PL2303EA
USB to Serial Bridge Controller
(With System-Level ESD Protection)
Product Datasheet

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Revision History

Revision	Description	Date
1.0.1	➢ Modify Ordering Information ➢ Add Distributor Information	May 4, 2012
1.0.0	➢ PL2303EA Datasheet – Formal Release	October 20, 2011

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1.0 Features

- Fully Compliant with USB Specification v2.0 (Full-Speed)
- On Chip USB 1.1 transceiver, 5V→3.3V regulator
- On-chip 96MHz clock generator
- ±15kV High ESD HBM (Human Body Model) Protection on USB Port (4-Pin)
- System-level ESD Specification on USB Port (4-Pin)
  - ±15kV IEC 61000-4-2 Air Discharge
  - ±8kV IEC 61000-4-2 Contact Discharge
- 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 12M bps
  - External RS232 driver power down control
  - Independent power source for serial interface
- Supports RS-422/RS-485 like serial interface (TXD, DTR_N, and RTS_N pins should be externally pulled-up to 5V)
- Extensive Flow Control Mechanism
  - Adjustable high/low watermark level
  - Automatic hardware flow control with CTS/RTS(1) or DSR/DTR
  - Automatic software 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
- Four (4) General Purpose I/O (GP0, GP1, GP2, & GP3) pins & Four (4) Auxiliary General Purpose I/O (RI_N, DSR_N, DCD_N, & CTS_N) pins.
- On-chip OTP (One Time Programming) ROM for startup device configurations
- Provides drivers support for Windows, Mac OS, Linux, and WinCE
- Windows 7, Vista, XP Certified Logo Drivers (x86 and x64) and Windows 8 compatible
- Small footprint 28-pin SSOP IC package
- Pin-to-Pin compatible with PL-2303HXD (HX Rev D) chip and driver compatible

Note:

(1) – CTS/RTS Hardware Flow Control supports either low-level active or high-level active.

