Full-integrated fast charge and discharge SOC with 4.8A Charger and Adjustable Voltage 18W Boost

1 Features

- **Support Mainstream Fast Charge Mode**
  - ✧ Built-in TYPE-C DRP protocol, supports single port input and output function.
  - ✧ Built-in Qualcomm Quick Charge 2.0/3.0 output fast charge protocol, with DCP Mode.
    - ◆ UL Certificate No：4787391468-2
    - ◆ https://www.qualcomm.com/documents/quick-charge-device-list
  - ✧
- **Boost**
  - ✧ Output Voltage Range: 5V to 12 V
  - ✧ Optimize for Quick Charge™: 3.1A @ 5V, 2.0A @ 9V, 1.5A @12V
- **4.8A Buck Charger**
  - ✧ Adaptive charging current control, excellent adapter compatibility
  - ✧ 92% Charge Efficiency at 3A
  - ✧ Support 4.20V/4.30V/4.35V/4.40V battery
  - ✧ NTC function for battery thermal protection
- **High Integration**
  - ✧ Integrated Switching MOSFET
  - ✧ Integrated ADC for Voltage, Charge Current
  - ✧ Supports 5/4/3/2 LEDs Modes to indicate the battery level
  - ✧ Support Torch-light driver
  - ✧ Push-button to control system
  - ✧ Integrated cellphone plug in and out detector
- **Low power**
  - ✧ Smart load detector, switching to standby mode automatically
  - ✧ <100 μA standby current
- **Fully customizable**
  - ✧ I2C interface makes customization flexible and low-cost
- **Package**
  - ✧ 6 mm × 6 mm QFN40

2 Applications

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

3 Description

IP5318A is a full-integrated input and output fast charge SOC including built-in TYPE-C protocol, and QC2.0/3.0 output protocol witch compatible with BC1.2,Apple and Samsung mode as well. Otherwise, the device includes synchronous boost converter, charge management for single cell Li-Lon and Li-polymer battery, display and many other functions. It can be dedicated to the solutions for portable power source.

Benefit from the high integration density and multi-function of IP5318A, it provides both buck and boost function with one single inductance. Along with so few external devices, it effectively makes the solutions much more simple and low-cost.

IP5318A supports QC2.0/3.0 fast charge output. It can provide powerful and effective output capability with the power up to 18W and the efficiency up to 96%. It can automatically turn to sleep mode when there is no load and the quiescent current will decrease to 100uA or less.

IP5318A supports high voltage charge with the charge current up to 4.8A and the efficiency up to 97%.

IP5318A also supports TYPE-C fast charge protocol. It can provide large input charge current and large output discharge current in the one Type-C port.

Typical Application

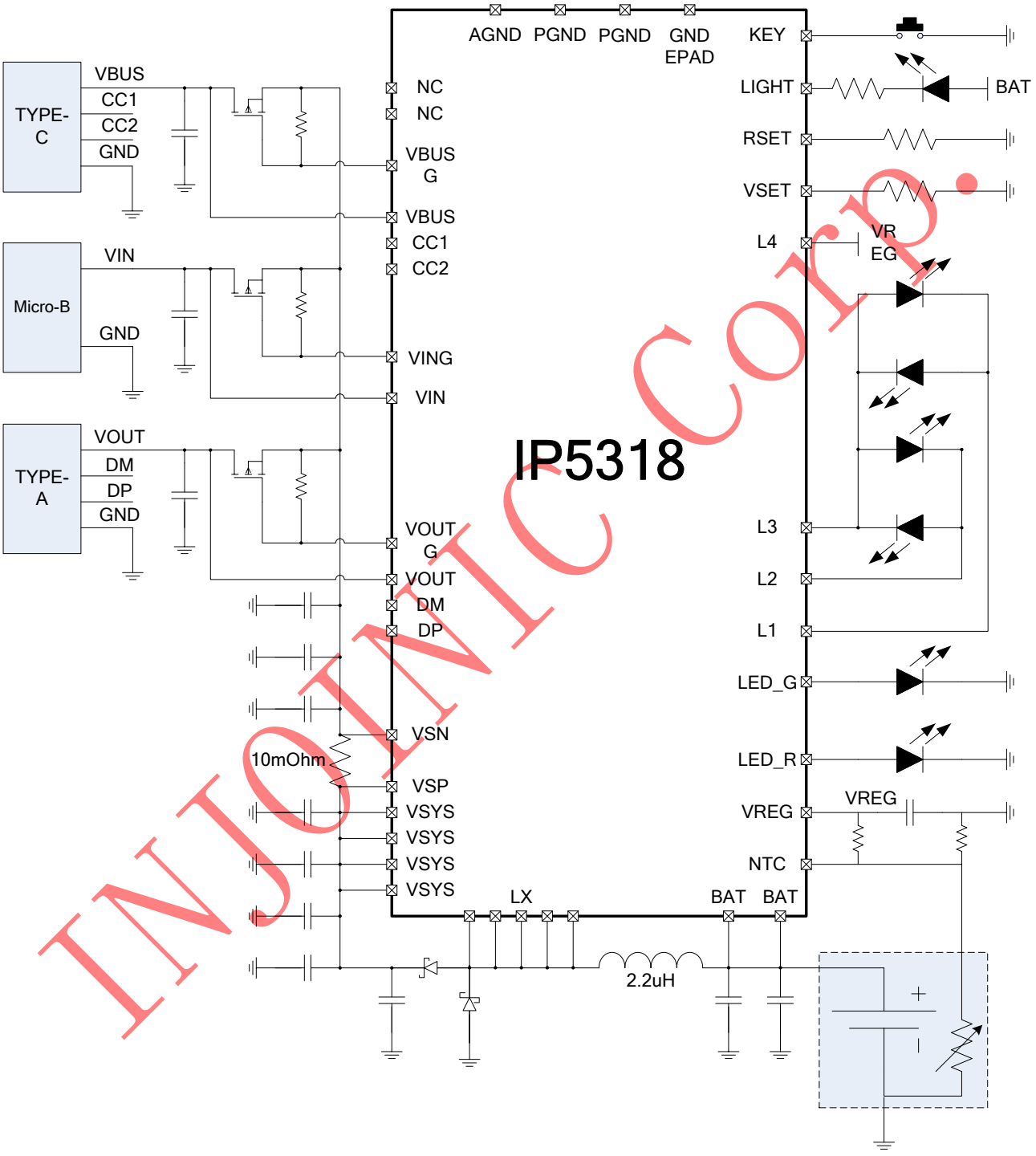


Figure 1

TYPE-A + Micro-B + TYPE-C simplify application schematic diagram (4 LED display mode)

