



PL-2521

Hi-Speed USB Cellular Mate and Flash Disk Controller

Product Datasheet

Document Revision: 1.0

Document Release: January, 2004

Prolific Technology Inc.

7F, No. 48, Sec. 3, Nan Kang Rd.

Nan Kang, Taipei 115, Taiwan, R.O.C.

Tel: 886-2-2654-6363 / Fax: 886-2-2654-6161

Email: sales@prolific.com.tw

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

Tech: <http://tech.prolific.com.tw>

Revision History

Revision	Description	Date
1.0	Formal Release	January 2004
0.8	Initial Release – PL-2521 Hi-Speed USB 2.0 Cellular Mate Controller IC Datasheet	October 2003

Table of Contents

1.0 FEATURES	5
2.0 OVERVIEW	6
2.1 Chip Configuration	7
3.0 PIN ASSIGNMENT AND DESCRIPTION	8
3.1 Pin Assignment and Description of PL-2521 LQFP64	8
4.0 USB PORT DESCRIPTOR	11
4.1 USB Descriptor of Embedded Hub.....	11
4.1.1 DEVICE DESCRIPTOR OF EMBEDDED HUB.....	11
4.1.2 CONFIGURATION DESCRIPTOR OF EMBEDDED HUB.....	12
4.1.3 INTERFACE DESCRIPTOR OF EMBEDDED HUB.....	12
4.1.4 INTERRUPT ENDPOINT DESCRIPTOR (ENDPOINT 1)	12
4.1.5 HUB DESCRIPTOR OF EMBEDDED HUB	13
4.2 USB Descriptor of Auxiliary Mass Storage Device.....	13
4.2.1 DEVICE DESCRIPTOR OF AUXILIARY MASS STORAGE DEVICE.....	13
4.2.2 CONFIGURATION DESCRIPTOR OF AUXILIARY MASS STORAGE DEVICE	14
4.2.3 INTERFACE DESCRIPTOR OF AUXILIARY MASS STORAGE DEVICE.....	14
4.2.4 BULK OUT ENDPOINT DESCRIPTOR (ENDPOINT 1).....	15
4.2.5 BULK IN ENDPOINT DESCRIPTOR (ENDPOINT 2)	15
4.3 USB Descriptor of Security Device.....	15
4.3.1 DEVICE DESCRIPTOR OF SECURITY DEVICE	16
4.3.2 CONFIGURATION DESCRIPTOR OF SECURITY DEVICE.....	16
4.3.3 INTERFACE DESCRIPTOR OF SECURITY DEVICE	17
4.4 USB Descriptor of Primary Mass Storage Device.....	17
4.4.1 DEVICE DESCRIPTOR OF PRIMARY MASS STORAGE DEVICE.....	17
4.4.2 CONFIGURATION DESCRIPTOR OF PRIMARY MASS STORAGE DEVICE	18
4.4.3 INTERFACE DESCRIPTOR OF PRIMARY MASS STORAGE DEVICE	18
4.4.4 BULK OUT ENDPOINT DESCRIPTOR (ENDPOINT 1).....	19
4.4.5 BULK IN ENDPOINT DESCRIPTOR (ENDPOINT 2)	19

5.0 DC CHARACTERISTICS	20
5.1 Absolute Maximum Ratings	20
5.2 Recommended Operation Conditions	20
5.3 General DC Characteristics	20
5.4 DC Electrical Characteristics for 3.3 V Operation	21
6.0 OUTLINE DIAGRAM.....	22
6.1 LQFP64pin Outline Diagram:	22

1.0 Features

- On-chip 3.3V to 2.5V regulator for internal circuit
- Supports up to four state-of-the-art NAND Flash Memories
- Capable of downloading and uploading data from/to a cellular phone:
 - ✧ Store data on the NAND Flash memories with file format compatible with most of the current Operating Systems.
 - ✧ Embedded file system so OS can easily access the stored files via the USB interface.
 - ✧ Data includes phone book, short message, and others.
- Embedded USB hub function with Mass Storage and Security devices attached:
 - ✧ Built-in USB 2.0 PHY
 - ✧ Full compliance with the Universal Serial Bus Specification v2.0
- Features of the Mass Storage include:
 - ✧ USB Mass Storage class compatible – no driver installation needed for the flash disk in Linux, Mac OS, Windows ME, 2000, XP and above. (Windows 98 requires additional driver installation and is provided separately)
 - ✧ High Performance Read/Write can reach over 5MByte/s and 3MByte/s respectively.
- Features of the Security device:
 - ✧ Protects the privacy of the data (customizable)
 - ✧ Flash/Security User Utility Program
- Advanced Power Management mechanism
- Package type: LQFP64pin

