

# SPECIFICATION

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**MX83076**

**USB Keyboard Encoder**

**Version 1.1**

## TABLE OF CONTENTS

<b>1. INTRODUCTION.....</b>	<b>3</b>
<b>2. FEATURE.....</b>	<b>3</b>
<b>3. APPLICATIONS.....</b>	<b>3</b>
<b>4 . PIN ASSIGNMENT.....</b>	<b>4</b>
<b>5. FUNCTION DESCRIPTION.....</b>	<b>5</b>
5.1 USB Keyboard Description.....	5
5.2 LED Report for USB Keyboard.....	8
5.3 USB Keyboard Scan Code.....	9
<b>6. ABSOLUTE MAXIMUM RATINGS.....</b>	<b>12</b>
<b>7. DC CHARACTERISTICS.....</b>	<b>12</b>
<b>8. APPLICATION CIRCUIT.....</b>	<b>13</b>
<b>9. APPLICATION MATRIX.....</b>	<b>14</b>
<b>10. PAD DIAGRAM.....</b>	<b>15</b>
<b>11. REVICION HICTORY.....</b>	<b>16</b>

## 1. INTRODUCTION

The MX83076 is a single chip keyboard encoder, these devices detect the key press and release activity, sends the scan code to system, and accepts the command from system. The MX83076 function in USB interface environment. For USB interface, it supports the USB standard request version 1.1 as well as HID class request version 1.1.

The MX83076 is the most powerful USB keyboard encoder. It is a crystal-less and low cost BOM solution with the minimal external components.

## 2. FEATURE

- Operating voltage 4.5V~5.5V
- Universal Serial Bus Specification Version 1.1
- USB Device Class Definition for Human Interface Device (HID), Firmware Specification Version 1.1
- Support HID Usage ID for USB
- Support USB Sleep Mode
- 104/107 keys with multi-media or other special application keyboard encoder
- Support WINDOWS 95, 98, 2000 , XP, VISTA keys
- Support multi-media or other special application keyboard encoder
- Phantom key detects
- A watch dog timer with its own on-chip RC oscillator to prevent system stand still
- Built-in power on reset (POR)
- Power-up timer (PWRT)
- Oscillator Startup timer (OST)
- Built in low voltage reset (LVR)
- Low power CMOS device technology

## 3. APPLICATIONS

- USB compatible with Keyboard.
- IBM PC AT or compatible machine keyboard.
- Apple PC USB keyboard.
- Japanese keyboard.
- Korean keyboard.
- Brazilian keyboard.

## 4 . PIN ASSIGNMENT

Symbol	I/O	Function Description
PB0~PB7	I/O	GPIO pins. These pins can be pulled-high internally through software control.
PC2~PC0	I/O	LED sink pins
PC7~PC6	I/O	LED sink pins
VDD	PWR	Power supply pin.
TEST	I/O	Test pin
VDD_A	PWR	Power supply pin.
V33	PWR	3.3V Power supply pin..
VOUT	PWR	3.3V regulator output.
GND	PWR	Ground pin.
DM_DATA ( PC5 )	I/O	USB minus data line interface or DATA for PS/2 keyboard. When the MX83076 is running under PS/2 mode, this pin will have an internal pulled-high resistor, with $V_{dd}=5.0V$ When the MX83076 is running under USB mode, this pin will have an internal pulled-high resistor, 1.5k Ohm, with $V_{3.3}=3.3V$
DP_CLK ( PC4 )	I/O	USB plus data line interface or CLK for PS/2 keyboard When the MX83076 is running under PS/2 mode, this pin will have an internal pulled-high resistor, with $V_{dd} =5.0V$
PE6~PE7	I/O	GPIO pins. These pins can be pulled-high internally through software control or LED sink pins.
PE0~PE5	I/O	GPIO pins. These pins can be pulled-high internally through software control or LED sink pins.
PA0~PA7	I/O	GPIO pins. These pins can be pulled-high internally through software control.
PD0~PD7	I/O	GPIO pins. These pins can be pulled-high internally through software control.

## 5. FUNCTION DESCRIPTION

### 5.1 USB KEYBOARD DESCRIPTION

We describe the USB keyboard function descriptions and data transfer in the following section.