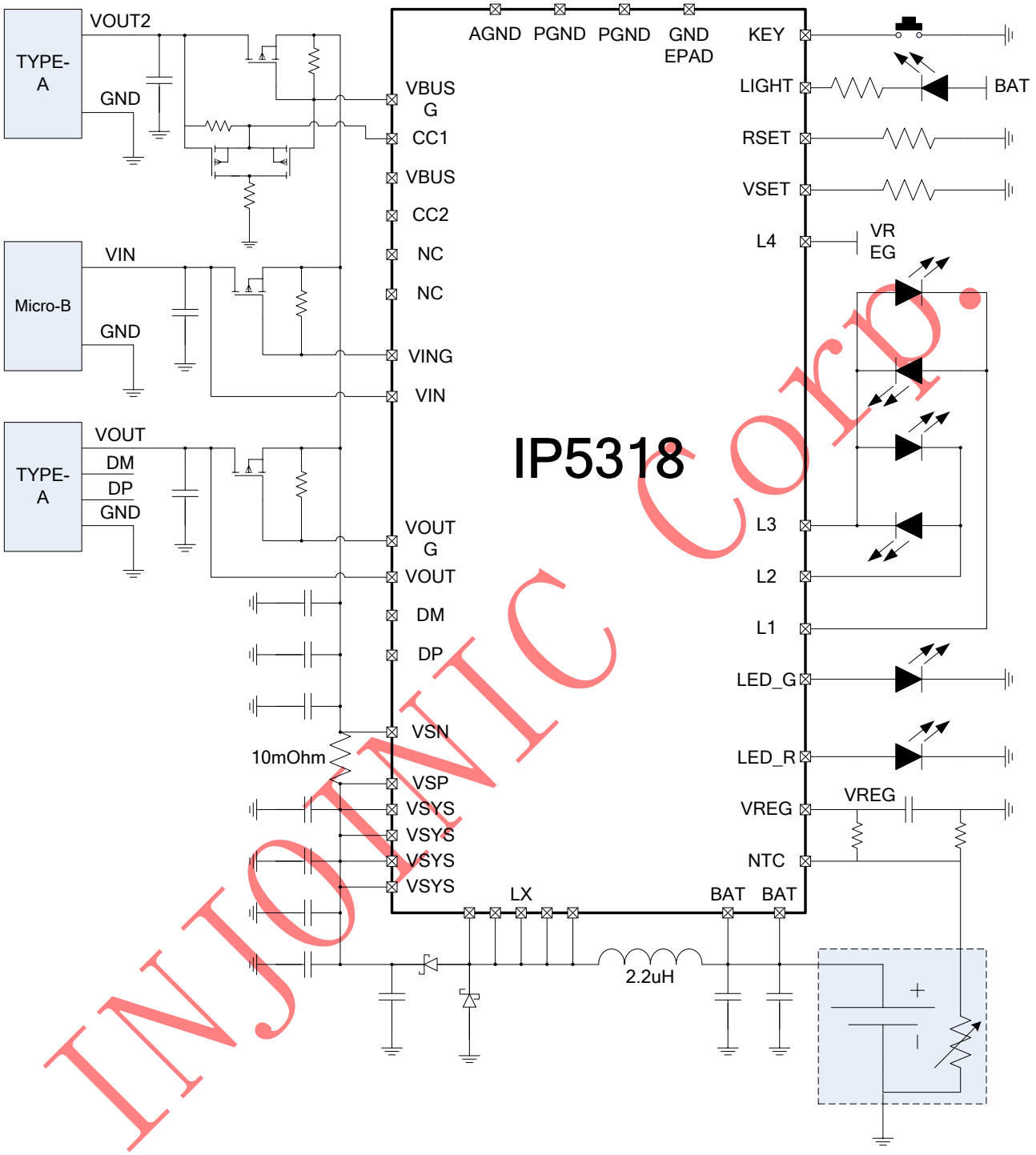


Figure 2

TYPE-A + Micro-B + TYPE-A simplify application schematic diagram (4 LED display mode)

Pin Definition

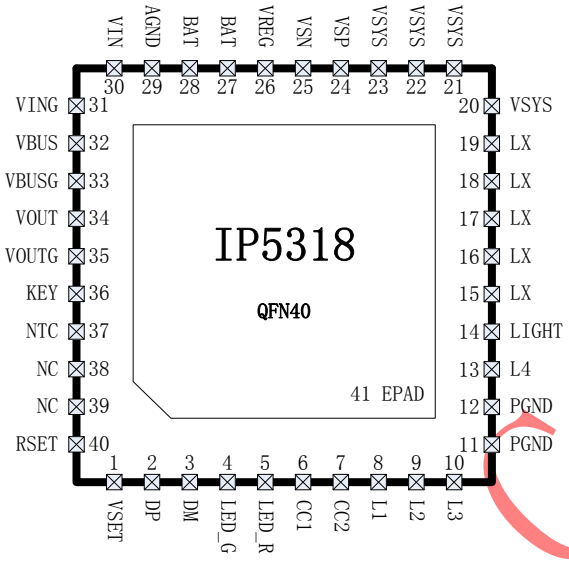


Figure 3 IP5318A Package

IP5318A PIN

PIN		DESCRIPTION
No.	Name	
1	VSET	Battery Voltage Setting Pin
2	DP	USB D+ data line output
3	DM	USB D- data line output
4	LED_G	Quick Charger State Indicator
5	LED_R	Quick Charger State Indicator
6	CC1	TYPE-C CC1
7	CC2	TYPE-C CC2
8	L1/SCL	Display Battery level
9	L2/SDA	Display Battery level
10	L3/IRQ	Display Battery level
11,12	PGND	Power ground
13	L4	Display Battery level
14	LIGHT	Torch-Light Driver, Open drain pin
15,16,17,18,19	LX	Switching node connecting to output inductor
20,21,22,23	VSYS	System connection point
24	VSP	connection point to the positive terminal of sense the

