# PL-2301 USB to USB Bridge Controller
# Product Datasheet

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# Revision History

| Revision | Description | Date |
|---|---|---|
| 1.7 | ➢ Revised PL-2301 Product Datasheet | October 17, 2005 |

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# 1.0 Features

- Transfer files between two PCs thru USB port interface
- Full compliance with the Universal Serial Bus Specification Version 1.13
- USB Full-Speed Connection
- Dual data buffer supporting two-way data transfer
- Low power consumption
- Supports suspend and resume for power management
- Supports remote wake-up
- PnP driver running on Windows 98SE, Windows ME, Windows 2000, and Windows XP.
- Bus powered from either USB port
- Suitable for mobile PC environment
- On-chip USB transceiver
- On-chip oscillator using one 12MHz crystal
- No glue logic needed – can be embedded in small space
- Designed for Windows XP/2000 Certified Logo Drivers
- USB-IF Logo Compliant with TID 41000098
- 28-Pin SSOP package

# 2.0 Introduction

The PL-2301 operates as a bridge between two PCs (USB host) that are widely utilized in PC-to-PC communication nowadays. With a more advanced bus protocol and operation system, this USB bridge cable could offer much higher bandwidth and easier user interface.

This chip is embedded into a link cable. Either port is an upstream port that could join a USB network, i.e. a PC's USB connector or a USB hub's downstream port. By means of switching and protocol changing in the chip, any two PCs or USB hosts can communicate with each other. The bulk-type data format is adopted for maximum speed. In addition, data are followed to flow in both directions simultaneously without any performance compromising. The PCs can control the device using standard USB command, while the data flow is directed by a vendor-specific scheme.

As shown in the block diagram next page, this ASIC contains two USB units working independently. Together with the two FIFOs and control logics in between, they exchange data with no blocking. All the clock oscillator, PLL, voltage regulators, USB transceivers, and power-on reset circuits are integrated on chip. There is no glue logic needed. This chip is designed for handy cable utility.

