PL-25A1 Hi-Speed USB Host-to-Host Bridge Controller (Chip Revision B)

Product Datasheet

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Revision History

Revision	Description	Date
1.0B	➢ Section 4.0: Modify Pin Description table.	March 8, 2007
1.0	➢ Initial Release – PL25A1 (Chip Rev B) Hi-Speed USB Host-to-Host Bridge Controller	March 6, 2007

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1.0 Introduction

The PL-25A1 is a single chip Hi-Speed USB Host-to-Host bridge controller specially designed for Windows USB Easy Transfer cable and Microsoft Windows Easy Transfer program. The Windows Easy Transfer program is built inside Windows Vista OS and also available for Windows XP Update. Using the Windows Easy Transfer program, the PL-25A1 embedded USB Easy Transfer cable allows end-users to easily connect (thru the USB port) an old computer running Microsoft Windows XP or Vista to another computer running Windows Vista. Once the program has established connection for both computers, the end-user can then transfer large data files and program settings from the old computer to the new Windows Vista based computer. It's the fastest and easiest ways to transfer your files and settings to your new computer. The PL-25A1 embedded cable is fully supported by Microsoft for Windows XP and Windows Vista OS.

The PL-25A1 includes two 2K-byte FIFO (4 pages of USB 2.0 Bulk Endpoint maximum package size - 512 bytes) for bi-directional bulk transfer to achieve the highest throughput of USB 2.0 Hi-Speed bandwidth. The PL-25A1 chip solution is especially suitable for those who need bulk data transfer between two PCs - either notebook PC or desktop PC.

2.0 Features

- Transfer data and share resources between two PCs via USB port
- Built-in driver (USB Easy Transfer Cable) and program (Windows Easy Transfer) support by Microsoft Windows Vista and Windows XP (download from Microsoft) Operating System.
- Also supports Windows Easy Transfer Companion (for US market only)
- Full compliance with the Universal Serial Bus Specification Version 1.1 and 2.0
- Supports USB Full/High Speed Control/Interrupt/Bulk Endpoints Transfer
- Supports Suspend and Resume power management features
- Embedded Turbo 8032 MCU
- Embedded Power on reset (POR) and 5V to 3.3V and 1.8V regulator
- Dual data buffer supporting two-way data transfer
- On-chip USB2.0 UTMI transceiver
- Supports external serial EEPROM to customize vender/product related information
- Supports LED indicator for connection and transfer status
- Bus powered from either USB port
- Suitable for mobile PC environment
- No glue logic needed – can be embedded in small spaces
- 48-Pin LQFP package
- 1.8V operation voltage

