Multi-Backlight Game Keyboard Series

IST83020 Datasheet

USB Game Keyboard IC

Version 1.00

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1. General Description

IST83020 is a customized multi-backlight USB game keyboard chip. The chip can support up to 160 keys, and the function of keyboard array can be modified at will. Fn+F1~F12 combination k, film keyboard array up to 26 keys without punching, according to film keyboard array can downward support 19 keys no punch, etc. IST83020 also supports the function of encoder, which can be customized as volume (±).

In the application of backlight, IST83020 has its own characteristics. It supports three single-line flashlight types, each of which has 9 backlight modes (including synchronization, Brilliant backlight mode and reaction mode). The combination keys Fn + Scr switch backlight mode, Fn + Ins switch color and so on are supported in both lamp types.

IST83020 can be divided into IST83020-01, IST83020-02 and IST83020-03 according to different film arrays. [See IST83020_Matrix for details]

It has a built-in LED driver and internal oscillator to minimize the external components.

2. Feature

- Keyboard Array 20X8, Various Array Types for Selection

- Film keyboard arrays have a maximum of 26 keys without punching, 19 keys without punching, etc

- Keyboard Key Conflict Detection

- Encoder adjusts volume

- Compliant with USB2.0 and USB HID Specification V1.1.

- Supports different versions of Windows, MAC OS, Linux systems

- support three single-line flashlight types, each of which has 9 backlight modes (including synchronization, Brilliant backlight mode and reaction mode)

- Fn+F1~F12 combination key function (multimedia, full key lock, etc.)

- It has a built-in LED driver and internal oscillator to minimize the external components.

Typical applications: ordinary film keyboard, light-emitting film keyboard, game keyboard, etc

3. Block Diagram

Figure 3-1 Block Diagram

4. PAD

4.1 PAD Assignment

(1770um,1910um)

Figure 4-1. PAD Assignment

4.2 PAD Definition

PAD No.	Pin Name	Type	Function deccription
1~2	VDD5V	POWER	5V power input
3	WINLCK	OUT	Win Lock or game mode indicator light
4	CAPS	OUT	Caps Lock indicator light
5	NUM	OUT	Num Lock indicator light
6	SCR	OUT	Scroll Lock indicator light
7~14	R0~R7	IN	Keyboard Scanning Input
15~34	C0~C19	OUT	Keyboard Scanning Output
35			Undefined
36	W2	IN	Volume Encoder Input
37	W1	IN	Volume Encoder Input
38	LED_SW	OUT	Backlight power control signal
39	SLED2	OUT	Single-line flashlight signal
40	SLED1	OUT	Single-line flashlight signal
41	SLED0	OUT	Single-line flashlight signal
42	DM	IN/OUT	USB D-
43	DP	IN/OUT	USB D+
44~45	GND	GROUND	GROUND
46~48			Undefined
49	ModeOpt	IN	Single-line flashlight Mode select

Table 4-1 PAD definition

5. Application Note

5.1 Keyboard and Keyboard Indicator lamp

5.1.1 Keyboard Array Function

IST83020 Keyboard Array has many choices, which can be divided into different array functions and the number of keys without punching, such as IST83020-01、IST83020-02、IST83020-03、….

