

2.1A Charge 2.4 A Highly integrated power bank for discharge SOC

1 characteristic

- **Synchronous switch charge and discharge**
 - 2.4A Synchronous boost conversion, 2.1A Synchronous switch charging
 - and boosting efficiency up to 96%
 - The highest charging efficiency 97%
 - Built-in power path management, support charging and discharging
 - Support load high current line compensation function
- **Charge**
 - Adaptive charging current adjustment, matching all adapters
 - Charging voltage accuracy: $\pm 0.5\%$
 - support 4.20/4.30/4.35/4.40V Battery
- **Power display**
 - support 4,3,2,1 Pieces led Power display
- **Feature rich**
 - Press the key to turn on
 - Built-in lighting driver
 - Automatic detection of mobile phone plugging and unplugging
- **Low power consumption**
 - Intelligently identify load, automatically enter standby
 - Standby power consumption is less than 100 μ A
- **BOM Minimalist**
 - power MOS Built-in, single inductor realizes charging and discharging
- **Multiple protection, high reliability**
 - Output over current, over voltage, short circuit protection
 - Input overvoltage, overcharge, overdischarge, overcurrent
 - discharge protection
 - ESD 4KV, Instantaneous withstand voltage 12V

2 application

- **Power Bank/Power Bank**
- **Portable devices such as mobile phones and tablets**

3 Introduction

IP5306 It is a multi-function power management with integrated boost converter, lithium battery charging management, and battery power indicator SOC, Provide a complete power solution for mobile power.

IP5306 The high integration level and rich functions of the sci BOM cost.

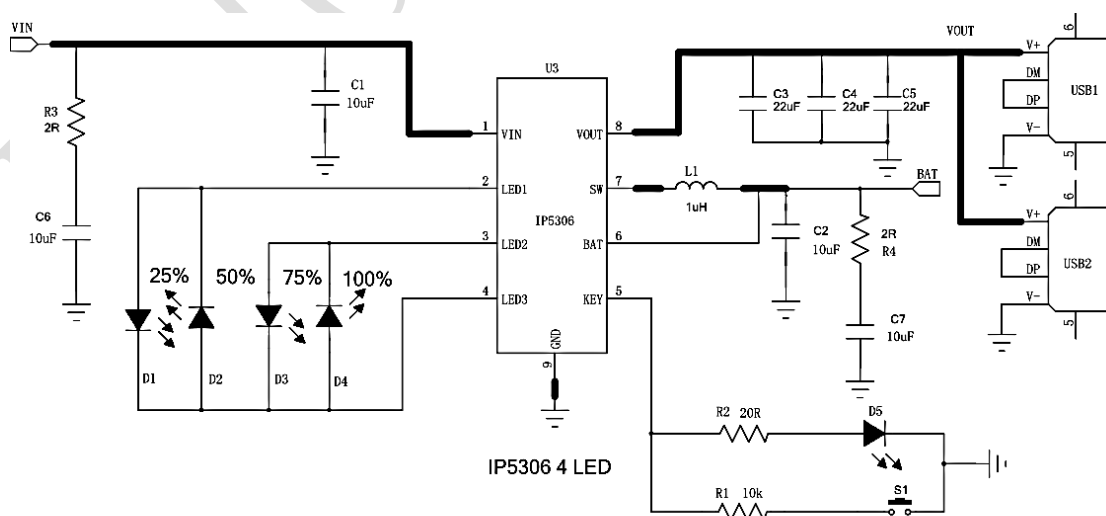
IP5306 Only one inductor is needed to realize the buck and boost functions.DC-DC The converter works at 500KHz, Can support low-cost inductors and capacitors.

IP5306 Synchronous boost system provides maximum 2.4A Output current, conversion efficiency is as high as 91%. When there is no load, it automatically enters the dormant state, and the quiescent current drops to 50uA.

IP5306 Using switch charging technology to provide maximum 2.1A Current, charging efficiency is as high as 97%. Built-in IC The temperature and input voltage intelligently adjust the charging current.