2.0 Functional Block Diagram

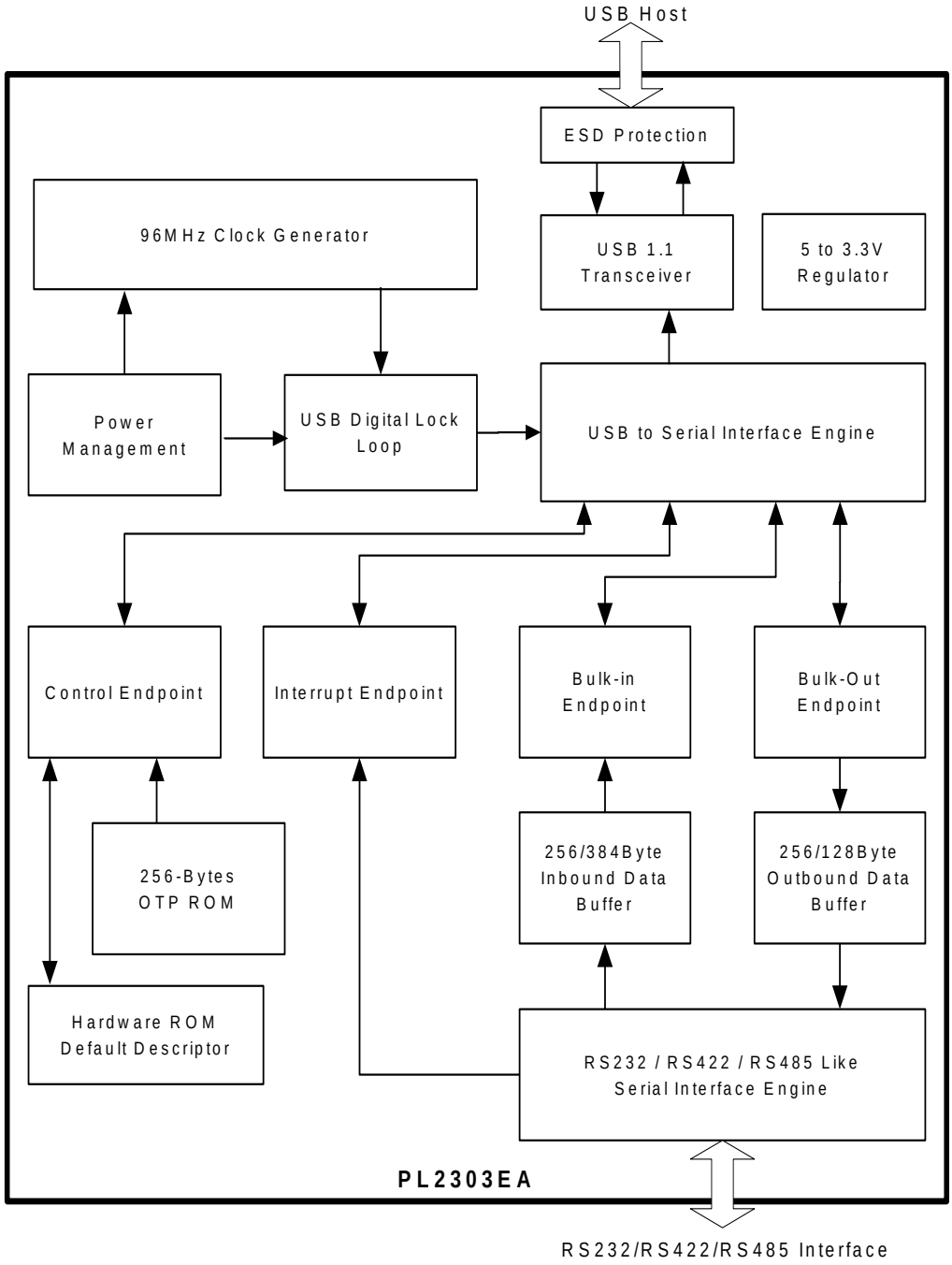

Figure 2-1 Block Diagram of PL2303EA

3.0 Introduction

The PL2303EA provides a convenient solution for connecting an RS232-like full-duplex asynchronous serial device to any Universal Serial Bus (USB) capable host. By providing a virtual COM port thru USB, the PL2303EA compatible drivers could simulate the traditional serial COM port on most operating systems allowing the existing serial port applications to easily migrate and be made USB ready.

Additionally, the PL2303EA provides USB port system-level ESD (electrostatic discharge) protection that eliminates the need for external ESD protection components to minimize PCB size and save BOM costs. The PL2303EA offers ESD protection on the USB port pins up to ±15kV Human Body Model (HBM) and is according to the IEC-61000-4-2 ESD specification.

By taking advantage of USB bulk transfer mode, large data buffers, and automatic flow control, the PL2303EA 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 the PL2303EA could be programmed to generate any rate between 75 bps to 12M bps.

The PL2303EA 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, the PL2303EA 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 the PL2303EA to connect directly to any 3.3V~1.8V range devices.