5.1.2 IST83020-01Array

	R0	R1	R2	R3	R4	R5	R6	R7
C0	Tab	`~	F7	Y	End	7&	:;	LedSpd+
	16	1	118	22	81	8	40	
C1	Caps							
	30							
C2	X	2@	MyComputer	Play/Pause	Media	Shift-R	Mute	CD Stop
	47	3				57		
C3	F	F1	F5	WWWBack	KeyLck	WWWForward	WWWStop	WWWSearch
	34	112	116					
C4	Shift-L	U	F6	F2	WinLck	Enter-L	LedMode	LedColor
	44	23	117	113		43		
C5	Ctrl-L	K	P	LedBrt+	LedBrt-	KeyExchg	Esc	Mail
	58	38	26				110	
C6	APP	G	↑	←	↓	M	Alt-L	→
		35	83	79	84	52	60	89
C7	T	F3		KeyPad(-)	KeyPad(+)	K107	KeyPad(Ent)	Rec
	21	114		105	106	107	108	
C8	D	=+	F9	LedOnOff	]}	9(	' "	Fn
	33	13	120		28	10	41	
C9	S	-	F8	4$	[{	8*	Insert	N
	32	12	119	5	27	9	75	51
C10	W	BackSpace	F11	PrintScr	Home	Del	H	.>
	18	15	122	124	80	76	36	54
C11	Q	J	F10	K14	|	0)	PageDown	,<
	17	37	121	14	29	11	86	53
C12	B	KeyPad(0 0)	KeyPad(0 0 0)	NumLck	KeyPad(7)	KeyPad(4)	KeyPad(1)	LedSpd-
	50			90	91	92	93	
C13	V	5%	Boss	KeyPad(/)	KeyPad(8)	KeyPad(5)	KeyPad(2)	KeyPad(0)
	49	6		95	96	97	98	99
C14	R	6^	¥	KeyPad(*)	KeyPad(9)	KeyPad(6)	KeyPad(3)	KeyPad(.)
	20	7		100	101	102	103	104
C15	E	L	F12	ScrollLck	Pause	PageUp	K42	/?
	19	39	123	125	126	85	42	55
C16	A	F4	O	Calculator	K45	K150	K151	Win-R
	31	115	25		45	150	151	
C17	Space	I	K56	Win-L	WWWHome	N-Chg	Chg	Roma
	61	24	56			131	132	133
C18	Z	1!	Power	PreTrack	ALT-R	NextTrack	Sleep	WakeUp
	46	2			62			
C19	C	3#	€	Vol+	Vol-	WWWRefresh	Ctrl-R	WWWFavorite
	48	4					64	

Fn+F1	Player	Fn+F7	Play/pasue
Fn+F2	Volume-	Fn+F8	Stop
Fn+F3	Volume+	Fn+F9	Brower
Fn+F4	Mute	Fn+F10	Mail
Fn+F5	Next Song	Fn+F11	My computer
Fn+F6	Last Song	Fn+F12	Full key Lock

【26key without punching】IST83020-01 array and Fn combination Key function compatible with SX83091、HK9705

Table 5-1 IST83020-01Array

5.1.3 IST83020-02 Array

	R0	R1	R2	R3	R4	R5	R6	R7
C0	Z 46	1! 2	Power	PreTrack	ALT-R 62	NextTrack	Sleep	WakeUp
C1	C 48	3# 4	€	Vol+	Vol-	WWWRefresh	Ctrl-R 64	WWWFavorite
C2	V 49	5% 6%	F5 116	WWWBack	Alt-L 60	WWWForward	WWWStop	WWWSearch
C3	F 34	F3 114	Pause 126	LedSpd+	LedSpd-	LedColor	Ctrl-L 58	Mail
C4	K56 56	4$ 5	Space 61	Win-L	WWWHome	N-Chg 131	Chg 132	Roma 133
C5	K14 14	F4 115	A 31	Calculator	WinLck	K150 150	K151 151	LedOnOff
C6	F7 118	`~ 1	S 32	Y 22	P 26	7& 8	LedMode	Win-R
C7	T 21	BackSpace 15	→ 89	KeyPad(-) 105	KeyPad(+) 106	K107 107	KeyPad(Ent) 108	Caps 30
C8	F10 121	F2 113	Q 17	O 25	\\| 29	0) 11	K42 42	,< 53
C9	F9 120	=+ 13	D 33	I 24	]} 28	9(10	' " 41	Fn
C10	F11 122	F1 112	W 18	PrintScr 124	Home 80	Del 76	Insert 75	.> 54
C11	F12 123	L 39	E 19	ScrollLck 125	End 81	PageUp 85	PageDown 86	/? 55
C12	App	:; 40	↑ 83	NumLck 90	KeyPad(7) 91	KeyPad(4) 92	KeyPad(1) 93	K45 45
C13	Esc 110	K 38	← 79	KeyPad(/) 95	KeyPad(8) 96	KeyPad(5) 97	KeyPad(2) 98	KeyPad(0) 99
C14	R 20	J 37	↓ 84	KeyPad(*) 100	KeyPad(9) 101	KeyPad(6) 102	KeyPad(3) 103	KeyPad(.) 104
C15	F8 119	-_ 12	Tab 16	U 23	[{ 27	8* 9	H 36	N 51
C16	X 47	2@ 3	My Computer	Play/Pause	Media	Shift-R 57	Mute	CD Stop
C17	G 35	KeyLck	LedBrt+	LedBrt-	KeyExchg		B 50	M 52
C18	Enter 43	6^ 7	F6 117	KeyPad(0 0)	KeyPad(0 0 0)	Shift-L 44	¥	Boss
C19								