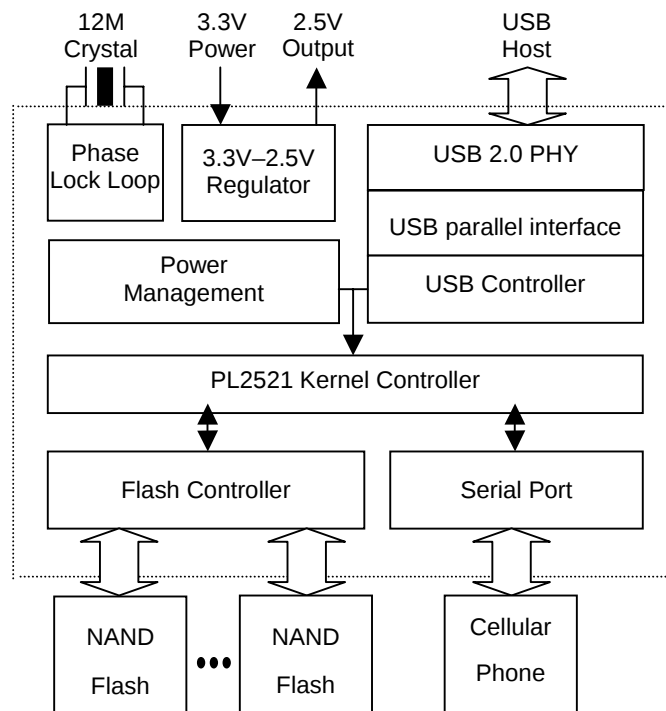


Figure 1-1 Block Diagram of PL-2521

2.0 Overview

The PL-2521 Hi-Speed USB Cellular Mate and Flash Disk Controller is a highly integrated IC that works both as an easy-to-use cellular phone data exchange and portable USB 2.0 Flash disk device. In order to achieve these functions, the PL-2521 allows you to interface up to four NAND Flash Memories for storing the data. This is the best data managing solution for cellular phones without complicated operation.

The Cellular Mate function allows users to easily download/upload phone book addresses and short messages between the cellular phone and PL-2521 through the use of only two push buttons. The phone data is stored on the NAND Flash memories via an embedded file system with the file format compatible to most of the OS in the market. This means that end-users can also access and manage the stored files in their PC via the USB interface.

The Flash Disk function allows the on-board NAND Flash memories to be used as a normal single disk or partitioned into a standard (open) mass storage device and a secured mass storage device. The sizes of the partitions can be easily configured and adjusted using the USB disk utility program where users can also set a password to lock the secured partition disk. In order to access the secured disk, users must need to enter the correct password using the utility program. Customers can preload the software driver and application program, or any other software utilities into the standard storage disk to save the extra disk cost and to enhance user convenience.

For true Plug and Play feature, the mass storage device is implemented according to the USB Mass Storage device class where the standard driver is already built-in within most of the current OS like Linux, Mac OS, Windows ME/2000/XP and above. Windows 98 requires a separate driver installation and is provided by Prolific.

The PL-2521 also provides options and software tools to customize the chip in showing the vendor and product identity. Customers can modify the Vendor ID, Product ID, Language ID, Manufacturer string, and Product string of the final product.

2.1 Chip Configuration

The PL-2521 supports one embedded generic hub, one or two USB mass-storage-class devices and one "Security device." Users can configure the chip by changing the setting of S_SQ_INJ⁽¹⁾ pin, and by using the USB Flash Disk Utility program. Thru the program, users can adjust the size (in MB unit) of the Standard and the Secured Disks or Partitions. Users can also set and check the password of the Secured Disk. Another function of the program is to let the PL-2521 change the subclass code to support different command blocks defined by the USB mass storage class specification. The table below shows all possible chip configurations setting by S_SQ_INJ pin and the program.

