



PL-2303X Edition (Chip Rev A) USB to Serial Bridge Controller Product Datasheet

Document Revision: 1.5F

Document Release: July 4, 2006

Prolific Technology Inc.

7F, No. 48, Sec. 3, Nan Kang Rd.
Nan Kang, Taipei 115, Taiwan, R.O.C.

Telephone: +886-2-2654-6363

Fax: +886-2-2654-6161

E-mail: sales@prolific.com.tw

Website: <http://www.prolific.com.tw>



Disclaimer

All the information in this document is subject to change without prior notice. Prolific Technology Inc. does not make any representations or any warranties (implied or otherwise) regarding the accuracy and completeness of this document and shall in no event be liable for any loss of profit or any other commercial damage, including but not limited to special, incidental, consequential, or other damages.

Trademarks

The Prolific logo is a registered trademark of Prolific Technology Inc. All brand names and product names used in this document are trademarks or registered trademarks of their respective holders.

Copyrights

Copyright © 2006 Prolific Technology Inc. All rights reserved.

No part of this document may be reproduced or transmitted in any form by any means without the express written permission of Prolific Technology Inc.

Document Revision History

Revision	Description	Date
1.5F	➤ Sec. 4.2: Modified QFN diagram to add IC bottom PAD information	July 4, 2006
1.5E	➤ Section 12.0: Correct Ordering Information for QFN	January 10, 2006
1.5D	<ul style="list-style-type: none"> ➤ Section 8.0: Added Data Formats & Programmable Baud Rate Generator ➤ Section 9.2: Added Operating Current value ➤ Section 9.4: Correct Operating Temperature and add test condition ➤ Section 10.0: Improve clarity of QFN Package Diagram 	April 12, 2005
1.5C	<ul style="list-style-type: none"> ➤ Modify Features section ➤ Modify List of Tables ➤ Modify notes for Pin Assignment section ➤ Modify DC and Temperature Characteristics section 	March 11, 2005
1.5B	➤ Add Lead-Free (Pb-Free) IC Ordering Information	March 8, 2005
1.5	<ul style="list-style-type: none"> ➤ Added List of Figures and List of Tables ➤ Modify Features section (Sec 1.0) ➤ Improve clarity of Functional Block diagram (Sec 2.0) and Pin Assignment diagram (Sec 4.0) ➤ Add (5) note "internal resistor pull-up to 3.3V" on page 10 ➤ Change Minimum Operating Temperature to 0°C ➤ Added IC quantity per reel information (Sec 10.1) ➤ Added Ordering Information (Sec 11.0) 	January 27, 2005
1.4	<ul style="list-style-type: none"> ➤ Modify the QFN Pin Diagram ➤ Correct some typo errors 	October 20, 2004
1.3	<ul style="list-style-type: none"> ➤ Added Pin 13 and Pin 14 descriptions ➤ Correct Min. Operating Voltage from 4.75 to 4.4V 	October 19, 2004
1.2	➤ Added QFN Package Pin Assignment	June 11, 2004
1.1	➤ Correct page 6 (3.0 Introduction) by removing 5V range	April 23, 2004
1.0A	➤ Modify DC Characteristics of the Serial I/O Pins	December 29, 2003
1.0	➤ Change Preliminary Version to Formal Release 1.0	December 15, 2003
0.9D	➤ Added DC Characteristics of Serial I/O Pins and the Power-On Reset	September 3, 2003
0.9C	➤ Modify DC Characteristics	February 13, 2003
0.9B	➤ Added Outline Diagram Packaging	December 23, 2002
0.9A	➤ Preliminary Release – PL-2303X USB to Serial Bridge Controller Datasheet	December 20, 2002

Table of Contents

1.0	FEATURES.....	8
2.0	FUNCTIONAL BLOCK DIAGRAM.....	9
3.0	INTRODUCTION	10
4.0	PIN ASSIGNMENT OUTLINE	11
	4.1 SSOP28 Package	11
	4.2 QFN Package	12
5.0	PIN ASSIGNMENT & DESCRIPTION.....	13
	5.1 SSOP28 Package	13
	5.2 QFN Package	14
6.0	USB STANDARD DESCRIPTORS	15
	6.1 Device Descriptor.....	15
	6.2 Configuration Descriptor.....	15
	6.3 Interface Descriptor.....	16
	6.4 Endpoint 1 Descriptor: Interrupt Input Endpoint.....	16
	6.5 Endpoint 2 Descriptor: Bulk Data Output Endpoint	16
	6.6 Endpoint 3 Descriptor: Bulk Data Input Endpoint.....	17
	6.7 String Descriptors.....	17
7.0	USB STANDARD REQUESTS.....	18
8.0	DATA FORMATS & PROGRAMMABLE BAUD RATE GENERATOR.....	19
9.0	DC & TEMPERATURE CHARACTERISTICS.....	19
	9.1 Absolute Maximum Ratings.....	19
	9.2 DC Characteristics	20
	9.3 Clock Characteristics	21
	9.4 Temperature Characteristics	21
	9.5 Leakage Current and Capacitance	22
	9.6 Power-On Reset.....	22

10.0 OUTLINE DIAGRAM	23
10.1 SSOP28 Package.....	23
10.2 QFN Package.....	24
11.0 REEL PACKING INFORMATION.....	25
11.1 Carrier Tape (SSOP-28).....	25
11.2 Reel Dimension	26
12.0 ORDERING INFORMATION.....	26

List of Figures

Figure 2-1 Block Diagram of PL-2303X (Chip Rev A)	9
Figure 4-1 Pin Assignment Outline of PL-2303X (SSOP28).....	11
Figure 4-2 Pin Assignment Outline of PL-2303X (QFN).....	12
Figure 9-6 Power-On Reset Diagram.....	22
Figure 10-1 Outline Diagram of PL-2303X SSOP28	23
Figure 10-2 Outline Diagram of PL-2303X QFN 32-Pin	24
Figure 11-1a SSOP28 Carrier Tape	25
Figure 11-1b IC Reel Placements	25
Figure 11-2 Reel Dimension	26