Fn+F1	Player	Fn+F7	Play/pasue
Fn+F2	Volume-	Fn+F8	Stop
Fn+F3	Volume+	Fn+F9	Brower
Fn+F4	Mute	Fn+F10	Mail
Fn+F5	Next Song	Fn+F11	My computer
Fn+F6	Last Song	Fn+F12	Full key Lock

【19key without punching】IST83020-02 array and Fn combination Key function compatible with SX83089-035D、HCT-303E

Table 5-2 IST83020-02 Array

5.1.4 IST83020-03 Array

	R0	R1	R2	R3	R4	R5	R6	R7
C0	Z / 46	1! / 2	Power	PreTrack	ALT-R / 62	NextTrack	Sleep	WakeUp
C1	C / 48	3# / 4	€	Vol+	Vol-	WWWRefresh	Ctrl-R / 64	WWWFavorite
C2	V / 49	5% / 6%	F5 / 116	WWWBack	Alt-L / 60	WWWForward	WWWStop	WWWSearch
C3	F / 34	F3 / 114	Pause / 126	LedSpd+	LedSpd-	LedColor	Ctrl-L / 58	Mail
C4	K56 / 56	4$ / 5	Space / 61	Win-L	WWWHome	N-Chg / 131	Chg / 132	Roma / 133
C5	K14 / 14	F4 / 115	A / 31	Calculator	WinLck	K150 / 150	K151 / 151	LedOnOff
C6	F7 / 118	`~ / 1	S / 32	Y / 22	P / 26	7& / 8	LedMode	Win-R
C7	T / 21	BackSpace / 15	→ / 89	KeyPad(-) / 105	KeyPad(+) / 106	K107 / 107	KeyPad(Ent) / 108	Caps / 30
C8	F10 / 121	F2 / 113	Q / 17	O / 25	| / 29	0) / 11	K42 / 42	,< / 53
C9	F9 / 120	=+ / 13	D / 33	I / 24	]} / 28	9(/ 10	' " / 41	Fn
C10	F11 / 122	F1 / 112	W / 18	PrintScr / 124	Home / 80	Del / 76	Insert / 75	.> / 54
C11	F12 / 123	L / 39	E / 19	ScrollLck / 125	End / 81	PageUp / 85	PageDown / 86	/? / 55
C12	App	;: / 40	↑ / 83	NumLck / 90	KeyPad(7) / 91	KeyPad(4) / 92	KeyPad(1) / 93	K45 / 45
C13	Esc / 110	K / 38	← / 79	KeyPad(/) / 95	KeyPad(8) / 96	KeyPad(5) / 97	KeyPad(2) / 98	KeyPad(0) / 99
C14	R / 20	J / 37	↓ / 84	KeyPad(*) / 100	KeyPad(9) / 101	KeyPad(6) / 102	KeyPad(3) / 103	KeyPad(.) / 104
C15	F8 / 119	-_ / 12	Tab / 16	U / 23	[{ / 27	8* / 9	H / 36	N / 51
C16	X / 47	2@ / 3	My Computer	Play/Pause	Media	Shift-R / 57	Mute	CD Stop
C17	G / 35	KeyLck	LedBrt+	LedBrt-	KeyExchg		B / 50	M / 52
C18	Enter / 43	6^ / 7	F6 / 117	KeyPad(0 0)	KeyPad(0 0 0)	Shift-L / 44	¥	Boss
C19								