#### **Device Descriptor:**

Descriptor size: 0X12

Descriptor type: 0X01

USB Specification release number: 0X0110

Device class: 0X00 Device subclass:

0X00 Device Protocol: 0X00

Max package for Endpoint 0 0X08

Device Release number: 0X0104

Index of string descriptor describing manufacturer: 0X01

Index of string descriptor describing product: 0X02

Index of string descriptor describing the device's serial number: 0X00

Number of possible configurations: 0X01

#### **Configuration Descriptor:**

Descriptor size: 0X09

Descriptor type: 0X02

Total length of data return for this configuration: 0X003B

Number of interfaces: 0X02

Value used to address this configuration: 0X01

Index of string descriptor describing this configuration: 0X00

Configuration characteristic: 0XA0

Maximum power consumption: 0X31

#### **Interface Descriptor (Interface 0)**

Descriptor size: 0X09

Descriptor type: 0X04

Number of this interface: 0X00

Alternate setting: 0X00

Number of endpoints used by this interface: 0X01

Class code: 0X03

Subclass code: 0X01

Protocol code : 0X01

Index of string descriptor describing this interface: 0X00

### **HID Descriptor**

Descriptor size: 0X09

Descriptor type: 0X21

HID Specification release number: 0X0110

Country code: 0X00

Number of class descriptors: 0X01

Type of class descriptor: 0X22

Length of report descriptor: 0X0036

### **Endpoint Descriptor**

Descriptor size: 0X07

Descriptor type: 0X05

Endpoint's status: 0X81

Endpoint's attributes: 0X03

Maximum package size of this endpoint: 0X08

Interval for polling endpoint for data transfers: 0X000A

### **Report Descriptor (Endpoint 1)**

Using page (generic desktop): 0x05 0x01

Using (keyboard): 0x09 0x06

Collection (application): 0xa1 0x01

Using page (Page#for LEDs): 0x05 0x08

Using minimum (1): 0x19 0x01

Using maximum (3): 0x29 0x03

Logical minimum (0): 0x15 0x00

Logical maximum (1): 0x25 0x01

Report size (1): 0x75 0x01

Report count (3): 0x95 0x03

Output (data, variable, absolute): 0x91 0x02

Report count (5): 0x95 0x05

Output (constant): 0x91 0x01

Using page (key codes): 0x05 0x07

Using minimum (224): 0x19 0xe0

Using maximum (231): 0x29 0xe7

Report count (8): 0x95 0x08

Input (data, variable, absolute): 0x81 0x02

Report size (8): 0x75 0x08  
Report count (1): 0x95 0x01  
Input (constant): 0x81 0x01  
Using minimum (0): 0x19 0x00  
Using maximum (91): 0x29 0x91  
Logical maximum (ff): 0x26 0xff 0x00  
Report count (6): 0x95 0x06 Input (data, array): 0x81 0x00  
End collection: 0xc0

#### **Interface Descriptor (Interface 1)**

Descriptor size: 0x09  
Descriptor type: 0x04  
Number of this interface: 0x01  
Alternate setting: 0x00  
Number of endpoints used by this interface: 0x01  
Class code: 0x03  
Subclass code: 0x00  
Protocol code: 0x00  
Index of string descriptor describing this interface: 0x00

#### **HID Descriptor**

Descriptor size: 0x09  
Descriptor type: 0x21  
HID Specification release number: 0x0110  
Country code: 0x00  
Number of class descriptors: 0x01  
Type of class descriptor: 0x22  
Length of report descriptor: 0x0034

#### **Endpoint Descriptor**

Descriptor size: 0x07  
Descriptor type: 0x05  
Endpoint's status: 0x82  
Endpoint's attributes: 0x03  
Maximum package size of this endpoint: 0x03  
Interval for polling endpoint for data transfers: 0x000A

