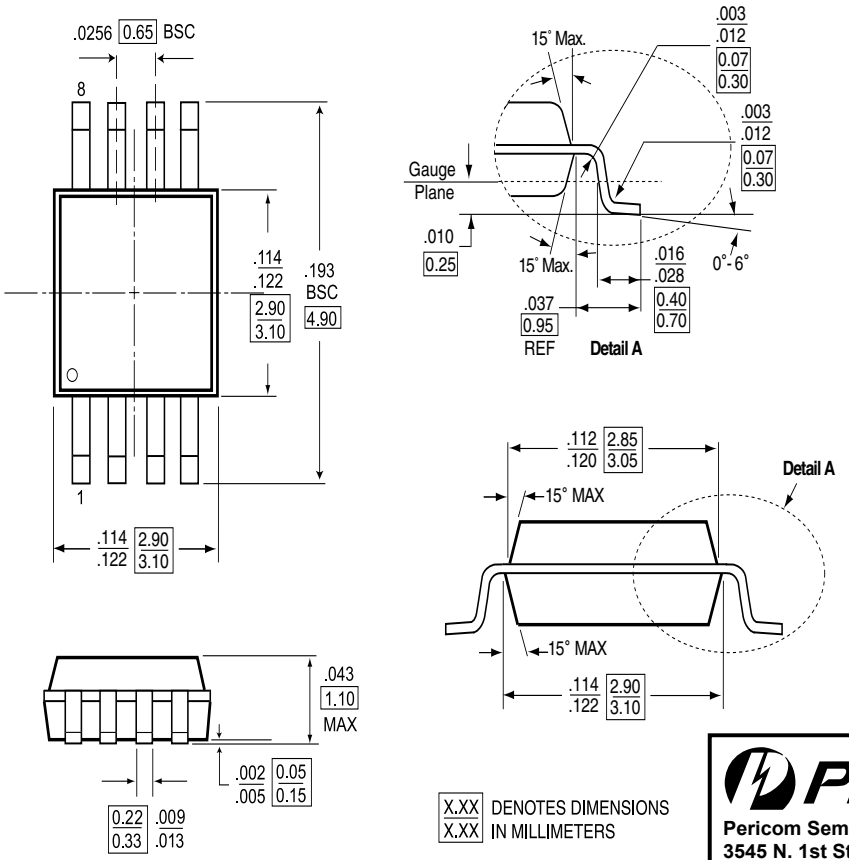
**DESCRIPTION: 16-Pin, 173mil Wide TSSOP**

**PACKAGE CODE: L**

**DOCUMENT CONTROL #: PD-1310** **REVISION: F**

12-0372

**Packaging Mechanical: 8-pin MSOP (U)**




**Notes:**
1) Controlling Dimensions inMillimeters
2) Ref. JEDEC MO-187E/AA

**DOCUMENT CONTROL NO.**
**PD - 1261**

**REVISION: E**
**DATE: 03/09/05**

**Pericom Semiconductor Corporation**
**3545 N. 1st Street, San Jose, CA 95134**
**1-800-435-2335 • www.pericom.com**

**DESCRIPTION: 8-Pin Mini Small Outline Package, MSOP**

**PACKAGE CODE: U**

## Ordering Information

| Ordering Code | Package Code | Package Description |
|---|---|---|
| PI90LV017AWE | W | Pb-free & Green, 8-pin SOIC |
| PI90LV017AUE | U | Pb-free & Green, 8-pin MSOP |
| PI90LV027AWE | W | Pb-free & Green, 8-pin SOIC |
| PI90LV027AUE | U | Pb-free & Green, 8-pin MSOP |
| PI90LV031AWE | W | Pb-free & Green, 16-pin SOIC |
| PI90LV031ALE | L | Pb-free & Green, 16-pin TSSOP |

**Notes:**
1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/

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Authorized Distributor

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