IP5306 support 1,2,3,4 Pieces led Power display.IP5306 support I2C Communication can be flexibly customized for requirements.

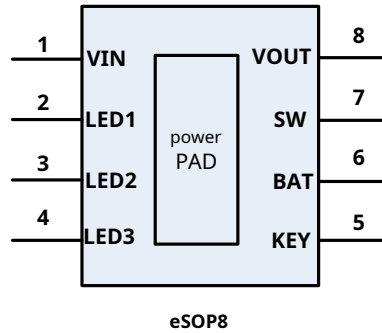
IP5306 use eSOP8L Package.



如果不需要照明功能，R2和D5可以省略

picture 1 Simplified application schematic (4 LED (Indicating battery))

4 Pin definition



picture 2 IP5306 Pin diagram

Pin Name	Pin Number	Pin Description
VIN	1	DC5V Charging input pin
LED1	2	led Drive pin
LED2	3	led Drive pin
LED3	4	led Drive pin
KEY	5	Key input, lighting drive multiplexing
BAT	6	Boost input pin, connected to the positive pole of the lithium battery.
SW	7	DC-DC Switch pin
VOUT	8	5V Boost output pin
PowerPAD		Connect to GND

5 IP Series mobile power IC Model selection table

IC model	Discharge		main feature							Encapsulation	
	Discharge	charge	led Number of lights	Illumination	button	I2C	DCP	Type-C	QC2.0/3.0	Specification	Cum Allow
IP5303	1.0A	1.2A	1,2	√	√	-	-	-	-	eSOP8	P2P
IP5305	1.0A	1.2A	1,2,3,4	√	√	-	-	-	-	eSOP8	
IP5306	2.4A	2.1A	1,2,3,4	√	√	√	-	-	-	eSOP8	
IP5108E	2.0A	1.0A	3,4,5	√	√	--		-	-	eSOP16	P2P
IP5108	2.0A	2.0A	3,4,5	√	√	√-		-	-	eSOP16	
IP5207	1.2A	1.2A	3,4,5	√	√	-√		-	-	QFN24	
IP5109	2.1A	2.1A	3,4,5	√	√	√	-	-	-	QFN24	P2P
IP5209	2.4A	2.1A	3,4,5	√	√	√	√	-	-	QFN24	
IP5219	2.4A	2.1A	3,4,5	√	√	√	√	√	-	QFN24	
IP5318Q	18W 4.8A	2.3, 4.5	3,4,5	√	√	√	√	-	√	QFN40	P2P
IP5318	18W 4.8A	2.3, 4.5	3,4,5	√	√	√	√	√	√	QFN40	

IP5306 Order model

Order model	Cell type
IP5306	4.20V
IP5306_4.30V	4.30V
IP5306_4.35V	4.35V
IP5306_4.40V	4.40V

6 Limit parameters

parameter	symbol	value	unit
Port input voltage range	V_{IN}	-0.3 ~ 5.5	V
Working environment temperature range	T_A	0 ~ 70	°C
Junction temperature range	T_J	-40 ~ 150	°C
Storage temperature range	T_{stg}	-60 ~ 150	°C
Thermal resistance (junction temperature to environment)	θ_{JA}	50	°C/W
Mannequin (HBM)	ESD	4	KV

* Stresses higher than the values listed in the Absolute Maximum Ratings section may cause permanent damage to the device. Excessive exposure under any absolute maximum rating conditions may affect the reliability and service life of the device.

7 Recommended working conditions

parameter	symbol	Minimum	Typical value	Max	unit
Input voltage	V_{IN}	4.5	5	5.5	V
Load current	I	0	2.4	3	A
Working temperature	T_A	0	--	70	°C

* Beyond these operating conditions, the operating characteristics of the device cannot be guaranteed.