List of Tables

Table 5-1 SSOP28 Pin Assignment Description.....	13
Table 5-2 QFN32 Pin Assignment Description	14
Table 6-1 Device Descriptor.....	15
Table 6-2 Configuration Descriptor	15
Table 6-3 Interface Descriptor.....	16
Table 6-4 Interrupt Input Endpoint Descriptor.....	16
Table 6-5 Bulk Data Output Endpoint Descriptor.....	16
Table 6-6 Bulk Data Input Endpoint Descriptor	17
Table 6-7-1 String Descriptor – Language ID	17
Table 6-7-2 String Descriptor – Manufacturer.....	17
Table 6-7-3 String Descriptor – Product	18
Table 6-7-4 String Descriptor – Serial Number.....	18
Table 8-1 Supported Data Formats	19
Table 8-2 Baud Rate Settings	19
Table 9-1 Absolute Maximum Ratings.....	19
Table 9-2 Operating Voltage and Suspend Current.....	20
Table 9-2-1 3.3V I/O Pins.....	20
Table 9-2-2a VDD_325@3.3V Serial I/O Pins.....	20
Table 9-2-2b VDD_325@2.5V Serial I/O Pins.....	21
Table 9-2-2c VDD_325@1.8V Serial I/O Pins.....	21
Table 9-3 Clock Characteristics	21
Table 9-4 Temperature Characteristics	21
Table 9-5 Leakage Current and Capacitance.....	22
Table 9-6 Power-On Reset	22
Table 10-1 SSOP28 Package Dimension	23

Table 11-2 Reel Part Number Information	26
Table 12-1 Ordering Information.....	26

1.0 Features

- Fully Compliant with USB Specification v2.0 (Full-Speed)
- On Chip USB 1.1 transceiver, 5V→3.3V regulator, and 12 MHz crystal oscillator
- Supports RS232-like Serial Interface
 - Full-duplex transmitter and receiver (TXD and RXD)
 - Six MODEM control pins (RTS, CTS, DTR, DSR, DCD, and RI)
 - 5, 6, 7 or 8 data bits
 - Odd, Even, Mark, Space, or None parity mode
 - One, one and a half, or two stop bits
 - Parity error, frame error, and serial break detection
 - Programmable baud rate from 75 bps to 6 Mbps
 - External RS232 driver power down control
 - Independent power source for serial interface
- Extensive Flow Control Mechanism
 - Adjustable high/low watermark level
 - Automatic flow control with CTS/RTS
 - Automatic flow control with XON/XOFF
 - Inbound data buffer overflow detection
- Configurable 512-byte bi-directional data buffer
 - 256-byte outbound buffer and 256-byte inbound buffer; or
 - 128-byte outbound buffer and 384-byte inbound buffer.
- Supports remote wake-up from MODEM input signals
- Two general purpose I/O (GPIO) pins
- Optional external EEPROM for startup device configurations
- Provides drivers support for Windows, Mac OS, Linux, and WinCE
- Designed for Windows XP Certified Logo Drivers
- USB-IF Logo Compliant with TID 40001480
- Small footprint 28-pin SSOP or 32-pin QFN IC package

2.0 Functional Block Diagram

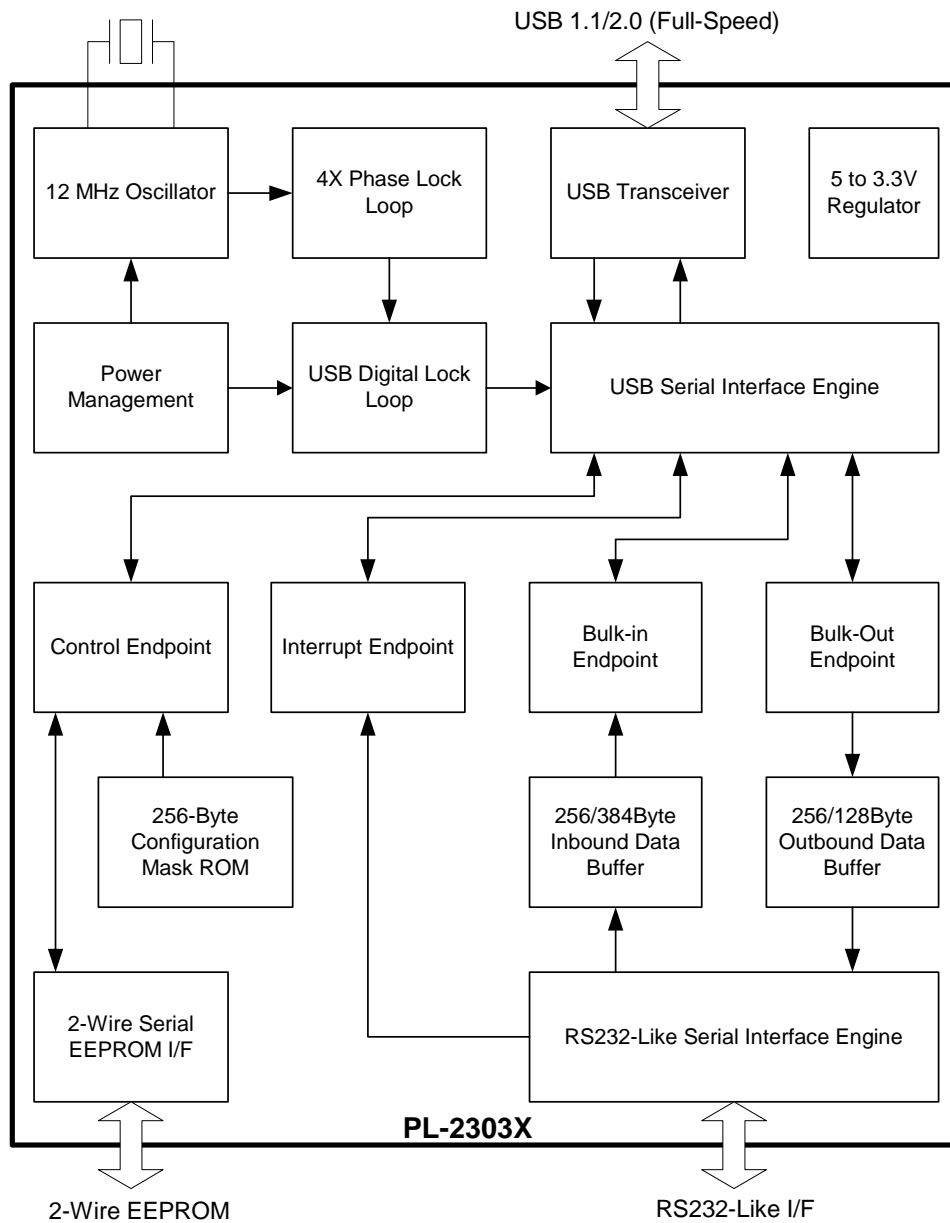


Figure 2-1 Block Diagram of PL-2303X (Chip Rev A)

3.0 Introduction

PL-2303X provides a convenient solution for connecting an RS232-like full-duplex asynchronous serial device to any Universal Serial Bus (USB) capable host. PL-2303X highly compatible drivers could simulate the traditional COM port on most operating systems allowing the existing applications based on COM port to easily migrate and be made USB ready.

By taking advantage of USB bulk transfer mode, large data buffers, and automatic flow control, PL-2303X is capable of achieving higher throughput compared to traditional UART (Universal Asynchronous Receiver Transmitter) ports. When real RS232 signaling is not required, baud rate higher than 115200 bps could be used for even higher performance. The flexible baud rate generator of PL-2303X could be programmed to generate any rate between 75 bps and 6Mbps.

