PL-2555 Hi-Speed USB Docking Station
Product Datasheet

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Revision History

Revision	Description	Date
0.94	➢ Add Packaging Outline Diagram (LQFP176)	October 9, 2003
0.93	➢ Correct Pin Packaging in Page 5. ➢ Correct ATA/ATAPI and UDMA Mode Support in Page 5.	August 2003
0.92	Preliminary Release – PL-2555 Hi-Speed USB Docking Station	August 2003

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1.0 Features

- Universal Serial Bus Specification 2.0 Compliant
- Integrated the full speed and high speed transceiver
- 5 V tolerant inputs, 3.3 V output drive
- Sufficient 4K bytes data buffer for both the downstream and upstream data transfer in optimized performance
- Support external serial EEPROM to customize vender/product related information
- Addition General Purpose IO pins for further customization
- On-chip 3.3v to 2.5v regulator to supply the power of 0.25 process core circuit
- Support external 32 K Flash ROM and in circuit programming (ICP)
- LQFP176 packaging available
- Consist of one embedded hub, one ATAPI controller for IDE, one Parallel controller for printer port or IDE, 3 Serial Controllers for one UART and 2 PS/2 ports
- Conform to USB mass storage class specification
- USB Printer Class Specification
- USB HID Class Specification
- AT Attachment with Packet Interface Extension (ATA/ATAPI-7) Compliant
- ATA interface support PIO mode 0 ~ 4, Multiword DMA mode 0 ~ 2, and Ultra-DMA mode 0 ~ 6 to work with ATA/ATAPI devices
- Support serial interface communication up to 1M bps

2.0 Product Overview

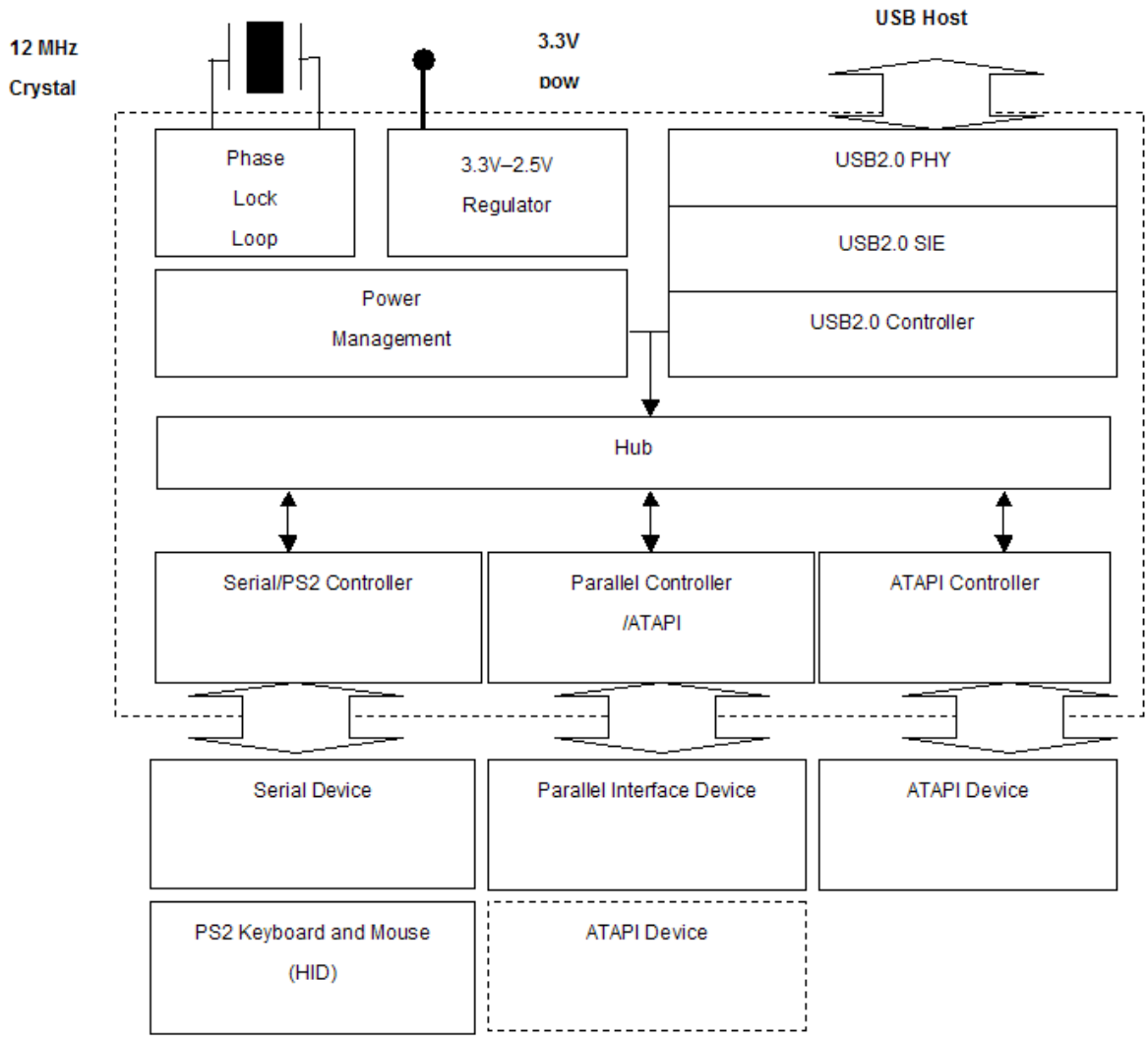
The PL-2555 is a single chip USB2.0 docking station, which is designed to perform a seamless protocol transfer between USB/ATA, USB/SERIAL, USB/PARALLEL interface.