Table 2.1 PL-2521 Chip Configurations

Security Switch [OFF] or Security Device Disabled (No Drivers Needed):					
S_SQ_INJ setting	Standard Disk	Secured Disk	Password	USB Devices detected by the OS Device Manager	Hub port number
3.3V	✓	No Partition	Don't Care	Generic Hub + Standard Disk	1
3.3V	No Partition	✓	None	Generic Hub + Secured Disk	1
3.3V	No Partition	✓	Yes	Generic Hub + (Secured Disk)*	1
3.3V	✓	✓	None	Generic Hub + Standard Disk + Secured Disk	2
3.3V	✓	✓	Yes	Generic Hub + Standard Disk + (Secured Disk)*	2
Security Switch [ON] or Security Device Enabled (Security Driver Needed):					
S_SQ_INJ setting	Standard Disk	Secured Disk	Password	USB Devices detected by the OS Device Manager	Hub port number
0V	✓	No Partition	Don't Care	Generic Hub + Security device + Standard Disk	2
0V	No Partition	✓	None	Generic Hub + Security device + Secured Disk	2
0V	No Partition	✓	Yes	Generic Hub + Security device + (Secured Disk)*	2
0V	✓	✓	None	Generic Hub + Security device + Standard Disk + Secured Disk	3
0V	✓	✓	Yes	Generic Hub + Security device + Standard Disk + (Secured Disk)*	3