PL-2303X is exclusively designed for mobile and embedded solutions in mind, providing a small footprint that could easily fit in to any connectors and handheld devices. With very small power consumption in either operating or suspend mode, PL-2303X is perfect for bus powered operation with plenty of power left for the attached devices. Flexible signal level requirement on the RS232-like serial port side also allows PL-2303X to connect directly to any 3.3V~1.8V range devices.

4.0 Pin Assignment Outline

4.1 SSOP28 Package

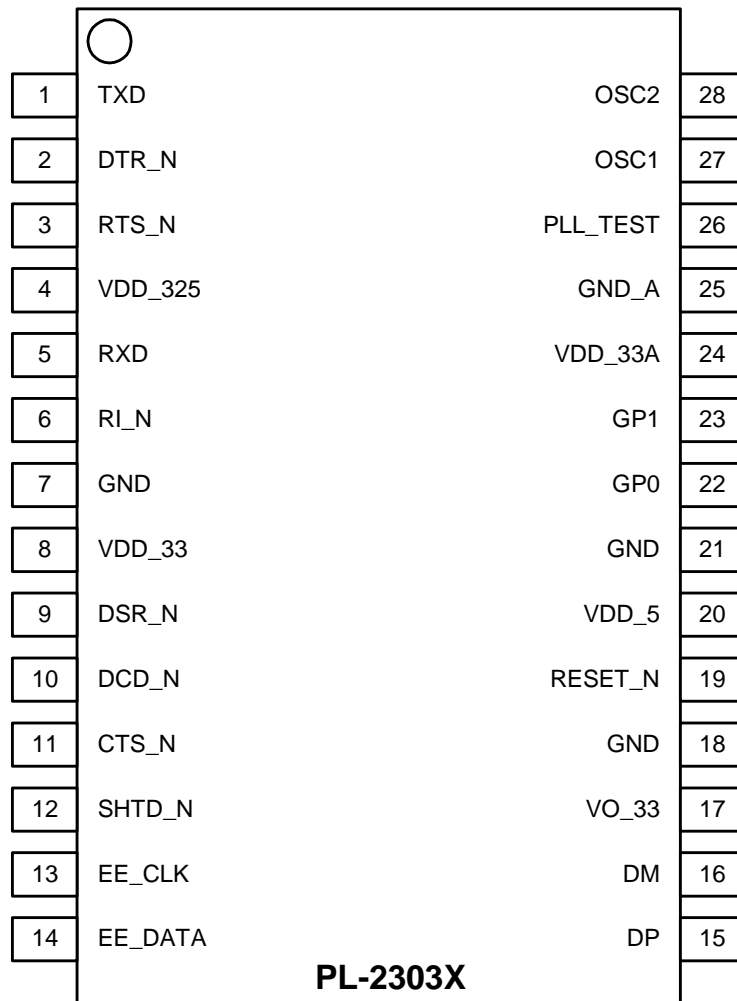


Figure 4-1 Pin Assignment Outline of PL-2303X (SSOP28)

4.2 QFN Package

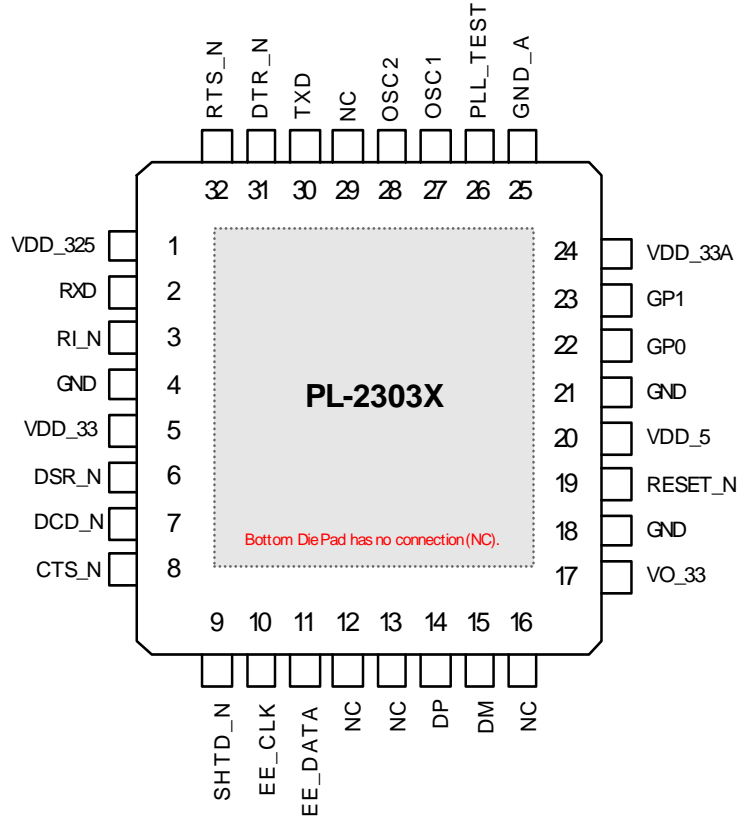


Figure 4-2 Pin Assignment Outline of PL-2303X (QFN)

5.0 PIN Assignment & Description

5.1 SSOP28 Package

Table 5-1 SSOP28 Pin Assignment Description

Pin #	Name	Type	Description
1	TXD	O ⁽¹⁾	Serial port (Transmitted Data)
2	DTR_N	O ⁽¹⁾	Serial port (Data Terminal Ready)
3	RTS_N	O ⁽¹⁾	Serial port (Request To Send)
4	VDD_325	P	RS232 VDD. The power pins for the serial port signals. When the serial port is 3.3V, this should be 3.3V. When the serial port is 2.5V, this should be 2.5V.
5	RXD	I ⁽²⁾	Serial port (Received Data)
6	RI_N	I/O ⁽³⁾	Serial port (Ring Indicator)
7	GND	P	Ground
8	VDD_33	P	Primary Power (3.3V)
9	DSR_N	I/O ⁽³⁾	Serial port (Data Set Ready)
10	DCD_N	I/O ⁽³⁾	Serial port (Data Carrier Detect)
11	CTS_N	I/O ⁽³⁾	Serial port (Clear To Send)
12	SHTD_N	O ⁽⁴⁾	RS232 Transceiver Shut Down Control
13	EE_CLK	I/O ⁽⁵⁾	2-Wire Serial EEPROM Clock
14	EE_DATA	I/O ⁽⁵⁾	2-Wire Serial EEPROM Data
15	DP	I/O	USB port D+ signal
16	DM	I/O	USB port D- signal
17	VO_33	P	Regulator Power Output, 3.3V
18	GND	P	Ground
19	RESET_N	I ⁽⁶⁾	External System Reset (Active Low)
20	VDD_5	P	USB port V _{BUS} , 5V Power.
21	GND	P	Ground
22	GP0	I/O ⁽⁷⁾	General Purpose I/O Pin 0
23	GP1	I/O ⁽⁷⁾	General Purpose I/O Pin 1
24	VDD_33A	P	Analog Power (3.3V) for PLL
25	GND_A	P	Analog Ground for PLL
26	PLL_TEST	I ⁽⁶⁾	PLL test mode control
27	OSC1	I	Crystal oscillator input
28	OSC2	I/O	Crystal oscillator output