# 3.0 Functional Block Diagram

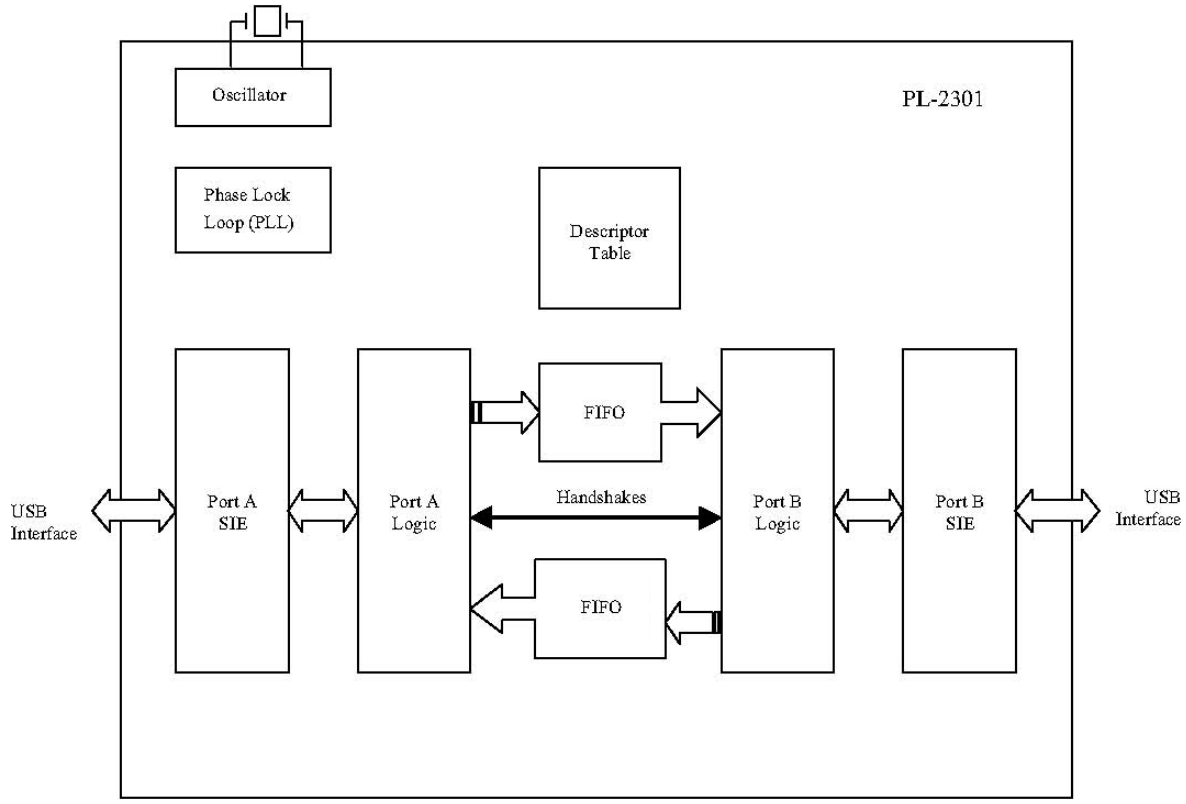


**Figure 3-1 Block Diagram of PL-2301**

# 4.0 Pin Assignment Outline

**SSOP 28 PACKAGE**
**(TOP VIEW)**

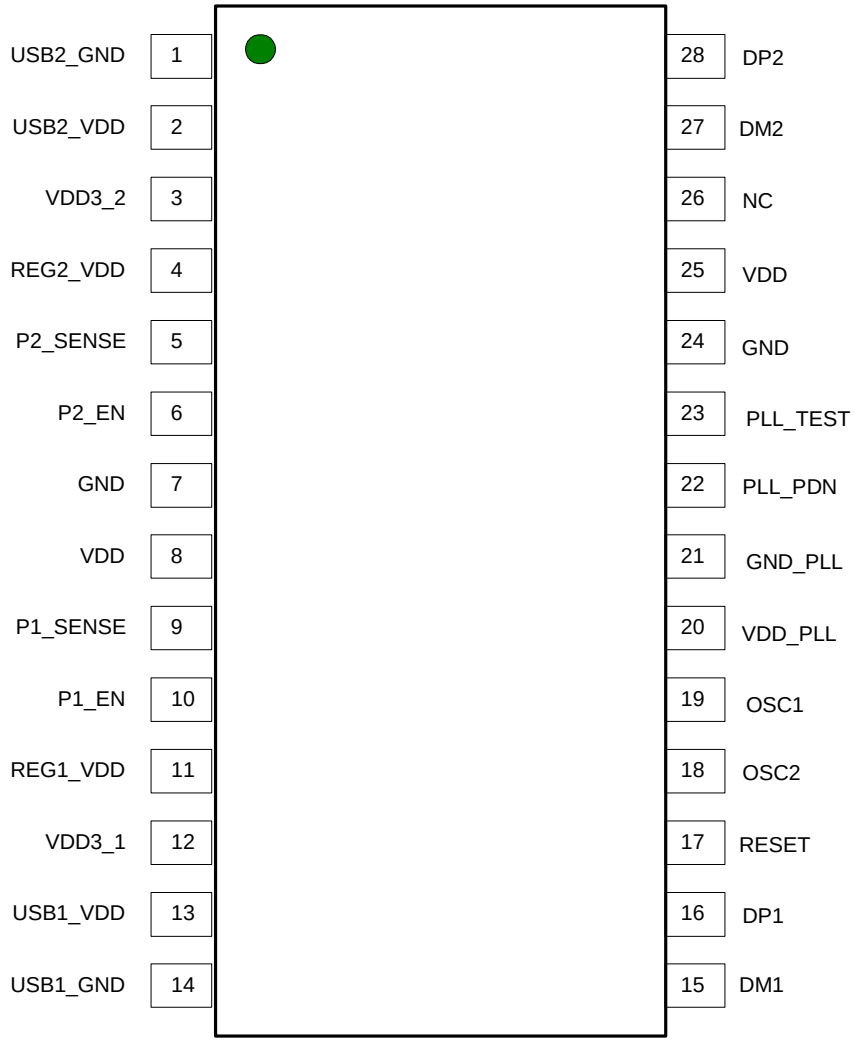


**Figure 4-1 Pin Assignment Outline of PL-2301**

# 5.0 Pin Assignment & Description

**Table 5-1 Pin Assignment & Description**

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | USB2_GND | P | Port 2 USB Ground |
| 2 | USB2_VDD | P | Port 2 USB VDD |
| 3 | VDD3_2 | P | Port 2 Transceiver Power |
| 4 | REG2_VDD | P | Regulator Power |
| 5 | P2_SENSE | I | Port 2 Sense |
| 6 | P2_EN | O | Port 2 Power Enable |
| 7 | GND | P | Ground |
| 8 | VDD | P | Power |
| 9 | P1_SENSE | I | Port 1 Sense |
| 10 | P1_EN | O | Port 1 Power Enable |
| 11 | REG1_VDD | P | Regulator Power |
| 12 | VDD3_1 | P | Port 2 Transceiver Power |
| 13 | USB1_VDD | P | Port 1 USB VDD |
| 14 | USB1_GND | P | Port 1 USB Ground |
| 15 | DM1 | I/O | Port 1 USB DMINUS Signal |
| 16 | DP1 | I/O | Port 1 USB DPLUS Signal |
| 17 | RESET | I | System Reset |
| 18 | OSC2 | O | Crystal Oscillator Output |
| 19 | OSC1 | I | Crystal Oscillator Input |
| 20 | VDD_PLL | P | PLL Power |
| 21 | GND_PLL | P | PLL Ground |
| 22 | PLL_PDN | I | PLL Trigger |
| 23 | PLL_TEST | I | PLL Test Mode Control |
| 24 | GND | P | Ground |
| 25 | VDD | P | VDD |
| 26 | NC | N | No Connection |
| 27 | DM2 | I/O | Port 2 USB DMINUS Signal |
| 28 | DP2 | I/O | Port 2 USB DPLUS Signal |

Type: I – Input signal O – Output signal I/O – Bi-directional signal P – Power/Ground N – No Connection