3.0 Pin Assignment and Description

3.1 Pin Assignment and Description of PL-2521 LQFP64

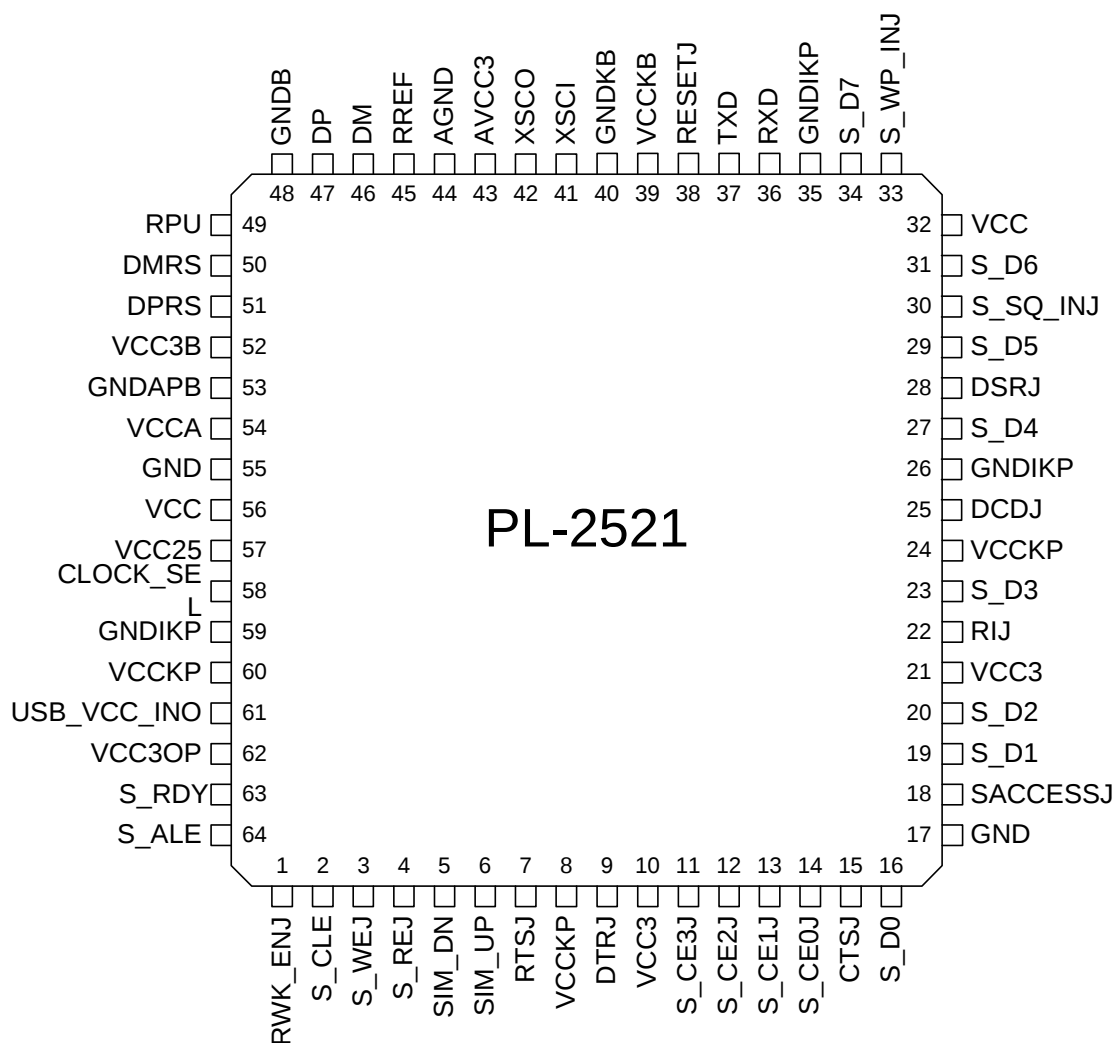


Figure 1-2 Pin Assignment of PL-2521 LQFP64

Table 3.1 Pin Descriptions of PL-2521 LQFP64

Pin	Symbol	Type	Description
1	RWK_ENJ	O	Remote wakeup enable signal, active low
2	S_CLE	O	NAND flash memory command latch signal
3	S_WEJ	O	NAND flash memory write enable signal, active low
4	S_REJ	O	NAND flash memory read enable signal, active low
5	SIM_DN	I	Download data from SIM card
6	SIM_UP	I	Upload data to SIM card
7	RTSJ	O	Request To Send signal of UART, active low
8	VCCKP	P	KP power
9	DTRJ	O	Data Terminal Ready signal of UART, active low
10	VCC3	P	3.3V power
11	S_CE3J	O	NAND flash memory 3 chip enable signal, active low
12	S_CE2J	O	NAND flash memory 2 chip enable signal, active low
13	S_CE1J	O	NAND flash memory 1 chip enable signal, active low
14	S_CE0J	O	NAND flash memory 0 chip enable signal, active low
15	CTSJ	I	Clear To Send signal of UART, active low
16	S_D0	B	NAND flash memory data bus bit 0
17	GND	P	Ground
18	SACCESSJ	O	NAND flash operation indication signal, active low
19	S_D1	B	NAND flash memory data bus bit 1
20	S_D2	B	NAND flash memory data bus bit 2
21	VCC3	P	3.3V input
22	RIJ	I	Ring Indicator signal of UART, active low
23	S_D3	B	NAND flash memory data bus bit 3
24	VCCKP	P	KP power
25	DCDJ	I	Detect Carrier Detect signal of UART, active low
26	GNDIKP	P	Ground
27	S_D4	B	NAND flash memory data bus bit 4
28	DSRJ	I	Data Set Ready signal of UART, active low
29	S_D5	B	NAND flash memory data bus bit 5
30	S_SQ_INJ	I	Security enable input, active low
31	S_D6	B	NAND flash memory data bus bit 6
32	VCC3	P	3.3V power
33	S_WP_INJ	I	Write protect input, active low
34	S_D7	B	NAND flash memory data bus bit 7
35	GNDIKP	P	Ground
36	RXD	I	Received Data signal, active low
37	TXD	O	Transmitted Data signal, active low

Pin	Symbol	Type	Description
38	RESETJ	I	Optional external Power-On-Reset signal, active low
39	VCKKB	P	KB power
40	GNDKB	P	Ground
41	XSCI	I	Crystal input. The input frequency is 12M
42	XSCO	O	Crystal output
43	AVCC3	P	Analog 3.3V power
44	AGND	P	Analog ground
45	RREF	I	Connect external reference resistor (12.1Kohm $\pm$ 1%) to Analog GND
46	DM	B	USB2.0 Data negative pin
47	DP	B	USB2.0 Data positive pin
48	GNCB	P	Ground
49	RPU	I	Connect external resistor (1.5Kohm $\pm$ 0.1%) to AVCC (Analog 3.3V power)
50	DMRS	B	USB2.0 Data negative pin, connect to external resistor (39ohm $\pm$ 0.1%)
51	DPRS	B	USB2.0 Data positive pin, connect to external resistor (39ohm $\pm$ 0.1%)
52	VCC3B	P	3.3V power
53	GNDAPB	P	Ground
54	VCCA	P	Analog 3.3V power
55	GND	P	Ground
56	VCC	P	3.3V power
57	VCC25	P	2.5V power output
58	CLOCK_SEL	I	Select the operating clock of 8032. 1: The 8032 operates in 60M Hz 0: The 8032 operates in 30M Hz
59	GNDIKP	P	Ground
60	VCKKP	P	KP power
61	USB_VCC_INO	I	USB VCC detection signal
62	VCC3OP	P	3.3V power
63	S_RDY	I	NAND flash memory ready signal
64	S_ALE	O	NAND flash memory address latch signal