4.0 Pin Assignment Outline

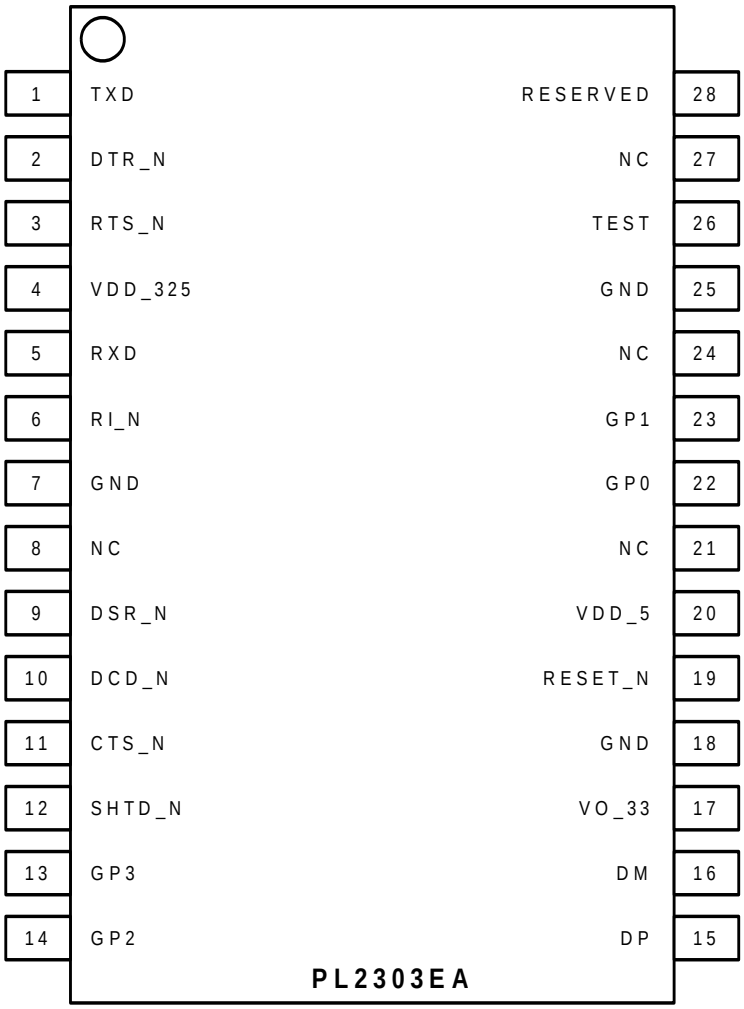

Figure 4-1 Pin Assignment Outline of PL2303EA SSOP28

5.0 Pin Assignment & Description

Pin Type Abbreviation:

I: Input	O: Output	B: Bidirectional I/O	P: Power/Ground

Table 5-1 Pin Assignment & Description (SSOP28)

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 pin 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. The range can be from 1.8V~3.3V.
5	RXD	I (2)	Serial Port (Received Data)
6	RI_N	B (2)	Serial Port (Ring Indicator); or Auxiliary General Purpose I/O Port when enabled(7).
7	GND	P	Ground
8	NC	-	No Connection
9	DSR_N	B (2)	Serial Port (Data Set Ready); or Auxiliary General Purpose I/O Port when enabled(7).
10	DCD_N	B (2)	Serial Port (Data Carrier Detect); or Auxiliary General Purpose I/O Port when enabled(7).
11	CTS_N	B (2)	Serial Port (Clear to Send); or Auxiliary General Purpose I/O Port when enabled(7).
12	SHTD_N	O (3)	RS232 Transceiver Shut Down Control
13	GP3	I/O	Auxiliary GPIO Pin 3 (Default output high mode) (6)
14	GP2	I/O	Auxiliary GPIO Pin 2 (Default output high mode) (6)
15	DP	B	USB Port D+ signal
16	DM	B	USB Port D- signal
17	VO_33	P	Regulator Power Output, 3.3V
18	GND	P	Ground
19	RESET_N	I (4)	External System Reset (Active Low)
20	VDD_5	P	USB Port V_{BUS}, 5V Power. (6.5V for OTPROM writing voltage).
21	NC	-	No Connection
22	GP0	B (5)	General Purpose I/O Pin 0
23	GP1	B (5)	General Purpose I/O Pin 1
24	NC	-	No Connection
25	GND	-	Ground
26	TEST	I	Test mode control
27	NC	-	No Connection
28	Reserved	-	Reserved pin (Must be floating)

Notes:

(1) – Tri-State, Output Pad. Level and Driving Capability decided by VDD_325.

(2) – Tri-State, CMOS Input/Output Pad with level shifter. Level and Driving Capability decided by VDD_325.

(3) – CMOS Output Pad.

(4) – CMOS Input Pad, 5V tolerant.

(5) – Tri-State, CMOS Input/Output Pad. (Default mode: Input)

(6) – Default output high mode; do not connect to ground.

(7) – **Enabling Auxiliary GPIO requires special customized driver.**

6.0 USB Standard Descriptors

The PL2303EA supports one configuration with one interface and four endpoints. The descriptors are basically stored in an internal hardware ROM. However, some fields could be optionally modified by properly programmed on-chip OTPROM. The contents of all descriptors are shown in the following sections and the format of OTPROM would be given in later chapter.

6.1 Device Descriptor

Table 6-1 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	0110h	USB Specification Release Number 1.1
4	*bDeviceClass*	Byte	00h	
5	*bDeviceSubClass*	Byte	00h	
6	*bDeviceProtocol*	Byte	00h	
7	*bMaxPacketSize0*	Byte	40h	Maximum packet size for endpoint zero is 64
8	*idVender*	Word	067Bh	Vender ID (1)
10	*idProduct*	Word	2303h	Product ID (1)
12	*bcdDevice*	Word	0400h	Device Release Number (1)
14	*iManufacturer*	Byte	01h	Manufacturer string descriptor index
15	*iProduct*	Byte	02h	Product name string descriptor index
16	*iSerialNumber*	Byte	00h/03h	Serial number string descriptor index (2)
17	*bNumConfigurations*	Byte	01h	One configuration.