		VSYS current
25	VSN	connection point to the negative terminal of sense the VSYS current
26	VREG	Internal 3.1V LDO output, 100mA Load Capacity
27,28	BAT	Battery connection point to the positive terminal of the battery pack
29	AGND	Analog GND
30	VIN	VIN PIN for Charge input
31	VING	Gate Drive Pin for Charge input PMOS from **VIN**
32	VBUS	VBUS PIN for Charge input
33	VBUSG	Gate Drive Pin for Charge input PMOS from **VBUS**
34	VOUT	Boost output Pin
35	VOUTG	Gate Drive Pin for Boost output PMOS from **VOUT**
36	KEY	Push button input
37	NTC	NTC resistor input to sense battery temperature.
38,39	NC	No Function
40	RSET	Battery level voltage compensation Pin
41	GND	Exposed pad beneath the IC for GND connection and heat dissipation. Always solder to the board, and connecting to ground plane

Absolute maximum ratings

Parameter	symbol	value	Unit
Port input voltage range	V_{IN}	-0.3 ~ 16	**V**
Operating free-air temperature range	T_A	0 ~ 70	℃
Junction temperature	T_J	-40 ~ 150	℃
Storage temperature	Tstg	-60 ~ 150	℃
Thermal resistance (from junction to ambient air)	θ_{JA}	26	**℃/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.

7 Recommended operation conditions

Parameter	symbol	MIN	Typical	MAX	Unit
Input voltage	V_{IN}	4.5	5	14	V
Battery Voltage	Vbat		3.7		V

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

8 Electrical Characteristics

TA=25℃, L=2.2uH, VBAT=3.7V unless otherwise noted

Parameter	symbol	Test condition	MIN	TYP	MAX	Unit
Charger system						
Input voltage	V_{IN} V_{VBUS}	Test at 5V input		5		V
Input current (charging)	V_{IN} V_{VBUS}	VIN=5V,fs= 500KHz	1	3	5	mA
Input current (standby)		VIN=5V,Device not switching	45	75	100	uA
Target charge voltage	V_{TRGT}	Rvset = NC	4.16	4.2	4.24	V
Charge current range	I_{CHRG}				4.8	A
Trickle charge current	I_{TRKL}	VBAT<1.0V	50	100	150	mA
		1.0V<VBAT<3.0V	300	400	500	mA
Trickle charge stop voltage	V_{TRKL}		2.9	3	3.1	V
Recharge threshold	V_{RCH}		4.08	4.1	4.13	V
Charger safety timer	T_{END}			24		Hour
Input under-voltage protection	V_{UVLO}	Rising voltage	4.4	4.5	4.6	V
Input under-voltage protection hysteresis	V_{UVLO}			200		mV
Boost mode						
Battery operation voltage	V_{BAT}		3.0		4.4	V
Battery operation current	I_{BAT}	VOUT=5.1V, fs=375KHz	3	5		mA
DC-DC output voltage	V_{OUT}	Vout=5V mode, Iout =1A	4.9	5.1	5.2	V
		Vout=9V mode, Iout =1A	8.7	9.0	9.2	V
		Vout=12V mode, Iout =1A	11.7	12.0	12.2	V
Output voltage ripple	ΔV_{OUT}	VOUT=5.0V, fs=375KHz		100		mV
Boost output current	I_{vout}	Vout=5V mode		3.1		A
		Vout=9V mode		2.0		A
		Vout=12V mode		1.5		A
Boost output shutdown current	Ioff	Vout=5V mode	3.4	3.6	3.8	A
Load over-current detect timer	T_{UVD}	Vout continuously lower than 4.4V		30		ms

Load short-circuit detect timer	T_{OCD}	Load current continuously larger than 3.5A	150		200	us
Control system						
Switching frequency		Boost switching frequency	250	375		KHz
		Charger switching frequency	375	500		KHz
PMOS on resistance	R_{DSON}		25	30	35	mΩ
NMOS on resistance			13	15	18	mΩ
VREG output voltage	V_{REG}		3.0	3.1	3.2	V
Battery standby current	I_{STB}	VIN=0V,VBAT=3.7V	80	90	100	uA
LDO output current	I_{LDO}		30	50	80	mA
LED lighting current	I_{light}		20	30	40	mA
LED indicator current	$I_{L1/L2/L3/L4}$		2	4	5	mA
Load removal detect timer	T_{loadD}	Load current continuously lower than 60mA	25	32	44	s
Push-button wake-up timer	$T_{OnDebounce}$		30	50		ms
Push-button light-on timer	$T_{Keylight}$		1.2	2		s
Thermal shutdown	T_{OTP}	Rising temperature	110	125	140	℃
Thermal shutdown hysteresis	ΔT_{OTP}			40		℃

9 Function description

Boost converter

IP5318A integrates a high power step-up DCDC converter for single-cell Li-ion battery. It's optimized for Quick Charge™ and can source 3.1A current at 5V output, 2.0A at 9V, 1.5A at 12V.

IP5318A's 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.

IP5318A's boost converter has a thermal regulation loop, which can adaptively regulate the output current to insure IC temperature below the setting value.

Charger

IP5318A integrates a synchronous constant-current and constant-voltage switching Li battery charger. It supports high input voltage fast charging.

When battery is below 3.0V, the charger is in trickle mode, and charging current is 400mA. When battery is above 3V, the charger turns to constant-current mode, and constant-voltage mode is used if battery voltage near charge end. When charge is over, recharge will begin if battery is below 4.1V.

IP5318A's charger has a 500KHz switching frequency, and its maximum charging current is 4.8A, charging efficiency is up to 97%, shortening 3/4 charging time in comparison with the normal chargers.

IP5318A's charger can adapt the charging current to the adapter of various load capacity, which can keep adapters away from malfunction.