3.0 Functional Block

3.1 Block Diagram

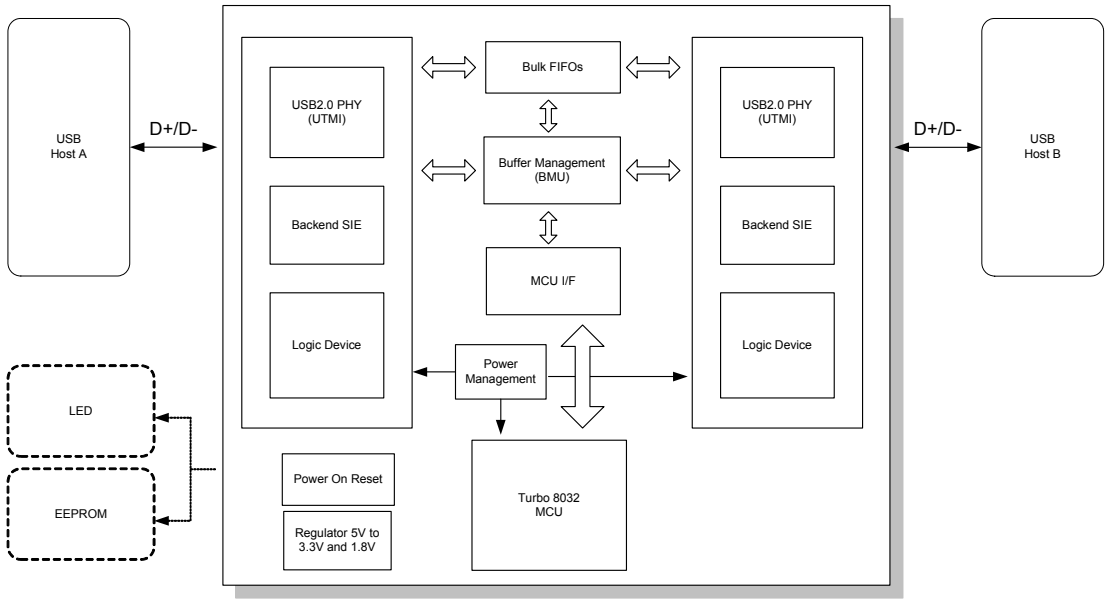


Figure 3-1 Block Diagram

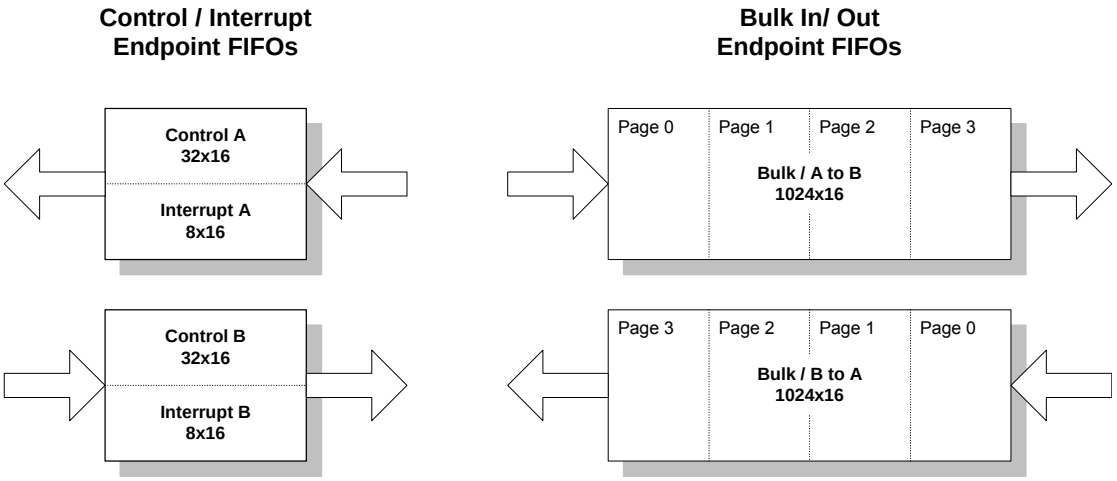


Figure 3-2 FIFO Structure

3.2 Block Description

3.2.1 USB Engine

- USB2.0 PHY. (UTMI)
  Transfer signals between serial D+/D- and parallel 16-bit data.
- Backend SIE
  Handle for CRC and Chirp.
- Logic Device
  Decode endpoints and control configuration registers.

3.2.2 Core Controller

- Bulk FIFOs
  Provide bi-directional buffers for Bulk Endpoint Transfer.
- BMU
  Data flow control for Control/Interrupt/Bulk Transfers, included Control/Interrupt Endpoints FIFOs.
- MCU I/F
  This is responsible for accessing internal Data RAM and communicating between Core Controller and Turbo 8032 MCU.
- Power Management
  Service for Suspend / Wakeup and Turbo 8032 MCU clock switch.

3.2.3 Embedded CPU

- MCU Turbo 8032
- Program ROM Size is 12Kx8 for default Program
- Internal Data RAM Size is 256-Byte for data usage