Fn+F1	Player	Fn+F7	Play/pasue
Fn+F2	Volume-	Fn+F8	Stop
Fn+F3	Volume+	Fn+F9	Brower
Fn+F4	Mute	Fn+F10	Mail
Fn+F5	Next Song	Fn+F11	My computer
Fn+F6	Last Song	Fn+F12	Full key Lock

【19key without punching】 IST83020-03 array and Fn combination Key function compatible with SX83089-035E、HK9708

Table 5-3 IST83020-03Array

5.1.2 Num，Scroll，Caps，WinLck

IST83020 has three standard indicators, Num, Scroll and Caps. The corresponding key operation will indicate the corresponding state. WinLck indicator light is to lock the Win and App keys. After locking the Win and App keys through the combination key Fn+Win-L, the WinLck indicator light will

be on, otherwise it will be extinguished.

5.2 Backlight LED

5.2.1 Lamp Type Note

Supporting three single-line dazzling lights. ModeOpt needs GND. There are three "SLED0/ SLED1 /SLED2" signals output to single-line flashlight. They all support flashing backlight mode, synchronous backlight mode and reaction mode. There are seven backlight colors. Flash color lamp uses special LED lamp or RGB lamp driven by driver chip (SNP15703). Up to 9 lamps can be used on each road. The default backlight mode of SLED0 is: streaming color; the default backlight mode of SLED1 is: running clouds and running water; and the default backlight mode of SLED2 is breathing.

5.2.2 Ambilight Backlight Mode

Colorful	M-Color	S-Color	Comet-Tail	Ambilight
Color	Blue/Red/Green/Cyan/Yellow/Pink/White	Blue/Red/Green/Cyan/Yellow/Pink/White	None	Brilliant

Table 5-4 Ambilight Backlight Mode

5.2.3 Synchronous Backlight Mode

Synchronous	Breathing	Constantly Bright	Mute	Neon
Color	Blue/Red/Green/Cyan/Yellow/Pink/White	Blue/Red/Green/Cyan/Yellow/Pink/White	None	Colorful

Table 5-5 Synchronous Backlight Mode

5.2.4 Reaction Mode

The default backlight is turned off. When the button is pressed, the backlight mode will perform a period of cyclic breathing and then turn off the light. Each time the key triggers the response mode, the color is changed.

5.2.5 Backlight Control method

● Combine keys Fn + Scr to switch lighting mode (excluding silence).
● Combination of keys Fn + Ins, switch the light color, such as breathing cycle, then cycle by cycle to switch monochrome, if bright, then switch monochrome by monochrome.

● Combination of keys Fn + PrtScr, switching lights on/off, from the light on, mute, light on (the previous mode).

● Combination button Fn+↑↓, adjust backlight brightness under constant light (8 gears)

● Combination keys Fn+←→, adjust backlight speed in other backlight modes (6 gears)

● Combination button Fn + L, If use the single-line dazzling lights, switch the current configuration of the light. The current light will flicker white for a period of time and then recover. At this time, other key combinations (Fn + Scr / Fn + Ins / Fn + PrtScr) will configure the current one-way light

5.3 Fn Composite Key Function

	Button	Function
Fn+	F1~F12	Ordinary mode/game mode can be customized to multimedia/full-key locking, etc
	W	WASD and ↑←↓→exchange
	Win-L	Lock Win and App
	↑	Increase backlight brightness（8 gear）
	↓	Decrease backlight brightness（8 gear）
	←	Decrease backlight speed（6 gears）
	→	Increase backlight speed（6 gears）
	Scr	Swtich backlight mode（Up to 8 species）
	Ins	Switch backlight color（Up to 7 species）
	PrtScr	Turn on/off backlight
	L	Backlight switching in current configuration (single-line brilliant lights only)

Table 5-6 Fn Composite key function

5.4 Encoder

Encoder function is volume + volume -.