It can easily connect to keyboard, mouse, printer, hard driver, CD_ROM etc at the same time. It is fully compatible with full speed or high speed USB transfer mode. The operating speed mode is determined by the capability of the host/hub it connected to.

PL-2555 is designed to be flexible, high performance, and easy-to-use so that customers can easily implement to their products.

3.0 Block Diagram

Figure 1-1 Block Diagram of PL-2555



4.0 Design Concept

The following concepts were taken to enable the implementation of performance-driven design and to easily resolve possible compatibility issues with diverse IDE devices.

- All registers in the hardware are implemented as memory-mapped registers for the 8032 micro controller. They are located at the 0xFC00 ~ 0xFCFF of data space.

- USB related protocol are extracted into register level protocol so that the firmware is able to fully control the activity by read/write the said registers without suffering from trivial details.

- Let the performance-related transaction, such as mass data transfer, to be spontaneous under controlled by firmware.

- The architecture is implemented based on the concept of interrupt/event driven. The firmware "registers" the expected interrupt event to hardware by writing proper registers. The hardware will generate an interrupt trigger to micro controller when the event occurs.

5.0 Supported SCSI Commands for ATA/ATAPI Devices

For ATA device, those commands listed below are supported by PL2555 (IDE Port):

Command Name	OpCode
INQUIRY	12h
REQUEST_SENSE	03h
MODE_SENSE(6)	1Ah
MODE_SENSE(10)	5Ah
READ(10)	28h
WRITE(10)	2Ah
READ_FORMAT_CAPACITIES	23h
READ_CAPACITY	25h
TEST_UNIT_READY	00h
VERIFY(10)	2Fh

Other commands, such as Start_Stop_Unit, are not supported. The firmware notifies the driver of such condition by stalling the succeeding BULK transfer after CBW and replies the proper error code in the CSW. For ATAPI devices, the command residing in the USB command wrap is pass through to the device directly.