3.2.4 Miscellaneous

- POR Power On Reset module
- REG Regulator 5V to 3.3V and 1.8V

4.0 Pin Assignment and Description

4.1 LQFP48 Pin Assignment Diagram

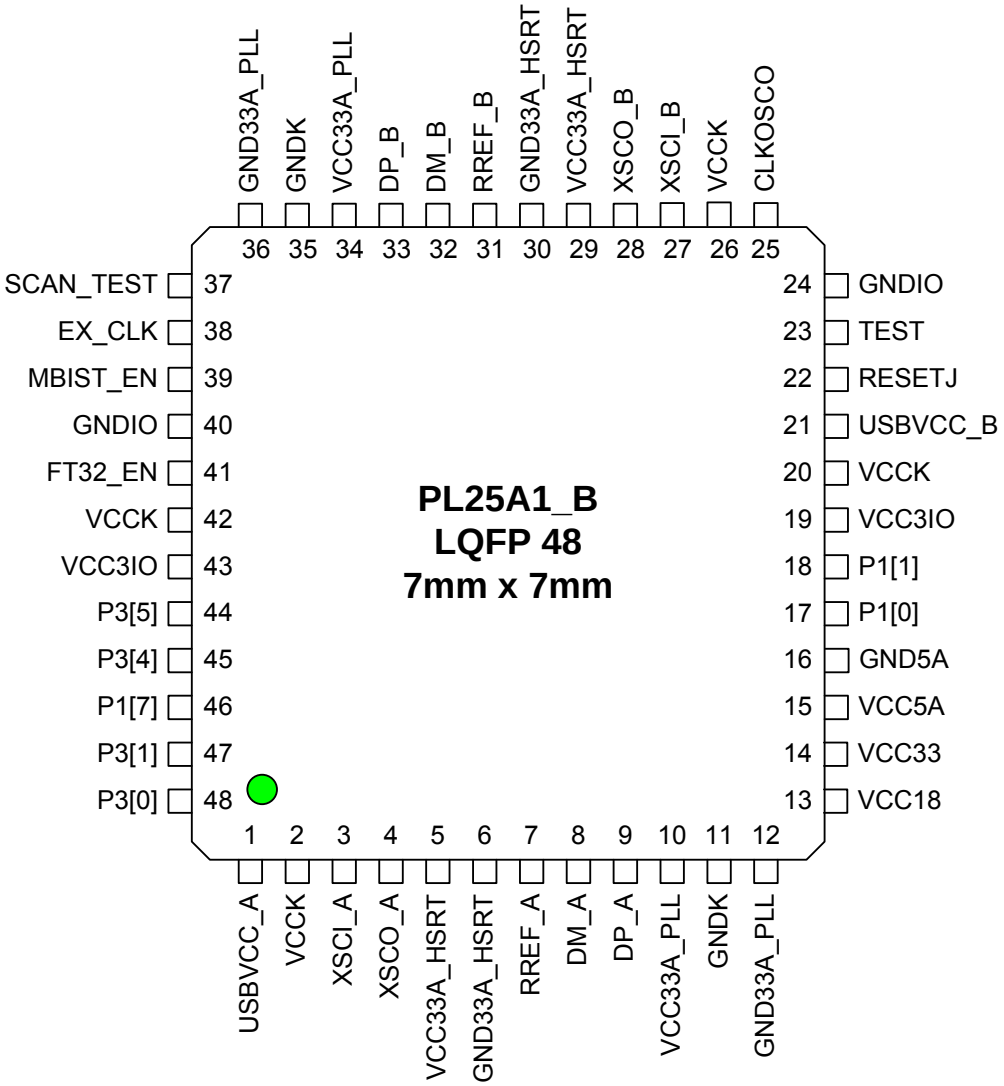


Figure 4-1 Pin Assignment of PL-25A1B LQFP48

4.2 Pin Assignment Table Description

The following table describes each pin:
I – Input signal O – Output signal I/O – Bi-directional signal
P – Power/Ground N – No connect

Table 4-1 USB2.0 Phy_A Related Pins

Name	Pin No	Type	Description
XSCI_A	3	I	Crystal oscillator input.(12MHz)
XSCO_A	4	O	Crystal oscillator output. (12MHz)
RREF_A	7	I	Reference resistor (12KΩ) to GND33A
DP_A	9	I/O	USB2.0 D+ signal
DM_A	8	I/O	USB2.0 D- signal
VCC33A_PLL	10	P	3.3V analog power for PLL
GND33A_PLL	12	P	Analog ground for PLL
VCC33A_HSRT	5	P	3.3V analog power for TX/RX
GND33A_HSRT	6	P	Analog ground for TX/RX

Table 4-2 USB2.0 Phy_B Related Pins

Name	Pin No	Type	Description
XSCI_B	27	I	Crystal oscillator input.(12MHz)
XSCO_B	28	O	Crystal oscillator output. (12MHz)
RREF_B	31	I	Reference resistor (12KΩ) to GND33A
DP_B	33	I/O	USB2.0 D+ signal
DM_B	32	I/O	USB2.0 D- signal
VCC33A_PLL	34	P	3.3V analog power for PLL
GND33A_PLL	36	P	Analog ground for PLL
VCC33A_HSRT	29	P	3.3V analog power for TX/RX
GND33A_HSRT	30	P	Analog ground for TX/RX