6. Electrical Characteristics

6.1 Absolute Maximum Rating

Parameters	Symbol	Min	Max	Unit	Notes
Supply Voltage	V_{DD}	-0.5	5.5	V	
Operating Temperature	T_O	-20	70	℃	
Storage Temperature	T_S	-50	125	℃	
Lead Solder Temperature	T_{SOLDER}	-	260	℃	
Input Voltage	V_{in}	-0.5	5.5	V	
ESD	V_{ESD}	2		KV	All pins, human body model

6.2 DC Electrical Characteristic(VDD = 5.0V, Temperature = 25℃)

Parameter	Symbol	Min	Typical	Max	Units	Notes
Operating Voltage	V_{DD}	4.5	5	5.5	V	
Operating Current	I_{OP}	-	3.6	-	mA	F_{OSC}=48MHz, excluding Backlight
Input Voltage High	V_{IH}	2	-	-	V	
Input Voltage Low	V_{IL}	-	-	0.8	V	
Output Voltage High	V_{OH}	2.8	-	3.6	V	
Output Voltage Low	V_{OL}	0	-	0.4	V	
LED Current (CAPS、NUM、SCR、WINLCK/GAME)	I_{LED}	-	10	-	mA	

7. Application Circuit
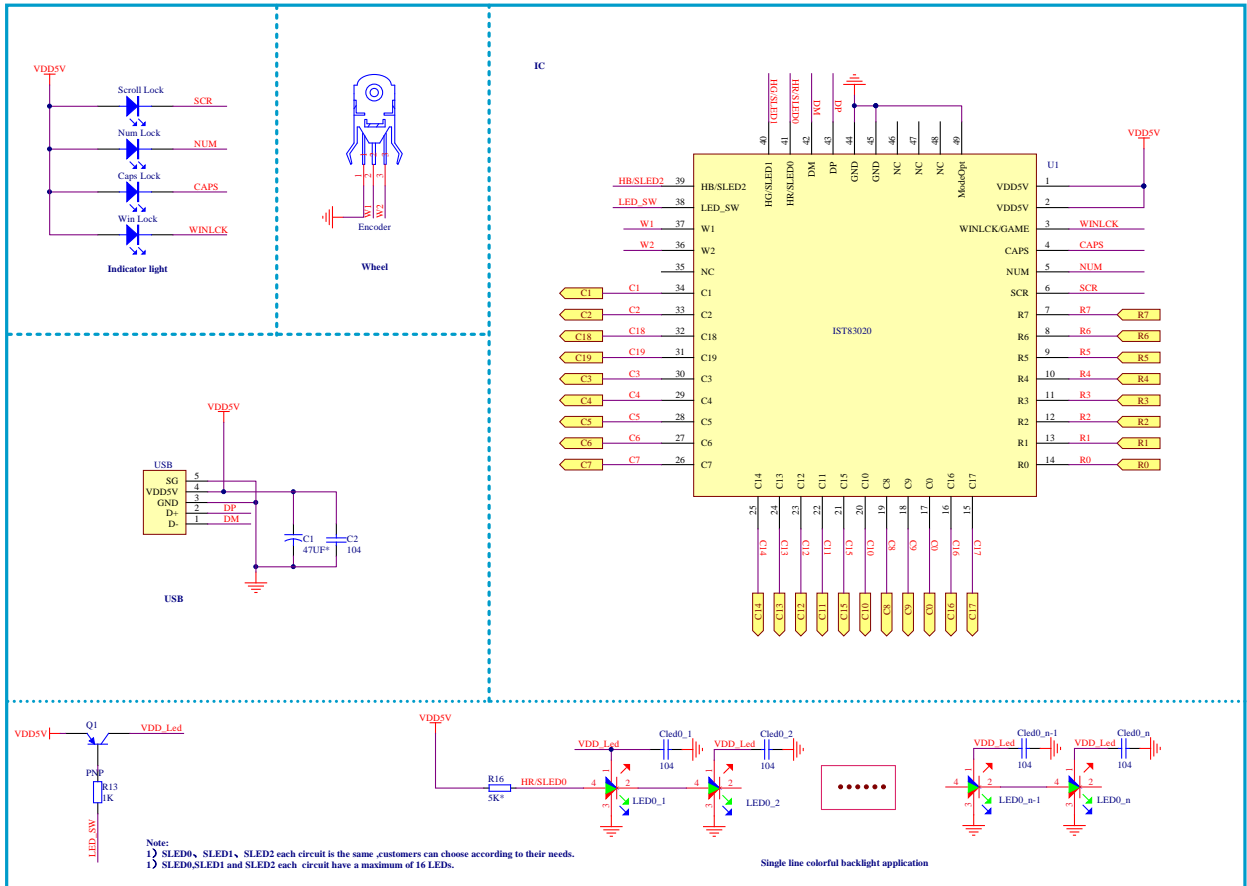
7.1 Typical Application Circuit

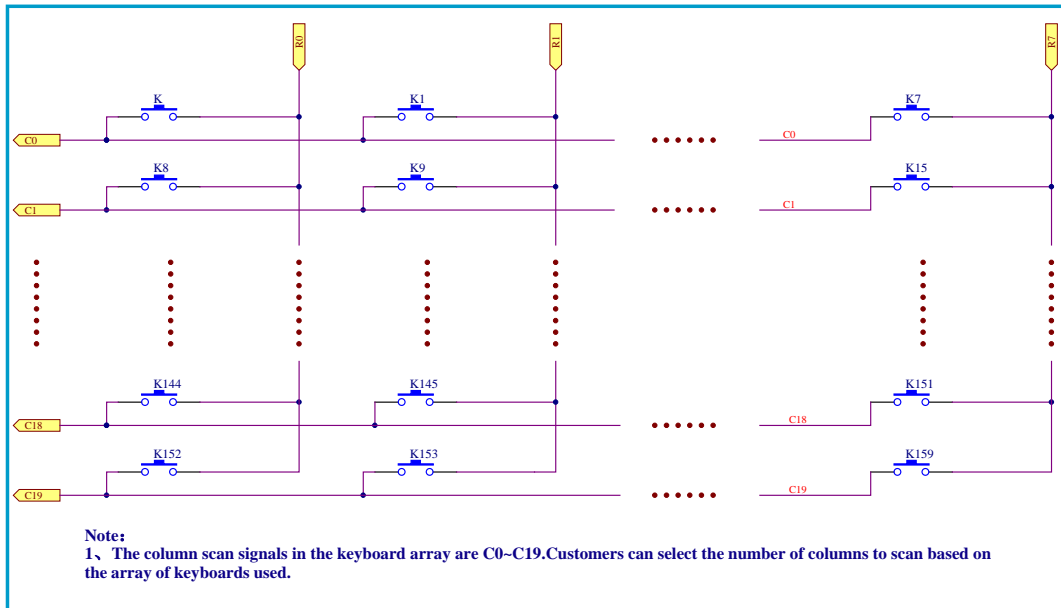Figure 7-1 Typical Application Circuit

7.2 Keyboard Array Circuit
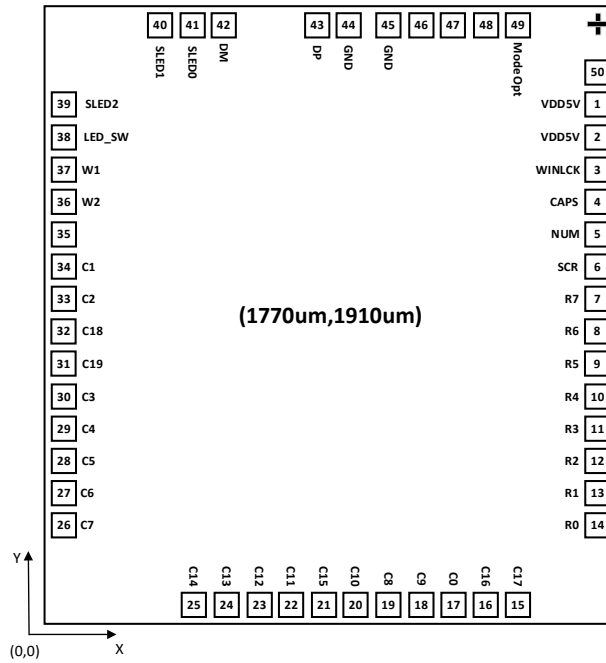

Figure 7-2. Keyboard Array Circuit

8. PAD Location

Figure 8-1. PAD Location
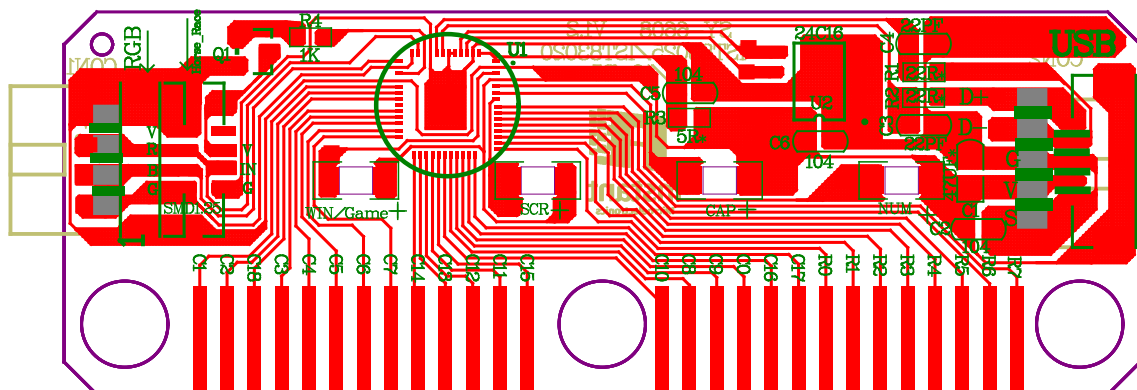
PAD NO.	NAME	X	Y	PAD NO.	NAME	X	Y
1	VDD5V	1709.65	1604.24	26	C7	60.34	304.24
2	VDD5V	1709.65	1504.24	27	C6	60.34	404.24
3	WINLCK	1709.65	1404.24	28	C5	60.34	504.24
4	CAPS	1709.65	1304.24	29	C4	60.34	604.24
5	NUM	1709.65	1204.24	30	C3	60.34	704.24
6	SCR	1709.65	1104.24	31	C19	60.34	804.24
7	R7	1709.65	1004.24	32	C18	60.34	904.24
8	R6	1709.65	904.24	33	C2	60.34	1004.24
9	R5	1709.65	804.24	34	C1	60.34	1104.24
10	R4	1709.65	704.24	35			
11	R3	1709.65	604.24	36	W2	60.34	1304.24
12	R2	1709.65	504.24	37	W1	60.34	1404.24
13	R1	1709.65	404.24	38	LED_SW	60.34	1504.24
14	R0	1709.65	304.24	39	SLED2	60.34	1604.24
15	C17	1464.72	60.31	40	SLED1	356.5	1849.69
16	C16	1364.72	60.31	41	SLED0	456.5	1849.69
17	C0	1264.72	60.31	42	DM	556.5	1849.69
18	C9	1164.72	60.31	43	DP	843.5	1849.69
19	C8	1064.72	60.31	44	GND	943.5	1849.69
20	C10	964.72	60.31	45	GND	1064.72	1849.69
21	C15	864.72	60.31	46			
22	C11	764.72	60.31	47			
23	C12	664.72	60.31	48			
24	C13	564.72	60.31	49	ModeOpt	1464.72	1849.69
25	C14	464.72	60.31				