Notes:

- (1)– CMOS Out, Output Pad. Level and Driving Capability decided by VDD_325.
- (2)– SCHMITT In, 5V Tolerant, Input Pad. Level and Driving Capability decided by VDD_325.
- (3)– SCHMITT In/CMOS Out, 5V Tolerant, Bi-directional Pad. Level and Driving Capability decided by VDD_325.
- (4)– CMOS Out, 3.3V, Output Pad, 4mA Output Driving Capability.
- (5)– SCHMITT In/CMOS Out, 5V Tolerant, Bi-directional Pad with internal resistor pulling-up to 3.3V, 4mA Output Driving Capability.
- (6)– LVTTTL In, 3.3V, Input Pad.
- (7)– SCHMITT In/CMOS Out, 5V Tolerant, Bi-directional Pad, 4mA Output Driving Capability.

5.2 QFN Package

Table 5-2 QFN32 Pin Assignment Description

Pin #	Name	Type	Description
1	VDD_325	P	RS232 VDD. The power pins for the serial port signals. When the serial port is 3.3V, this should be 3.3V. When the serial port is 2.5V, this should be 2.5V.
2	RXD	I ⁽²⁾	Serial port (Received Data)
3	RI_N	I/O ⁽³⁾	Serial port (Ring Indicator)
4	GND	P	Ground
5	VDD_33	P	Primary Power (3.3V)
6	DSR_N	I/O ⁽³⁾	Serial port (Data Set Ready)
7	DCD_N	I/O ⁽³⁾	Serial port (Data Carrier Detect)
8	CTS_N	I/O ⁽³⁾	Serial port (Clear To Send)
9	SHTD_N	O ⁽⁴⁾	RS232 Transceiver Shut Down Control
10	EE_CLK	I/O ⁽⁵⁾	2-Wire Serial EEPROM Clock
11	EE_DATA	I/O ⁽⁵⁾	2-Wire Serial EEPROM Data
12	NC	-	Not Connected
13	NC	-	Not Connected
14	DP	I/O	USB port D+ signal
15	DM	I/O	USB port D- signal
16	NC	-	Not Connected
17	VO_33	P	Regulator Power Output, 3.3V
18	GND	P	Ground
19	RESET_N	I ⁽⁶⁾	External System Reset (Active Low)
20	VDD_5	P	USB port V _{BUS} , 5V Power.
21	GND	P	Ground
22	GP0	I/O ⁽⁷⁾	General Purpose I/O Pin 0
23	GP1	I/O ⁽⁷⁾	General Purpose I/O Pin 1
24	VDD_33A	P	Analog Power (3.3V) for PLL
25	GND_A	P	Analog Ground for PLL
26	PLL_TEST	I ⁽⁶⁾	PLL test mode control
27	OSC1	I	Crystal oscillator input
28	OSC2	I/O	Crystal oscillator output
29	NC	-	Not Connected
30	TXD	O ⁽¹⁾	Serial port (Transmitted Data)
31	DTR_N	O ⁽¹⁾	Serial port (Data Terminal Ready)
32	RTS_N	O ⁽¹⁾	Serial port (Request To Send)
IC Center Die PAD		-	No Connection

Notes:

- (1)– CMOS Out, Output Pad. Level and Driving Capability decided by VDD_325.
- (2)– SCHMITT In, 5V Tolerant, Input Pad. Level and Driving Capability decided by VDD_325.
- (3)– SCHMITT In/CMOS Out, 5V Tolerant, Bi-directional Pad. Level and Driving Capability decided by VDD_325.
- (4)– CMOS Out, 3.3V, Output Pad, 4mA Output Driving Capability.
- (5)– SCHMITT In/CMOS Out, 5V Tolerant, Bi-directional Pad with internal resistor pulling-up to 3.3V, 4mA Output Driving Capability.
- (6)– LVTTTL In, 3.3V, Input Pad.
- (7)– SCHMITT In/CMOS Out, 5V Tolerant, Bi-directional Pad, 4mA Output Driving Capability.

6.0 USB Standard Descriptors

PL-2303X supports one configuration with one interface and four endpoints. The descriptors are basically stored in an internal Mask ROM. However, some fields could be optionally modified by properly programmed external 2-wire serial EEPROM. The contents of all descriptors are shown in the following sections.

6.1 Device Descriptor

Table 6-1 Device Descriptor

Offset	Field	Size	Value	Description
0	<i>bLength</i>	Byte	12H	Size of this descriptor (in bytes)
1	<i>bDescriptorType</i>	Byte	01H	DEVICE descriptor type
2	<i>bcdUSB</i>	Word	0110H	USB Specification Release Number 1.1
4	<i>bDeviceClass</i>	Byte	00H	
5	<i>bDeviceSubClass</i>	Byte	00H	
6	<i>bDeviceProtocol</i>	Byte	00H	
7	<i>bMaxPacketSize0</i>	Byte	40H	Maximum packet size for endpoint zero is 64
8	<i>idVender</i>	Word	067BH	Vender ID ⁽¹⁾
10	<i>idProduct</i>	Word	2303H	Product ID ⁽¹⁾
12	<i>bcdDevice</i>	Word	0300H	Device Release Number ⁽¹⁾
14	<i>iManufacturer</i>	Byte	01H	Manufacturer string descriptor index
15	<i>iProduct</i>	Byte	02H	Product name string descriptor index
16	<i>iSerialNumber</i>	Byte	00H/03H	Serial number string descriptor index ⁽²⁾
17	<i>bNumConfigurations</i>	Byte	01H	One configuration.

Notes:

- (1) – The Vender ID, Product ID, and Device Release Number could be replaced by the contents of external EEPROM.
 (2) – The serial number string descriptor index could be defined by the contents of external EEPROM. If specified, the index will be 3 instead of 0.