4.0 USB Port Descriptor

There are up to four USB devices in PL-2521 – an embedded hub, an auxiliary and a primary mass storage device, and a security device. Each device has its own standard USB descriptors.

4.1 USB Descriptor of Embedded Hub

The embedded hub supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The embedded hub has one default configuration descriptor that 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.

4.1.1 Device Descriptor of Embedded Hub

Table 4.1.1 Device Descriptor of Embedded Hub

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	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	2515h	Product ID for the embedded hub. ⁽¹⁾
12	bcdDevice	Word	0100h	Device Release 1.00. ⁽¹⁾
14	iManufacturer	Byte	01h	String index 1 describes manufacturer. ⁽²⁾
15	iProduct	Byte	03h	String index 3 describes the product. ⁽³⁾
16	iSerialNumber	Byte	00h	No string index for serial number.
17	bNumConfigurations	Byte	01h	One possible configuration.

NOTE:

⁽¹⁾ – These default values shown here could be modified by customers.

⁽²⁾ – The default string is “Prolific Technology Inc.” in UNICODE format and could be changed by customers.

⁽³⁾ – The default string is “USB 2.0 Hub” in UNICODE format and could be changed by customers.

4.1.2 Configuration Descriptor of Embedded Hub

Table 4.1.2 Configuration Descriptor of Embedded Hub

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 configuration, interface, and endpoint descriptors.
4	bNumInterfaces	Byte	01h	The embedded 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 configuration.
7	bmAttributes	Byte	80h	Configuration characteristics: Bus Powered, No Remote Wakeup. ⁽¹⁾
8	MaxPower	Byte	FAh	Maximum power consumption is 500mA. ⁽¹⁾

Note: ⁽¹⁾ – These default values shown here could be modified by customers.

4.1.3 Interface Descriptor of Embedded Hub

Table 4.1.3 Interface Descriptor of Embedded Hub

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, and 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.

4.1.4 Interrupt Endpoint Descriptor (Endpoint 1)

Table 4.1.4 Interrupt Endpoint 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	In 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 12 frames.

4.1.5 Hub Descriptor of Embedded Hub

Table 4.1.5 Hub Descriptor of Embedded 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	03h	This hub could support 0, 1, 2, or 3 downstream ports.
4	wHubCharacteristics	Word	000Dh	Configuration characteristics: This hub is a part of a compound device with individual port over-current protection, and individual port power switching capabilities.
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 100mA.
7	DeviceRemovable	Byte	0Eh	All device attached to the hub is un-removable.
8	PortPwrCtrlMask	Byte	FFh	This field is used for compatibility with software written for 1.0 compliant device.

4.2 USB Descriptor of Auxiliary Mass Storage Device

The auxiliary mass storage device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The auxiliary mass storage device has one default configuration descriptor that supports one interface.
- Interface descriptor. The auxiliary mass storage device has single interface with one possible alternate.
- Endpoint descriptor. The auxiliary 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.

4.2.1 Device Descriptor of Auxiliary Mass Storage Device

Table 4.2.1 Device Descriptor of Auxiliary Mass Storage Device

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.

Table 4.2.1 Device Descriptor of Auxiliary Mass Storage Device (cont...)

Offset	Field	Size	Value	Description
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	2517h	Product ID for the auxiliary mass storage device. ⁽¹⁾
12	bcdDevice	Word	0100h	Device Release 1.00. ⁽¹⁾
14	iManufacturer	Byte	01h	String index 1 describes manufacturer. ⁽²⁾
15	iProduct	Byte	04h	String index 4 describes the product. ⁽³⁾
16	iSerialNumber	Byte	00h	No string index for serial number.
17	bNumConfigurations	Byte	01h	One possible configuration.