8 Electrical characteristics

Unless otherwise specified, $T_A=25^{\circ}\text{C}$, $L=1.0\mu\text{H}$

parameter	symbol	Test Conditions	The smallest value	typical value	maximum value	unit
Charging system						
Input voltage	V_{IN}		4.5	5	5.5	V
Input working current	I_{VIN}	$V_{IN}=5\text{V}, f_s=500\text{KHz}$			2	mA
Input quiescent current		$V_{IN}=5\text{V}$, Device not switching		100		uA
Charging target voltage	V_{TRGT}			4.2		V
recharging current	I_{CHRG}			2.1	2.4	A
Trickle charge current	I_{TRKL}	$V_{IN}=5\text{V}, \text{BAT}=2.7\text{V}$		100		mA
Trickle cut-off voltage	V_{TRKL}			2.9		V
Recharge threshold	V_{RCH}			4.1		V

Charging cut-off time	T_{END}			twenty four		Hour
Input undervoltage protection	V_{UVLO}	Rising voltage		4.5		V
Undervoltage protection hysteresis	V_{UVLOH}			200		mV
Boost system						
Battery working voltage	V_{BAT}		3.0		4.4	V
Switch working battery input Current	I_{BAT}	$V_{BAT}=3.7V, V_{OUT}=5.0V, f_s=500KHz$		3		mA
		$V_{IN}=5V, \text{Device not switching}$		100		μA
DC The output voltage	V_{OUT}	$V_{BAT}=3.7V$		5.0		V
Output line compensation voltage	V_{OUT}	$V_{BAT}=3.7V$		5.15		V
Output line compensation current point	I_{out}	$V_{BAT}=3.7V$		1		A
Output voltage ripple	ΔV_{OUT}	$V_{BAT}=3.7V, V_{OUT}=5.0V, f_s=500KHz$		50		mV
Boost system power supply current	I_{vout}			2.4		A
Load overcurrent detection time	T_{UVD}	The output voltage is continuously lower than 4.2V		30		ms
Load short circuit detection time	T_{OCD}	The output current is continuously greater than 3.5A	150		200	μs
Control System						
operating frequency	f_s			500		KHz
PMOS On resistance	$r_{DS(on)}$			35		$m\Omega$
NMOS On resistance				30		$m\Omega$
Battery input standby current	I_{STB}	$V_{IN}=0V, V_{BAT}=3.7V$		50		μA
led Lighting drive current	Key			25		mA
led Display drive current	I_{L1}			4		mA
	I_{L2}					
	I_{L3}					
Automatic load detection time	T_{loadD}	The load current is continuously less than 45mA		32		s
Short key-press wake-up time	$T_{OnDebounce}$			50		ms
Open light time	$T_{Keylight}$			2		s
Thermal shutdown temperature	T_{OTP}	Rising temperature		125		$^{\circ}C$
Thermal shutdown temperature hysteresis	ΔT_{OTP}			40		$^{\circ}C$

9 Light display mode

- 4 Light mode

Discharge

Electricity C(%)	D1	D2	D3	D4
$C \geq 75\%$	Bright	Bright	Bright	Bright
$50\% \leq C < 75\%$	Bright	Bright	Bright	Extinguish
$25\% \leq C < 50\%$	Bright	Bright	Extinguish	Extinguish
$3\% \leq C < 25\%$	Bright	Extinguish	Extinguish	Extinguish
$0\% < C < 3\%$	1.5Hz Flashing	Extinguish	Extinguish	Extinguish

Charge

Electricity C(%)	D1	D2	D3	D4
full	Bright	Bright	Bright	Bright
$75\% \leq C$	Bright	Bright	Bright	1.5Hz Flashing
$50\% \leq C < 75\%$	Bright	Bright	1.5Hz Flashing	Extinguish
$25\% \leq C < 50\%$	Bright	1.5Hz Flashing	Extinguish	Extinguish
$C < 25\%$	1.5Hz Flashing	Extinguish	Extinguish	Extinguish

- 3 Light mode

The display mode of three lights is similar to that of four lights, and the battery power corresponding to each light is shown in the table below