6.0 PIN Assignment & Description

6.1 Pin Assignment for LQFP176 Package

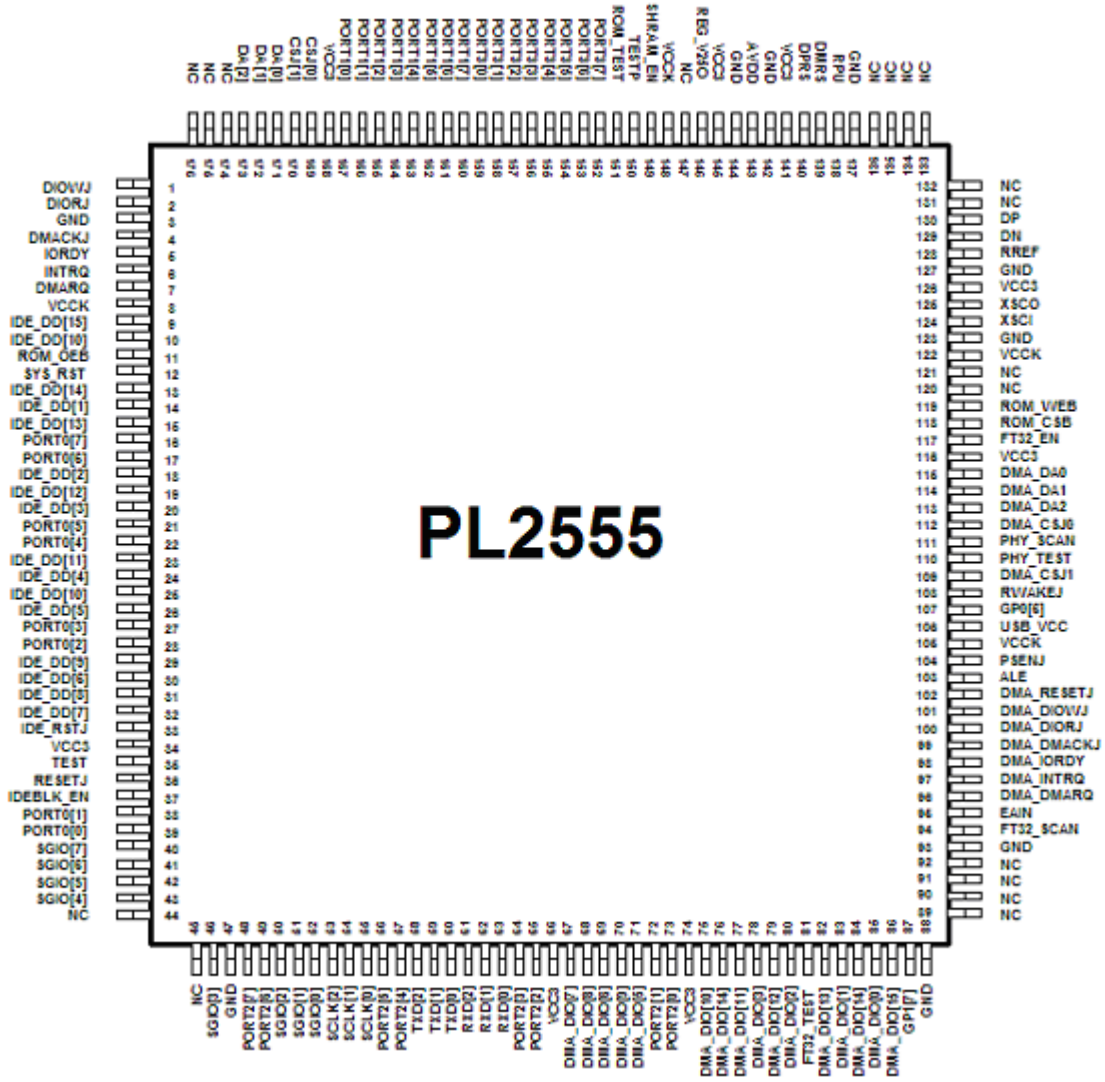


Figure 1-3 Pin Assignment Diagram of PL-2555 LQFP176

6.1.1 USB2.0 PHY Related Pins

Table 6-1-1 USB2.0 PHY Related Pins

Symbol	Type	Pin No	Description
XSCI	I	124	Clock in or CMOS oscillator input.
XSCO	B	125	CMOS oscillator output.
RREF	A	128	PLL Reference level
DP	B	130	High speed DPLUS signal
DM	B	129	High speed DMINUS signal
RPU	A	138	1.5 K-ohm Pull-up resistor
DPRS	B	140	Full speed DPLUS signal
DMRS	B	139	Full speed DMINUS signal
VCCK	P	8	Digital Power 2.5v
GNDK	P	41	Digital Ground
AVDD1, AVDD2, AVDD3	P	112, 116, 127	Analog Power 3.3v for on-chip PHY
AGND1, AGND2, AGND3	P	113, 117 128	Analog Ground for on-chip USB PHY.

6.1.2 IDE Interface Related Pins

Table 6-1-2 IDE Interface Related Pins

Symbol	Type	Pin No	Description
IDE_DD[15:0] 0 8 ↓ ↓ 7 15	B	10, 9, 14,13, 18,15, 20,19, 24,23, 26,25, 30,29, 32,31	16 pins Data bus of IDE interface
DA[2],DA[1],DA[0]	T	173,172,171	DA, Data Address pins of IDE interface. Will be in high impedance state until USB connection.
CSJ[1], CSJ[0]	T	170,169	CS_, Chip Select pins of IDE interface. Will be in high-impedance state until USB connection.
USB_VCC	I	106	Power signal from USB connection.
IDE_RSTJ	T	33	Hardware reset pin of IDE interface. Will be in high impedance state until USB connection.

6.1.3 IDE Interface Related Pins

Table 6-1-3 IDE Interface Related Pins

Symbol	Type	Pin No	Description
DIOWJ	T	1	ATA control. Will be in high impedance state until USB connection.
DIORJ	T	2	ATA control. Will be in high impedance state until USB connection.
DMACKJ	T	4	ATA control. Will be in high impedance state until USB connection.
IORDY	I	5	ATA control.
INTRQ	I	6	ATA control.
DMARQ	I	7	ATA control.

6.1.4 SECONE IDE Interface Related Pins

Table 6-1-4 SECOND IDE Interface Related Pins

Symbol	Type	Pin No	Description
DMA_DIO[15:0] 0 8 ↓ ↓ 7 15	B	85,68, 83,70, 80,75, 78,77, 76,79, 71,82, 69,84, 67,86	16 pins Data bus of IDE interface
DMA_DA2 DMA_DA1 DMA_DA0	T	113 114 115	DA, Data Address pins of IDE interface. Will be in high impedance state until USB connection.
DMA_CSJ[1] DMA_CSJ[0]	T	109 112	CS_, Chip Select pins of IDE interface. Will be in high-impedance state until USB connection.
DMA_RESETJ	T	102	Hardware reset pin of IDE interface. Will be in high impedance state until USB connection.

6.1.5 SECOND IDE Interface Related Pins

Table 6-1-5 SECOND IDE Interface Related Pins

Symbol	Type	Pin No	Description
DMA_DIOWJ	T	101	ATA control. Will be in high impedance state until USB connection.
DMA_DIORJ	T	100	ATA control. Will be in high impedance state until USB connection.
DMA_DMACKJ	T	99	ATA control. Will be in high impedance state until USB connection.
DMA_IORDY	I	98	ATA control.
DMA_INTRQ	I	97	ATA control.
DMA_DMARQ	I	96	ATA control.

6.1.6 Series Interface Related Pins. (PS2 / Keyboard)

Table 6-1-6 SERIES Interface Related Pins (PS2)

Symbol	Type	Pin No	Description
SCLK[2]	B	53	Mouse clock
RXD[2]	B	61	Mouse data
TXD[2]	B	58	Mouse data
SCLK[1]	B	54	Key Board clock
RXD[1]	B	62	Key Board data
TXD[1]	B	59	Key Board data
PS2_VCC_ENJ	I	87	PS2 Power Enable. Active Low

6.1.7 Series Interface Related Pins. (RS232)

Table 6-1-7 SERIES Interface Related Pins (RS232)

Symbol	Type	Pin No	Description
SCLK[0]	B	55	RS232 clock
RXD[0]	B	63	RS232 data
TXD[0]	B	60	RS232 data
CTS	B	41	RS232 flow control
DCD	B	42	RS232 flow control
DSR	B	43	RS232 flow control
RI	B	46	RS232 flow control
RTS	B	50	RS232 flow control
DTR	B	51	RS232 flow control
SDJ	B	52	RS232 shut down bit