#### **Report Descriptor (Endpoint 2)**

Using page (consumer): 0x05 0x0c  
Using (consumer): 0x09 0x01  
Collection (application): 0xa1 0x01  
Report id (01): 0x85 0x01  
Using minimum (00): 0x19 0x00  
Using maximum (023c): 0x2a 0x3c 0x02  
Logical minimum (0): 0x15 0x00  
Logical maximum (023c): 0x26 0x3c 0x02  
Report count (1): 0x95 0x01  
Report size (10): 0x75 0x10  
Input (data, array, absolute): 0x81 0x00  
End collection: 0xc0  
Using (system control): 0x09 0x80  
Collection (application): 0xa1 0x01  
Report id (2): 0x85 0x02  
Using minimum (81): 0x19 0x81  
Using maximum (83): 0x29 0x83  
Logical minimum (0): 0x15 0x00  
Logic maximum (1): 0x25 0x01  
Report size (1): 0x75 0x01  
Report count (3): 0x95 0x03  
Input (data, variable, absolute): 0x81 0x02  
Report count (5): 0x95 0x05  
Input (constant): 0x81 0x01End collection: 0xc0

## 5.2 LED REPORT FOR USB KEYBOARD

When one of the LED buttons (Num, Caps, Scroll) is pressed, the host issues a Setup package with a Set\_Report request to Endpoint 0 and an Out package with 1 byte data, which indicates the LED status. The format of the 1 byte data is:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Constant	Constant	Constant	Kana	Compose	Scroll Lock	Caps Lock	Num Lock

## 5.3 USB KEYBOARD SCAN CODE

When the keys of HID Using Page 07 are pressed, the scan codes will be sent using Endpoint 1. If the keys of HID Using Page 01 and 0C are pressed, the scan codes will be sent using Endpoint 2.



When the host issues an IN packet to Endpoint 1 to receive data from the device and the keys of HID Using Page 07 are pressed, the device return 8 bytes to the host. The 8 bytes as follows:

Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0
Key 6	Key 5	Key 4	Key 3	Key 2	Key 1	Reserved	Modifier

The modifier bytes are as follows:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Right GUI	Right Alt	Right Shift	Right Ctrl	Left GUI	Left Alt	Left Shift	Left Ctrl

When the host issues an IN packet to Endpoint 2 to receive data from the device and the keys of HID Using Page 0C (or 01) are pressed, the device return 3 (or 2) bytes to the host. The 3 (or 2) bytes are as follows:

<b>HID Using Page 0C:</b>		
<b>Byte 2</b>	<b>Byte 1</b>	<b>Byte 0</b>
Using ID 2 <sup>nd</sup> Byte	Using ID 1 <sup>st</sup> Byte	Report ID 0X01
<b>HID Using Page 01:</b>		
<b>Byte 1</b>	<b>Byte 0</b>	
Using ID	Report ID 0X02	



**HID Using ID:**

Key	HID Using Page	HID Using ID	Key	HID Using Page	HID Using ID
~(`)	07	35	X	07	1B
1	07	1E	C	07	06
2	07	1F	V	07	19
3	07	20	B	07	05
4	07	21	N	07	11
5	07	22	M	07	10
6	07	23	,(<)	07	36
7	07	24	.(>)	07	37
8	07	25	/(&?)	07	38
9	07	26	Shift_R	07	E5
0	07	27	Ctrl_L	07	E0
-(-)	07	2D	Alt_L	07	E2
=(+)	07	2E	Space	07	2C
Backspace	07	2A	Alt_R	07	E6
Tab	07	2B	Ctrl_R	07	E4
Q	07	14	Num	07	53
W	07	1A	(7)	07	5F
E	07	08	(4)	07	5C
R	07	15	(1)	07	59
T	07	17	(8)	07	60
Y	07	1C	(5)	07	5D
U	07	18	(2)	07	5A
I	07	0C	(0)	07	62
O	07	12	(*)	07	55
P	07	13	(9)	07	61
[({	07	2F	(6)	07	5E
]})	07	30	(3)	07	5B
\( )@1	07	31	(DEL)	07	63
CAPS	07	39	(-)	07	56
A	07	04	(+)	07	57
S	07	16	(Enter)	07	58
D	07	07	ESC	07	29



