



PL-2533

Hi-Speed USB MS PRO / MS / SD / MMC

Card Reader Controller IC

Product Datasheet

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Revision History

Revision	Description	Date
1.4	1. Modify pin assignment and pin diagram: ➤ Pin5 change from SD_MS_PS to MS_PS#. ➤ Pin26 change from SD_LED# to ACC_LED1#. ➤ Pin28 change from MS_LED# to ACC_LED0#. ➤ Pin33 change from NC to RXD. ➤ Pin35 change from NC to TXD. ➤ Pin37 change from NC to SER_CLK. 2. Add pin description to pins 32 (SDA) and 34 (SCLK).	Feb 10, 2004
1.3	Modify pin assignment: ➤ Pin58 change from NC to SD_PS#. ➤ Pin64 change from Conf [4] to SD_CD#.	July 28, 2003
1.2	Modify pin assignment: ➤ Pin17 [G16] change from NC to SD_WP. ➤ Pin58 [GP17] change from SD_WP to NC.	July 1, 2003
1.1	Update following pin assignment diagram/table: ➤ Pin 2 (NC) change to Conf [0] ➤ Pin 20 (NC) change to Conf [1] ➤ Pin 23 (NC) change to Conf [2] ➤ Pin 26 (NC) change to SD_LED ➤ Pin 30 (NC) change to Conf [3] ➤ Pin 64 (NC) change to Conf [4]	June 18, 2003
1.0	Convert to Formal Release 1.0	June 11, 2003
0.5	Correct Offset 16 (iSerialNumber) description	June 2003
0.4	Correct Outline Diagram to LQFP64	June 2003
0.3	Modify the MS/MS-Pro/SD/MMC descriptors	June 2003
0.1	Datasheet Initial Internal Release	May 2003

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1.0 Features

- Fully compliant with Universal Serial Bus Specification v2.0
- Compliant with Memory Stick Standard Format Specifications v1.3
- Compliant with Memory Stick Standard Memory Stick PRO Format Specifications v1.0
- Complaint with Secure Digital (SD) Specification v1.0
- High Performance MS Pro Read/Write can reach up to 4MByte/s and 1.4MByte/s respectively
- On-chip USB 2.0 PHY
- On-chip 3.3V-2.5V 150mA regulator for internal circuit
- Mass Storage class compatible – no drivers needed for Linux, MAC OS, Windows ME, 2000, XP or above (Windows 98 requires additional driver installation)
- Supports external Serial EEPROM to customize vendor/product related information
- Advanced power management mechanism
- Package type: LQFP64pin