6.1.8 8051 Interface Related Pins

Table 6-1-8 8051 Interface Related Pins

Symbol	Type	Pin No	Description
PORT2[7]	B	48	8051 port2
PORT2[6]		49	
PORT2[5]		56	
PORT2[4]		57	
PORT2[3]		64	
PORT2[2]		65	
PORT2[1]		72	
PORT2[0]		73	
PORT0[7]	B	16	8051 port0
PORT0[6]		17	
PORT0[5]		21	
PORT0[4]		22	
PORT0[3]		27	
PORT0[2]		28	
PORT0[1]		38	
PORT0[0]		39	
PORT3[7]	B	152	8051 port3
PORT3[6]		153	
PORT3[5]		154	
PORT3[4]		155	
PORT3[3]		156	
PORT3[2]		157	
PORT3[1]		158	
PORT3[0]		159	
PORT1[7]	B	160	8051 port1
PORT1[6]		161	
PORT1[5]		162	
PORT1[4]		163	
PORT1[3]		164	
PORT1[2]		165	
PORT1[1]		166	
PORT1[0]		167	
ALE	O	103	8051 Address Latch Enable
PSENJ	O	104	8051 Program Switch Enable. Active Low
EAIN	I	95	8051 External Access
FT32_EN	I	117	If Set, Enable Internal 8051, or select external 8051

6.1.9 System Pins

Table 6-1-9 System Pins

Symbol	Type	Pin No	Description
REGPWR	P	145	3.3v Power pin for on-chip 3.3v/2.5v regulator
REGGND	P	144	Ground pin for on-chip 3.3v/2.5v regulator
REGVO	P	146	2.5v power output of 3.3v/2.5v regulator
RESETJ	I	36	External reset pin. Low active.
PORT3[5] (SCL)	O	154	Clock pin of two wire serial EEPROM interface
PORT3[4] (SDA)	B	155	Data pin of two wire serial EEPROM interface
TEST	I	35	Chip Test mode enable. The chip will enter test mode if pin is pull-high. The timer or counter will be shortened during the test mode.
RWAKE0J	I	108	USB Remote Wakeup Enable. Tie to Vcc to disable. Tie to Ground to enable. The assertion of low to this pin during suspend mode will let the chip to send a remote wakeup signal to host if the “Remote Wakeup” function is enabled by host before suspend. The assertion of this signal is required in form of low active pulse with min. pulse width of 3 ms. If the remote wakeup function is not needed in the application, pull-high this pin.
ROM_WEB	O	119	External Flash Write Enable. Active Low.
ROM_CSB	O	118	External Flash Chip Select. Active Low.
ROM_OEB	O	11	External Flash Output Enable. Active Low.
SYS_RST	O	12	Reset external system.
IDEBLK_EN	I	37	If set one ->selsect second IDE function. If set zero->select parallel function
VCC	P	34,74,116,168	3.3v Power pins
VCCK	P	8,66,105,148	2.5v Power pins
GND	P	47,88,3	Digital ground pins

7.0 USB Port Descriptor for PL-2555

There are four USB devices in PL-2555 – an embedded hub, parallel port, serial port, and a mass storage devices. Each device has its own standard USB descriptors.

7.1 USB Descriptor of Embedded Hub

- Device descriptor.
- Configuration descriptor. The embedded hub has one default configuration descriptor which supports one interface.
- Interface descriptor. The embedded hub has single interface with one possible alternate.
- Endpoint descriptor. The embedded hub supports one interrupt endpoint for status change.
- Hub descriptor.

7.1.1 Device Descriptor of Embeded Hub

Table 7-1-1 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	0200h	USB Specification version 2.0
4	BdeviceClass	Byte	09h	Interface Specific.(hub class)
5	BdeviceSubclass	Byte	00h	Interface Specific.
6	BdeviceProtocol	Byte	01h	Interface Specific.
7	WmaxPacketSize0	Byte	40h	Maximum packet size for endpoint 0 is 64.
8	IdVendor	Word	067Bh	Vendor ID for Prolific Technologies.(1)
10	IdProduct	Word	2555h	Product ID for PL-2555. (1)
12	BcdDevice	Word	0100h	Device Release 1.0. (1)
14	Imanufacturer	Byte	01h	String index 1 describes manufacturer. (2)
15	IProduct	Byte	02h	String index 2 describes product. (3)
16	ISerialNumber	Byte	00h	No serial number string
17	bNumConfigurations	Byte	01h	One possible configuration

Notes:

(1) – These default values shown here could be modified by external EEPROM;

(2) – The default string is "Prolific Technology Inc." in UNICODE format and could be replaced by the contents of external EEPROM.

(3) – The default string is "ATAPI-6 Bridge Controller" in UNICODE format and could be replaced by the contents of external EEPROM.

7.1.2 Configuration Descriptor of Embeded Hub

Table 7-1-2 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	bTotalLength	Word	0022h	34 bytes of all INTERFACE & ENDPOINT.
4	bNumInterfaces	Byte	01h	The embeded hub has one interface.
5	bConfigurationValue	Byte	01h	Value to write to the Device Configuration Register (DCR) to select this configuration.
6	iConfiguration	Byte	00h	No string description for this.
7	bmAttributes	Byte	80h	Configuration characteristics: (4) Bus Powered, No Remote Wakeup.
8	MaxPower	Byte	Fah	Maximum power consumption is 500 mA.(5)

Notes:

(4) (5) – The default value could be replaced by the contents of external EEPROM.