	D1	D2	D3	D4
Three lights	3%	66%	100%	without
Four lights	25%	50%	75%	100%

- 2 Light mode

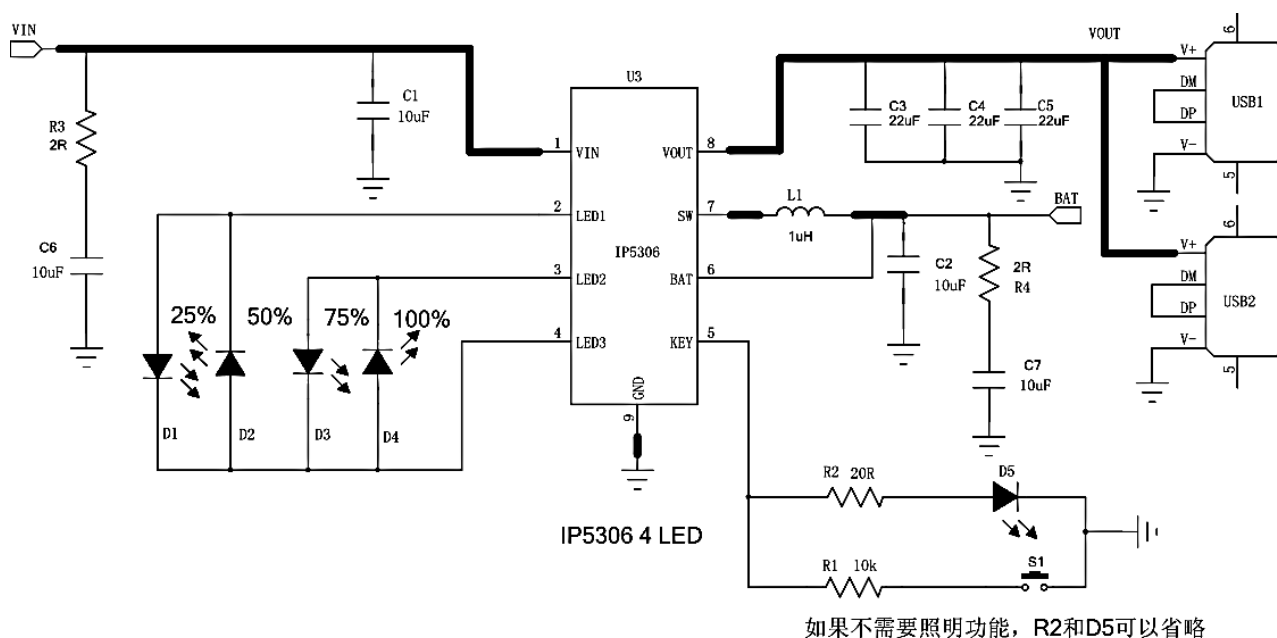
	state	D1	D2
Charge	Charging process	Flashing	Extinguish
	full	Bright	Extinguish
Discharge		Extinguish	Bright
	Low power	Extinguish	Flashing