IP5318A enter to charge mode when the voltage of VIN is above 4.5V, and the boost switch turn to shut-down.

Quick Charge Interface

The IP5318A can automatically detect Quick Charge 2.0/3.0 capable devices with handshake by USB D+/D- data line. It's also complaint with BC1.2/Apple 2.4A mode/Samsung Mode.

- Apple Device: Applying 2.7V on D+ line and 2.7V on D- line.
- Samsung Smart-Phone: Applying 1.2V on D+ line and 1.2V on D- line.
- BC1.2 : Shorting D+ Line to D- Line
- Quick Charge 2.0/3.0: D+ and D- line config as below and the 2 LEDs indicate the different voltage

D+	D-	Result	LED_G(Green)	LED_R(Red)
0.6V	GND	5V	Off	Off
3.3V	0.6V	9V	Off	On
0.6V	0.6V	12V	On	On
0.6V	3.3V	Continue Mode	-	-
3.3V	3.3V	Keep	-	-

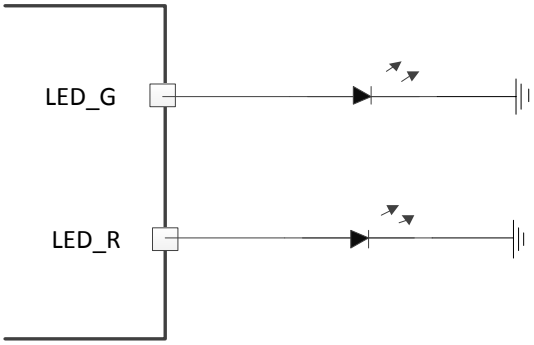
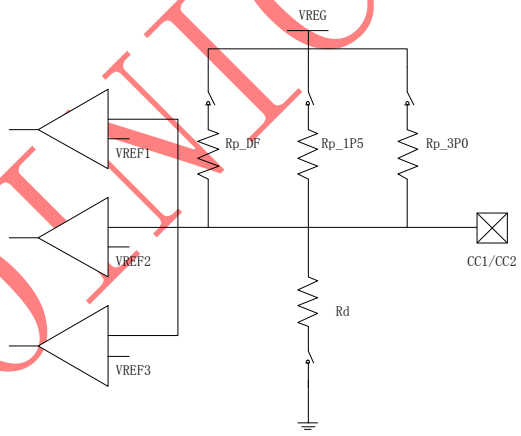


Figure 4 The LED indicator of Quick Charge State

Type-C Interface

The built-in Type-C DRP protocol by IP5318A can supports single port input and output function. It support Try.SRC function, and prior to as source port when connect DRP device.

When IP5318A is Downstream-Facing Port (DFP), the CC pins advertises 3 A (default), 1.5 A or 500 mA for Type-C power. As Upstream-Facing Port (UFP), It can determines the advertised current from the DFP.



Pull-up/Pull-down Resistor

Resistor Type	Resistor Value
Rp_DF	33k
Rp_1P5	11k
Rp_3P0	4.2k
Rd	5.1K

CC Voltage Threshold on Source Side

Table 4-21 CC Voltages on Source Side – Default USB

	Minimum Voltage	Maximum Voltage	Threshold
Powered cable/adapter (vRa)	0.00 V	0.15 V	0.20 V
Sink (vRd)	0.25 V	1.50 V	1.60 V
No connect (vOPEN)	1.65 V		

Table 4-22 CC Voltages on Source Side – 1.5 A @ 5 V

	Minimum Voltage	Maximum Voltage	Threshold
Powered cable/adapter (vRa)	0.00 V	0.35 V	0.40 V
Sink (vRd)	0.45 V	1.50 V	1.60 V
No connect (vOPEN)	1.65 V		

Table 4-23 CC Voltages on Source Side – 3.0 A @ 5 V

	Minimum Voltage	Maximum Voltage	Threshold
Powered cable/adapter (vRa)	0.00 V	0.75 V	0.80 V
Sink (vRd)	0.85 V	2.45 V	2.60 V
No connect (vOPEN)	2.75 V		

CC Voltage Threshold On Sink Side

Table 4-25 Voltage on Sink CC pins (Multiple Source Current Advertisements)

Detection	Min voltage	Max voltage	Threshold
vRa	−0.25 V	0.15 V	0.2 V
vRd-Connect	0.25 V	2.04 V	
vRd-USB	0.25 V	0.61 V	0.66 V
vRd-1.5	0.70 V	1.16 V	1.23 V
vRd-3.0	1.31 V	2.04 V	