7.1.3 Interface Descriptors of Embeded Hub

Table 7-3 Interface Descriptors

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	Interface 0.
3	bAlternateSetting	Byte	00h	Alternate 0.
4	bNumEndpoints	Byte	01h	Supports endpoint 0, 1
5	bInterfaceClass	Byte	09h	Hub class.
6	iInterfaceSubClass	Byte	00h	Interface Subclass Code = 0
7	bInterfaceProtocol	Byte	00h	Interface protocol Code = 0
8	iInterface	Byte	00h	No String descriptor for this interface.

Interrupt Endpoint Descriptor (Endpoint 1)

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	IN for Endpoint 1
3	bmAttributes	Byte	03h	Interrupt Endpoint
4	wMaxPacketSize	Word	0001h	Maximum packet size is 1
6	bInterval	Byte	0Ch	This pipe should be pulled for every 2 frames.

7.1.4 Hub Descriptors of Embeded Hub

Offset	Field	Size	Value	Description
0	bDescLength	Byte	09h	Size of this descriptor in bytes.
1	bDescriptorType	Byte	29h	Hub descriptor type.
2	bNbrPorts	Byte	04h	This hub could support **0, 1, 2, 3 or 4** downstream ports.
4	wHubCharacteristices	word	000Dh	Configuration characteristics: This hub is a part of a compound device with individual port over-current protection, and individual port power switching ca
5	bPwrOn2PwrGood	Byte	32h	The time from the time that the power-on sequence begins on a port until power is good on that port is 100 ms.
6	bHubContrCurrent	Byte	64h	The hub controller consumes 100 mA.
7	DeviceRemovable	Byte	1Eh	All device attached to the hub is unremovable.
8	PortPwrCtrlMask	Byte	FFh	This field is used for compatibility with software written for 1.0 compliant devices.

7.2 USB Descriptor of A Mass Storage Device

The mass storage device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The mass storage device has one default configuration descriptor which supports one interface.
- Interface descriptor. The mass storage device has single interface with one possible alternate.
- Endpoint descriptor. The mass storage device supports the following endpoints:
  - Bulk-Out endpoint for host-to-device data/command transfer.
  - Bulk-In endpoint for device-to-host data/status transfer.

7.2.1 Device Descriptor of Mass Storage Device

Table 7-2-1 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	0200h	USB Specification version 2.0
4	BdeviceClass	Byte	00h	Interface Specific.
5	BdeviceSubclass	Byte	00h	Interface Specific.
6	BdeviceProtocol	Byte	00h	Interface Specific.
7	WmaxPacketSize0	Byte	40h	Maximum packet size for endpoint 0 is 64.
8	IdVendor	Word	067Bh	Vendor ID for Prolific Technologies.(1)
10	IdProduct	Word	2507h	Product ID for PL-2555. (1)
12	BcdDevice	Word	0100h	Device Release 1.0. (1)
14	Imanufacturer	Byte	01h	String index 1 describes manufacturer. (2)
15	IProduct	Byte	02h	String index 2 describes product. (3)
16	ISerialNumber	Byte	00h	No serial number string
17	bNumConfigurations	Byte	01h	One possible configuration

7.2.2 Configuration Descriptor of Mass Storage Device

Table 7-2-2 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	bTotalLength	Word	0020h	32 bytes of all INTERFACE & ENDPOINT.
4	bNumInterfaces	Byte	01h	The embeded hub has one interface.
5	bConfigurationValue	Byte	01h	Value to write to the Device Configuration Register (DCR) to select this configuration.
6	iConfiguration	Byte	00h	No string description for this.
7	bmAttributes	Byte	C0h	Configuration characteristics: (4) Bus Powered, Remote Wakeup.
8	MaxPower	Byte	32h	Maximum power consumption is 100 mA.(5)

7.2.3 Interface Descriptors of Mass Storage Device

Table 7-2-3 Interface Descriptors

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	Interface 0.
3	bAlternateSetting	Byte	00h	Alternate 0.
4	bNumEndpoints	Byte	02h	Supports endpoint 0, 1, 2
5	bInterfaceClass	Byte	08h	Mass storage class.
6	iInterfaceSubClass	Byte	06h	Subclass code of 8070i transparent command set.
7	bInterfaceProtocol	Byte	50h	Protocol code of Bulk-only transport.
8	iInterface	Byte	00h	No String descriptor for this interface.

Bulk OUT Endpoint Descriptor (Endpoint 1)

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	01h	OUT for Endpoint 1
3	bmAttributes	Byte	02h	BULK Endpoint
4	wMaxPacketSize	Word	0200h	Maximum packet size is 512 bytes
6	bInterval	Byte	00h	N/A

Bulk IN Endpoint Descriptor (Endpoint 2)

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	82h	IN for Endpoint 2
3	bmAttributes	Byte	02h	BULK Endpoint
4	wMaxPacketSize	Word	0200h	Maximum packet size is 512 bytes
6	bInterval	Byte	00h	N/A

7.3 USB Descriptor of Serial Device

The Serial device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The Serial device has one default configuration descriptor which supports one interface.
- Interface descriptor. The Serial device has single interface with one possible alternate.
- Endpoint descriptor. The Serial device supports the following endpoints:
  - Bulk-Out endpoint for host-to-device data/command transfer.
  - Bulk-In endpoint for device-to-host data/status transfer.