# 6.0 USB Standard Descriptors

## 6.1 String Descriptor

The String index 0, by USB Specification, is defined as Language ID. The PL-2301 supports only manufacturer ID accessed by String index 1.

**Table 6-1 String Descriptor**

| Offset | Value | Description |
|---|---|---|
| 0 | 04h | String Index 0 |
| 1 | 03h | |
| 2:3 | 0409h | Language ID for English (United States) |
| 4 | 32h | String Index 1 |
| 5 | 03h | |
| 6:53 | 00h, ‘P’; 00h, ‘r’; 00h, ‘o’; 00h, ‘l’; 00h, ‘i’; 00h, ‘f’; 00h, ‘i’; 00h, ‘c’; 00h, ‘’; 00h, ‘T’; 00h, ‘e’; 00h, ‘c’; 00h, ‘h’; 00h, ‘n’; 00h, ‘o’; 00h, ‘l’; 00h, ‘o’; 00h, ‘g’; 00h, ‘y’; 00h, ‘’; 00h, ‘I’; 00h, ‘n’; 00h, ‘c’; 00h, ‘.’; | “Prolific Technology Inc.”<br>00h is padded for UNICODE. |

## 6.2 Device Descriptor

**Table 6-2 Device Descriptor**

| Offset | Field | Size | Value | Description |
|---|---|---|---|---|
| 0 | *bLength* | Byte | 12h | Size of this descriptor (in bytes) |
| 1 | *bDescriptorType* | Byte | 01h | DEVICE descriptor type |
| 2 | *bcdUSB* | Word | 0100h | USB Specification Release Number |
| 4 | *bDeviceClass* | Byte | 00h | |
| 5 | *bDeviceSubClass* | Byte | 00h | |
| 6 | *bDeviceProtocol* | Byte | 00h | |
| 7 | *bMaxPacketSize0* | Byte | 08h | Maximum packet size for endpoint 0 |
| 8 | *idVender* | Word | 067Bh | Vender ID |
| 10 | *idProduct* | Word | 0000h | Product ID |
| 12 | *bcdDevice* | Word | 0000h | Release Number (BCD) 0.0 |
| 14 | *iManufacturer* | Byte | 01h | Manufacturer string descriptor index |
| 15 | *iProduct* | Byte | 00h | Product name string descriptor index |
| 16 | *iSerialNumber* | Byte | 00h | Serial number string descriptor index |
| 17 | *bNumConfigurations* | Byte | 01h | One possible configuration. |