Table 4-3 System Pins

Name	Pin No	Type	Description
P1[0]	17	I/O	Reserved. (Pins must be floating)
P1[1]	18		
P1[7]	46		
P3[0]	48	I/O	LED_TRAN: P3[1] – control pin for LED behavior during data transfer operation. See reference schematic for details.
P3[1]	47		LED_CNNT: P3[0] – control pin for LED behavior when cable is plug-in to PC. See reference schematic for details.
P3[4]	45	I/O	EE_CLK: P3[5]
P3[5]	44		EE_DATA: P3[4]
USBVCC_A	1	I	USBVCC of PHY_A
USBVCC_B	21	I	USBVCC of PHY_B
VCCK	2, 20 26, 42	P	1.8V digital power pins
GNDK	11, 35	P	Digital ground pins
VCC3IO	19, 43	P	3.3V power pins for IO pads
GNDIO	24, 40	P	Ground pins for IO pads
VCC18	13	P	Regulator Power 1.8V output from on-chip 5V to 3.3V & 1.8V regulator
VCC33	14	P	Regulator Power 3.3V output from on-chip 5V to 3.3V & 1.8V regulator
VCC5A	15	P	Regulator Power In: 5V Power pin for on-chip 5V to 3.3V & 1.8V regulator
GND5A	16	P	Regulator Ground pin for on-chip 5V to 3.3V & 1.8V regulator
RESETJ	22	I	External reset pin. Low active.
TEST	23	I	Chip Test mode enable. It should be NC or tie to Ground.
CLKOSCO	25	O	12MHz clock source output from PHY_A
SCAN_TEST	37	I	SCAN_TEST pin for MBIST & DFT. It should be NC or tie to Ground.
EX_CLK	38	I	External CLK input for Testing or output for debug pins
MBIST_EN	39	I	MBIST enable. It should be NC or tie to Ground.
FT32_EN	41	I	FT32_EN, internal 8032 MCU enable. It should be tie to VCC3IO.

5.0 USB DESCRIPTORS

This USB device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor that supports one interface.
- String descriptors. Three string descriptors are implemented namely, language ID, Vender String, and Product String.

5.1 Device Descriptor

Table 5-1 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 Release Number (BCD): Rev1.1 (0110h), Rev 2.0 (0200h)
4	bDeviceClass	Byte	FFh	No Class defined.
5	bDeviceSubclass	Byte	00h	No Subclass defined.
6	bDeviceProtocol	Byte	00h	No Protocol defined.
7	bMaxPacketSize0	Byte	40h	Maximum packet size for endpoint 0: 64 Bytes
8	idVendor	Word	067Bh	Vendor ID for Prolific Technologies (1)
10	idProduct	Word	25A1h	Product ID (1)
12	bcdDevice	Word	8006h	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	String index3 describes serial number. (4)
17	bNumConfigurations	Byte	01h	One possible configurations.

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 “USB Transfer Cable” in UNICODE format and could be replaced by the contents of external EEPROM;

(4) The default is no serial number unless modified by external EEPROM with 03h.

5.2 Configuration Descriptor

Table 5-2 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	0027h	Total length of data returned for this configuration.
4	bNumInterfaces	Byte	01h	Number of 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: (5) Bus-Powered.
8	bMaxPower	Byte	32h	Maximum power consumption is 100 mA. (5)

Note:

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

5.3 Interface Descriptor

Table 5-3 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	Interface 0.
3	bAlternateSetting	Byte	00h	Alternate 0.
4	bNumEndpoints	Byte	03h	03h: Supports endpoint 1, 2 and 3.
5	bInterfaceClass	Byte	FFh	FFh: Vendor-specific Class.
6	bInterfaceSubClass	Byte	00h	00h: Default
7	bInterfaceProtocol	Byte	00h	00h: Default
8	iInterface	Byte	00h	No String descriptor for this interface.

5.4 Endpoint Descriptors

- Endpoint 1 Interrupt mps: 8 Bytes
- Endpoint 2 Bulk Out mps: 64B/Full Speed, 512B/High Speed
- Endpoint 3 Bulk In mps: 64B/Full Speed, 512B/High Speed

Table 5-4 Endpoint 1 Descriptor: Interrupt

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	Out Endpoint 1
3	bmAttributes	Byte	03h	Transfer type is INTERRUPT.
4	wMaxPacketSize	Word	0008h	Maximum packet size is 8 Bytes
6	bInterval	Byte	01h	Polling on every 1 ms interval.