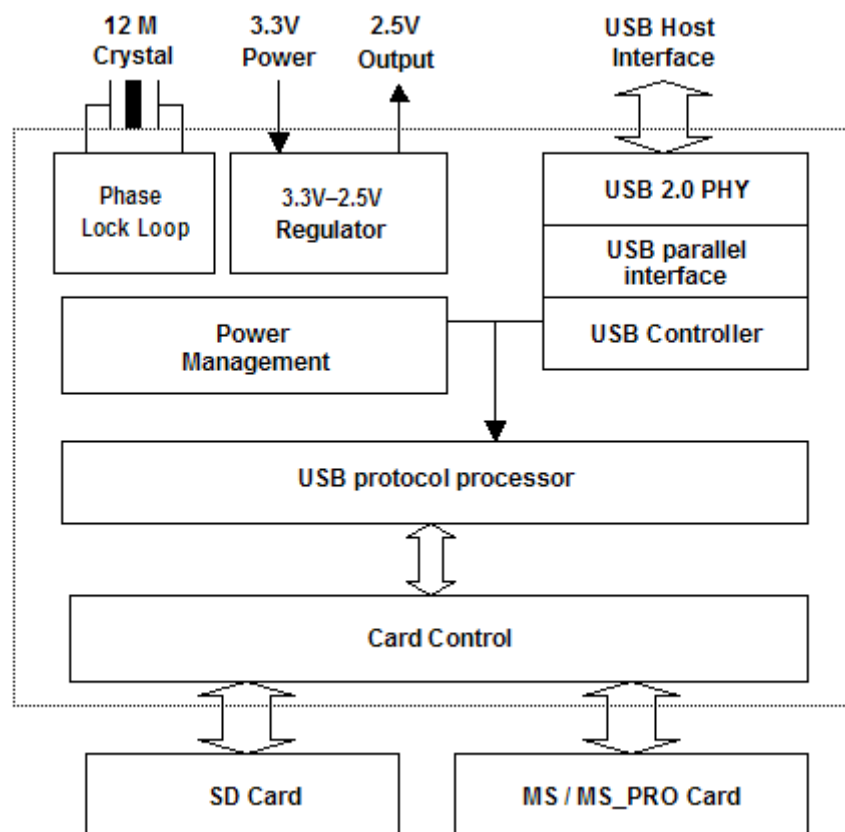


Figure 1-1 Block Diagram of PL-2533

2.0 Overview

The PL-2533 is a single chip Hi-Speed USB card reader controller IC. It provides high speed transmission to Memory Stick PRO/Memory Stick (MS PRO/MS) as well as Secure Digital (SD) and Multi Media Card (MMC) interfaces. The PL-2533 can be used as a removable storage disk whenever users need to exchange data between PCs or between PC and consumer electronic devices. With the PL-2533, users can transfer data, graphics, texts or digital images stored in various MS PRO, MS, SD, or MMC cards to PC quickly and easily.

To exploit the highest transfer rate of MS PRO, the PL-2533 implements 4-bit parallel data transfer scheme. The write performance of MS PRO can reach up to 1.4Mbytes/sec and read performance of up to 4Mbytes/sec. To take advantage of Plug and Play, the mass storage device is implemented according to the USB mass storage class. Since the default driver is embedded within most of the current OS, no extra driver is needed for Linux, Mac OS, Windows ME/2000/XP and above. Windows 98 requires additional driver installation.