## 6.3 Configuration Descriptor

The default configuration descriptor is used, which contains only one interface. When accessed, all the configuration descriptor, the interface descriptor, and all the endpoint descriptors are returned.

**Table 6-3 Configuration Descriptor**

| Offset | Field | Size | Value | Description |
|---|---|---|---|---|
| 0 | *bLength* | Byte | 09h | Size of this descriptor (in bytes) |
| 1 | *bDescriptorType* | Byte | 02h | CONFIGURATION descriptor type |
| 2 | *wTotalLength* | Word | 0027h | Total length of data returned for this configuration. |
| 4 | *bNumInterface* | Byte | 01h | One interface for this device. |
| 5 | *bConfigurationValue* | Byte | 01h | |
| 6 | *iConfiguration* | Byte | 00h | |
| 7 | *bmAttributes* | Byte | A0h | Characteristic attributes |
| 8 | *MaxPower* | Byte | 32h | Maximum power consumption is 100mA |

## 6.4 Interface Descriptor

The interface descriptor contains all relevant definition fully describing the device. There is only one setting for the interface.

**Table 6-4 Interface Descriptor**

| Offset | Field | Size | Value | Description |
|---|---|---|---|---|
| 0 | *BLength* | Byte | 09h | Size of this descriptor (in bytes) |
| 1 | *BDescriptorType* | Byte | 04h | INTERFACE descriptor type |
| 2 | *BInterfaceNumber* | Byte | 00h | |
| 3 | *BAlternateSetting* | Byte | 00h | |
| 4 | *BNumEndpoints* | Byte | 03h | |
| 5 | *BInterfaceClass* | Byte | FFh | Vendor Specific Class |
| 6 | *BInterfaceSubClass* | Byte | 00h | |
| 7 | *BInterfaceProtocol* | Byte | 00h | |
| 8 | *IInterface* | Byte | 00h | |

## 6.5 Endpoint Descriptor: Control Endpoint Descriptor

Since endpoint 0 is used as the default control endpoint, there is no dedicated standard or class-specific control endpoint descriptor.

## 6.6 Endpoint 1 Descriptor: Interrupt Endpoint Descriptor

**Table 6-6 Endpoint 1 Descriptor**

| Offset | Field | Size | Value | Description |
|---|---|---|---|---|
| 0 | *bLength* | Byte | 07h | Size of this descriptor (in bytes) |
| 1 | *bDescriptorType* | Byte | 05h | ENDPOINT descriptor type |
| 2 | *bEndpointAddress* | Byte | 81h | Input endpoint |
| 3 | *bmAttributes* | Byte | 03h | Transfer type is INTERRUPT |
| 4 | *wMaxPacketSize* | Word | 0001h | 1 Byte |
| 6 | *bInterval* | Byte | 01h | Polling on every 1 ms interval |

## 6.7 Endpoint 2 Descriptor: Bulk-Out Endpoint Descriptor

**Table 6-7 Endpoint 2 Descriptor**

| Offset | Field | Size | Value | Description |
|---|---|---|---|---|
| 0 | *bLength* | Byte | 07h | Size of this descriptor (in bytes) |
| 1 | *bDescriptorType* | Byte | 05h | ENDPOINT descriptor type |
| 2 | *bEndpointAddress* | Byte | 02h | Output endpoint |
| 3 | *bmAttributes* | Byte | 02h | Transfer type is BULK |
| 4 | *wMaxPacketSize* | Word | 0040h | 64 bytes |
| 6 | *bInterval* | Byte | 00h | Ignored field |