6.2 Configuration Descriptor

Table 6-2 Configuration Descriptor

Offset	Field	Size	Value	Description
0	<i>bLength</i>	Byte	09h	Size of this descriptor (in bytes)
1	<i>bDescriptorType</i>	Byte	02h	CONFIGURATION descriptor type
2	<i>wTotalLength</i>	Word	0027h	Total length of data returned for this configuration.
4	<i>bNumInterface</i>	Byte	01h	One interface for this device.
5	<i>bConfigurationValue</i>	Byte	01h	
6	<i>iConfiguration</i>	Byte	00h	
7	<i>bmAttributes</i>	Byte	A0h/80h	Characteristic attributes ⁽³⁾
8	<i>MaxPower</i>	Byte	32h/FAh	Maximum power consumption ⁽⁴⁾

Notes:

- (3) – The Remote Wakeup attribute (bit 5) depends on the settings of the Remote Wakeup Enable (Setting in the Device Configuration Registers, DCR, of PL-2303X). If all remote wakeup sources are disabled, the *bmAttributes* will be 80h. Otherwise, A0h is returned to indicate that this device is Remote Wakeup capable.

- (4) – The value of maximum power consumption can be configured initially by setting DCR on the external EEPROM. If it is set to 1, the MaxPower byte will be FAh to indicate 500mA required from the USB host. Otherwise, it is 32h that indicates 100mA required.

6.3 Interface Descriptor

Table 6-3 Interface Descriptor

Offset	Field	Size	Value	Description
0	<i>BLength</i>	Byte	09h	Size of this descriptor (in bytes)
1	<i>BDescriptorType</i>	Byte	04h	INTERFACE descriptor type
2	<i>BInterfaceNumber</i>	Byte	00h	One interface only
3	<i>BAlternateSetting</i>	Byte	00h	No alternate interface
4	<i>BNumEndpoints</i>	Byte	03h	Three endpoints (excluding control endpoint)
5	<i>BInterfaceClass</i>	Byte	FFh	Vendor Specific Class
6	<i>BInterfaceSubClass</i>	Byte	00h	
7	<i>BInterfaceProtocol</i>	Byte	00h	
8	<i>IInterface</i>	Byte	00h	

6.4 Endpoint 1 Descriptor: Interrupt Input Endpoint

Table 6-4 Interrupt Input Endpoint Descriptor

Offset	Field	Size	Value	Description
0	<i>bLength</i>	Byte	07h	Size of this descriptor (in bytes)
1	<i>bDescriptorType</i>	Byte	05h	ENDPOINT descriptor type
2	<i>bEndpointAddress</i>	Byte	81h	Input endpoint
3	<i>bmAttributes</i>	Byte	03h	Transfer type is INTERRUPT
4	<i>wMaxPacketSize</i>	Word	000Ah	Ten Bytes
6	<i>bInterval</i>	Byte	01h	Polling on every 1 ms interval

6.5 Endpoint 2 Descriptor: Bulk Data Output Endpoint

Table 6-5 Bulk Data Output Endpoint Descriptor

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

6.6 Endpoint 3 Descriptor: Bulk Data Input Endpoint

Table 6-6 Bulk Data Input Endpoint Descriptor

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

6.7 String Descriptors

PL-2303X supports four string descriptors:

- Language ID
- Manufacturer
- Product
- Serial Number

Except for Serial Number, the other three string descriptors are stored in the internal Mask ROM, i.e. their contents are fixed. Serial Number is a special case. If the External EEPROM were not present, or not properly programmed, then Serial Number would be hidden from the system. If the External EEPROM is presented and properly programmed, then Serial Number will be read from the EEPROM.

The following tables demonstrate the current defined value for each descriptor:

6.7.1 String Descriptor 0 – Language ID

Table 6-7-1 String Descriptor – Language ID

Offset	Field	Size	Value	Description
0	<i>bLength</i>	Byte	04h	Size of this descriptor (in bytes)
1	<i>bDescriptorType</i>	Byte	03h	STRING descriptor type
2	<i>bLANGID[0]</i>	Word	0409h	English (United States)

6.7.2 String Descriptor 1 – Manufacturer

Table 6-7-2 String Descriptor – Manufacturer

Offset	Field	Size	Value	Description
0	<i>BLength</i>	Byte	32h	Size of this descriptor (in bytes)
1	<i>bDescriptorType</i>	Byte	03h	STRING descriptor type
2	<i>bSTRING</i>	—	⇒	“Prolific Technology Inc.” in UNICODE

6.7.3 String Descriptor 2 – Product

Table 6-7-3 String Descriptor – Product

Offset	Field	Size	Value	Description
0	<i>bLength</i>	Byte	2Ch	Size of this descriptor (in bytes)
1	<i>bDescriptorType</i>	Byte	03h	STRING descriptor type
2	<i>bSTRING</i>	—	⇒	“USB-Serial Controller” in UNICODE

6.7.4 String Descriptor 3 – Serial Number

Table 6-7-4 String Descriptor – Serial Number

Offset	Field	Size	Value	Description
0	<i>bLength</i>	Byte	12h	Size of this descriptor (in bytes)
1	<i>bDescriptorType</i>	Byte	03h	STRING descriptor type
2	<i>bSTRING</i>	—	⇒	“X ₇ X ₆ X ₅ X ₄ X ₃ X ₂ X ₁ X ₀ ” in UNICODE

Note:

The size of Serial Number is fixed in PL-2303X design. It must be exactly 8 UNICODE characters (or 16 bytes). Note that in USB Specification, this serial number must be unique for each device.

7.0 USB Standard Requests

PL-2303X supports the following USB standard requests. For non-supported requests, or requests with invalid parameters, PL-2303X will respond with STALL packet.

- Clear Feature
- Get Configuration
- Get Descriptor
- Get Status
 - Device Status
 - Interface Status
 - Endpoint 0, 1, 2, and 3 Status
- Set Address
- Set Configuration
- Set Feature

8.0 Data Formats & Programmable Baud Rate Generator

The PL-2303X controller supports versatile data formats and has a programmable baud rate generator. The supported data formats are shown on Table 8-1. The programmable baud rate generator supports baud rates up to 6M bps as shown in Table 8-2.

Table 8-1 Supported Data Formats

Parameter	Description
Stop bits	1 1.5 2
Parity type	None Odd Even Mark Space
Data bits	5, 6, 7, 8

Table 8-2 Baud Rate Settings

Baud Rates (bps)	Baud Rates (bps)	Baud Rates (bps)	Baud Rates (bps)	Baud Rates (bps)
6000000	614400	38400	7200	1200
3000000	460800	28800	4800	600
2457600	230400	19200	3600	300
1228800	115200	14400	2400	150
921600	57600	9600	1800	75

9.0 DC & Temperature Characteristics

9.1 Absolute Maximum Ratings

Table 9-1 Absolute Maximum Ratings

Items	Ratings
Power Supply Voltage	-0.3 to 5.5 V
Input Voltage of 3.3V I/O	-0.3 to VO_33 + 0.3 V
Input Voltage of 3.3V I/O with 5V Tolerance I/O	-0.3 to VDD_5 + 0.3V
Output Voltage of 3.3V I/O	-0.3 to VO_33 + 0.3 V
Storage Temperature	-40 to 150 °C

9.2 DC Characteristics

Table 9-2 Operating Voltage and Suspend Current

Parameter	Symbol	Min	Typ	Max	Unit
Operating Voltage Range	VDD_5	3.6	5	5.5	V
Regulator Output Driving Current (VDD_5= 5V)	I _{LOAD}	-	-	150	mA
Operating Current ⁽¹⁾ (Power Consumption)	I _{DD}	-	10	15	mA
Suspend Current	I _{SUS}	-	400	450	μA

Note: (1) – No device connected.

