3A Charge/Discharge Power Bank SOC Integrated With Digital Tube Driver And TYPE_C Protocol

1. Features

- **Switch buck charger and boost**
  - ✧ 3A Synchronous switching charger and 5V@3A boost converter
  - ✧ Boost converter efficiency up to 95%
  - ✧ Switching charger efficiency up to 93%
  - ✧ Integrated power-path management, support charging discharging at the same time
  - ✧ Support line compensation
- **Charger**
  - ✧ Adaptive charging current control, excellent adapter compatibility
  - ✧ Support VBUS port with 3A current, and VIN port with 2A current
  - ✧ Support 4.20V/4.30V/4.35V/4.40V battery
- **State of charge indicator**
  - ✧ Integrated 10bit ADC and coulometer
  - ✧ Support 1/2/3/4 LED battery level indicator
  - ✧ Support 88/188 nixie tube
  - ✧ Auto recognition of LED number
- **Fully featured**
  - ✧ Integrated torch-light driver
  - ✧ Support battery NTC
  - ✧ Support auto detect of plug in and out
  - ✧ Integrated TYPE_C DRP protocol, support for charging and discharging in the one port
  - ✧ Support DCP protocol
- **Low power**
  - ✧ Enter standby mode automatically in light load
  - ✧ Standby power consumption up to 150 μA minimum
- **Ultra simplified BOM**
  - ✧ Integrated power FET, charging/boosting with a single inductor
  - ✧ Built in multiple nixie tube drive circuits
- **Multiple protections, high reliability**
  - ✧ Output over-current, over-voltage, short-circuit protection
  - ✧ Output over current, over voltage and short circuit protection
  - ✧ Over temperature protection
  - ✧ 4kV ESD, Input voltage up to 16V
- **Fully customizable**
  - ✧ Flexible and low-cost customization scheme
- **Package size: 4mm × 4mm QFN28**

2. Applications

- Power bank, Portable Charger
- Mobile Phones, Smart Phones, Handheld Devices, Portable Media Player, Tablet

3. Description

IP5320 is a fully-integrated multi-function power management SoC. It integrates a boost converter, a Li battery charger management system, and a battery state of charge indicate controller. It provides a turn-key solution for power bank and portable charger applications.

IP5320's high integration and multiple features make the minimized component number in application. It can effectively downsize the application and lower the BOM cost.

IP5320's synchronous boost converter provides 3A output current. Its efficiency is up to 95%. It can switch to standby mode at empty load automatically, and the standby current can be reduced to 150μA.

IP5320's synchronous switching charger provides 3A charging current. Its efficiency is up to 93%. It regulates the charging current by IC temperature and input voltage.

IP5320 integrates a 10bit ADC and current sensing circuit, which can accurately measure battery voltage and current. The algorithm of remaining battery capacity of IP5320 can accurately obtain battery level information. The battery capacity can be seted to accurately display the remaining battery capacity.

IP5320 supports1/2/3/4 LED battery level indicator, and 88/188 digital tube battery level indicator. IP5320 supports lightning function and supports buttons.

IP5320 supports I2C control interface.

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4. Reversion History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

First Release V1.0 (March 2021)	Page
● Firs release	1

Change version V1.00 to version V1.10（April 2021）	Page
● Chapter 12 layout precautions update: NTC parallel 100nF capacitor	19

Change version V1.10 to version V1.20（May 2021）	Page
● Chapter 13 update of typical application schematic diagram: add 1 bat 22 μF capacitance	20

Change version V1.20 to version V1.30（September 2021）	Page
● Chapter 13 typical schematic diagram update	20

Change version V1.30 to version V1.33（July 2022）	Page
● Chapter 10 update of electrical characteristics: update some parameter descriptions	9