## 6.8 Endpoint 3 Descriptor: Bulk-In Endpoint Descriptor

**Table 6-8 Endpoint 3 Descriptor**

| Offset | Field | Size | Value | Description |
|---|---|---|---|---|
| 0 | *bLength* | Byte | 07h | Size of this descriptor (in bytes) |
| 1 | *bDescriptorType* | Byte | 05h | ENDPOINT descriptor type |
| 2 | *bEndpointAddress* | Byte | 83h | Input endpoint |
| 3 | *bmAttributes* | Byte | 02h | Transfer type is BULK |
| 4 | *wMaxPacketSize* | Word | 0040h | 64 bytes |
| 6 | *bInterval* | Byte | 00h | Ignored field |

# 7.0 Electrical, Temperature & Timing Characteristics

## 7.1 Absolute Maximum Ratings

**Table 7-1 Absolute Maximum Ratings**

| Items | Ratings |
|---|---|
| Power Supply Voltage | -0.3 to 6.0 V |
| Input Voltage | -0.3 to VDD+0.3 V |
| Output Voltage | -0.3 to VDD+0.3 V |
| Storage Temperature | -55 to 150 $^{o}$C |

## 7.2 DC Characteristics

**Table 7-2 DC Characteristics**

| Parameter | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Power Supply Current | $I_{DD}$ | 0.5 | 19 | 24 | mA |
| Input Voltage | | | | | |
| Low | $V_{IL}$ | -- | -- | 0.3 $V_{DD}$ | V |
| High | $V_{IH}$ | 0.7 $V_{DD}$ | -- | -- | V |
| Output Voltage | | | | | |
| Low | $V_{OL}$ | -- | -- | 0.4 | V |
| High | $V_{OH}$ | 3.5 | -- | -- | V |
| Input Leakage Current | $I_L$ | -1 | -- | 1 | uA |
| Tri-state Leakage Current | $I_{oz}$ | -10 | -- | 10 | uA |
| Input Capacitance | $C_{IN}$ | -- | 3 | -- | Pf |
| Output Capacitance | $C_{OUT}$ | -- | 3 | -- | Pf |
| Bi-directional Buffer Capacitance | $C_{BID}$ | -- | 3 | -- | Pf |
| Operating Voltage Range | -- | 4.1 | 5 | 5.25 | V |
| Suspend Current | $I_{SUS}$ | -- | 400 | 490 | uA |
| Operating Temperature | -- | -40 | -- | 85 | $^{o}$C |

## 7.3 Clock Characteristics

**Table 7-3 Clock Characteristics**

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Frequency of Operation | 11.976 | 12.000 | 12.024 | MHz |
| Clock Period | 83.1 | 83.3 | 83.5 | ns |
| Duty Cycle | 45 | 50 | 55 | % |

## 7.4 USB Transceiver Characteristics

**Table 7-4 USB Transceiver Characteristics**

| Parameter | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Rise and Fall Times:<br>(10%—90%)<br>(90%—10%) | <br>$T_R$<br>$T_F$ | <br>4<br>4 | <br>8<br>8 | <br>15<br>15 | <br>ns<br>ns |
| Cross Point | $V_{CR}$ | 1.3 | -- | 2.0 | V |
| Output Impedance | $R_D$ | 23 | 28 | 33 | ohm |
| High Level Output | $V_{OH}$ | 2.8 | -- | -- | V |
| Low Level Output | $V_{OL}$ | -- | -- | 0.7 | V |
| High Level Input | $V_{IH}$ | 2.0 | -- | -- | V |
| Low Level Input | $V_{IL}$ | -- | -- | 0.8 | V |

Note: $C_L$: 50pf

# 8.0 Ordering Information

**Table 8-1 Ordering Information**

| Part Number | Package Type |
|---|---|
| PL-2301 | 28-pin SSOP |
| PL-2301 L/F | 28-pin SSOP (Lead-Free or Pb-Free) |