Key	HID Using Page	HID Using ID	Key	HID Using Page	HID Using ID
F	07	09	F1	07	3A
G	07	0A	F2	07	3B
H	07	0B	F3	07	3C
J	07	0D	F4	07	3D
K	07	0E	F5	07	3E
L	07	0F	F6	07	3F
;(:)	07	33	F7	07	40
'(")	07	34	F8	07	41
K42	07	32	F9	07	42
Enter	07	28	F10	07	43
Shift_L	07	E1	F11	07	44
K45	07	64	F12	07	45
Z	07	1D	Scroll	07	47
Ins	07	49	(/)	07	54
Del	07	4C	Print	07	46
Left	07	50	Pause	07	48
Home	07	4A	Break (Pause+Ctrl)	07	48
Up	07	52	www Back	0C	0224
Down	07	51	www Forward	0C	0225
Page Up	07	4B	www stop	0C	0226
Page Down	07	4E	www Refresh	0C	0227
Right	07	4F	www Search	0C	0221
WIN_L	07	E3	www Favorite	0C	022A
WIN_R	07	E7	www Home	0C	0223
APP	07	65	Mail	0C	018A
N-CHG (131)	07	8B	Mute	0C	00E2
CHG (132)	07	8A	Volume +	0C	00E9
ROMA	07	88	Volume	0C	00EA

Key	HID Using Page	HID Using ID	Key	HID Using Page	HID Using ID
(133)					
K14	07	89	Play/Pause	0C	00CD
K56	07	87	Stop	0C	00B7
K107	07	85	PreTrack	0C	00B6
KL	07	91	Nexttrack	0C	00B5
KR	07	90	Media Select	0C	0183
Power	01	81	My Computer	0C	0194
Sleep	01	82	Calculator	0C	0192
Wake up	01	83			

## 6. ABSOLUTE MAXIMUM RATINGS

Parameter	Sym.	Ratings
Supply Voltage	VCC	-0.5 ~ +6V
Input Voltage	VIN	-0.3V ~ +6V
Output Voltage	VOUT	-0.3V ~ +6V
Operating temperature	TOP	-20°C ~ 70°C
Storage temperature	TS	-50°C ~ 150°C