7.3.1 Device Descriptor of Serial Device

Table 7-3-1 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	0200h	USB Specification version 2.0
4	BdeviceClass	Byte	00h	Interface Specific.
5	BdeviceSubclass	Byte	00h	Interface Specific.
6	BdeviceProtocol	Byte	00h	Interface Specific.
7	WmaxPacketSize0	Byte	40h	Maximum packet size for endpoint 0 is 64.
8	IdVendor	Word	067Bh	Vendor ID for Prolific Technologies.(1)
10	IdProduct	Word	2017h	Product ID for PL-2017. (1)
12	BcdDevice	Word	0100h	Device Release 1.0. (1)
14	Imanufacturer	Byte	01h	String index 1 describes manufacturer. (2)
15	IProduct	Byte	05h	String index 5 describes product. (3)
16	ISerialNumber	Byte	00h	No serial number string
17	bNumConfigurations	Byte	01h	One possible configuration

7.3.2 Configuration Descriptor of Serial Device

Table 7-3-2 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	bTotalLength	Word	003Ah	58 bytes of all INTERFACE & ENDPOINT.
4	bNumInterfaces	Byte	01h	The embeded hub has one interface.
5	bConfigurationValue	Byte	01h	Value to write to the Device Configuration Register (DCR) to select this configuration.

6	iConfiguration	Byte	00h	No string description for this.
7	bmAttributes	Byte	E0h	Configuration characteristics: [4] Bus Powered, Remote Wakeup.
8	MaxPower	Byte	00h	Maximum power consumption is 100 mA.[5]

7.3.3 Interface Descriptors of Serial Device

Table 7-3-3 Interface Descriptors

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	Interface 0.
3	bAlternateSetting	Byte	00h	Alternate 0.
4	bNumEndpoints	Byte	03h	Supports endpoint 0, 1, 2, 3
5	bInterfaceClass	Byte	FFh	Vendor specific class.
6	iInterfaceSubClass	Byte	00h	Subclass code
7	bInterfaceProtocol	Byte	00h	Protocol code
8	iInterface	Byte	00h	No String descriptor for this interface.

Interrupt Endpoint Descriptor (Endpoint 1)

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	IN for Endpoint 1
3	BmAttributes	Byte	03h	Interrupt Endpoint
4	WMaxPacketSize	Word	000Ah	Maximum packet size is 10 bytes
6	bInterval	Byte	01h	

Bulk OUT Endpoint Descriptor (Endpoint 2)

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	OUT for Endpoint 2
3	bmAttributes	Byte	02h	BULK Endpoint
4	wMaxPacketSize	Word	0040h	Maximum packet size is 64 bytes
6	bInterval	Byte	00h	N/A

Bulk IN Endpoint Descriptor (Endpoint 3)

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	IN for Endpoint 3
3	bmAttributes	Byte	02h	BULK Endpoint
4	wMaxPacketSize	Word	0040h	Maximum packet size is 64 bytes
6	bInterval	Byte	00h	N/A

7.4 USB Descriptor of HID class Device

The HID class device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The HID class device has one default configuration descriptor which supports one interface.
- Interface descriptor. The HID class device has single interface with one possible alternate.
- Endpoint descriptor. The HID class device supports the following endpoints:
  - Interrupt endpoint for device-to-host data/status transfer.

7.4.1 Device Descriptor of HID class Device

Table 7-4-1 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	0200h	USB Specification version 2.0
4	BdeviceClass	Byte	00h	Interface Specific.
5	BdeviceSubclass	Byte	00h	Interface Specific.
6	BdeviceProtocol	Byte	00h	Interface Specific.
7	WmaxPacketSize0	Byte	40h	Maximum packet size for endpoint 0 is 64.
8	IdVendor	Word	067Bh	Vendor ID for Prolific Technologies.(1)
10	IdProduct	Word	2004h	Product ID for PL-2004. (1)
12	BcdDevice	Word	0100h	Device Release 1.0. (1)
14	Imanufacturer	Byte	01h	String index 1 describes manufacturer. (2)
15	IProduct	Byte	02h	String index 2 describes product. (3)
16	ISerialNumber	Byte	00h	No serial number string
17	bNumConfigurations	Byte	01h	One possible configuration

7.4.2 Configuration Descriptor of Serial Device

Table 7-4-2 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	bTotalLength	Word	003Bh	59 bytes of all INTERFACE & ENDPOINT.
4	bNumInterfaces	Byte	02h	The HID device has two interface.
5	bConfigurationValue	Byte	01h	Value to write to the Device Configuration Register (DCR) to select this configuration.
6	iConfiguration	Byte	00h	No string description for this.
7	bmAttributes	Byte	A0h	Configuration characteristics: (4) Bus Powered, Remote Wakeup.
8	MaxPower	Byte	32h	Maximum power consumption is 100 mA.(5)

7.4.3 Interface Descriptors of Serial Device

Table 7-4-3 Interface Descriptors

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	Interface 0.
3	bAlternateSetting	Byte	00h	Alternate 0.
4	bNumEndpoints	Byte	01h	Supports endpoint 0, 1
5	bInterfaceClass	Byte	03h	HID class.
6	iInterfaceSubClass	Byte	01h	Subclass code
7	bInterfaceProtocol	Byte	01h	Protocol code
8	iInterface	Byte	00h	No String descriptor for this interface.