Type-C Detect Timing

Figure 4-36 DRP Timing

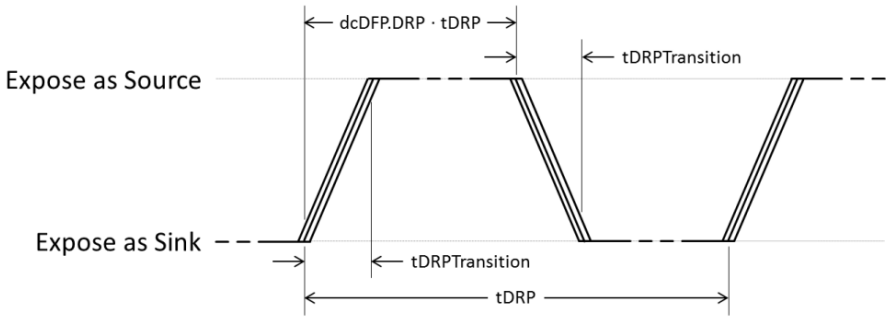
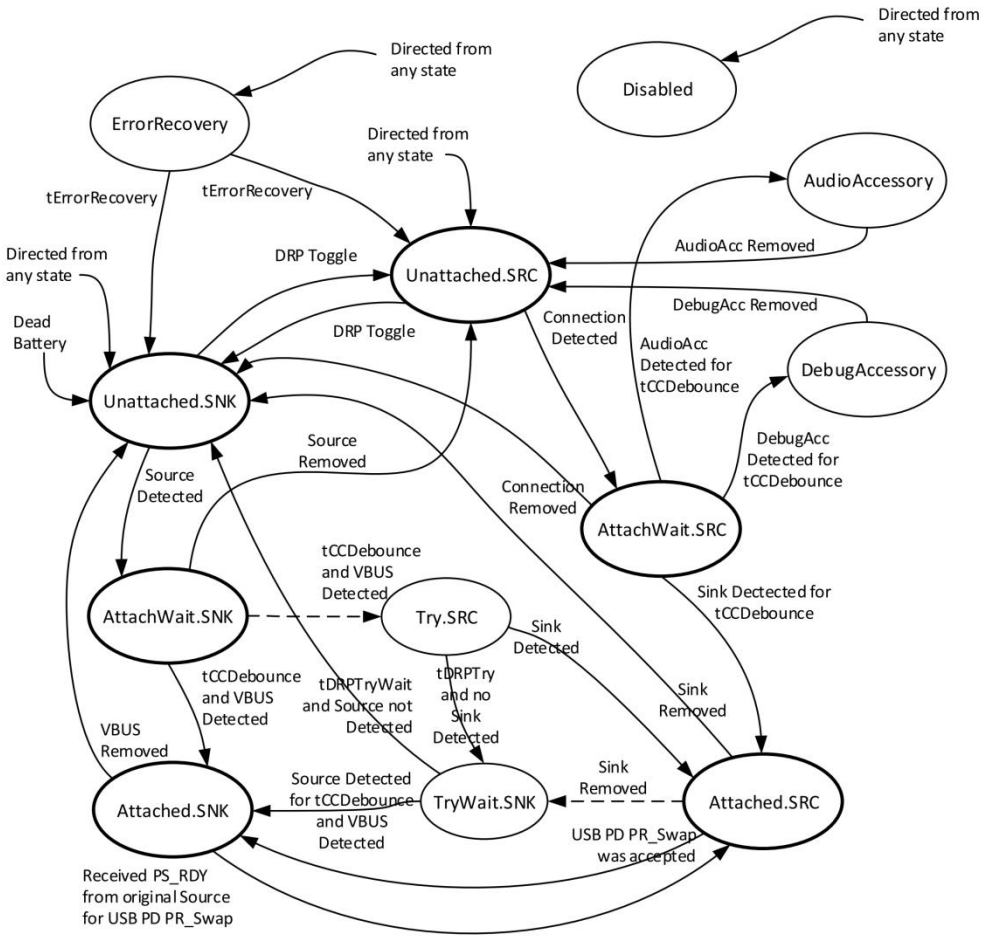


Table 4-19 DRP Timing Parameters

	Minimum	Maximum	Description
tDRP	50 ms	100 ms	The period a DRP shall complete a Source to Sink and back advertisement
dcSRC.DRP	30%	70%	The percent of time that a DRP shall advertise Source during tDRP
tDRPTransition	0 ms	1 ms	The time a DRP shall complete transitions between Source and Sink roles during role resolution
tDRPTry	75 ms	150 ms	Wait time associated with the Try.SRC state.
tDRPTryWait	400 ms	800 ms	Wait time associated with the TryWait.SNK state

Type-C State Machine

Figure 4-16 Connection State Diagram: DRP with Accessory and Try.SRC Support



PowerPath Management

Standby State:

When the adapter insert into VIN PIN or VBUS PIN, turn to Charge State

When the Type-C UFP insert to VBUS PIN, turn to Boost State

When the VOUT pin connect the powered smart device, turn to Boost State

Boost State:

In the Boost state, the path between output of step-up converter and VOUT pin is always open. The power-path between output of step-up converter and VBUS pin will be closed until the successful handshake by Type-C Protocol

The High Voltage of Quick Charge 2.0 Output (9V/12) only delivers through VOUT pin. The voltage of VBUS only is 5V.

Charge state:

The step-up switch converter and the path to VOUT pin will be shut-down once in the Charge State,

The Source of Charger is either from VIN PIN or VBUS PIN. Which source is supply early which is preferred select and other is close. For example, when VIN pin is powered firstly, the path from VBUS pin to input of charger would be close advisedly until absence of power to VIN pin

Battery voltage selection

IP5318A can support different batteries by changing the resistance of VSET to GND. The relation is show as below. When the resistor vary, the battery level of LED would be automatic adjust.

VSET (KOhm)	Battery Type
NC	4.2V
120	4.3V
68	4.35V
0	4.4V

NTC

IP5318A integrated NTC, and can detect battery pack temperature.

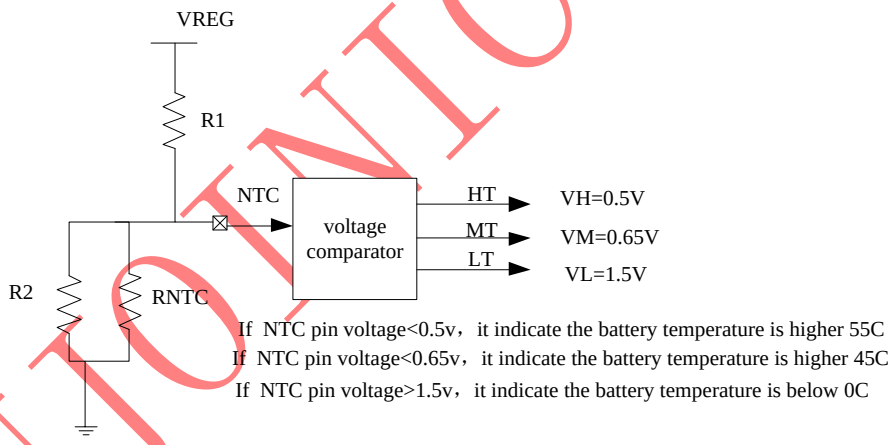


Figure 5 Battery NTC Threshold

When NTC module detects the temperature is in 0~45º C, normal charging current is used. When temperature is in 45~55 º C, half charging current is used. When temperature is above 55 º C, charger and boost are stopped.