Note:

⁽¹⁾ – These default values shown here could be modified by customers.

⁽²⁾ – The default string is “Prolific Technology Inc.” in UNICODE format and could be changed by customers.

⁽³⁾ – The default string is “Mass Storage Device” in UNICODE format and could be changed by customers.

4.2.2 Configuration Descriptor of Auxiliary Mass Storage Device

Table 4.2.2 Configuration Descriptor of Auxiliary Mass Storage Device

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 configuration, interface, and endpoint descriptors.
4	bNumInterfaces	Byte	01h	The embedded 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 configuration.
7	bmAttributes	Byte	C0h	Configuration characteristics: Self Powered, No Remote Wakeup.
8	MaxPower	Byte	00h	Maximum power consumption is 0mA.

4.2.3 Interface Descriptor of Auxiliary Mass Storage Device

Table 4.2.3 Interface Descriptor of Auxiliary Mass Storage Device

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, and 2.

Table 4.2.3 Interface Descriptor of Auxiliary Mass Storage Device (cont...)

Offset	Field	Size	Value	Description
5	bInterfaceClass	Byte	08h	Mass storage class.
6	iInterfaceSubClass	Byte	06h	Subclass code of SCSI transparent command set.
7	bInterfaceProtocol	Byte	50h	Protocol code of Bulk-only transport.
8	iInterface	Byte	00h	No String descriptor for this interface.

4.2.4 Bulk Out Endpoint Descriptor (Endpoint 1)

Table 4.2.4 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 bytes.
6	bInterval	Byte	00h	N/A

4.2.5 Bulk In Endpoint Descriptor (Endpoint 2)

Table 4.2.5 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 is 512 bytes.
6	bInterval	Byte	00h	N/A

4.3 USB Descriptor of Security Device

The security device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The security device has one default configuration descriptor that supports one interface.
- Interface descriptor. The security device has single interface with one possible alternate.

Because the security device contains only the default control endpoint, there is no endpoint descriptor.

4.3.1 Device Descriptor of Security Device

Table 4.3.1 Device Descriptor of Security Device

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	2516h	Product ID for the security device. ⁽¹⁾
12	bcdDevice	Word	0200h	Device Release 2.00. ⁽¹⁾
14	iManufacturer	Byte	01h	String index 1 describes manufacturer. ⁽²⁾
15	iProduct	Byte	05h	String index 5 describes the product. ⁽³⁾
16	iSerialNumber	Byte	00h	No string index for serial number.
17	bNumConfigurations	Byte	01h	One possible configuration.

Note:

⁽¹⁾ – These default values shown here could be modified by customers.

⁽²⁾ – The default string is “Prolific Technology Inc.” in UNICODE format and could be changed by customers.

⁽³⁾ – The default string is “Security Device” in UNICODE format and could be changed by customers.

4.3.2 Configuration Descriptor of Security Device

Table 4.3.2 Configuration Descriptor of Security Device

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	0012h	18 bytes of all configuration, interface, and endpoint descriptors.
4	bNumInterfaces	Byte	01h	The security device 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 configuration.
7	bmAttributes	Byte	C0h	Configuration characteristics: Self Powered, No Remote Wakeup.
8	MaxPower	Byte	00h	Maximum power consumption is 0 mA.

4.3.3 Interface Descriptor of Security Device

Table 4.3.3 Interface Descriptor of Security Device

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	00h	Supports endpoint 0 only.
5	bInterfaceClass	Byte	FFh	Vendor Specific class.
6	iInterfaceSubClass	Byte	FFh	Vendor Specific subclass.
7	bInterfaceProtocol	Byte	FFh	Vendor Specific interface protocol.
8	iInterface	Byte	00h	No String descriptor for this interface.

4.4 USB Descriptor of Primary Mass Storage Device

The primary mass storage device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The primary mass storage device has one default configuration descriptor that supports one interface.
- Interface descriptor. The primary mass storage device has single interface with one possible alternate.
- Endpoint descriptor. The primary 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.

4.4.1 Device Descriptor of Primary Mass Storage Device

Table 4.4.1 Device Descriptor of Primary Mass Storage Device

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	2517h	Product ID for the primary mass storage device. ⁽¹⁾
12	bcdDevice	Word	0100h	Device Release 1.00. ⁽¹⁾

Table 4.4.1 Device Descriptor of Primary Mass Storage Device (cont...)