Notes:

(1) – The Vender ID, Product ID, and Device Release Number could be replaced by the contents of the on-chip OTPROM.

(2) – The serial number string descriptor index could be defined by the contents of the on-chip OTPROM. 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	*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/80h	Characteristic attributes (3)
8	*MaxPower*	Byte	32h/FAh	Maximum power consumption (4)

Notes:

(3) – The Remote Wakeup attribute (bit 5) depends on the settings of the Remote Wakeup Enable (bit 0 to 4 of Device

Configuration Register 2). 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 depends on the LD_MODE (bit 5 of Device Configuration Register 2) parameter. If it is set to 1, the MaxPower byte will be FAh for it requires 500mA from the system. Otherwise, it is 32h that indicates 100mA required.

6.3 Interface Descriptor

Table 6-3 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	One interface only
3	*BAlternateSetting*	Byte	00h	No alternate interface
4	*BNumEndpoints*	Byte	03h	Three endpoints (excluding control endpoint)
5	*BInterfaceClass*	Byte	FFh	Vendor Specific Class
6	*BInterfaceSubClass*	Byte	00h	
7	*BInterfaceProtocol*	Byte	00h	
8	*IInterface*	Byte	00h	

6.4 Endpoint 1 Descriptor: Interrupt Input Endpoint

Table 6-4 Endpoint1 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	000Ah	Ten Bytes
6	*bInterval*	Byte	01h	Polling on every 1 ms interval

6.5 Endpoint 2 Descriptor: Bulk Data Output endpoint

Table 6-5 Endpoint2 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

6.6 Endpoint 3 Descriptor: Bulk Data Input endpoint

Table 6-6 Endpoint3 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

6.7 String Descriptors

The PL2303EA 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. The Serial Number is a special case. If the on-chip OTPROM is not properly programmed, then the Serial Number would be hidden from the system. If the on-chip OTPROM is properly programmed, then the Serial Number will be read from the on-chip OTPROM.

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

6.7.1 String Descriptor 0 – Language ID

Table 6-7a String Descriptor – Language ID

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

6.7.2 String Descriptor 1 – Manufacturer

Table 6-7b String Descriptor – Manufacturer

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

6.7.3 String Descriptor 2 - Product

Table 6-7c String Descriptor – Product

Offset	Field	Size	Value	Description
0	*Blength*	Byte	30h	Size of this descriptor (in bytes)
1	*bDescriptorType*	Byte	03h	STRING descriptor type
2	*bSTRING*	—	⇒	“USB-Serial Controller C” in UNICODE

6.7.4 String Descriptor 3 – Serial Number

Table 6-7d String Descriptor – Serial Number

Offset	Field	Size	Value	Description
0	*bLength*	Byte	12h	Size of this descriptor (in bytes)
1	*bDescriptorType*	Byte	03h	STRING descriptor type
2	*bSTRING*	—	⇒	“$X_7X_6X_5X_4X_3X_2X_1X_0$” in UNICODE

Note:
The size of Serial Number is fixed in PL2303EA 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

The PL2303EA supports the following USB standard requests. For non-supported requests or requests with invalid parameters, The PL2303EA 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

Valid Feature Selector supported by the PL2303EA includes:

- DEVICE_REMOTE_WAKEUP (for Device)
- ENDPOINT_HALT (for all Endpoints)

8.0 Data Formats & Programmable Baud Rate Generator

The PL2303EA 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 12M bps and standard driver already supports several baud rate settings as shown in Table 8-2.

Table 8-1 Supported Data Formats

	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 (Supported by Driver)

Baud Rates (bps)	Baud Rates (bps)	Baud Rates (bps)	Baud Rates (bps)	Baud Rates (bps)
12000000				
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

Note: For special baud rate requirements, please contact Prolific FAE for driver customization support.

9.0 DC & Temperature Characteristics

9.1 Absolute Maximum Ratings

Table 9-1 Absolute Maximum Ratings

Items	Ratings
Power Supply Voltage - VDD_5	-0.3 to 6.5 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 VDD_5 +0.3 V
Storage Temperature	-40 to 150 ^{o}C

9.2 DC Characteristics

9.2.1 Operating Voltage and Suspend Current

Table 9-2a Operating Voltage and Suspend Current

Parameter	Symbol	Min	Typ	Max	Unit
Operating Voltage Range	VDD_5	4.5	5	6.5	V
Output Voltage of Regulator	VO_33	2.97	3.3	3.63	V
Operating Current(1) (Power Consumption)	I_{DD}	-	20	25	mA
Suspend Current	I_{SUS}	-	260	450	µA

Note: (1) – No device connected.