Push Button

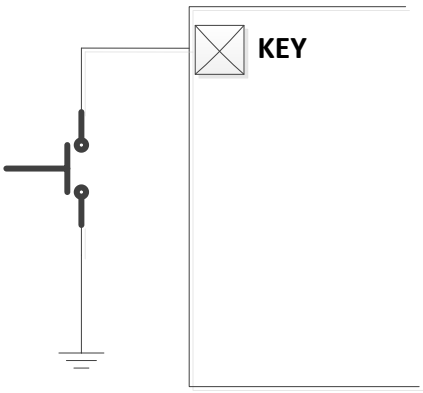


Figure 6 KEY button

Push button's connecting is shown above. IP5318A can identify long push and short push.

- If button is pushed longer than 30ms but shorter than 2s, IP5318A will identify the action as short push. Short push will open battery level LEDs and step-up converter
- If button is pushed longer than 2s, IP5318A will identify the action as long push. Long push will open or close flashlight LED
- If two short push is detected within 1s, IP5318A will close step-up convertor, SOC indicator LED and flashlight LED.
- If button is pushed shorter than 30ms, IP5318A will ignore the action.

Fuel gauge and State of Charge (SOC) indication

IP5318A has an integrated fuel gauge, which can indicate the battery's state of charge accurately.

IP5318A can support 2/3/4/5 LEDs as the SOC indicator with very simple configuration. By the built-in identification algorithm, IP5318A can automatically identify how many LEDs are used as the SOC indicator.

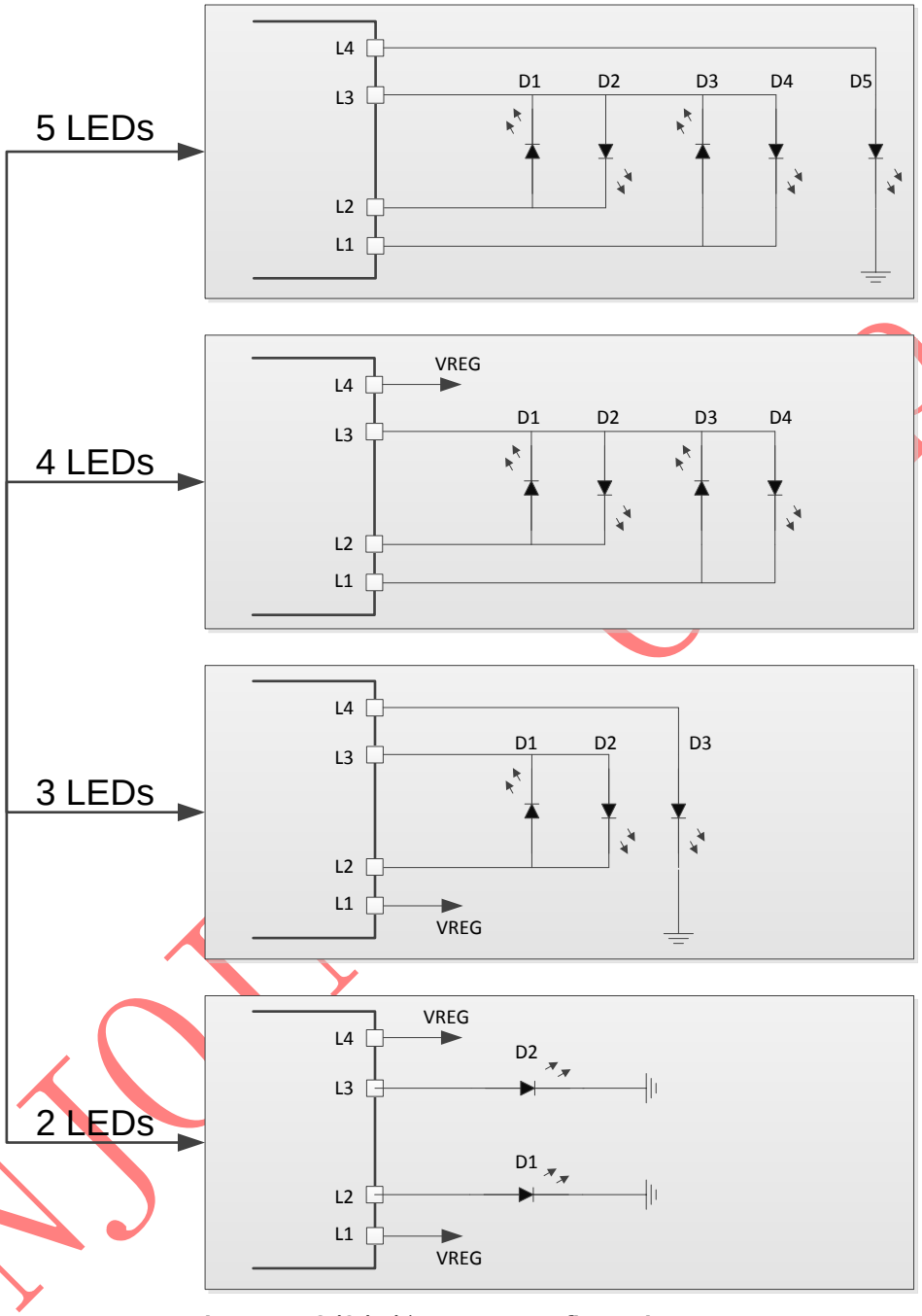


Figure 7 2/3/4/5 LED PIN configuration

Discharging mode, 4 LEDs as the indicator

SOC(%)	L1	L2	L3	L4
SOC≥75%	ON	ON	ON	ON
50%≤SOC＜75%	ON	ON	ON	OFF
25%≤SOC＜50%	ON	ON	OFF	OFF
3%≤SOC＜25%	ON	OFF	OFF	OFF

0%＜SOC＜3%	1.5Hz blink	OFF	OFF	OFF
SOC=0%	OFF	OFF	OFF	OFF

Charging mode 4 LEDs as the indicator

SOC(%)	L1	L2	L3	L4
Full	ON	ON	ON	ON
75%≤SOC	ON	ON	ON	1.5Hz blink
50%≤SOC＜75%	ON	ON	1.5Hz blink	OFF
25%≤SOC＜50%	ON	1.5Hz blink	OFF	OFF
SOC＜25%	1.5Hz blink	OFF	OFF	OFF

The displays of 3 LEDs and 5 LEDs are similar to that of 4 LEDs. The corresponding SOC of each LED is presented in the following table.