7.4.4 HID Descriptors

Table 7-4-4 HID Descriptors

Offset	Field	Size	Value	Description
0	bLength	Byte	09h	Size of this descriptor in bytes.
1	bDescriptorType	Byte	21h	INTERFACE descriptor type.
2	bInterfaceNumber	Byte	10h	Interface 0.
3	bAlternateSetting	Byte	01h	Alternate 0.
4	bNumEndpoints	Byte	00h	Supports endpoint 0, 1
5	bInterfaceClass	Byte	01h	HID class.
6	iInterfaceSubClass	Byte	22h	Subclass code
7	bInterfaceProtocol	Byte	XX	Protocol code
8	iInterface	Byte	00h	No String descriptor for this interface.

Interrupt Endpoint Descriptor (Endpoint 1)

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	IN for Endpoint 1
3	BmAttributes	Byte	03h	Interrupt Endpoint
4	WMaxPacketSize	Word	0008h	Maximum packet size is 8 bytes
6	bInterval	Byte	0Ah	

7.4 Endpoint Descriptors

7.4.1 In High speed mode

Table 7-4-1a Bulk Out Endpoint Descriptor (Endpoint 1)

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	01h	Out Endpoint 1.
3	bmAttributes	Byte	02h	BULK Endpoint.
4	wMaxPacketSize	Word	0200h	Maximum packet size is 512.
6	bInterval	Byte	00h	N/A

Table 7-4-1b Bulk In Endpoint Descriptor (Endpoint 2)

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	82h	In Endpoint 2.
3	bmAttributes	Byte	02h	BULK Endpoint
4	wMaxPacketSize	Word	0200h	Maximum packet size is512.
6	bInterval	Byte	00h	N/A

7.4.2 In Full speed mode

Table 7-4-2a Bulk Out Endpoint Descriptor (Endpoint 1)

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	01h	Out Endpoint 1.
3	bmAttributes	Byte	02h	BULK Endpoint.
4	wMaxPacketSize	Word	0040h	Maximum packet size is 512.
6	bInterval	Byte	00h	N/A

Table 7-4-1b Bulk In Endpoint Descriptor (Endpoint 2)

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	82h	In Endpoint 2.
3	bmAttributes	Byte	02h	BULK Endpoint
4	wMaxPacketSize	Word	0040h	Maximum packet size is512.
6	bInterval	Byte	00h	N/A

7.5 Device_Qualifier Descriptors

Table 7-5 Device Qualifier Descriptors

Offset	Field	Size	Value	Description
0	bLength	Byte	0Ah	Size of this descriptor in bytes.
1	bDescriptorType	Byte	06h	DEVICE Qualifier descriptor type.
2	bcdUSB	Word	0200h	USB Specification version 2.0
4	bDeviceClass	Byte	00h	Interface Specific.
5	bDeviceSubclass	Byte	00h	Interface Specific.
6	bDeviceProtocol	Byte	00h	Interface Specific.
7	wMaxPacketSize0	Byte	40h	Maximum packet size for endpoint 0 is 64.
8	bNumConfigurations	Byte	01h	Number of other-speed configurations.
9	bReserved	Byte	00h	Reserved for future use, must be zero

7.6 Other_Speed_Configuration Descriptors

Table 7-6 Other Speed Configuration Descriptors

Offset	Field	Size	Value	Description
0	bLength	Byte	09h	Size of this descriptor in bytes.
1	bDescriptorType	Byte	07h	CONFIGURATION descriptor type.
2	bTotalLength	Word	0020h	32 bytes of all INTERFACE & ENDPOINT.
4	bNumInterfaces	Byte	01h	Number of interface supported, one interface.
5	bConfigurationValue	Byte	01h	Value to write to the Device Configuration Register (DCR) to select this configuration.
6	iConfiguration	Byte	00h	No string description for this.
7	bmAttributes	Byte	C0h	Configuration characteristics: Self-Powered & No Remote Wakeup.
8	MaxPower	Byte	32h	Maximum power consumption is 100mA.

8.0 DC Characteristics

8.1 Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNITS
V_{CC}	2.5V Power Supply	-0.3 to 3.0	V
	3.3V Power Supply	-0.3 to 3.9	
V_{IN2}	Input Voltage of 2.5V I/O	-0.3 to V_{cc2I} +0.3	V
	Input Voltage of 2.5V I/O with 3.3V Tolerance	-0.3 to 3.9	
V_{IN3}	Input Voltage of 3.3V I/O	-0.3 to V_{cc3I} +0.3	V
	Input Voltage of 3.3V I/O with 5V Tolerance	-0.3 to 5.5	
T_{STG}	Storage Temperature	-40 to 150 (TBD)	°C

8.2 Operating Current Parameters

SYMBOL	PARAMETER	TYP	UNITS
I_{DD}	High Speed V_{DD} Supply Current	100	mA
I_{SUS}	Suspend Current	< 2.5	mA

8.3 Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_{CC21}	Power Supply of 2.5V I/O	2.25	2.5	2.75	V
V_{CC3I}	Power Supply of 3.3V I/O	3.0	3.3	3.6	V
T_J	Commercial Junction Operating Temperature	0	25	115	°C
	Industrial Junction Operating Temperature	-40	25	125	

8.4 Leakage Current and Capacitance(3)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
I_{IL}	Input Leakage Current(2)	no pull-up or pull-down	-10		10	uA
C_{IN2}	Input Capacitance			3.1		pF
C_{OUT2}	Output Capacitance			3.1		pF

(1) Permanent device damage may occur if Absolute Maximum Ratings are exceeded.