Table 5-5 Endpoint 2 Descriptor: Bulk Out

Offset	Field	Size	Value Full/High	Description
0	bLength	Byte	07h	Size of this descriptor, in bytes.
1	bDescriptorType	Byte	05h	ENDPOINT descriptor type.
2	bEndpointAddress	Byte	02h	Out Endpoint 2
3	bmAttributes	Byte	02h	Transfer type is BULK.
4	wMaxPacketSize	Word	0040h/0200h	Maximum packet size for High Speed: 512 bytes. Full Speed: 64 bytes.
6	bInterval	Byte	00h	Ignored.

Table 5-6 Endpoint 3 Descriptor: Bulk In

Offset	Field	Size	Value Full/High	Description
0	bLength	Byte	07h	Size of this descriptor, in bytes.
1	bDescriptorType	Byte	05h	ENDPOINT descriptor type.
2	bEndpointAddress	Byte	83h	In Endpoint 3
3	bmAttributes	Byte	02h	Transfer type is BULK.
4	wMaxPacketSize	Word	0040h/0200h	Maximum packet size for High Speed: 512 bytes. Full Speed: 64 bytes.
6	BInterval	Byte	00h	Ignored.

5.5 Device_Qualifier Descriptor

Table 5-7 Device_qualifier descriptor

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	FFh	Class code.
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

5.6 Other_Speed_Configuration Descriptor

Table 5-8 Other_Speed_Configuration Descriptor

Offset	Field	Size	Value	Description
0	bLength	Byte	09h	Size of this descriptor in bytes.
1	bDescriptorType	Byte	07h	OTHER_SPEED_CONFIGURATION descriptor type.
2	bTotalLength	Word	0027h	Total length of data returned for this configuration.
4	bNumInterfaces	Byte	01h	Number of 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: (5) Bus-Powered.
8	MaxPower	Byte	32h	Maximum power consumption is 100 mA. (5)

Note:

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

5.7 String Descriptor

Table 5-9 String Descriptor 0, language ID

Offset	Field	Size	Value Full/High	Description
0	bLength	Byte	04h	Size of this descriptor, in bytes.
1	bDescriptorType	Byte	03h	String descriptor type.
3-2	wLanguageID	Word	0409h	US

Table 5-10 String Descriptor 1, manufacturer string

Offset	Field	Size	Value Full/High	Description
0	bLength	Byte	32h	Size of this descriptor, in bytes.
1	bDescriptorType	Byte	03h	String descriptor type.
49-2	cString		Prolific Technology Inc.	Unicode string

Table 5-11 String Descriptor 2, product string

Offset	Field	Size	Value Full/High	Description
0	bLength	Byte	3ch	Size of this descriptor, in bytes.
1	bDescriptorType	Byte	03h	String descriptor type.
59-2	cString		USB Transfer Cable	Unicode string.

Table 5-12 String Descriptor 3, serial string

Offset	Field	Size	Value Full/High	Description
0	bLength	Byte	04h	Size of this descriptor, in bytes.
1	bDescriptorType	Byte	03h	String descriptor type.
3-2	cString	Word	‘1’,0x00	Default serial number is ‘1’

6.0 EEPROM Interface

Table 6-1 EEPROM Content

Bytes	Name	Description
1: 0	EECHK	When the EEPROM is programmed, these two bytes is configured as 067B. After reset, they will be checked for the value. If matched, the following information will be loaded as the default parameters.
3: 2	VID	USB Vendor ID.
5: 4	PID#0	Product ID.
7: 6	RN	Release number (BCD).
8	C_bmAttributes	bmAttributes of Configuration Descriptor
9	C_MaxPower	MaxPower of Configuration Descriptor
15:10	Reserved	
21:16	Reserved	
22	iSerialNumber	Serial number index, 0x03 has serial number, 0x00(no serial number)
23	ChangeDevice	0x00 uses the selection pins to choose device, 0x01-0x04 corresponds to the 25A1 devices
25:24	Reserved	
27:26	Reserved	
29:28	Reserved	
31:30	Reserved	
35:32	Language ID string	0x04 0x03 0x0409
	Manufacturer string	
	Product string	
	Serial Number string	

7.0 DC Characteristics

7.1 Absolute Maximum Ratings

Table 7-1 Absolute Maximum Ratings

SYMBOL	PARAMETER	RATING	UNITS
V_{CCK}	1.8V Core Power Supply	-0.3 to 2.16	V
V_{CC}	3.3V Power Supply	-0.3 to 4.0	V
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	°C

7.2 Recommended Operating Conditions

Table 7-2 Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V_{CCK}	1.8V Core Power Supply	1.62	1.8	1.98	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	

7.3 Leakage Current and Capacitance

Table 7-3 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			2.2		pF
C_{OUT2}	Output Capacitance			2.2		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.