9.2.1 3.3V I/O Pins

Table 9-2-1 3.3V I/O Pins

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I _{DD}	--	4	--	mA
Output Voltage of Regulator	VO_33	3.0	3.3	3.6	V
Input Voltage (CMOS)					
Low	V _{IL}	--	--	0.3* VO_33	V
High	V _{IH}	0.7* VO_33	--	--	V
Input Voltage (LVTTTL)					
Low	V _{IL}	--	--	0.8	V
High	V _{IH}	2.0	--	--	V
Schmitt Trigger Threshold Voltage					
Negative going	V _{t-}	0.9	1.2	--	V
Positive going	V _{t+}	--	2.1	2.5	V
Output Voltage, 3.3V					
Low	V _{OL}	--	--	0.4	V
High	V _{OH}	2.4	--	--	V

9.2.2 Serial I/O Pins

Table 9-2-2a VDD_325@3.3V Serial I/O Pins

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I _{DD}	--	4	--	mA
Power Supply for Serial I/O Pins	VDD_325	3.0	3.3	3.6	V
Input Voltage					
Low	V _{IL}	--	--	0.8	V
High	V _{IH}	2.0	--	--	V
Schmitt Trigger Threshold Voltage					
Negative going	V _{t-}	0.8	1.1	--	V
Positive going	V _{t+}	--	1.6	2.0	V
Output Voltage					
Low	V _{OL}	--	--	0.4	V
High	V _{OH}	2.4	--	--	V

Table 9-2-2b VDD_325@2.5V Serial I/O Pins

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I _{DD}	--	2.6	--	mA
Power Supply for Serial I/O Pins	VDD_325	2.25	2.5	2.75	V
Input Voltage					
Low	V _{IL}	--	--	0.25* VDD_325	V
High	V _{IH}	0.7* VDD_325	--	--	V
Schmitt Trigger Threshold Voltage					
Negative going	V _{t-}	0.25* VDD_325	0.84	--	V
Positive going	V _{t+}	--	1.31	0.7* VDD_325	V
Output Voltage					
Low	V _{OL}	--	--	0.4	V
High	V _{OH}	1.85	--	--	V

Table 9-2-2c VDD_325@1.8V Serial I/O Pins

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I _{DD}	--	1.4	--	mA
Power Supply for Serial I/O Pins	VDD_325	1.65	1.8	1.95	V
Input Voltage					
Low	V _{IL}	--	--	0.25* VDD_325	V
High	V _{IH}	0.7* VDD_325	--	--	V
Schmitt Trigger Threshold Voltage					
Negative going	V _{t-}	0.25* VDD_325	0.6	--	V
Positive going	V _{t+}	--	1.04	0.7* VDD_325	V
Output Voltage					
Low	V _{OL}	--	--	0.4	V
High	V _{OH}	1.25	--	--	V

9.3 Clock Characteristics

Table 9-3 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	%

9.4 Temperature Characteristics

Table 9-4 Temperature Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature	--	-40 ⁽¹⁾	--	85 ⁽¹⁾	°C
Junction Operation Temperature	T _J	-40	25	125	°C

Note: (1) – Test condition: Baud rate 115200 bps loop testing (4096 bytes/loop, random/fix 0xFF data transfer) over 30 minutes.

9.5 Leakage Current and Capacitance

Table 9-5 Leakage Current and Capacitance

Parameter	Symbol	Min	Typ	Max	Unit
Input Leakage Current ⁽¹⁾	I_L	-10	± 1	10	μA
Tri-state Leakage Current	I_{oz}	-10	± 1	10	μA
Input Capacitance	C_{IN}	--	2.8	--	pF
Output Capacitance	C_{OUT}	2.7	--	4.9	pF
Bi-directional Buffer Capacitance	C_{BID}	2.7	--	4.9	pF

Note: (1) – No pull-up or pull-down resistor.

9.6 Power-On Reset

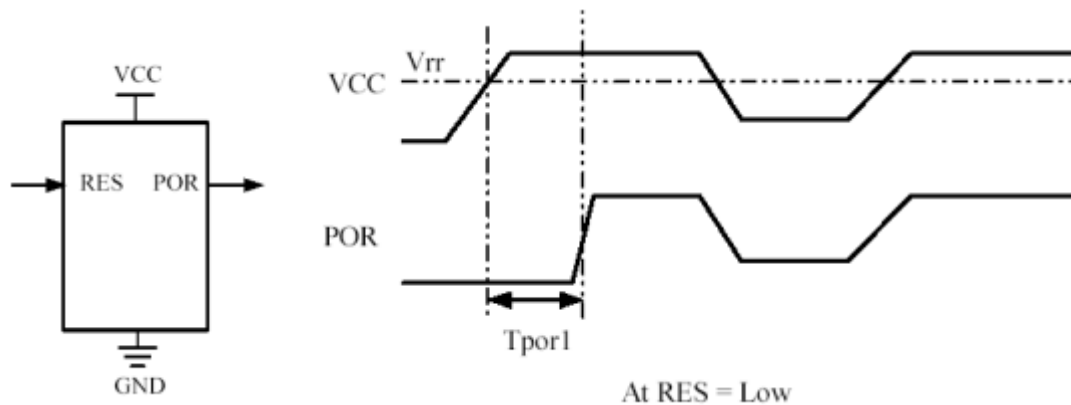


Figure 9-6 Power-On Reset Diagram

Table 9-6 Power-On Reset

Description and Condition	Symbol	Min	Typ	Max	Unit
Power supply voltage	VCC	2.8	3.3	4.0	V
VCC rise relax voltage	V_{rr}	1.8	2.3	2.8	V
Power output low duration VCC _{rise} @ V_{rr} to POR _{rise} @ $1/2*VCC$ (VCC slew rate = 1V/1us)	T_{por1}	2.6	3.7	4.8	μS