SOC(%)	D1	D2	D3	D4	D5
3 LEDs	33%	66%	100%		
4 LEDs	25%	50%	75%	100%	
5 LEDs	20%	40%	60%	80%	100%

The 2LEDs mode is Bi-color LED display

Charging mode

SOC(%)	D1	D2
100%	ON	ON
66%≤C＜100%	OFF	1.5Hz blink
33%≤C＜66%	1.5Hz blink	1.5Hz blink
C＜33%	1.5Hz blink	OFF

Discharging mode

SOC(%)	D1	D2
66%≤C＜100%	OFF	ON
33%≤C＜66%	ON	ON
C＜33%	ON	OFF
C＜3%	1.5Hz blink	OFF

Battery impendence setting

IP5318A can set the battery impendence by RSET pin which make the SOC indicator LEDs display more evenly. The relationships between the resistance connected to RSET and battery impendence are shown in the following table.

RSET resistance (KOhm)	Battery impendence (mOhm)
184	165
174	155
164	145
154	135
144	125
134	110
124	100
114	90
104	80
94	70
84	60
74	40
64	30
54	20
44	10
33	0

Flash Light

IP5318A has an integrated MOS FET. LIGHT PIN in IP5318A can drive lighting LED directly. Maximum driving current is 100mA. When two short push is detected within 1s, lighting LED is opened or closed. If flash light is not needed, light should connect to GND, IP5318A will automatically close flash light.

VREG

VREG is an always on LDO with 50mA load capacity.

Automatic cellphone plug-in detect

IP5318A can automatically detect the cellphone's plug-in. When detecting the plug-in, IP5318A will wake up from standby mode and open the step-up converter without push button action. IP5318A supports modules without push buttons.

10 Typical application schematic

IP5318A only needs capacitors, resistors, and inductors to realize a full featured power bank solution.

TYPE-A + Micro-B + TYPE-C

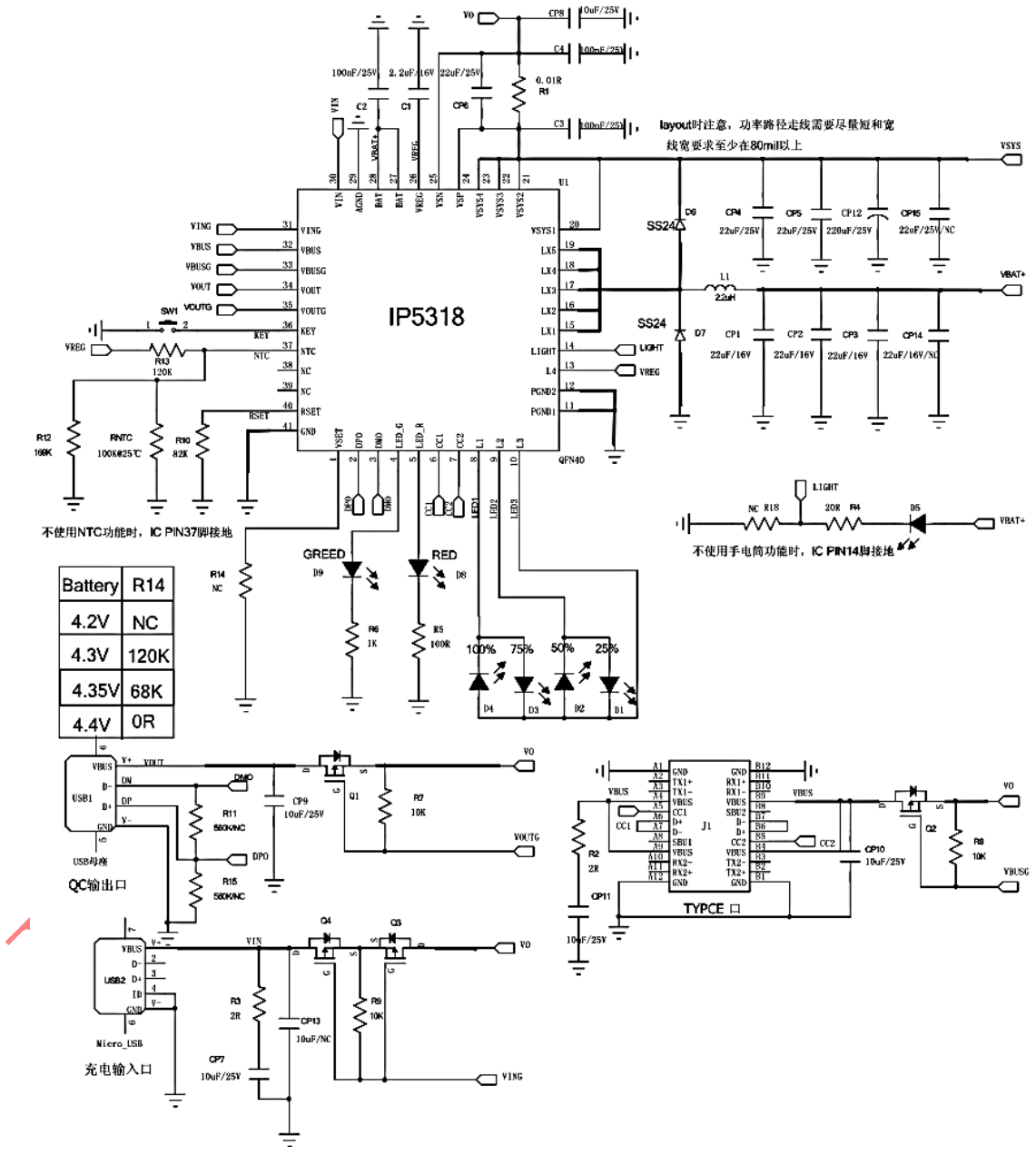


Figure 8 Typical application schematic (A+B+C)