3.0 Pin Assignment and Description

3.1 Pin Assignment and Description of PL-2533 LQFP64

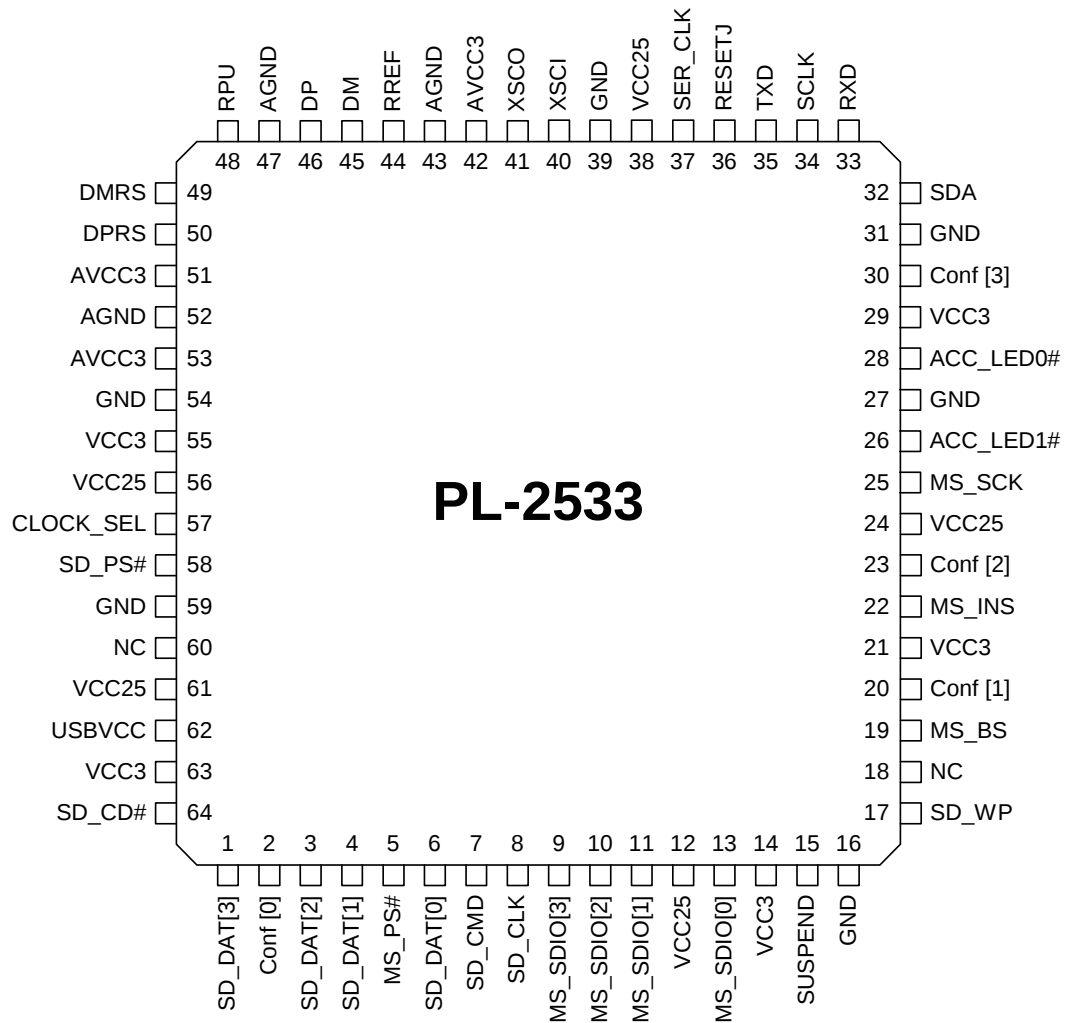


Figure 1-2 Pin Assignment of PL-2533 LQFP64

Table 2.1 Pin Descriptions of PL-2533 LQFP64

Type	P: Power/Ground	O: Output pin	I: Input pin	B: Bidirectional
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Pin	Symbol	Type	Description
1	SD_DAT[3]	B	SD data pin
2	Conf [0]	I	Configuration pin
3	SD_DAT[2]	B	SD data pin
4	SD_DAT[1]	B	SD data pin
5	MS_PS#	O	MS power switch
6	SD_DAT[0]	B	SD data pin
7	SD_CMD	O	SD command pin
8	SD_CLK	O	SD clock pin
9	MS_SDIO[3]	B	MS data signal
10	MS_SDIO[2]	B	MS data signal
11	MS_SDIO[1]	B	MS data signal
12	VCC25	P	2.5V input
13	MS_SDIO[0]	B	MS data signal
14	VCC3	P	3.3V input
15	SUSPEND	O	Chip suspend signal 1: suspend 0: normal operation
16	GND	P	Ground
17	SD_WP	I	SD write protect
18	NC		
19	MS_BS	O	MS bus state signal
20	Conf [1]	I	Configuration pin
21	VCC3	P	3.3V input
22	MS_INS	I	MS insertion
23	Conf [2]	I	Configuration pin
24	VCC25	P	2.5V power
25	MS_SCK	O	MS clock
26	ACC_LED1#	O	Access LED (OFF when ready; Flashes during access)
27	GND	P	Ground
28	ACC_LED0#	O	Access LED (ON when ready; Flashes during access)
29	VCC3	P	3.3V power
30	Conf [3]	I	Configuration pin
31	GND	P	Ground
32	SDA	B	I2C Interface (data) to EEPROM
33	RXD		Not used but should be tied to ground.