- 1 Light mode

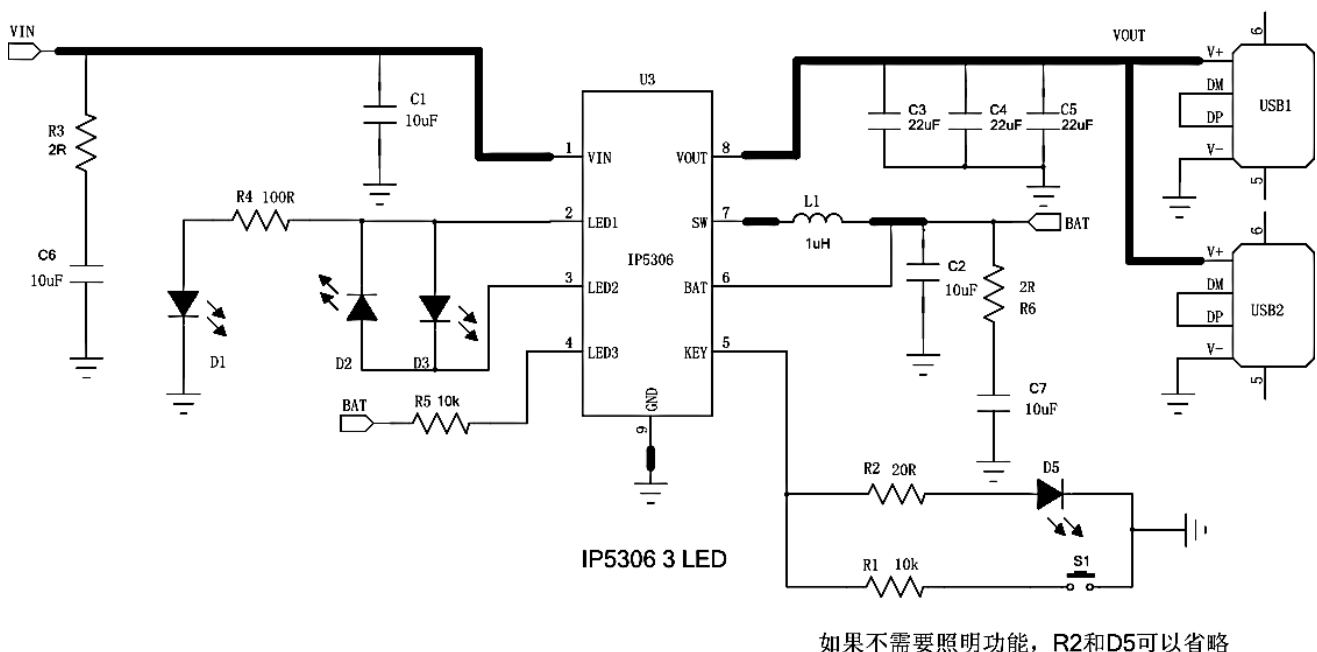
	state	D1
Charge	Charging process	Flashing
	Full	Bright
Discharge	Normal discharge	Bright
	Low power	Flashing

10 Typical application schematic

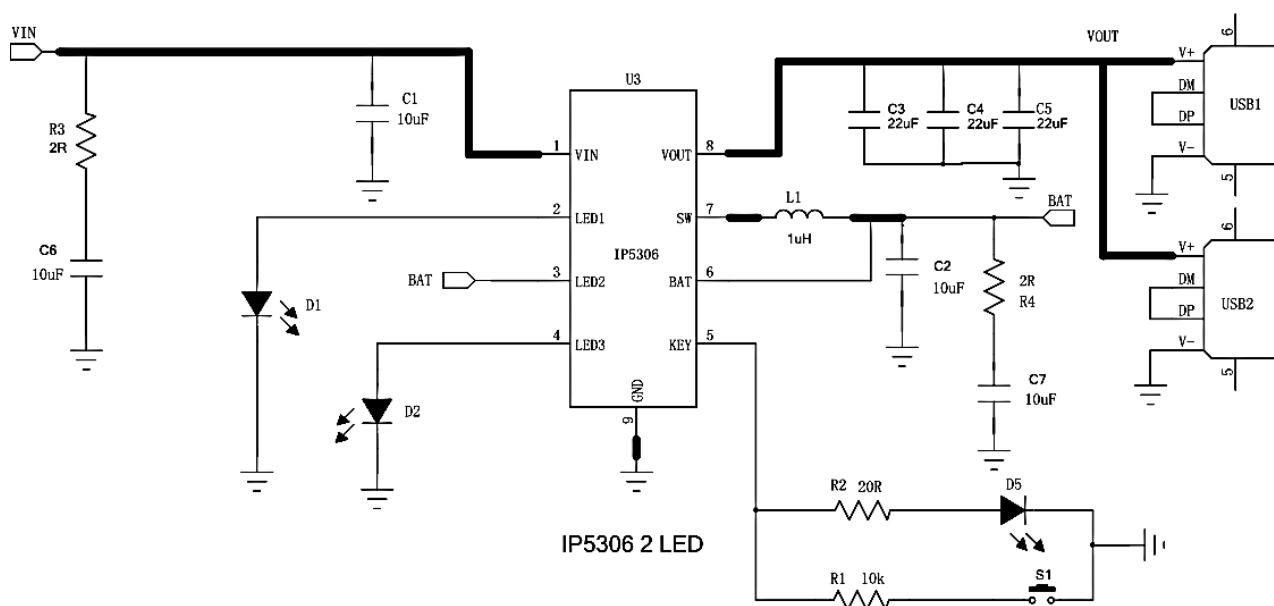
IP5306 Only inductance, capacitance, and resistance are needed to realize a fully functional mobile power solution.