5. Simplified application schematic diagram

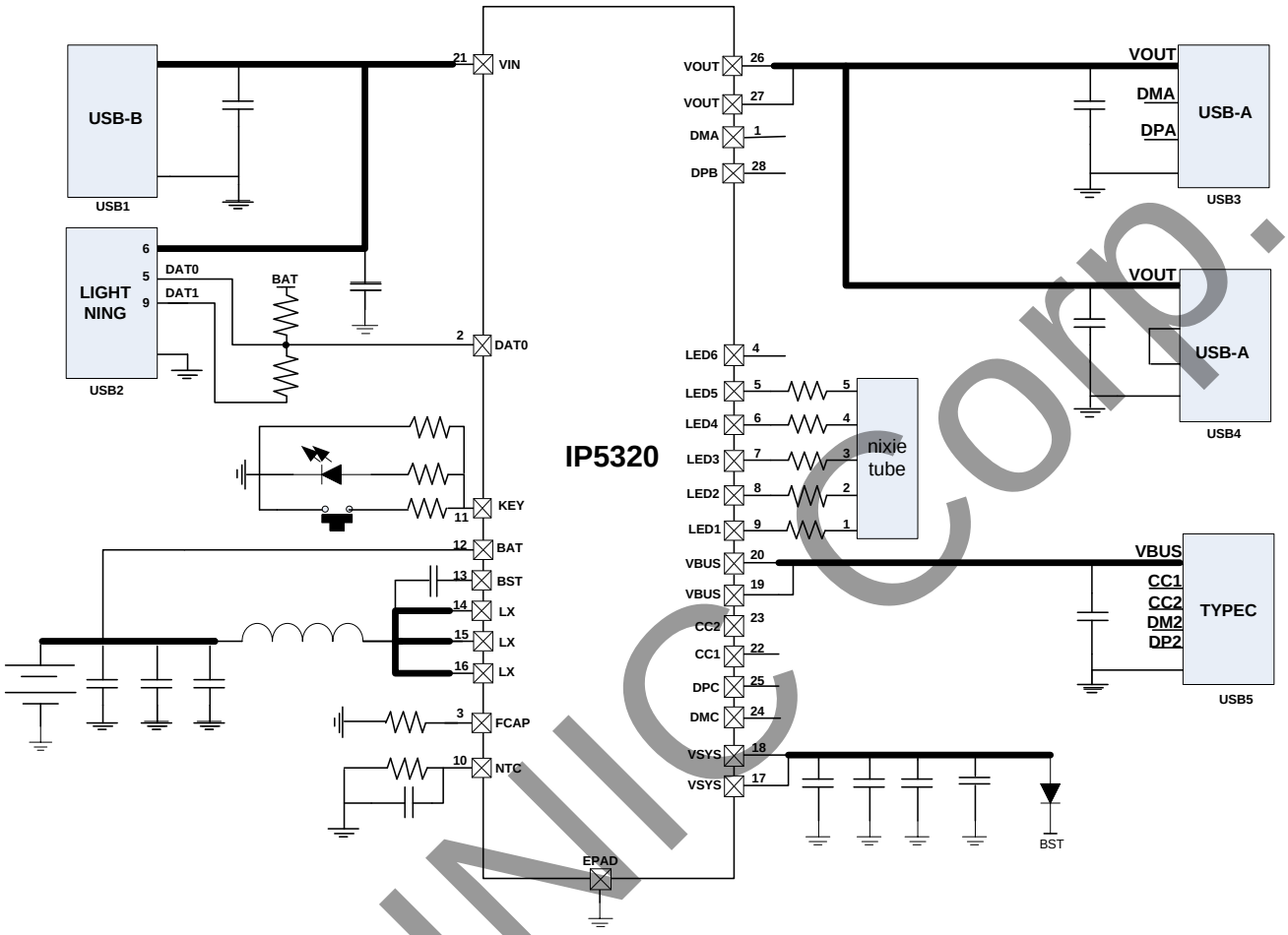


Figure 1 Simplified Application

6. IP Series Products List

6.1. Power Bank IC

IC Part No.	boost / charge		Main feature								Package	
	boost	充电	Compatibility	Compatibility	key	I2C	DCP	USB C	QC Certificate	PD3.0 /PPS	Package	Compatibility
IP5303T	1.0A	1.2A	1,2	√	√	-	-	-	-	-	ESOP8	PIN2PIN
IP5305T	1.0A	1.2A	1,2,3,4	√	√	-	-	-	-	-	ESOP8	
IP5306	2.4A	2.1A	1,2,3,4	√	√	√	-	-	-	-	ESOP8	
IP5306H	2.4A	2.1A	1,2,3,4	√	√	√	-	-	-	-	ESOP8	
IP5406T	2.4A	2.1A	1,2,4	√	√	-	-	-	-	-	ESOP8	
IP5407	2.4A	2.1A	1,2,4	√	√	-	-	-	-	-	ESOP8	
IP5207	1.2A	1.2A	3,4,5	√	√	-	√	-	-	-	QFN24	PIN2PIN
IP5209	2.4A	2.1A	3,4,5	√	√	√	√	-	-	-	QFN24	
IP5209U	2.4A	2.1A	3,4,5	√	√	√	√	-	-	-	QFN24	
IP5207T	1.2A	1.2A	1,2,3,4	√	√	√	√	-	-	-	QFN24	PIN2PIN
IP5189T	2.1A	2.1A	1,2,3,4	√	√	√	√	-	-	-	QFN24	
IP5189TH	2.1A	2.1A	1,2,3,4	√	√	√	√	-	-	-	QFN24	
IP5310	3.1A	3.0A	1,2,3,4	√	√	√	√	√	-	-	QFN32	
IP5506	2.4A	2.1A	nixie tube	√	√	-	-	-	-	-	ESOP16	
IP5508	2.4A	2.1A	nixie tube	√	√	-	√	-	-	-	QFN32	
IP5320	3.1A	3.0A	nixie tube	√	√	√	√	√	-	-	QFN28	
IP5330	3.1A	3.0A	nixie tube	√	√	-	√	√	-	-	QFN32	
IP5566	3.1A	3.0A	1,2,3,4	√	√	-	√	√	-	-	QFN40	
IP5322P	18W	4.0A	1,2,3,4	√	√	√	√	-	√	-	QFN32	
IP5332	18W	4.0A	1,2,3,4	√	√	√	√	√	√	√	QFN32	
IP5328P	18W	4.0A	1,2,3,4	√	√	√	√	√	√	√	QFN40	
IP5353	22.5W	5.0A	4	√	√	-	√	√	√	√	QFN32	
IP5356	22.5W	5.0A	nixie tube	√	√	-	√	√	√	√	QFN40	
IP5358	22.5W	5.0A	nixie tube	√	√	-	√	√	√	√	QFN48	
IP5568	22.5W	5.0A	nixie tube	√	√	-	√	√	√	√	QFN64	
IP5386	45W	8.0A	nixie tube	√	√	-	√	√	√	√	QFN48	
IP5389	100W	8.0A	nixie tube	√	√	-	√	√	√	√	QFN64	

7. Pin Configuration and Functions

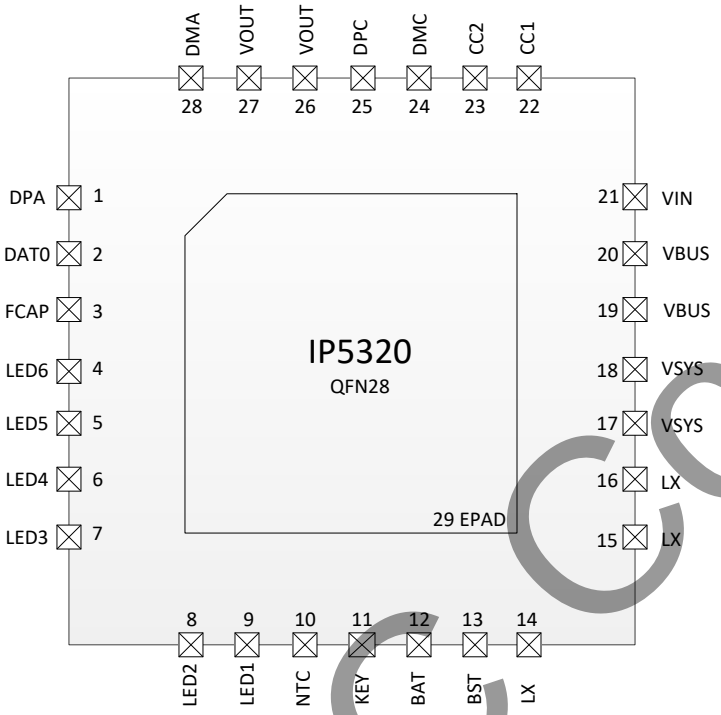


Figure 2 IP5320 Top View

7.1. IP5320 Pin Functions

Pin Num	Pin Name	DESCRIPTION
1	DPA	VOUT port DP pin
2	DAT0	Lightning DAT0 pin
3	FCAP	Battery capacity setting pin
4	LED6	Battery level display drive pin LED6
5	LED5	Battery level display drive pin LED5
6	LED4	Battery level display drive pin LED4
7	LED3	Battery level display drive pin LED3
8	LED2	Battery level display drive pin LED2
9	LED1	Battery level display drive pin LED1
10	NTC	NTC pin
11	KEY	Key detect pin, reused as WLED torch light function
12	BAT	Battery supply pin
13	BST	Internal high voltage drive, serial capacitor to LX
14、15、16	LX	DCDC switch node, connect to inductor
17、18	VSYS	Public Node of system power input and output
19、20	VBUS	USB Type_C port power pin
21	VIN	VIN power pin
22	CC1	USB Type_C CC1 pin

23	CC2	USB Type_C CC2 pin
24	DMC	USB Type_C port DM pin
25	DPC	USB Type_C port DP pin
26、27	VOUT	VOUT output port power pin
28	DMA	VOUT port DM pin
29	EPAD	GROUND