Pin	Symbol	Type	Description
34	SCLK	O	I2C Interface (clock) to EEPROM
35	TXD		Not used but should be tied to ground.
36	RESETJ	I	Optional external Power-On-Reset signal, active low.
37	SER_CLK		Not used but should be tied to ground.
38	VCC25	P	2.5V power
39	GND	P	Ground
40	XSCI	I	Crystal input. The input frequency is 12M.
41	XSCO	O	Crystal output
42	AVCC3	P	Analog 3.3V power
43	AGND	P	Analog ground
44	RREF	I	Connect external reference resistor (12.5Kohm $\pm$ 1%) to Analog GND
45	DM	B	USB2.0 Data negative pin
46	DP	B	USB2.0 Data positive pin
47	AGND	P	Analog ground
48	RPU	I	Connect external resistor (1.5Kohm $\pm$ 0.1%) to AVCC (Analog 3.3V power)
49	DMRS	B	USB2.0 Data negative pin, connect to external resister (39ohm $\pm$ 0.1%)
50	DPRS	B	USB2.0 Data positive pin, connect to external resister (39ohm $\pm$ 0.1%)
51	AVCC3	P	Analog 3.3V power
52	AGND	P	Analog ground
53	AVCC3	P	Analog 3.3V power
54	GND	P	Ground
55	VCC3	P	3.3V power
56	VCC25	P	2.5V power output
57	CLOCK_SEL	I	Select the operating clock of 8032. 1: The 8032 operates in 60M Hz 0: The 8032 operates in 30M Hz
58	SD_PS#	O	SD Power Switch
59	GND	P	Ground
60	NC		
61	VCC25	P	2.5V power
62	USBVCC	I	Use to detect the USB bus power.
63	VCC3	P	3.3V power
64	SD_CD#	I	SD Card Detection

4.0 USB Port Descriptor

4.1 USB Descriptor of MS/MS_Pro/SD/MMC Device

The MS/MS_PRO/SD/MMC device supports the following standard USB descriptors:

- Device descriptor.
- Configuration descriptor. The MS/MS_PRO/SD/MMC device has one default configuration descriptor that supports one interface.
- Interface descriptor. The MS/MS_PRO/SD/MMC device has single interface with one possible alternate.
- Endpoint descriptor. The MS/MS_PRO/SD/MMC 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.

4.1.1 Device Descriptor of MS/MS_Pro/SD/MMC

Table 4.1.1 Device Descriptor of MS/MS_Pro/SD/MMC

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.
10	idProduct	Word	2533h	Product ID for the MS/MS_PRO.
12	bcdDevice	Word	0001h	Device Release 1.00.
14	iManufacturer	Byte	01h	String index 1 describes manufacturer. ⁽¹⁾
15	iProduct	Byte	02h	String index 2 describes the product.
16	iSerialNumber	Byte	03h	String index 3 describes the serial number.
17	bNumConfigurations	Byte	01h	One possible configuration.

NOTE:

⁽¹⁾ – The default string is “Prolific Technology Inc.” in UNICODE format and could be changed by customers.

4.1.2 Configuration Descriptor of MS/MS_Pro/SD/MMC

Table 4.1.2 Configuration Descriptor of MS/MS_Pro/SD/MMC

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	80h	Configuration characteristics: Bus Powered, No Remote Wakeup.
8	MaxPower	Byte	FAh	Maximum power consumption is 500mA.

4.1.3 Interface Descriptor of MS/MS_Pro/SD/MMC

Table 4.1.3 Interface Descriptor of MS/MS_Pro/SD/MMC

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, and 1.
5	bInterfaceClass	Byte	08h	Mass Storage Class
6	iInterfaceSubClass	Byte	05h	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.