(2) The pull up/pull down input leakage current can be derived from the pull up/pull down resistance (Rpu/Rpd) in the DC characteristics table for each type I/O buffer.

(3) The capacitances listed above do not include PAD capacitance and package capacitance. One can estimate pin capacitance by adding pad capacitance's that is about 0.1pF and the package capacitance.

8.5 DC Characteristics of 2.5V Programmable I/O Cells

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{CC21}	Power Supply	2.5V I/O	2.25	2.5	2.75	V
V_{IL}	Input Low Voltage	CMOS			0.3*VCC	V
V_{IH}	Input High Voltage	CMOS	0.7*VCC			V
I_{IN}	Input Leakage Current	Vin=0 or VCC21	-10		10	uA

8.6 DC Characteristics of 3.3V Programmable I/O Cells

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{CC31}	Power Supply	3.3V I/O	3.0	3.3	3.6	V
V_{IL}	Input Low Voltage*	CMOS/LVTTL			0.8	V
V_{IH}	Input High Voltage*	CMOS/LVTTL	2.0			V
I_{IN}	Input Leakage Current	Vin=0 or VCC31	-10		10	uA

9.0 Outline Diagram

9.1 LQFP176pin Outline Diagram:

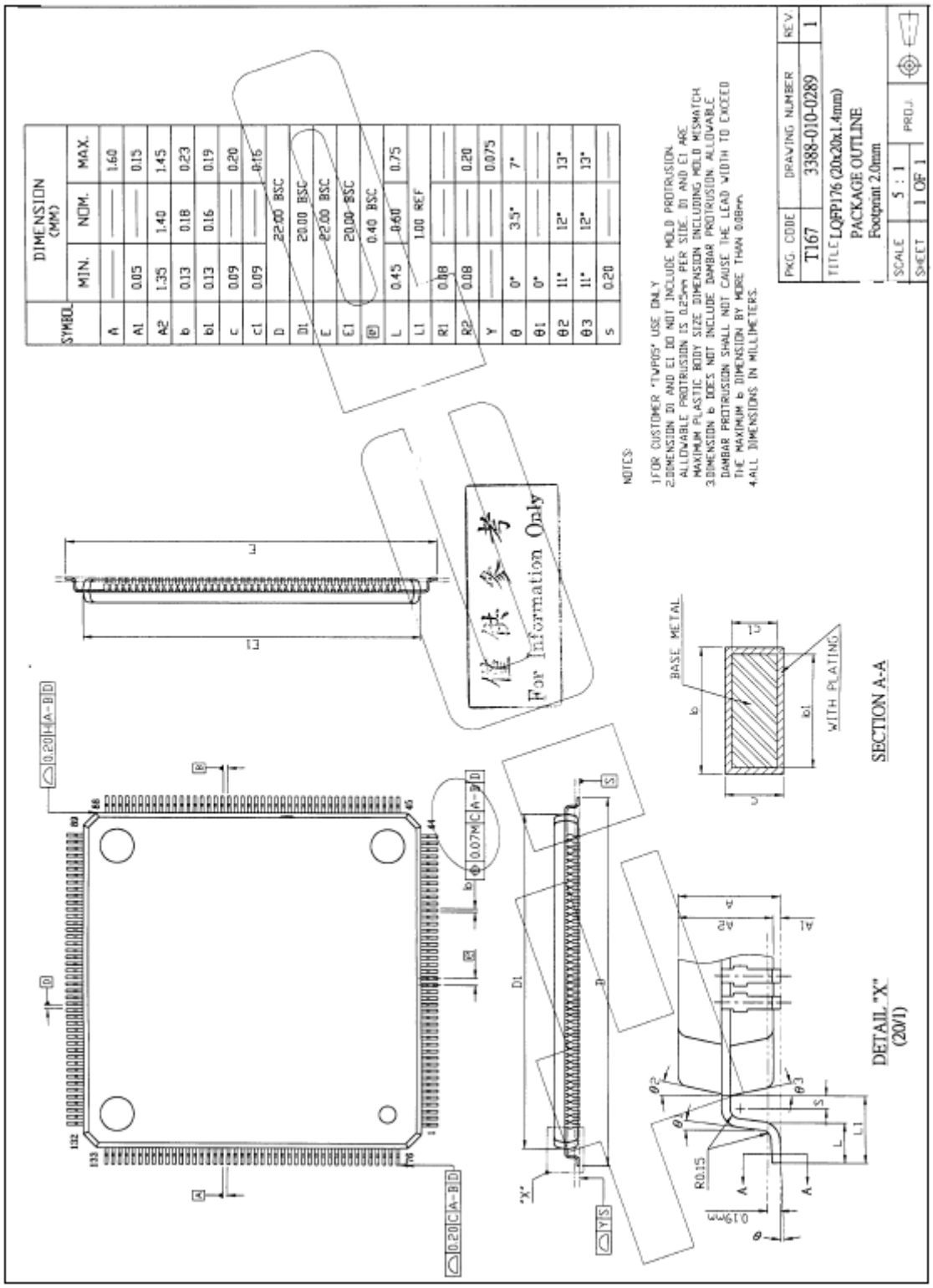


Figure 1-4 Outline Diagram of PL-2555 LQFP176