8. Functional Block Diagram

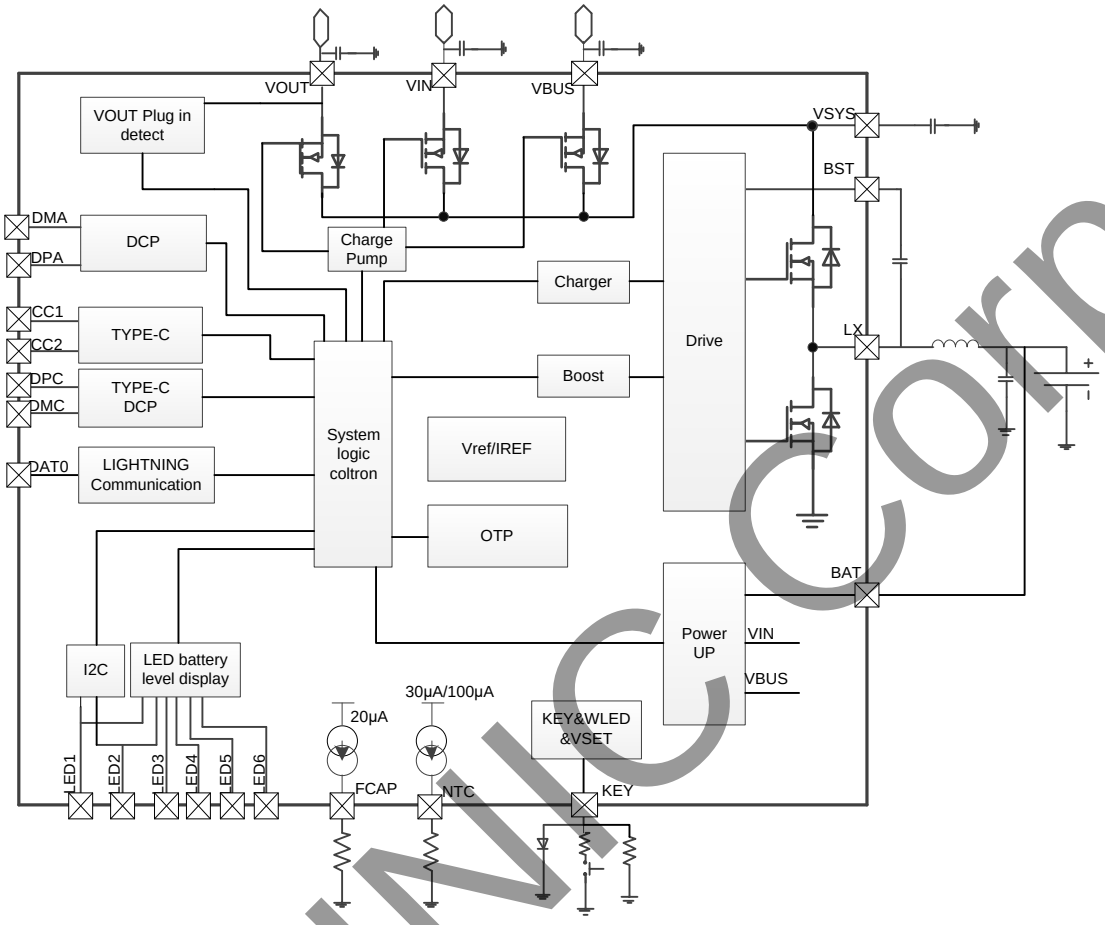


Figure 3 Functional Block Diagram

9. Absolute maximum ratings

Parameter	symbol	value	Unit
Port input voltage range	V_{BUS}/V_{IN}	-0.3 ~12	**V**
Junction temperature	T_J	-40 ~ 150	℃
Storage temperature	Tstg	-60 ~ 150	℃
Thermal resistance (from junction to ambient air)	θ_{JA}	40	**℃/W**
Human-body model (HBM)	ESD	4	**KV**

***** Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

10. Recommended operation conditions

Parameter	symbol	MIN	Typical	MAX	Unit
Input voltage	V_{BUS}/V_{IN}	4.65	5	6.2	V
Working Temperature	T_A	0	--	70	℃

* Beyond these operation conditions, the device's performance will not be guaranteed.

11. Electrical Characteristics

TA=25℃, L=2.2μH unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Charging System						
Input voltage	V_{IN}	V_{BAT}=3.7V	4.6	5.0	6.2	V
	V_{BUS}	V_{BAT}=3.7V				
Input Over Voltage	V_{INOV}		6.2	6.4	6.8	V
	V_{BUSOV}					
Input Under Voltage	V_{SYSUV}			4.5		V
Constant Charge Voltage	$CV_{4.2V}$	V_{SET}=4.20V	4.18	4.21	4.24	V
	$CV_{4.30V}$	V_{SET}=4.30V	4.28	4.31	4.34	V
	$CV_{4.35V}$	V_{SET}=4.35V	4.33	4.36	4.4	V
	$CV_{4.4V}$	V_{SET}=4.40V	4.38	4.41	4.44	V
Charge Stop Current	I_{STOP}	V_{IN}=5V	200	300	500	mA
Charge Current	I_{VIN}	V_{IN} =5V, input current	1.7	2.0	2.3	A

	I_{VBUS}	V_{BUS} =5V, input current	2.3	2.6	2.9	A
Trickle Charge Current	I_{TRKL}	V_{IN}=5V，V_{BAT}=2.7V	100	200	300	mA
Trickle Charge Stop Voltage	V_{TRKL}		2.9	3.0	3.1	V
Recharge Voltage Threshold	V_{RCH}		4.06	4.10	4.14	V
Charge Safety Time	T_{END}		40	48	56	Hour
Boost System						
Battery operation voltage	V_{BAT}		3.0	3.7	4.4	V
Low power off voltage	V_{BATLOW}	I_{OUT}=1A	2.9	2.95	3.0	V
DC output voltage	V_{OUT}	V_{BAT}=3.7V @0A	5.00	5.12	5.25	V
		V_{BAT}=3.7V @3A	5.00	5.20	5.30	V
Output voltage ripple	ΔV_{OUT}	V_{BAT}=3.7V @I_{OUT}=2A,C_{OUT}=88μF	50	150	250	mV
Boost output current	I_{VOUT}	V_{BAT}=3.0V~4.4V		3.0		A
Boost overcurrent shut down threshold	I_{SHUT}	V_{BAT}=3.0V~4.4V	3.2	3.5	4.2	A
Load overcurrent detect time	T_{UVD}	Duration of output voltage under 4.2V		30		ms
Control System						
Switch frequency	Fs	Discharge switch frequency		350		kHz
		Charge switch frequency		350		kHz
NMOS on resistance	R_{DSON}	Upper NMOS		20		mΩ
NMOS on resistance		Lower NMOS		20		mΩ
VIN and VSYS MOS on resistance		V_{IN}=5V		90		mΩ
VOUT and VSYS MOS on resistance		V_{OUT}=5V		35		mΩ
VBUS and VSYS MOS on resistance		V_{BUS}=5V		35		mΩ
Input overcurrent protection	I_{INOCP}	V_{IN}=5V		4		A
Battery port standby current	I_{STB}	V_{IN}=0V，V_{BAT}=3.7V		100	150	μA
LED light driving current	I_{WLED}		5	9	13	mA

IO driving current	I_{GPIO}		3	4	5	mA
Total load Light load shut down detect time	T_{LOAD}	The load current is consistently less than 100mA	28	32	36	s
Output light load shutdown current	I_{PLOUT}	V_{BAT}=3.7V	30	60	100	mA
Short press on key wake up time	$T_{OnDebounce}$		100		300	ms
Time of WLED turn on	$T_{Keylight}$		2		3	s
Thermal shut down temperature	T_{OTP}	Rising temperature	130	140	150	℃
Thermal shut down hysteresis	ΔT_{OTP}		30	40	50	℃

12. Function description

12.1. Low power lock out and activation

The first time IP5320 access to the battery, whatever the battery voltage, IC is in lock out state, battery level indicator LED will flash 4s, or the digit 0 of the nixie tube flashes 4s for prompt; Under non-charging state, if the battery voltage is too low to trigger the low power shutdown, IP5320 will enter lock out state too.

In low battery state, to decrease the quiescent power, IP5320 do not support plug in detect function or key press activation function. During which, key press action will not trigger boost output, and battery level indicator LED will flash 4s.

Under the lock out state, only by entering charging status can activate IP5320 's full function.

12.2. Boost

IP5320 integrates a 5V output step-up DCDC converter with 3A output capacity. It works at 350 kHz. When input voltage is 3.8V, its efficiency is 95% with the output of 5V@3A,. Internal soft-start circuit prevents malfunction caused by starting inrush current. It integrate short-circuit, over-voltage, over-voltage protection, making the system stable and reliable.

The output current of the boost system can be automatically adjusted with the temperature to ensure that the chip temperature is below the set temperature.