10.0 Outline Diagram

10.1 SSOP28 Package

Table 10-1 SSOP28 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

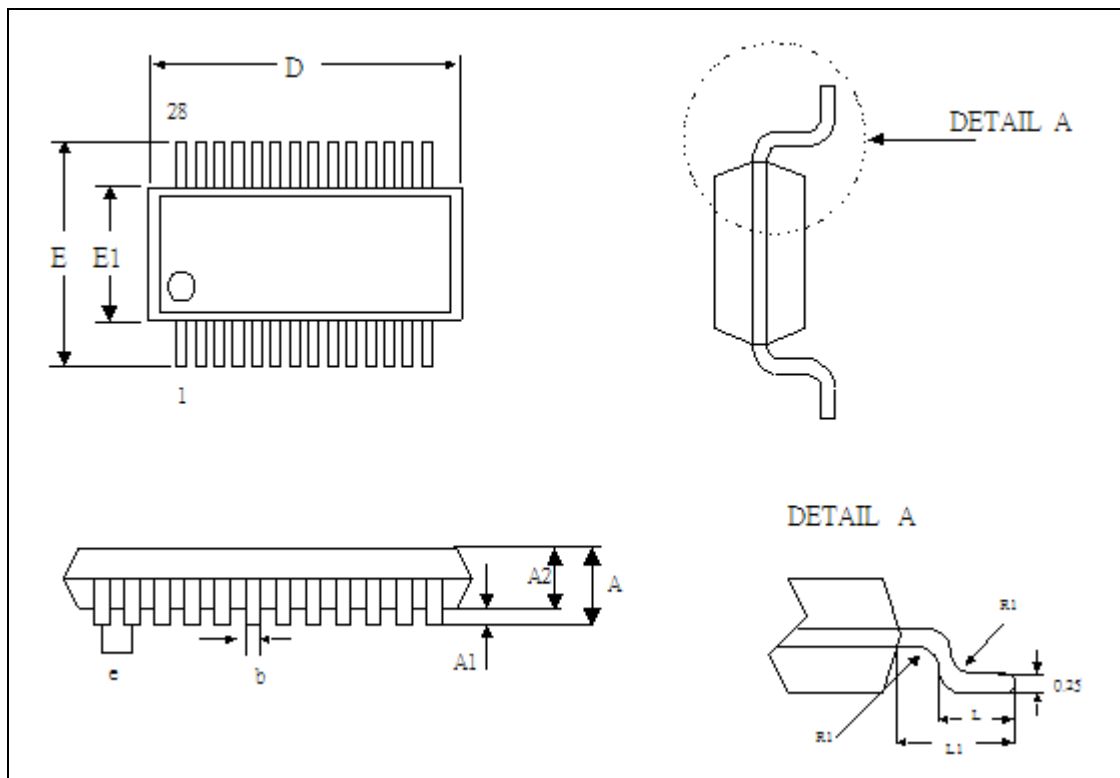


Figure 10-1 Outline Diagram of PL-2303X SSOP28

10.2 QFN Package

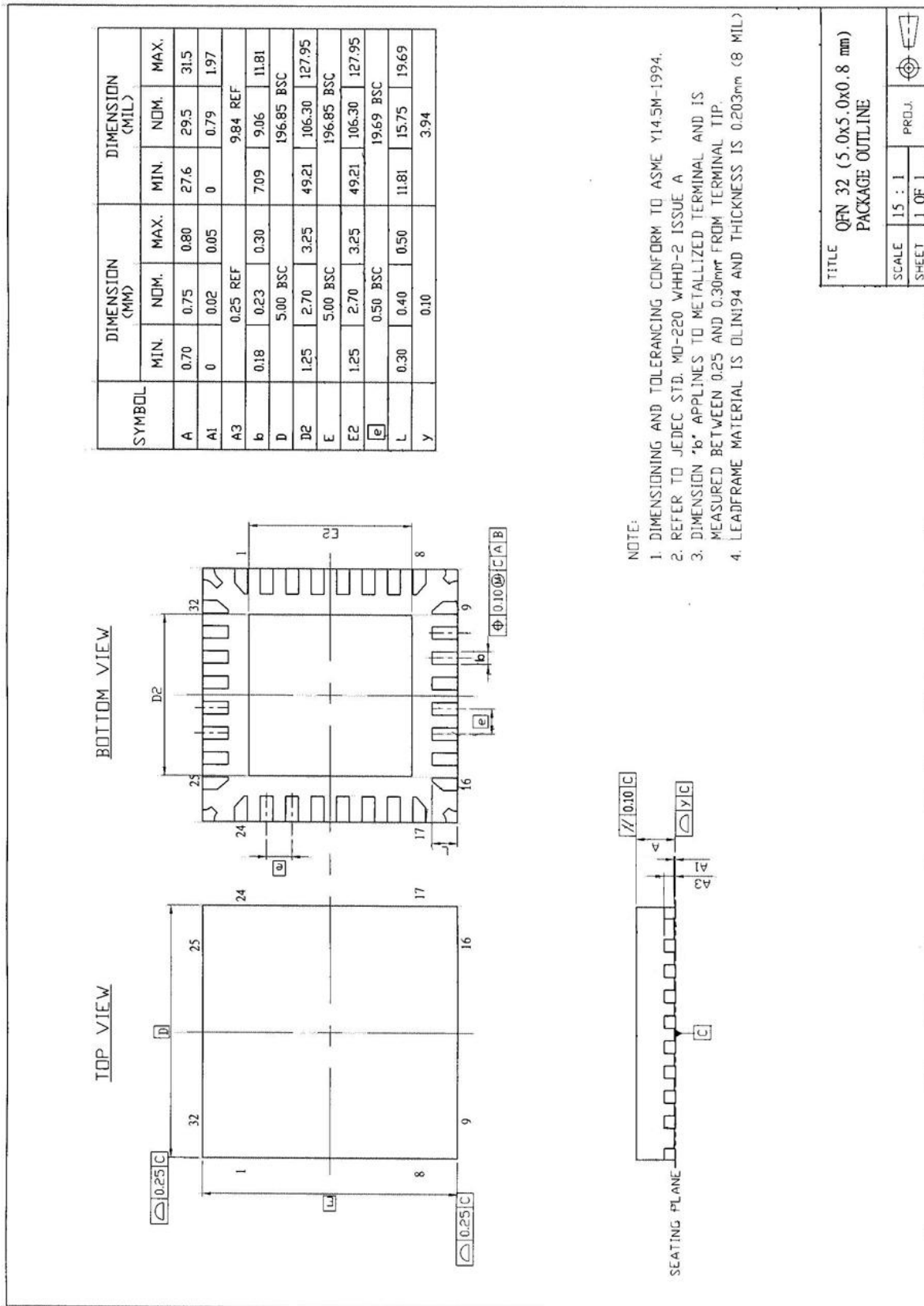


Figure 10-2 Outline Diagram of PL-2303X QFN 32-Pin

11.0 Reel Packing Information

11.1 Carrier Tape (SSOP-28)

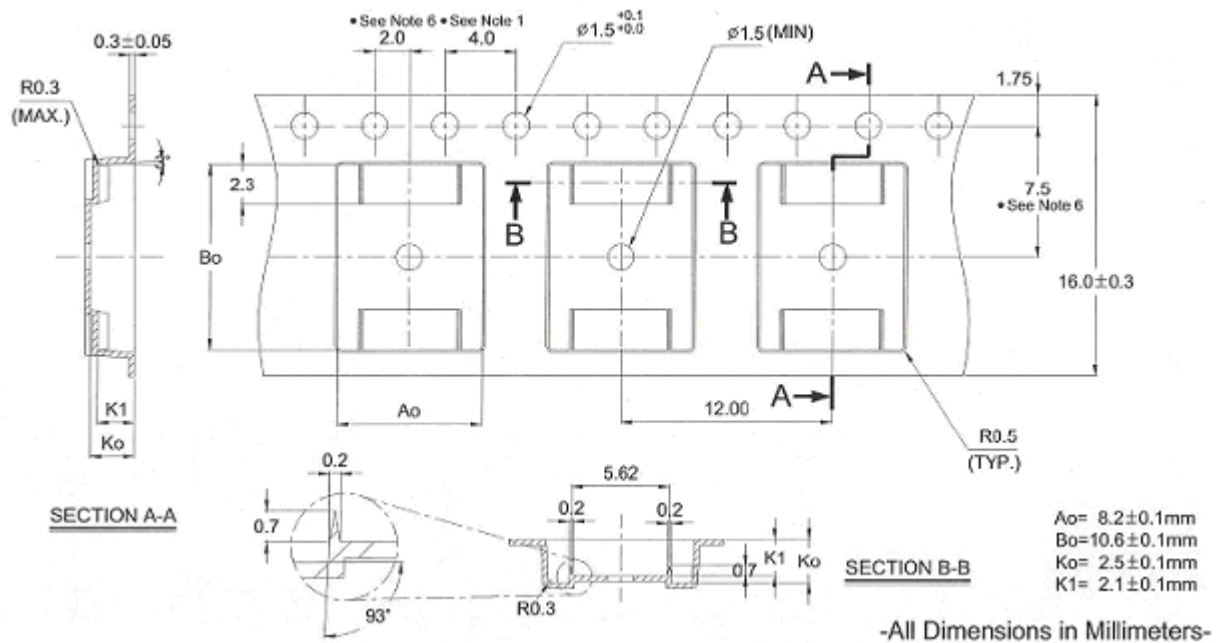


Figure 11-1a SSOP28 Carrier Tape

Notes:

1. 10 sprocket hole pitch cumulative tolerance ± 0.2
2. Camber not to exceed 1mm in 100mm.
3. Material: Black Polystyrene.