# 9.0 Outline Diagram

## 9.1 SSOP28 Package

**Table 9-1 Package Dimension**

| Symbol | Millimeter | | | Inch | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| b | 0.22 | | 0.38 | 0.009 | | 0.015 |
| E | 7.40 | 7.80 | 8.20 | 0.291 | 0.307 | 0.323 |
| E1 | 5.00 | 5.30 | 5.60 | 0.197 | 0.209 | 0.220 |
| L | 0.55 | 0.75 | 0.95 | 0.021 | 0.030 | 0.037 |
| R1 | 0.09 | | | 0.004 | | |
| D | 9.9 | 10.2 | 10.5 | 0.390 | 0.402 | 0.413 |
| A | | | 2.0 | | | 0.079 |
| e | | 0.65 | | | 0.0256 | |
| L1 | | 1.25 | | | 0.050 | |
| A1 | 0.05 | | | 0.020 | | |
| A2 | 1.65 | 1.75 | 1.85 | 0.065 | 0.069 | 0.073 |

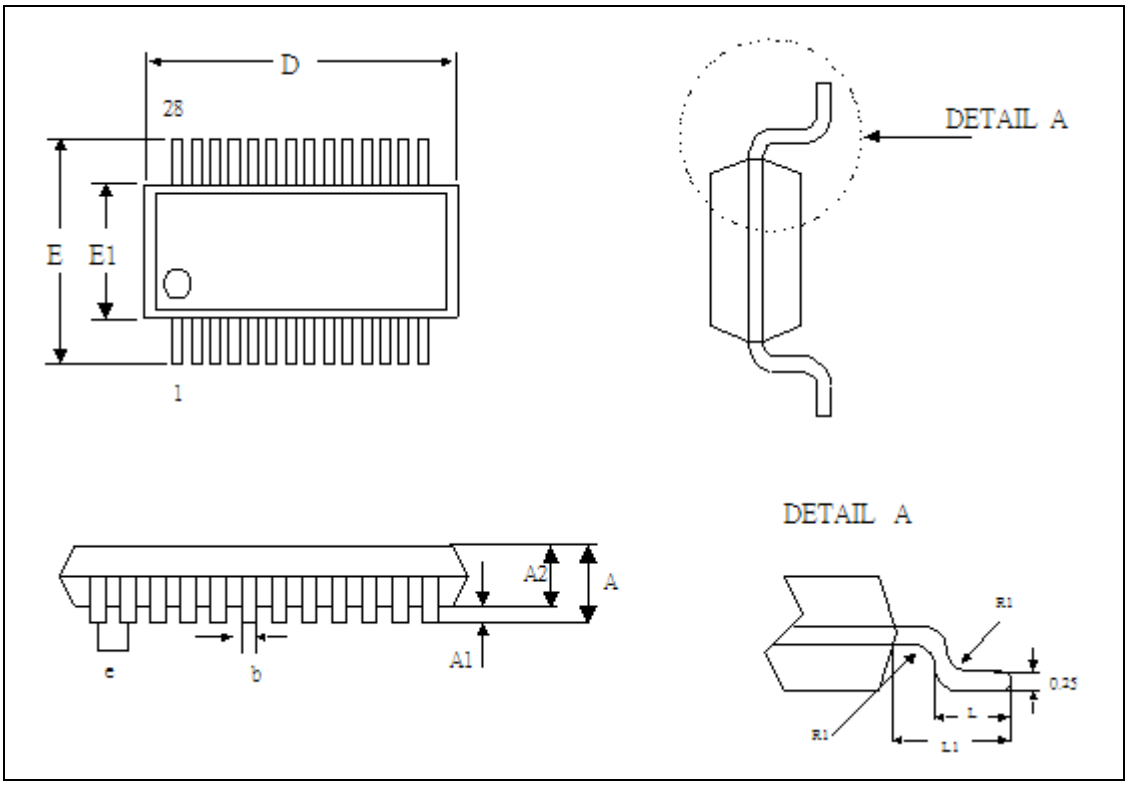


**Figure 9-1 Outline Diagram of PL-2301 SSOP28**