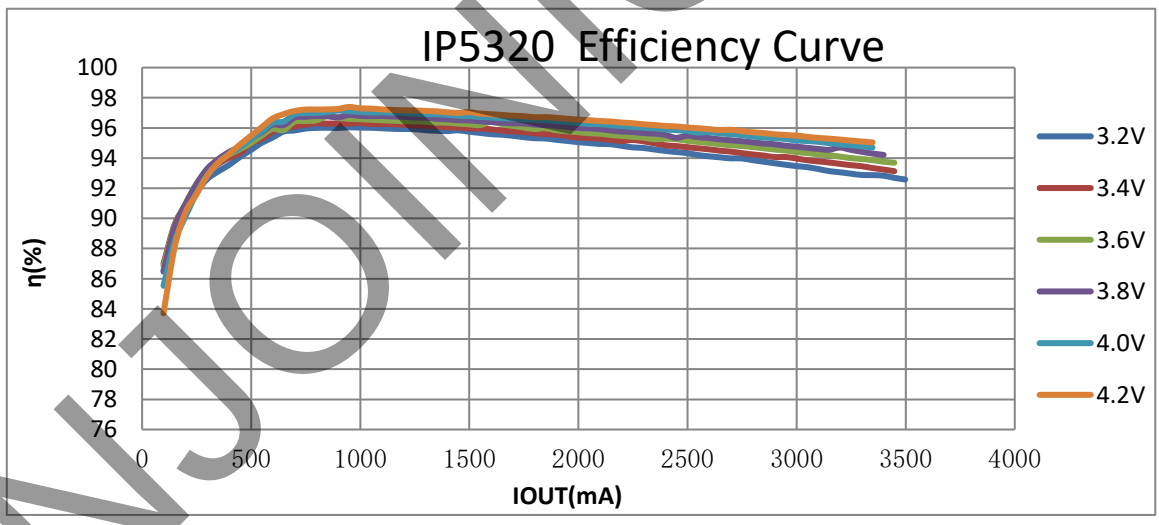


Figure 4 IP5320 Efficiency Curve

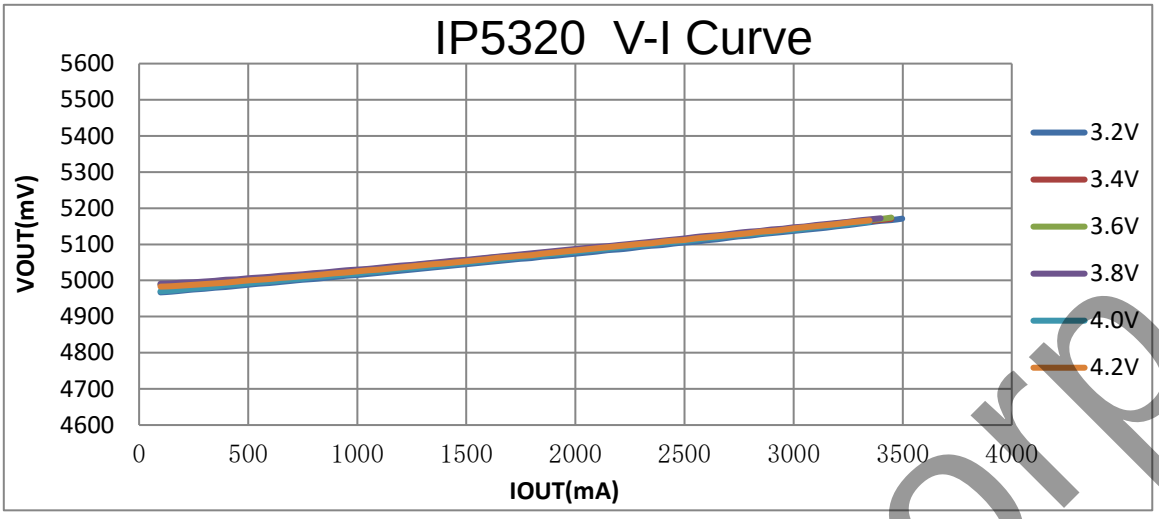


Figure 5 IP5320 VOUT=5V V-I Curve

12.3. Charger

IP5320 integrated a constant current and constant voltage Li battery charging management system with synchronous switch, adaptive to various charging voltage.

When the battery voltage is lower than 3V, trickle charging less than 200mA charging current is applied;

when the battery voltage is higher than 3V, enters constant current charging stage;

When the charging stage is accomplished, once the battery voltage falls under 4.1V, battery charging stage will be restarted.

IP5320's charge current can up to 5V/3A, when use VBUS port; and when use VIN port, the max charge current is 2A. At the same time, it can detect the input voltage and chip temperature to automatically adjust the charging current.

Any port of VIN port and VBUS port can be charged by inserting the power supply. If both ports are connected to the power supply for charging, the power supply inserted first will be preferred for charging.

IP5320 will detect whether the VSYS voltage is greater than 4.5V when charging. If it is greater than 4.5V, it will charge the battery with the maximum current. When it is lower than 4.5V, it will start to reduce the charging current and automatically adapt to the load output capacity of the adapter.

IP5320 has built-in power path management, which can be customized to support charging and discharging at the same time. In the charging state, turn on the PMOS tube that inputs VIN or VBUS and outputs VOUT to charge external devices.

When IP5320 is charging and discharging, NMOS tubes that input VIN and output VBUS, VOUT, input VBUS and output VOUT have the functions of over temperature, 4A over-current, short-circuit protection, etc.

12.4. Lightning Line Communication Circuit

IP5320 integrated lightning communication circuit, external connection mode is shown in Figure 6.

Since the communication circuit needs to be pulled up to bat through an external 510Ω resistor, the communication can be successful only when the battery voltage is above 3V. If the communication can succeed when the battery voltage is lower than 3V, it is recommended to add lightning communication chip.

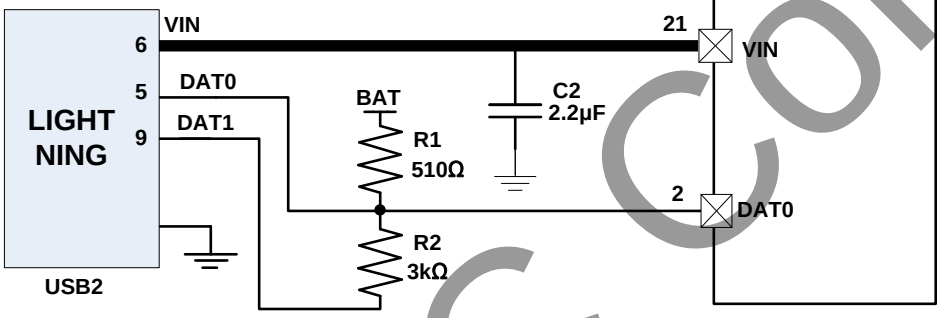


Figure 6 Lightning communication circuit

12.5. KEY, Lights and Vset

IP5320 has built-in key and lighting functions, and supports external pins to select battery type. The circuit diagram is as follows:

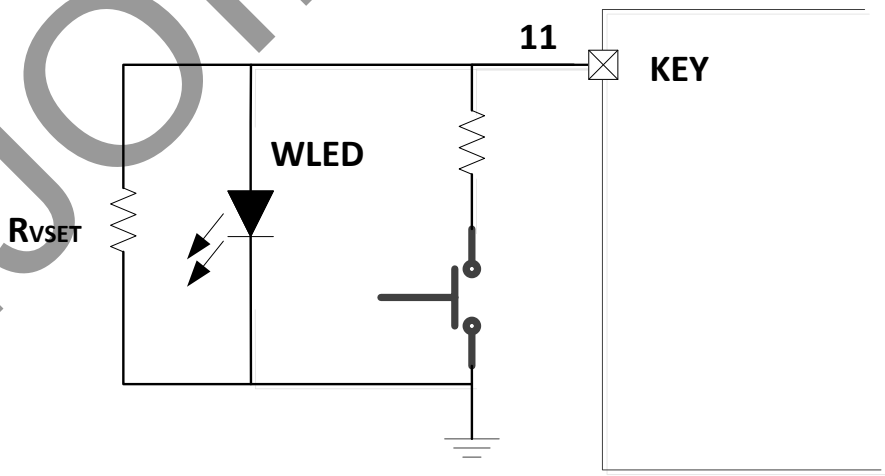


Figure 7 KEY circuit

- Short press : pressed time in range of 100ms~2s：turn on the battery level display LED and BOOST output
- Long press :pressed time longer than 2s：turn on or turn off the torch light WLED
- No response on press time less than 30ms

- Two short press in 1s: turn off boost output, battery level display LED and torch light WLED
- Long 10s press will reset the whole system

IP5320 supports external resistance to select battery type and configure parameters of different battery specifications. The applied resistance and the set battery type are shown in the following table:

Table 1 Battery voltage selection

Resistance	Battery Type
NC	4.20V
70kΩ	4.30V
50kΩ	4.35V
30kΩ	4.40V

12.6. Coulombmeter and battery level display

IP5320 has built-in coulombmeter function, which can realize accurate calculation of the remaining battery capacity.

IP5320 supports LED/88 / 188 nixie tube to display the remaining battery capacity .

IP5320 supports external pin selection of LED light mode and nixie tube mode.

12.6.1. Battery level display for LED mode

IP5320 4LED、3LED、2LED and 1LED battery level display solution, the connection method is as follows.

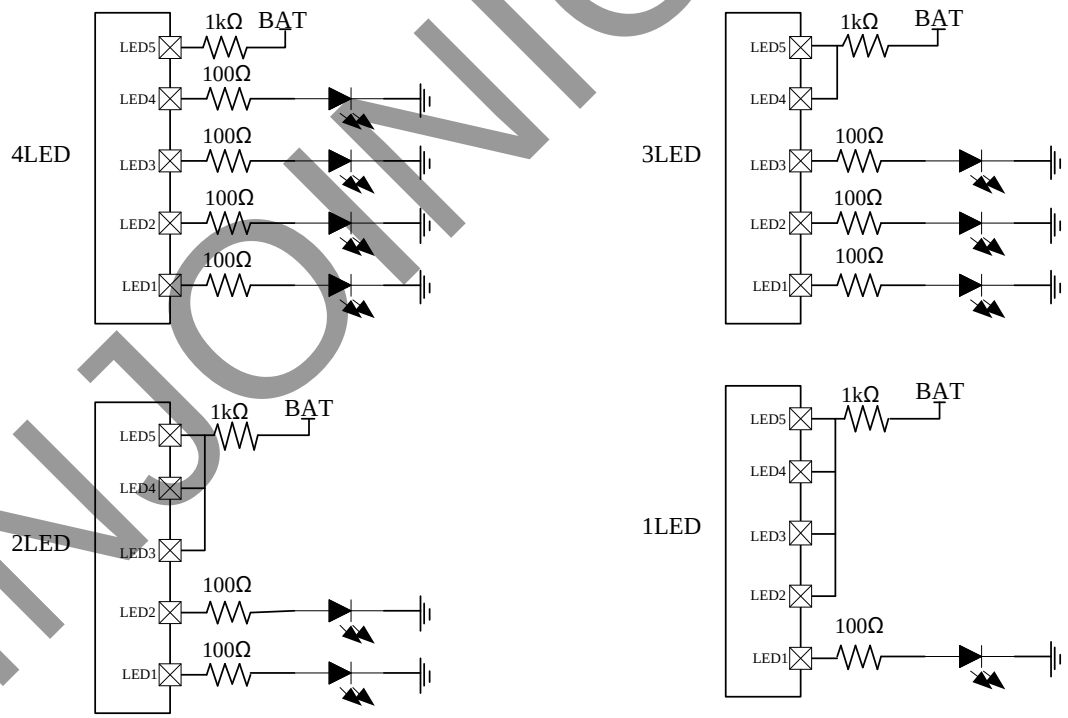


Figure 8 LED circuits

Table 2 4LED display mode During discharging

Battery capacity (C) (%)	D1	D2	D3	D4
C≥75%	ON	ON	ON	ON
50%≤C<75%	ON	ON	ON	OFF
25%≤C<50%	ON	ON	OFF	OFF
3%≤C<25%	ON	OFF	OFF	OFF
0%<C<3%	1.0Hz Flash	OFF	OFF	OFF

Table 3 4LED display mode During charging

Battery capacity (C) (%)	D1	D2	D3	D4
Fully charged	ON	ON	ON	ON
75%≤C	ON	ON	ON	0.5Hz Flash
50%≤C<75%	ON	ON	0.5Hz Flash	OFF
25%≤C<50%	ON	0.5Hz Flash	OFF	OFF
C<25%	0.5Hz Flash	OFF	OFF	OFF

Table 4 3LED display mode During discharging

Battery capacity (C) (%)	D1	D2	D3
C≥66%	ON	ON	ON
33%≤C<66%	ON	ON	OFF
3%≤C<33%	ON	OFF	OFF
0%<C<3%	1.0Hz Flash	OFF	OFF

Table 5 3LED display mode During charging

Battery capacity (C) (%)	D1	D2	D3
Fully charged	ON	ON	ON
66%≤C	ON	ON	0.5Hz Flash
33%≤C<66%	ON	0.5Hz Flash	OFF
C<25%	0.5Hz Flash	OFF	OFF

Table 6 2LED display mode During charging and boost

	State	D1	D2
charging	charging	0.5Hz Flash	OFF
	Fully charged	ON	OFF
discharging	discharging	OFF	ON
	Low power	OFF	1Hz Flash

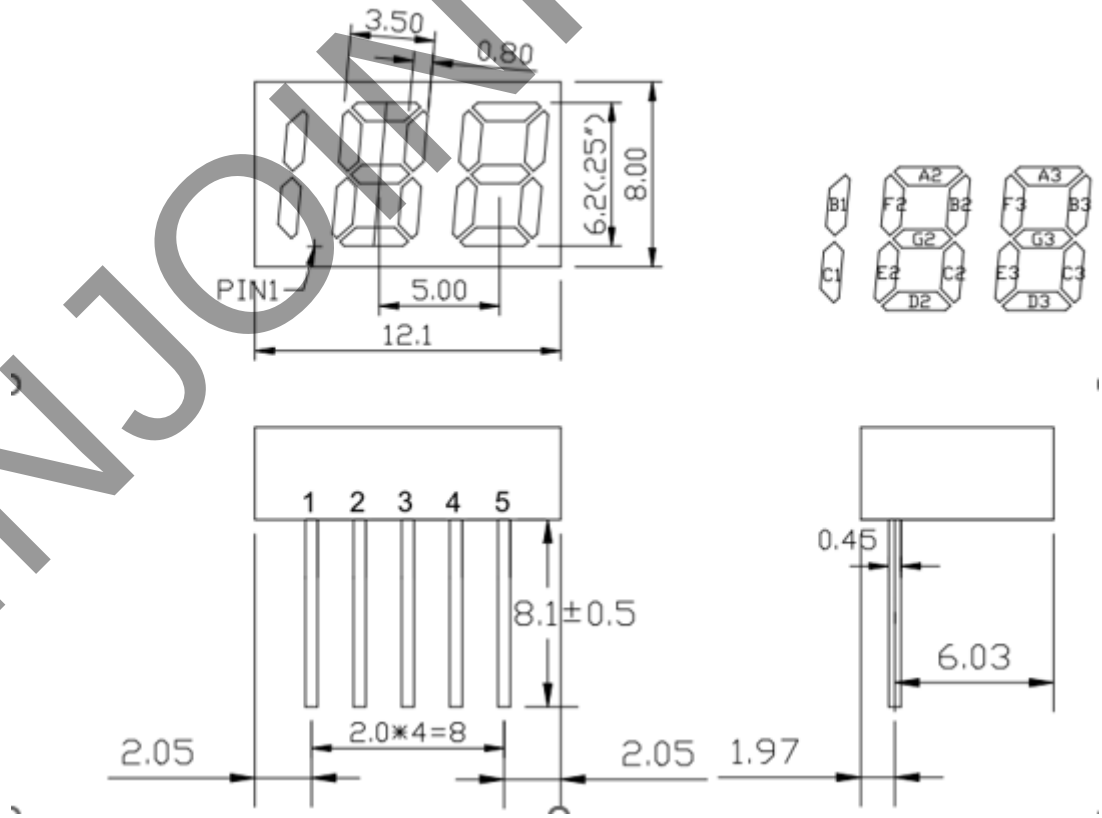
Table 7 1LED display mode During charging and boost