9. Typical Application PCB and Bonding

9.1 Typical Application PCB

Note: 1. Safety Circuit, PCB compatible with IST83010、IST83020

2.19-key non-punching, four indicator lamp, SLED0 single-line dazzling lights

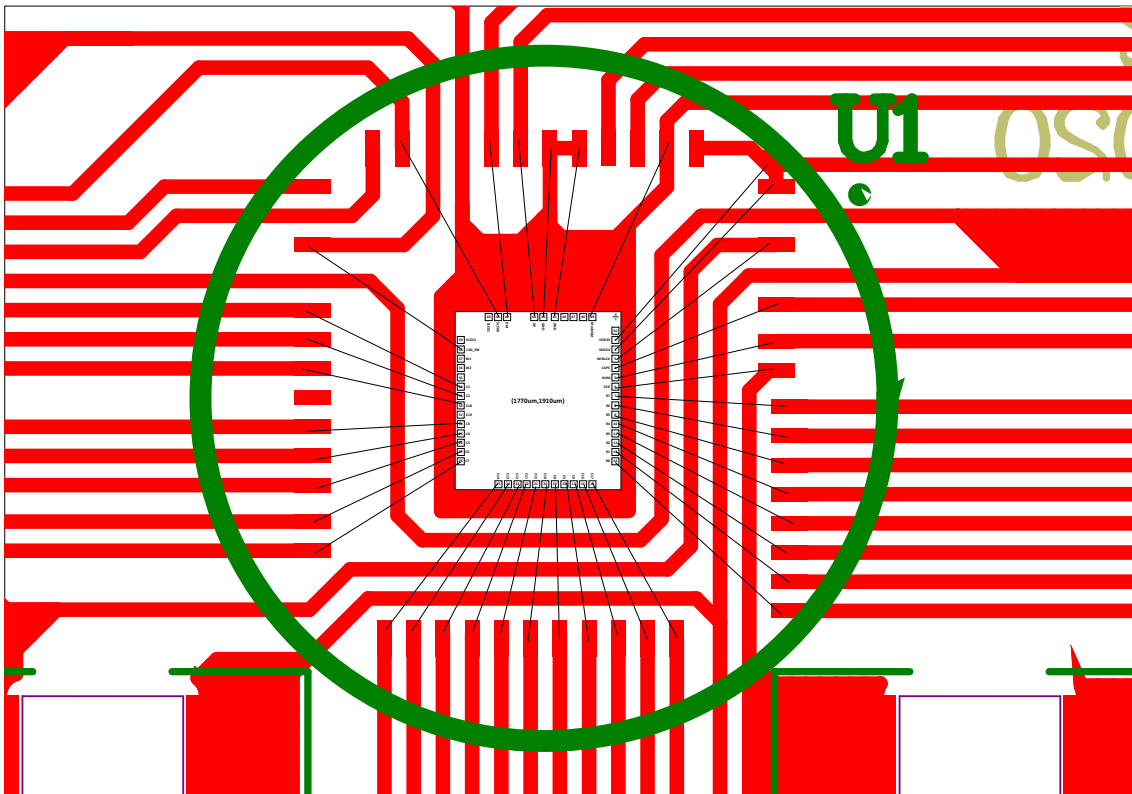Figure 9-1 Typical Application PCB

9.2 Typical Application Bonding

Figure 9-2 Typical Application Bonding

10. Revision History

Version	Date	Reviser	Description
IST83020_Spec_EN.V1.00	2019/03/22	Jimmy	Create Preliminary Version