9.2.2 3.3V I/O Pins

Table 9-2b 3.3V I/O Pins

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I_{DD}		4		mA
Power Supply for 3.3V I/O Pins	VO_33	2.97	3.3	3.63	V
Input Voltage (CMOS)					
Low	V_{IL}	--	--	0.3* VO_33	V
High	V_{IH}	0.7* VO_33	--	--	V
Input Voltage (LVTTL)					
Low	V_{IL}	--	--	0.8	V
High	V_{IH}	2.0	--	--	V
Output Voltage, 3.3V					
Low	V_{OL}	--	--	0.4	V
High	V_{OH}	2.4	--	--	V

9.2.3 Serial I/O Pins

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

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I_{DD}		8		mA
Power Supply for Serial I/O Pins	VDD_325	2.97	3.3	3.63	V
Input Voltage					
Low	V_{IL}	--	--	0.25* VDD_325	V
High	V_{IH}	0.7* VDD_325	--	--	V
Output Voltage					
Low	V_{OL}	--	--	0.4	V
High	V_{OH}	2.4	--	--	V

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

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I_{DD}		5.2		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
Output Voltage					
Low	V_{OL}	--	--	0.4	V
High	V_{OH}	1.85	--	--	V

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

Parameter	Symbol	Min	Typ	Max	Unit
Output Driving Capability	I_{DD}		4.4		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
Output Voltage					
Low	V_{OL}	--	--	0.4	V
High	V_{OH}	1.25	--	--	V

9.3 ESD Protection

Table 9-3 ESD Protection

Item	Condition	Typ	Unit
ESD Protection Voltage	Human Body Model (HBM) - All pins except for USB port	±2	kV
	Human Body Model (HBM) - USB Port	±15	
	IEC 61000-4-2, Contact Discharge - USB Port	±8	
	IEC 61000-4-2, Air-Gap Discharge - USB Port	±15	

9.4 Clock Characteristics

Table 9-4 Clock Characteristics

Parameter	Min	Typ	Max	Units
Frequency of Operation	11.97	12.0	12.03	MHz
Clock Period	83.1	83.3	83.5	ns
Duty Cycle	45	50	55	%

9.5 Temperature Characteristics

Table 9-5 Temperature Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature	--	-40	--	85	^{o}C
Junction Operation Temperature	T_J	-40	25	105	^{o}C

9.6 Leakage Current and Capacitance

Table 9-6 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

*1. No pull-up or pull-down resistor.

9.7 Power-On Reset

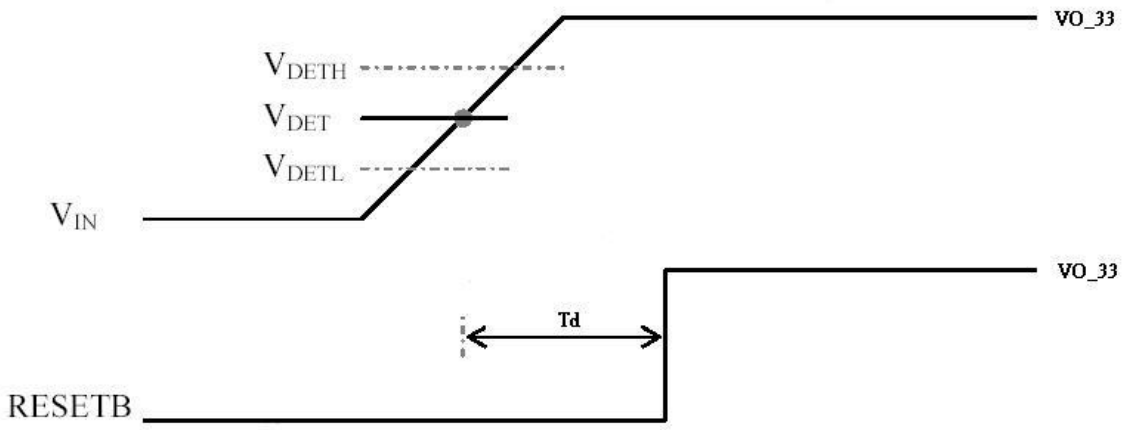

Figure 9-1 Power-On Reset Diagram

Table 9-7 Power-On Reset

Parameter	Symbol	FF@70°C VO_33=3.63V	TT@25°C VO_33=3.3V	SS@0°C VO_33=2.97V	Unit
Output Delay Time	Td	1.18	2.68	182.5	μsec

Note: The delay time is simulated with VIN ramp of 1V/μsec.