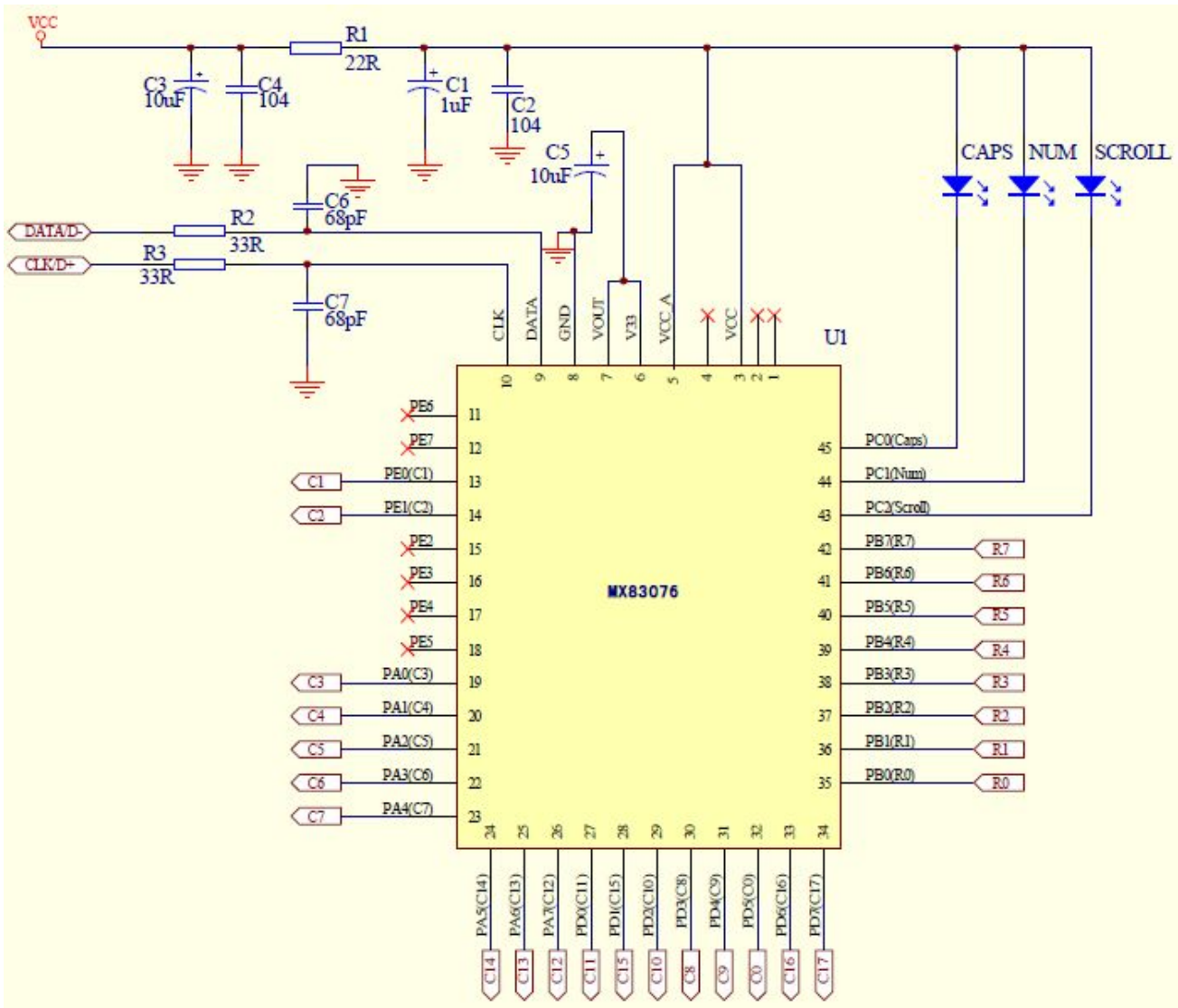
## 7. DC CHARACTERISTICS

(VDD = 5V, Temperature = 27°C)

Parameter	Sym.	Min.	Typ.	Max.	Unit	Condition
Operating voltage	VCC	4.5	5	5.5	V	
Operating supply current	ICC	-	-	7	mA	Fosc=6MHz
Input leakage	IIN	-	-	2	μA	VIN=VCC,VSS
Input high voltage	VIH	2.0	-	-	V	
Input low voltage	VIL	-	-	0.8	V	

Output low voltage	VOL1	-	-	0.4	V	IOL1=4.4mA
Output low voltage for LEDS	VOL2	-	-	3.2	V	IOL2=10mA
Internal Pull-high resistance (PORT B, E)	R <sub>PH1</sub>	2	-	16	KΩ	V <sub>PH1</sub> =0
Internal Pull-high resistance for DATA CLK	R <sub>PH2</sub>	3.5	4.2	5	KΩ	V <sub>PH2</sub> =0
Output low voltage for DATA CLK	VOL3	-	-	0.4	V	IOL3=5mA