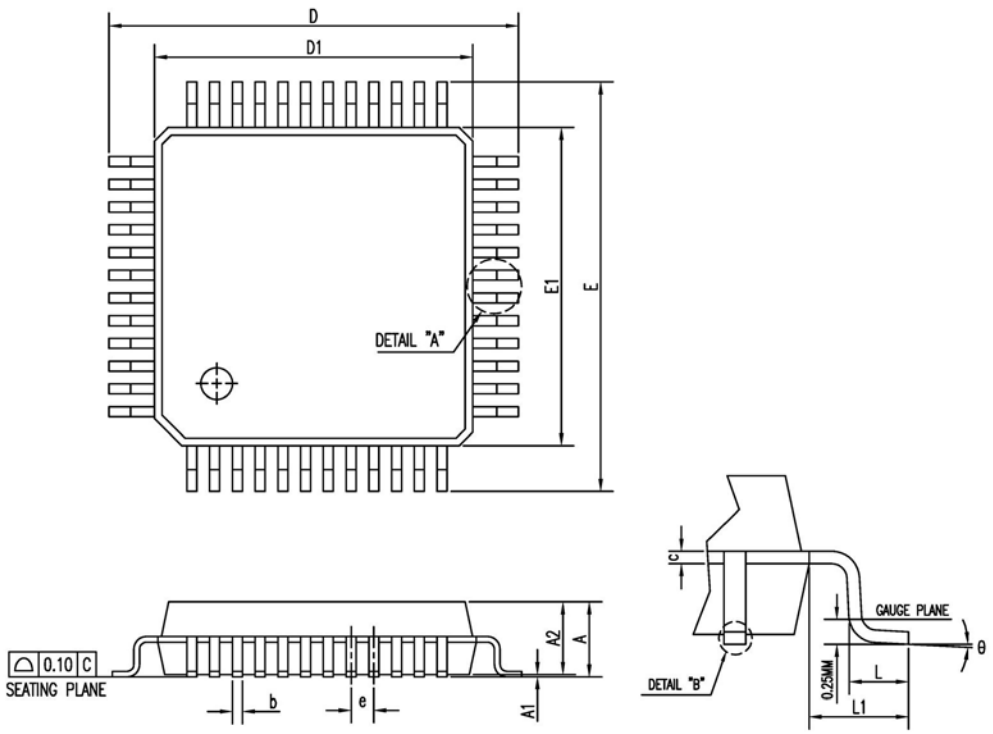
8.0 Ordering Information

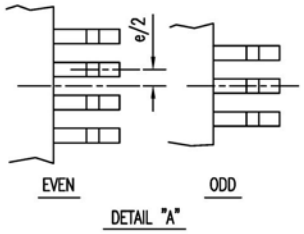
Table 8-1 Ordering Information

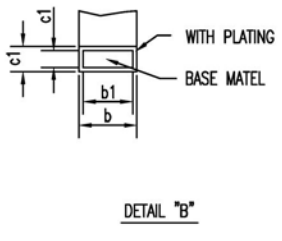
Part Number	Package Type
PL-25A1B (48-pin)	48-pin LQFP (7x7mm)
PL-25A1B LF (48-pin)	48-pin LQFP (7x7mm) Lead (Pb) Free

9.0 Outline Diagram

9.1 LQFP48 Package







SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM	MAX.	MIN.	NOM	MAX.
A			1.60			0.063
A1	0.05		0.15	0.002		0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
D	8.90	9.00	9.10	0.350	0.354	0.358
D1	6.90	7.00	7.10	0.272	0.276	0.280
E	8.90	9.00	9.10	0.350	0.354	0.358
E1	6.90	7.00	7.10	0.272	0.276	0.280
c	0.129 TYP.			0.007 TYP.		
c1	0.127 TYP.			0.005 TYP.		
L	0.50	0.60	0.70	0.020	0.024	0.028
L1	1.00 REF.			0.039 REF.		
θ	0	3.5	7	0	3.5	7
JEDEC						

	b (MM)			b1 (MM)			e (MM)			JEDEC
N	MIN.	NOM	MAX.	MIN.	NOM	MAX.	MIN.	NOM	MAX.	
48L	0.19	0.22	0.25	0.17	0.20	0.23	0.50 BSC.			

Figure 9-1 Outline Diagram of PL-25A1B LQFP48 (7mm x 7mm)