picture 7 4LED Typical application schematic diagram of battery display

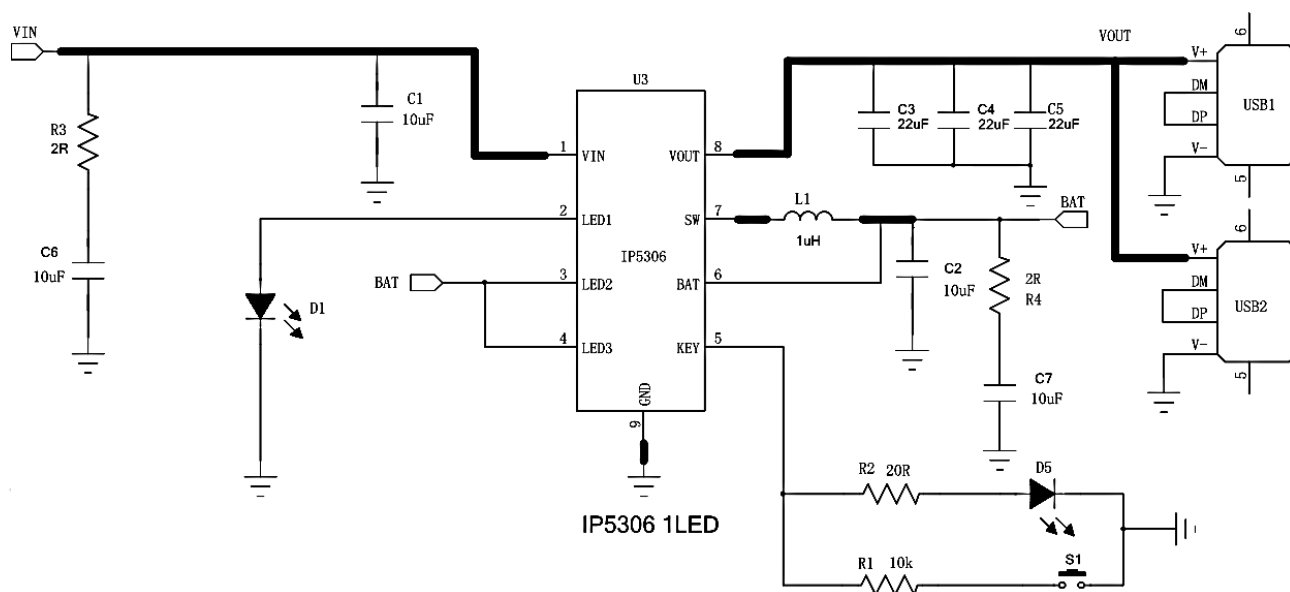


picture 8 3LED Typical application schematic diagram of battery display



如果不需要照明功能，R2和D5可以省略

picture 9 2LED Typical application schematic diagram of battery display



如果不需要照明功能，R2和D5可以省略

picture 10 1LED Typical application schematic diagram of battery display

11 BOM surface

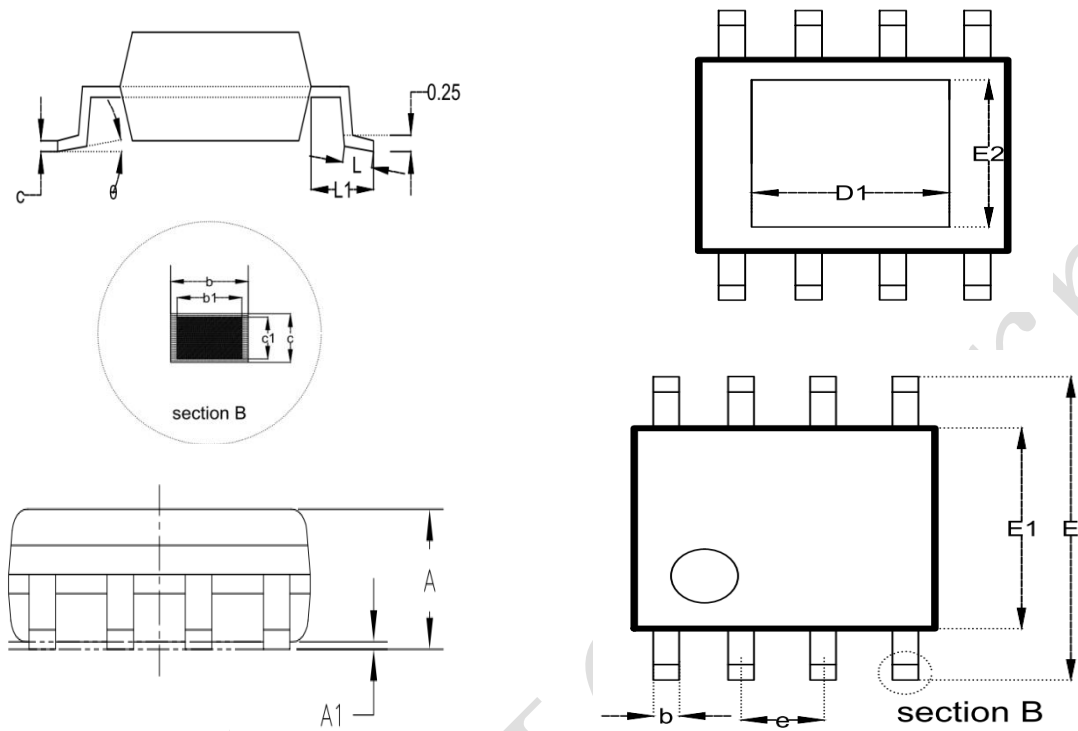
Serial number	Component name	Model & Specification	unit	Dosage	Location	Remark
1	IC	IP5306	PCS	1	U1	
2	Chip resistor	0603 2R 5%	PCS	1	R3 ,R4	
3	Chip resistor	0603 20R 5%	PCS	1	R2	According to the brightness of the lighting, Can be connected to other resistance values or short-circuit
4	Chip resistor	0603 10K 5%	PCS	1	R1	
5	Chip capacitors	0805 10uF 10%	PCS	3	C1,C2,C6,C7	Withstand voltage greater than 16V, It is recommended to use SMD ceramic capacitors
6	Chip capacitors	0805 22uF 10%	PCS	3	C3,C4,C5	Withstand voltage greater than 16V, It is recommended to use SMD ceramic capacitors