## 8. APPLICATION CIRCUIT

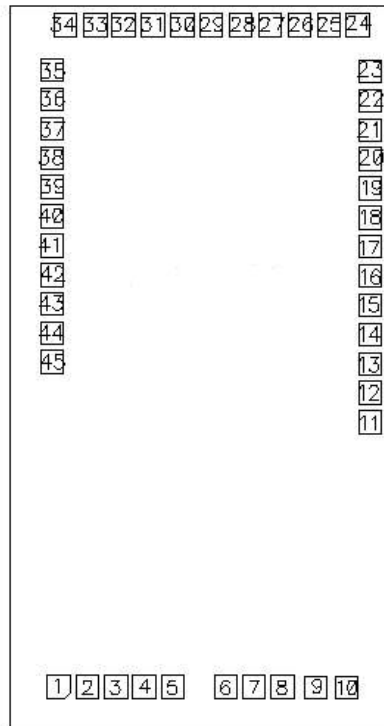


## 9. APPLICATION MATRIX

	R0	R1	R2	R3	R4	R5	R6	R7
C0	Pause 126	Power	€	Sleep	Ctrl-R 064	Wake up	Ctrl-L 058	F5 116
	Q 017				Tab 016		A 031	ESC 110
C2	W 018	Cap 030	S 032	K45 045	X 047	CHG 132	F1 112	2(@) 003
	E 019	F3 114	D 033	F4 115	C 048	ROMA 133	F2 113	3(#) 004
C4	R 020	T 021	F 034	G 035	V 049	B 050	5(%) 006	4(\$) 005
	U 023	Y 022	J 037	H 036	M 052	N 051	6(^) 007	7(&) 008
C6	I 024	]({) 028	K 038	F6 117	,(<) 053	K56 056	+(<=) 013	8(*<) 009
	O 025	F7 118	L 039	¥ E045	.(>) 054	APP APP	F8 119	9(( 010
C8	P 026	[({) 027	;(:) 040	'(") 041	K42 042	/(?<) 055	_(-) 012	0()) 011
	SCROLL 125	00	Fn	ALT-L 060	Office Lock	ALT-R 062	000	Print 124
K14 014	Back 015			\( ) 029		F11 122		Enter 043
C11	7 (K) 091	4 (K) 092	1 (K) 093	Space 061	Num 090	↓ 084	Del 076	Power Sleep
	8 (K) 096	5 (K) 097	2 (K) 098	0 (K) 099	/<) (K) 095	→ 089	Ins 075	
C13	9 (K) 101	6 (K) 102	3 (K) 103	. (Del) (K) 104	* (K) 100	- 105	Page up 085	Page down 086
	+ (K) 106	K107	Enter (K) 108	↑ 083	Play/Paus e	← 079	Home 080	END 081
Wake up	Shift-L 044		Shift-R 057	Volumn- Volumn+		NextTrack PrevTrack	Media	
C16	Mail	WIN-L	www Forward	www Stop	www Back	www Refresh	Mute	www Search
C17	K150 (KC-L)	www Favorite	Win-R	MyCompu ter	Stop	Calculator	Web/Home	K151 (KC-R)

NOTE: ALL DATA AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

## 10. PAD DIAGRAM



Substrate Size: 1800μm×3000μm

Substrate Connect GND

Pin No.	Pin Name	Coordinate		Pin No.	Pin Name	Coordinate	
		X	Y			X	Y
1	PC7	171.42	148.06	24	PA5	1226.48	2484.96
2	PC6	273.67	148.06	25	PA6	1123.26	2484.96
3	VDD	373.67	148.06	26	PA7	1020.04	2484.96
4	TEST	473.67	148.06	27	PD0	916.82	2484.96
5	VDD_A	573.67	148.06	28	PD1	813.60	2484.96
6	V33	760.31	148.06	29	PD2	710.38	2484.96
7	VOUT	860.31	148.06	30	PD3	607.16	2484.96
8	GND	960.31	148.06	31	PD4	503.94	2484.96
9	PC5	1078.20	146.91	32	PD5	400.72	2484.96
10	PC4	1188.20	146.91	33	PD6	300.72	2484.96
11	PE6	1271.23	1082.05	34	PD7	194.28	2484.96
12	PE7	1271.23	1185.27	35	PB0	148.06	2325.01
13	PE0	1271.23	1288.49	36	PB1	148.06	2221.79

14	PE1	1271.23	1391.71	37	PB2	148.06	2118.57
15	PE2	1271.23	1494.93	38	PB3	148.06	2015.35
16	PE3	1271.23	1598.15	39	PB4	148.06	1912.13
17	PE4	1271.23	1701.37	40	PB5	148.06	1808.91
18	PE5	1271.23	1804.59	41	PB6	148.06	1705.69
19	PA0	1271.23	1907.81	42	PB7	148.06	1602.47
20	PA1	1271.23	2011.03	43	PC2	148.06	1500.22
21	PA2	1271.23	2114.25	44	PC1	148.06	1397.97
22	PA3	1271.23	2217.47	45	PC0	148.06	1295.72
23	PA4	1271.23	2320.69				

## 11. REVICION HICTORY

Version	Update date	Revised Content	Version by	Confirmed by
V1.0	2011-3-28	Orignal	LiuXing	Alan