	State	D1
charging	charging	0.5Hz Flash
	Fully charged	ON
discharging	discharging	ON
	Low power	1Hz Flash

12.6.2. 188 nixie tube display mode

Table 8 The nixie tubes supported by IP5320 by default are as follows

Nixie Tube	During charging		During discharging	
	Not fully charged	Fullly charged	Battery capacity <5%	Battery capacity>5%
188 （YF2252SR-5）	0 - 99% 0.5HZ Flash	constantly on 100%	0 - 5% 1.0Hz Flash	5% -100% constantly on



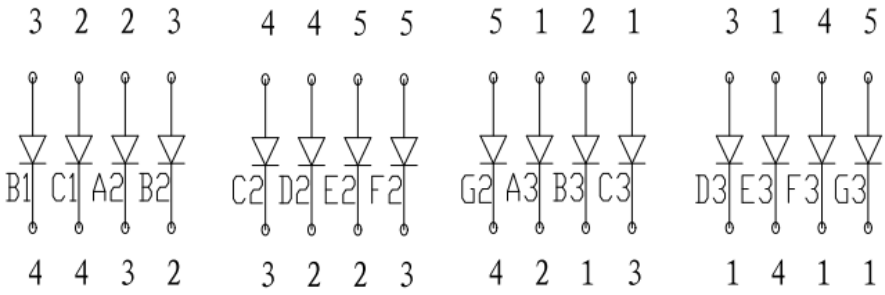


Figure 9 5pin 188 nixie tube circuit

12.6.3. Coulombmeter

IP5320 supports the external resistor setting of the initial capacity of the battery, and uses the integration of the current and time at the port of the battery to manage the remaining capacity of the battery, which can accurately display the current remaining capacity of the battery.

IP5320 external pin sets the initial battery capacity formula: battery capacity = R5 * 0.357 (mAh). Supported capacities range from 5000 mAh to 50000 mAh.

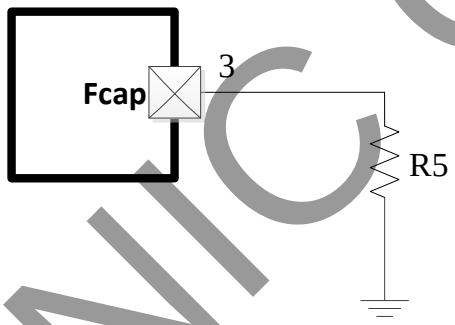


Figure 10 Battery capacity configuration circuit

Table 9 Typical battery capacity config table

R5 Resistance	Battery initial capacity
14kΩ	5000mAh
28kΩ	10000mAh
42.2kΩ	15000mAh
56kΩ	20000mAh
84.5kΩ	30000mAh
113kΩ	40000mAh
140kΩ	50000mAh

12.7. Automatic detection of mobile phone

IP5320 support auto detection on sink device/phone attachment/plug in, once the attachment is detected, the boost will be turned on charging the sink device / phone, so non-key solution are supported.

IP5320 supports light load automatic standby. When the load current is less than 60mA and lasts for 32s, it automatically enters the standby state.

12.8. NTC function

IP5320 integrates NTC function, which can detect battery temperature. When IP5320 is working, NTC pin output current, and generate voltage through external NTC resistance. IC internal detects the voltage of NTC pin to determine the current battery temperature.

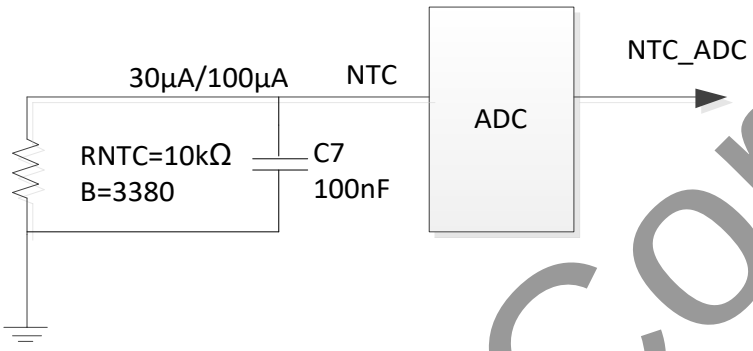


Figure 11 NTC circuit

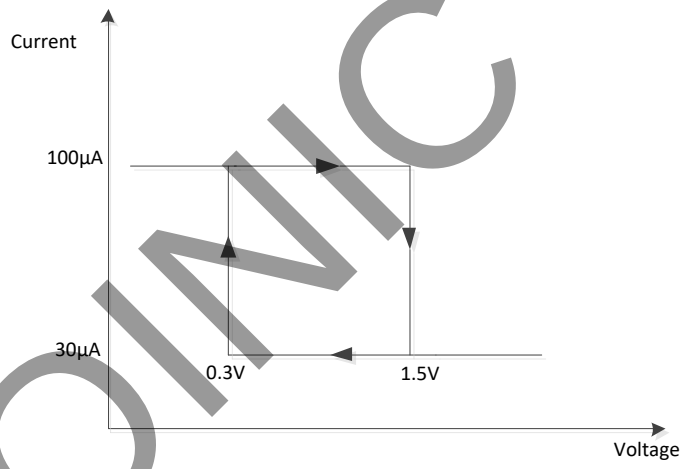


Figure 12 Relationship between NTC voltage and output current

In order to accurately distinguish the temperature of battery NTC, IP5320 adopts current switching NTC detection module. The chip internally detects the current output by the NTC pin and the voltage generated by the external pull-down NTC thermistor to judge the current battery temperature.

When the NTC discharge current is 100μA, if the NTC voltage is higher than 1.5V, the current becomes 30μA;

when the NTC discharge current is 30μA, if the NTC voltage is lower than 0.3V, the current changes to 100μA.

In the state of charge:

When the NTC voltage is lower than 0.49V, it means the battery temperature is higher than 45℃，the charging is stopped.

When the NTC voltage is higher than 0.82V, it means the battery temperature is lower than 0℃，the charging is stopped.

In the state of discharge:

When the NTC voltage is lower than 0. 3V, it means the battery temperature is higher than 60℃， the discharging is stopped.