4. Ao and Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.
7. IC quantity per one reel: 1,000 (min) ~ 2,000 (max)

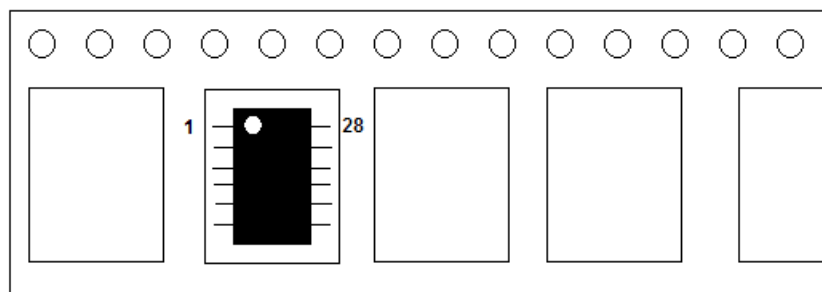


Figure 11-1b IC Reel Placements

11.2 Reel Dimension

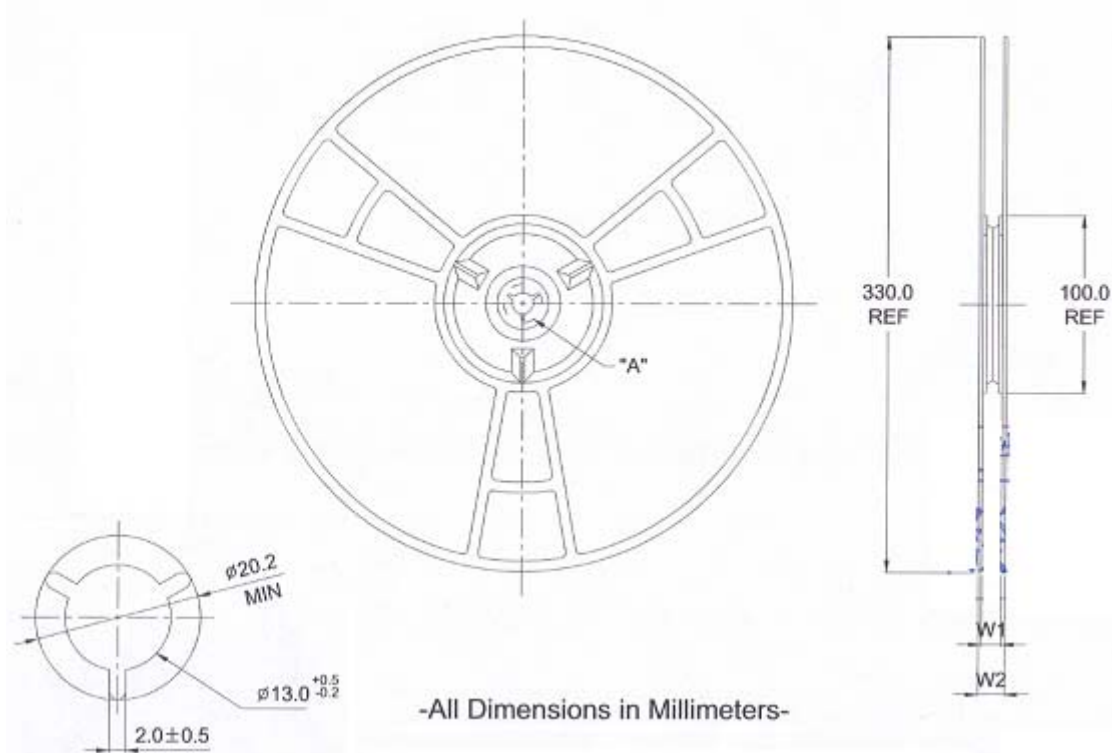


Figure 11-2 Reel Dimension

Table 11-2 Reel Part Number Information

Part Number	Normal Hub Width	W1 +0.3mm -0.2mm	W2 Max
RD33008SW-T + RD33008SW-T	16mm	16.8mm	22.2mm

12.0 Ordering Information

Table 12-1 Ordering Information

Part Number	Package Type
PL-2303X	28-pin SSOP
PL-2303X LF	28-pin SSOP (Lead Free or Pb-Free)
PL-2303X QFN	32-pin QFN (Lead Free or Pb-Free)