7	Patch led	0603	PCS	4	D1,D2,D3,D4	
8	led	5mm	PCS	1	D5	
9	inductance	SPM70701R0	PCS	1	L1	saturation Isat, Temperature rise current Idc more than the 4.5A, DCR Less than 0.01,Sense value1uH @500KHz
10	USB Female seat	10mm Short body curl	PCS	2	USB1 ,USB2	
11	Mini USB	Micro USBFemale seat 5Full foot	PCS	1	J1	
12	button	6.5mm*5.1mm	PCS	1	S1	
13	AC Electronic wire	2*100mm Red black	PCS	2	B+ B-	

Recommended inductor model

SPM70701R0

DARFON PIN	Inductance (uH)	Tolerance	DC Resistance (mΩ)		Heat Rating Current DC Amp.	Saturation Current DC Amps.	Measuring Condition
			Typ.	Max.	Idc(A)Max.	Isat(A)Max.	
SPM70701R0	1.0	±20%	8.5	8	12	15	

12 Package information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	--	--	1.65
A1	0.05	--	0.15
A	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	--	0.48
b1	0.38	0.41	0.43
c	0.21	--	0.25
c1	0.19	0.20	0.21
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC		
h	0.25	--	0.50
L	0.50	0.60	0.80
L1	1.05BSC		
θ	0	--	8°
D1	--	2.09	--
E2	--	2.09	--