When the NTC voltage is higher than 2.09V, it means the battery temperature is lower than -20℃，the discharging is stopped.

If NTC is not required in the application, 10kΩ resistance shall be connected to the ground at NTC pin, and floating or direct grounding is not allowed.

13. PCB Layout

13.1. Location of VSYS capacitor

The capacitance on IP5320 VSYS pins (pins 17 and 18) requires four 22μF ceramic capacitors; During PCB design, the capacitance on VSYS should be placed as close to the VSYS pin of IP5320 as possible, and the capacitance ground should be perforated nearby, and the ground loop from the VSYS capacitance ground to the EPAD under IP5320 should be as small as possible; It is required that there should be no wiring on the back of PCB to isolate the VSYS capacitor from the ground of IP5320 EPAD.

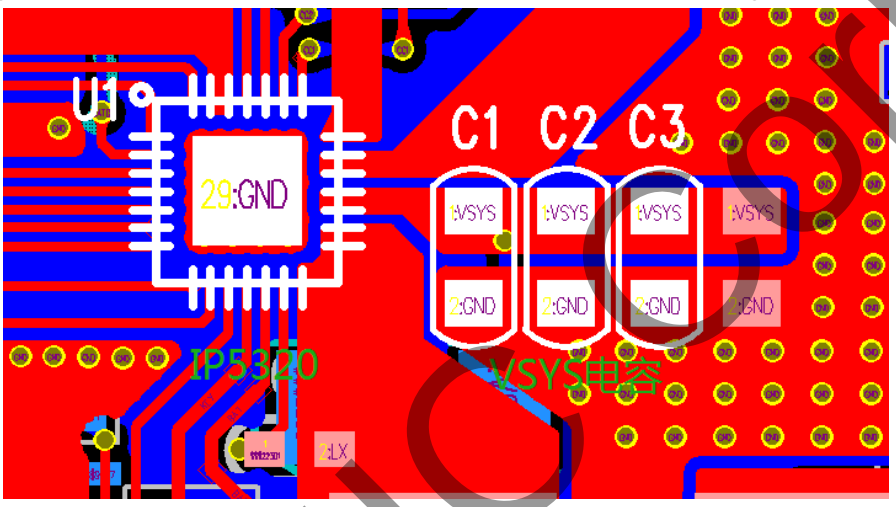


Figure13 Location of VSYS capacitor

13.2. Location of NTC capacitor

NTC 100nF capacitor is required to be placed close to the chip pin

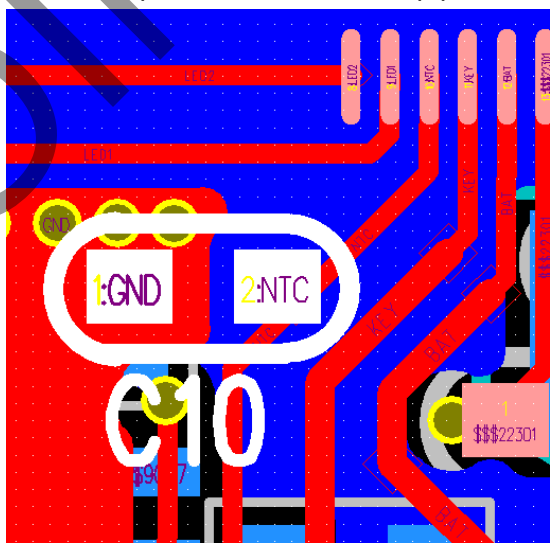
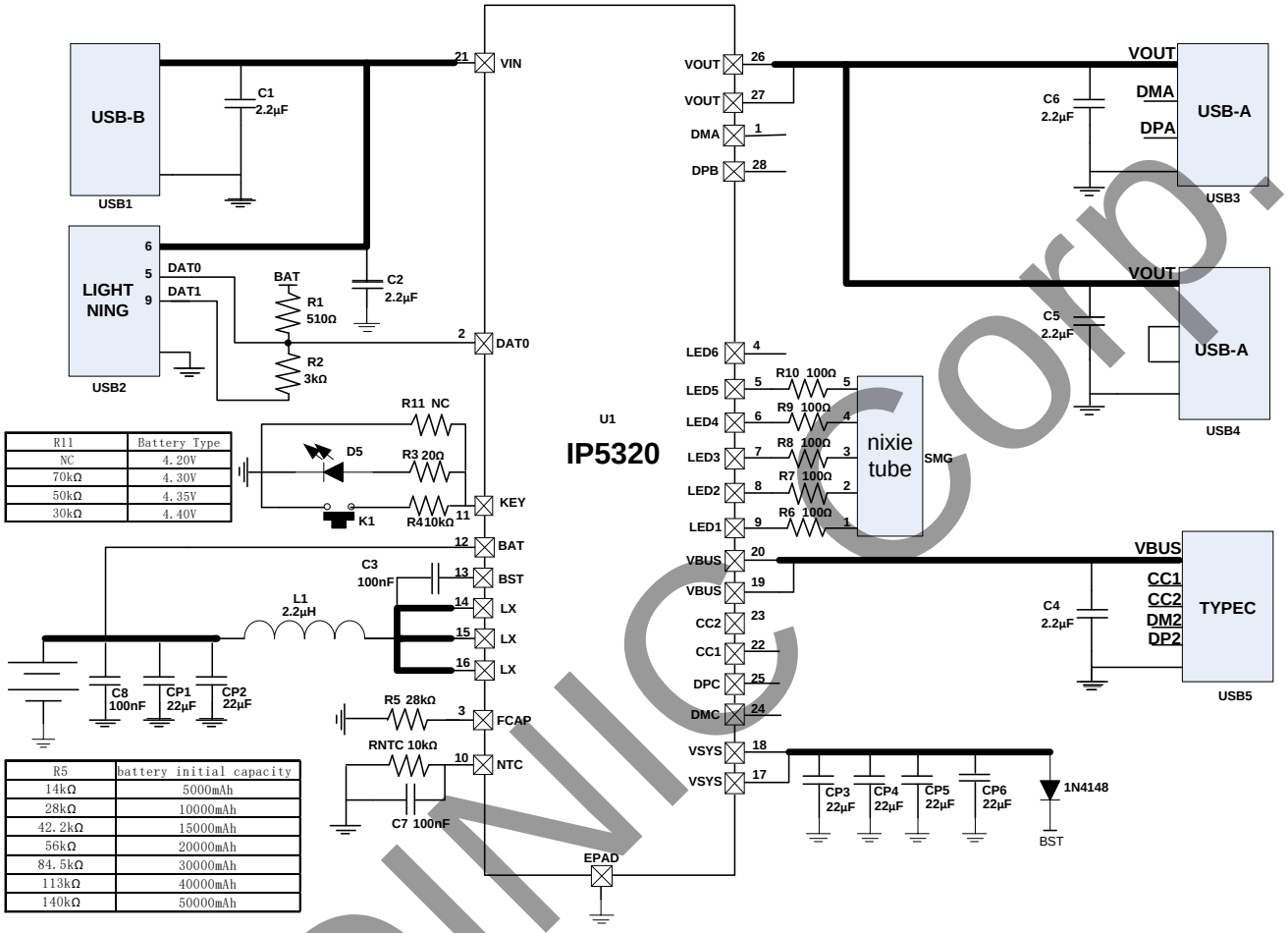


Figure14 Location of NTC capacitor

14. Typical application schematic

IP5320 only needs capacitors, resistors, and inductors to realize a full featured power bank solution.