10.0 Outline Diagram

Table 10-1 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

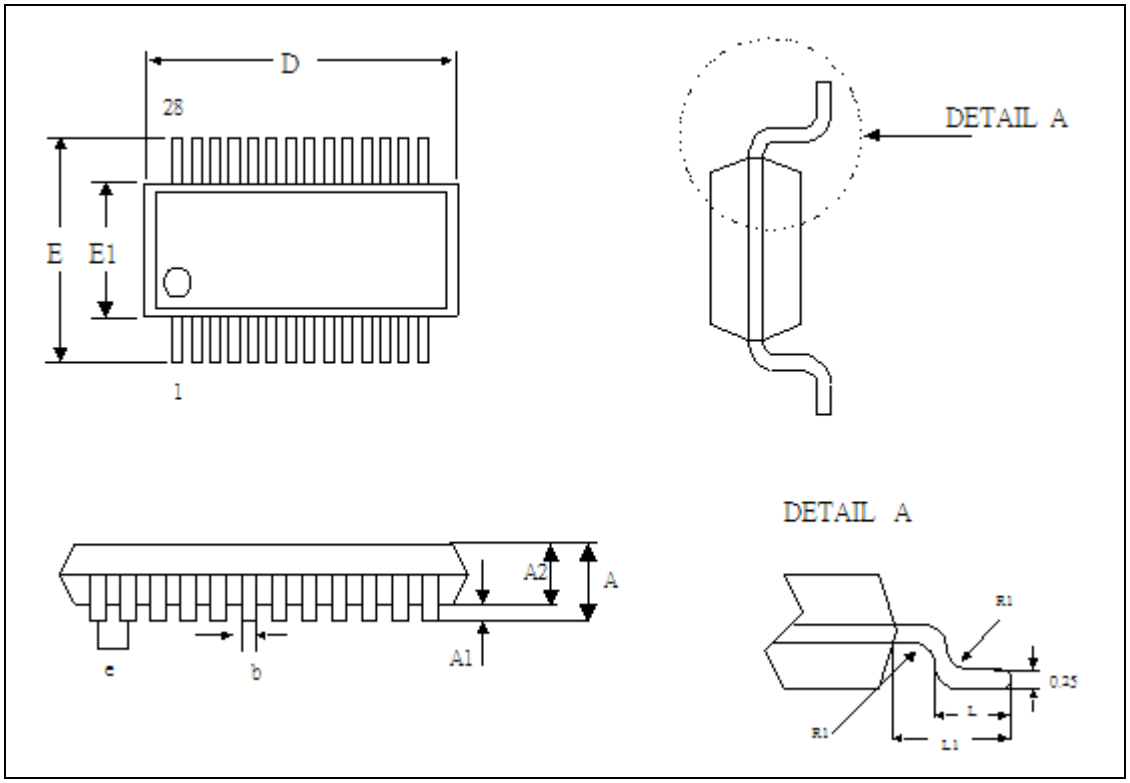

Figure 10-1 Outline Diagram of PL2303EA SSOP28

11.0 Ordering Information

Table 11-1 Ordering Information

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

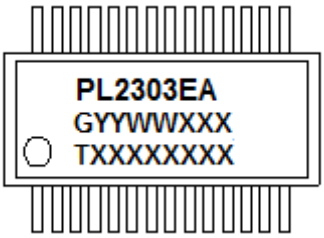

Figure 11-1 Chip Part Number Information

Table 11-2 Chip Marking Information

Line	Marking	Description
First Line	PL2303EA	Chip Product Name
Second Line (GYYWWXX)	G	Green compound packing material (Pb-free)
	YY	Last two digits of the manufacturing year
	WW	Week number of the manufacturing year
	XX	Chip Version (2DA)
Third Line	TXXXXXXXX	Manufacturing LOT code

Example: "*G12092DA*" – means Green packing + Year 2012 + Week no. 09 + 2DA chip version.

12.0 Contact Information

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