Offset	Field	Size	Value	Description
14	iManufacturer	Byte	01h	String index 1 describes manufacturer. ⁽²⁾
15	iProduct	Byte	06h	String index 6 describes product. ⁽³⁾
16	iSerialNumber	Byte	00h	No string index for serial number.
17	bNumConfigurations	Byte	01h	One possible configuration.

Notes:

⁽¹⁾ – These default values shown here could be modified by customers.

⁽²⁾ – The default string is “**Prolific Technology Inc.**” in UNICODE format and could be changed by customers.

⁽³⁾ – The default string is “**Mass Storage Device**” in UNICODE format and could be changed by customers.

4.4.2 Configuration Descriptor of Primary Mass Storage Device

Table 4.4.2 Configuration Descriptor of Primary Mass Storage Device

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 configuration, interface, and endpoint descriptors.
4	bNumInterfaces	Byte	01h	The primary mass storage device 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 configuration.
7	bmAttributes	Byte	C0h	Configuration characteristics: Self Powered, No Remote Wakeup.
8	MaxPower	Byte	00h	Maximum power consumption is 0 mA.

4.4.3 Interface Descriptor of Primary Mass Storage Device

Table 4.4.3 Interface Descriptor of Primary Mass Storage Device

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, and 2.
5	bInterfaceClass	Byte	08h	Mass storage class.

Table 4.4.3 Interface Descriptor of Primary Mass Storage Device (cont...)

Offset	Field	Size	Value	Description
6	iInterfaceSubClass	Byte	06h	Subclass code of SCSI transparent command set.
7	bInterfaceProtocol	Byte	50h	Protocol code of Bulk-only transport.
8	iInterface	Byte	00h	No String descriptor for this interface.

4.4.4 Bulk Out Endpoint Descriptor (Endpoint 1)

Table 4.4.4 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 bytes.
6	BInterval	Byte	00h	N/A

4.4.5 Bulk In Endpoint Descriptor (Endpoint 2)

Table 4.4.5 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 is 512 bytes.
6	bInterval	Byte	00h	N/A

5.0 DC Characteristics

5.1 Absolute Maximum Ratings

Table 5.1 Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNITS
Vcc3	Power Supply	-0.3 to 3.6	V
AVcc3	Power Supply	-0.3 to 3.6	V
Vcc25	Power Supply	-0.3 to 2.75	V
Vin	Input Voltage	-0.3 to Vcc+0.3	V
Vout	Output Voltage	-0.3 to Vcc+0.3	V
Tstg	Storage Temperature	-55 to 150 (TBD)	C

5.2 Recommended Operation Conditions

Table 5.2 Recommended Operatrion Conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
Vcc3	Commercial Power Supply	3.0	3.3	3.6	V
AVcc3	Commercial Power Supply	3.0	3.3	3.6	V
Vcc25	Commercial Power Supply	2.25	2.5	2.75	V
Vin	Input Voltage	0	-	Vcc3	V
Tj	Commercial Junction Operation Temperature	0	25	115	C

5.3 General DC Characteristics

Table 5.3 General DC Characteristics

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Iil	Input leakage current	No pull-up or pull-down	-10		10	uA
Ioz	Tri-state leakage current		-10		10	uA
Cin	Input capacitance			3.1		pF
Cout	Output capacitance			3.1		pF
Cbid3	Bi-directional buffer capacitance			3.1		pF

Note: The capacitance listed above does not include PAD capacitance and package capacitance.

5.4 DC Electrical Characteristics for 3.3 V Operation

Table 5.4 DC Electrical Characteristics for 3.3V Operation

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V _{il}	Input low voltage	CMOS			0.3*V _{cc}	V
V _{ih}	Input high voltage	CMOS	0.7*V _{cc}			V
V _{t-}	Schmitt trigger negative going threshold voltage	CMOS	0.8	1.10		V
V _{t+}	Schmitt trigger positive going threshold voltage	CMOS		1.6	2.0	V
V _{ol}	Output low voltage	I _{OL} = 2, 4, 8, 12, 16, 24 mA			0.4	V
V _{oh}	Output high voltage	I _{OL} = 2, 4, 8, 12, 16, 24 mA	2.4			V
R _i	Input pull-up/pull-down resistance	V _{IL} = 0v or V _{IH} = V _{cc}		75		KΩ