4.1.4 Bulk Out Endpoint Descriptor (Endpoint 1)

Table 4.1.4 Bulk Out Endpoint 1 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	01h	In Endpoint 1.
3	bmAttributes	Byte	02h	Bulk Endpoint
4	wMaxPacketSize	Word	0200h	Maximum packet size is 512 bytes.
6	bInterval	Byte	00h	N/A

4.1.5 Bulk Out Endpoint Descriptor (Endpoint 2)

Table 4.1.5 Bulk Out Endpoint 2 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	82h	In Endpoint 1.
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:

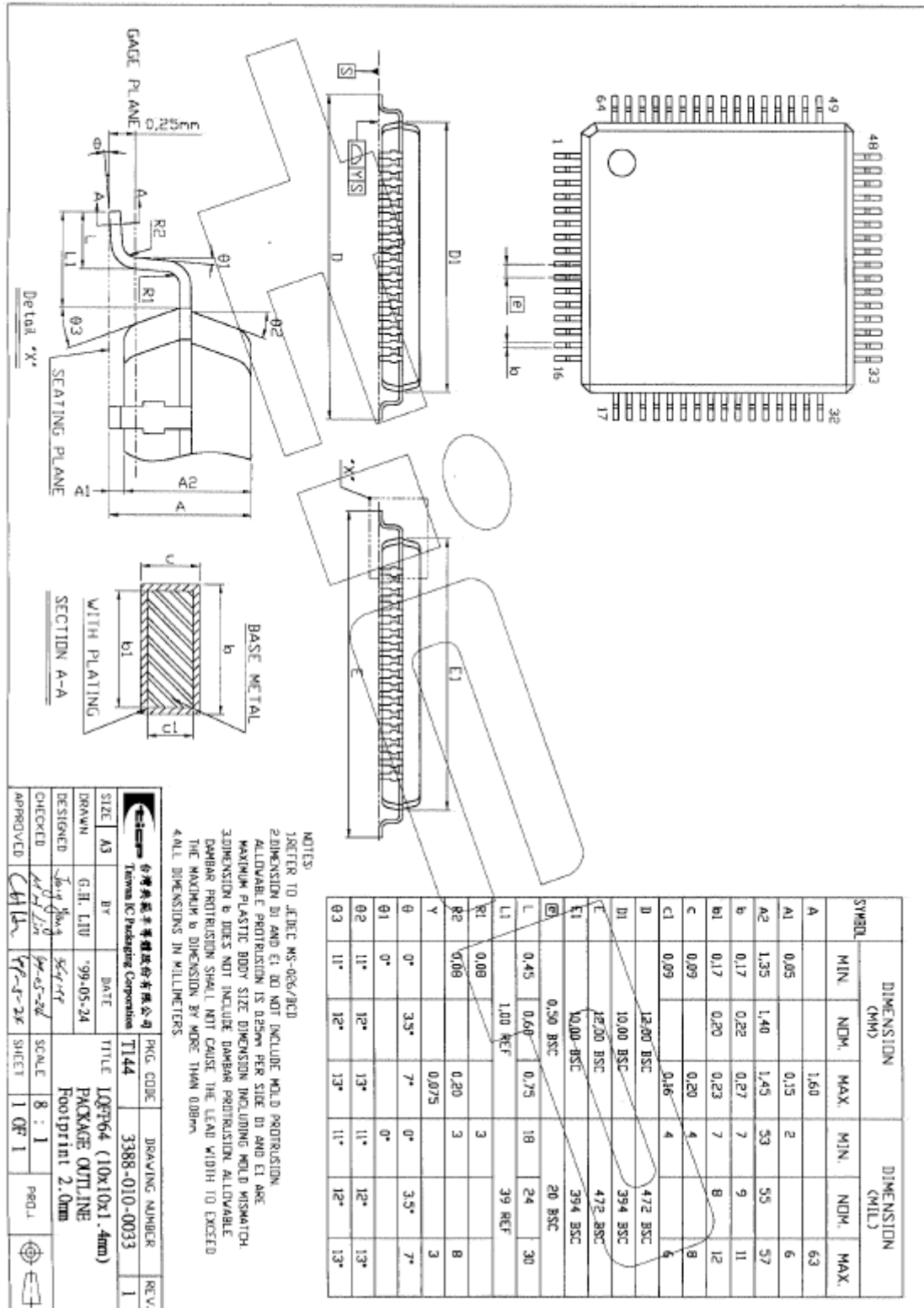


Figure 1-3 Outline Diagram of PL-2533 LQFP64