R11	Battery Type
NC	4.20V
70kΩ	4.30V
50kΩ	4.35V
30kΩ	4.40V

R5	battery initial capacity
14kΩ	5000mAh
28kΩ	10000mAh
42.2kΩ	15000mAh
56kΩ	20000mAh
84.5kΩ	30000mAh
113kΩ	40000mAh
140kΩ	50000mAh

Figure15 Typical application schematic

BOM

No.	Part Name	Type	Location	Num	Note
1	SMT IC	QFN28 IP5320	U1	1	
2	SMT capacitor	0603 2.2μF 10% 16V	C1 C2 C4 C5 C6	5	
3	SMT capacitor	0603 100nF 10% 16V	C3 C7 C8	3	
4	SMT capacitor	0805 22μF 10% 16V	CP1 CP2 CP3 CP4 CP5 CP6	6	
5	SMT resistor	0603R 510Ω 1%	R1	1	
6	SMT resistor	0603R 3kΩ 1%	R2	1	
7	SMT resistor	0603R 20Ω 1%	R3	1	
8	SMT resistor	0603R 10kΩ 1%	R4	1	
9	SMT resistor	0603R NC 1%	R11	1	
10	SMT LED	5MM LED	D5	1	
11	SMT resistor	0603R 28kΩ 1%	R5	1	
12	SMT resistor	0603R 100Ω 1%	R6 R7 R8 R9 R10	5	
13	Nixie tube	YF2252SR-5	SMG	1	
14	NTC THERMAL RESISTOR	10kΩ @25℃ B=3380	RNTC	1	
15	Inductor	2.2μH 10*10	L1	1	
16	Key	SMT 3*6	K1	1	
17	OUTPUT USB	SMTUSB	USB3 USB4	2	
18	INPUT USB	MICRO-7-DIP-5.9	USB1	1	
19	USB C CONNECTOR	USB C CONNECTOR	USB5	1	
20	LIGHTNING CONNECTOR	LIGHTNING	USB2	1	

Recommended inductance model

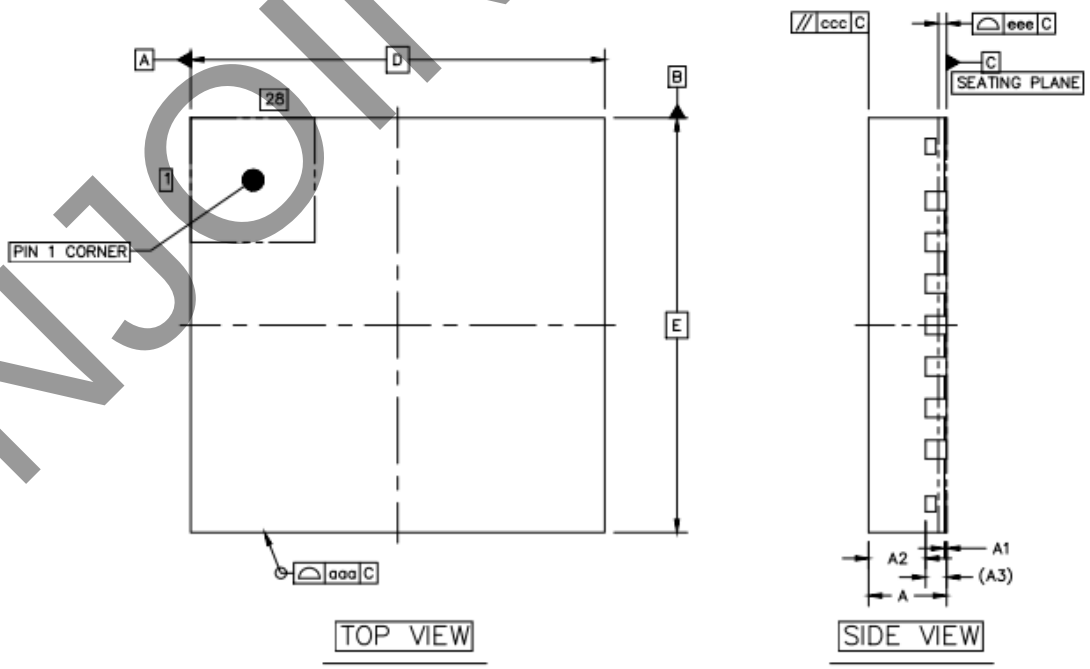
DARFON PIN	Thickness (mm)	Inductance (μH)	Tolerance	DC Resistance (mΩ)		Heat Rating Current DC Amp.	Saturation Current DC Amps.	Measuring Condition
				Typ.	Max.	Idc(A)Max.	Isat(A)Max.	
SPM70702R2MESQ	5	2.2	±20%	9	10.2	10.5	13.5	100kHz/1.0V
SPM10102R2MESN	4	2.2	±20%	6	7	12	18	100kHz/1.0V
SHC1004-2R2M	4	2.2	±20%	7	9	12	24	

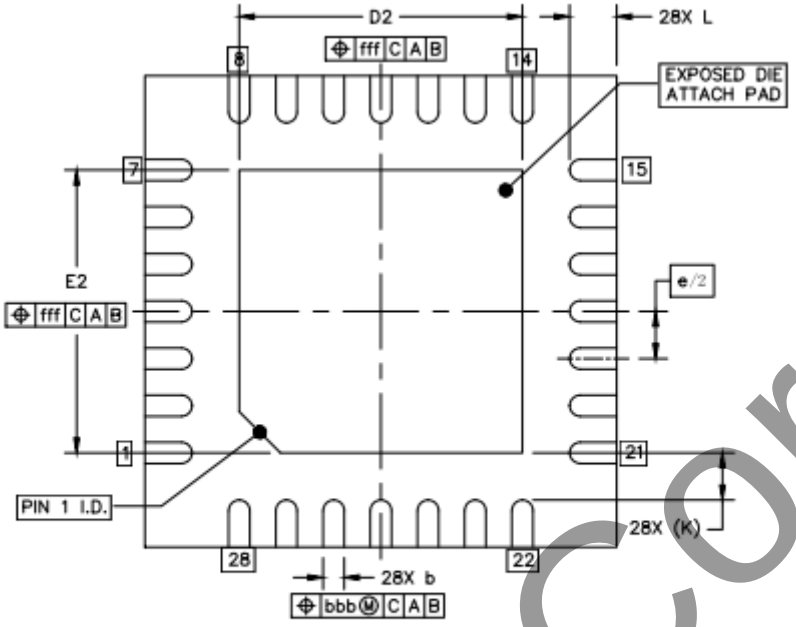
15. IC Silk Screen Description

Note:
1、 --Injoinic Logo
2、IP5320 --Part Number
3、XXXXXXXX --Manufacture number
4、 ○ --PIN1 location

Figure16 Marking description

16. Package





		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.7	0.75	0.8
STAND OFF		A1	0	0.02	0.05
MOLD THICKNESS		A2	---	0.55	---
L/F THICKNESS		A3		0.203 REF	
LEAD WIDTH		b	0.15	0.20	0.25
BODY SIZE	X	D		4 BSC	
	Y	E		4 BSC	
LEAD PITCH		e		0.4 BSC	
EP SIZE	X	D2	2.3	2.4	2.5
	Y	E2	2.3	2.4	2.5
LEAD LENGTH		L	0.3	0.4	0.5
LEAD TIP TO EXPOSED PAD EDGE		K		0.4 REF	
PACKAGE EDGE TOLERANCE		aaa		0.1	
MOLD FLATNESS		ccc		0.1	
COPLANARITY		eee		0.08	
LEAD OFFSET		bbb		0.07	
EXPOSED PAD OFFSET		fff		0.1	

Figure17 IP5320 Package

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