6.0 Outline Diagram

6.1 LQFP64pin Outline Diagram:

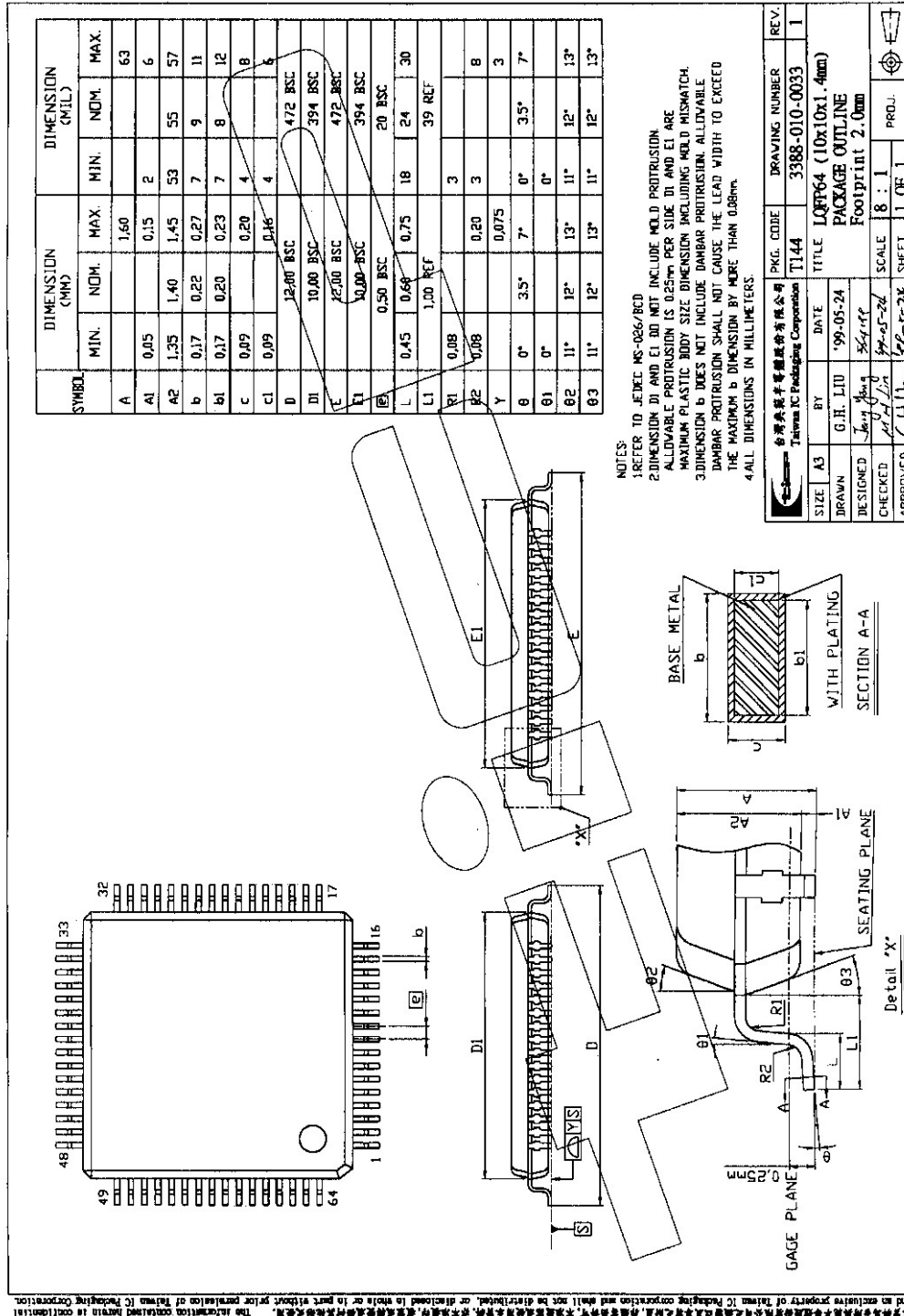


Figure 1-3 Outline Diagram of PL-2521 LQFP64