BOM List

Index	Component name	Part number& spec	Unit	Num	Position
1	IC	QFN40 IP5318A	U1	1	
2	SMD Capacitor	0603 100nF 10% 25V	C2 C3 C4	3	
3	SMD Capacitor	0603 2.2uF 10% 16V	C1	1	
4	SMD Capacitor	0805 22uF 10% 16V	CP1 CP2 CP3	3	
5	SMD Capacitor	0805 22uF 10% 25V	CP4 CP5 CP6	3	
6	SMD Capacitor	0805 10uF 10% 25V	CP7 CP8 CP9 CP10 CP11	5	
7	Electrolytic Capacitor	220uF 25V 10%	CP12	1	
8	SMD Resistor	1206R 0.01R 1%	R1	1	
9	SMD Resistor	0603R 2R 5%	R2 R3	2	
10	SMD Resistor	0603R 20R 5%	R4	1	Adjust brightness of Light
11	SMD Resistor	0603R 100R 5%	R5	1	
12	SMD Resistor	0603R 1K 5%	R6	1	
13	SMD Resistor	0603R 10K 5%	R7 R8 R9	3	
14	SMD Resistor	0603R 82K 5%	R10	1	
15	SMD Resistor	0603R 120K 1%	R13	1	
16	SMD Resistor	0603R 169K 1%	R12	1	NTC
17	NTC Resistor	100K@25℃ B=4200	RNTC	1	
18	SMD LED	0603 Blue LED	D1 D2 D3 D4	4	
19	SMD LED	0603 Green LED	D9	1	
20	SMD LED	0603 Red LED	D8	1	
21	Torch LED	5MM LED	D5	1	
22	Inductor	2.2UH 10*10	L1	1	
23	Schottky Diode	DO-214AB SS24	D6 D7	2	
24	PMOS	SOT23-3 VS3407A	Q1 Q2 Q3 Q4	4	Rds(on)<20m ohm I>=3A
25	TYPE-C	TYPE-C	J1	1	
26	Push Button	SMT 3*6 Push Button	SW1	1	
27	TypeA USB	AF10 8PIN USB	USB1	1	
28	Micro USB	MICRO-7-DIP-5.9	USB2	1	

Recommend Inductor Type

DARFON PIN	Thickness (mm)	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.	
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	

TYPE-A + Micro-B + TYPE-A

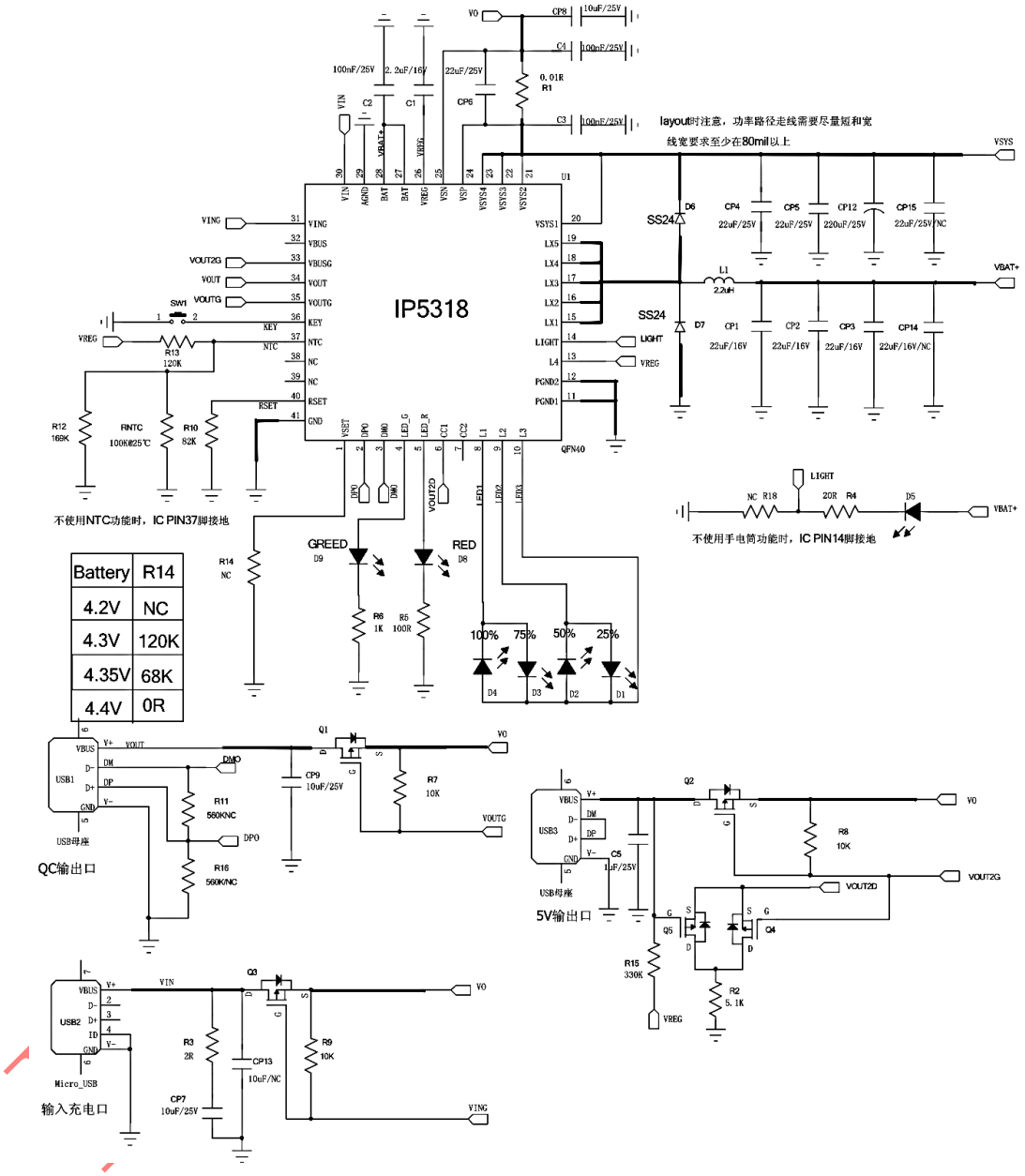


Figure 9 Typical application schematic (A+A+B)

BOM List

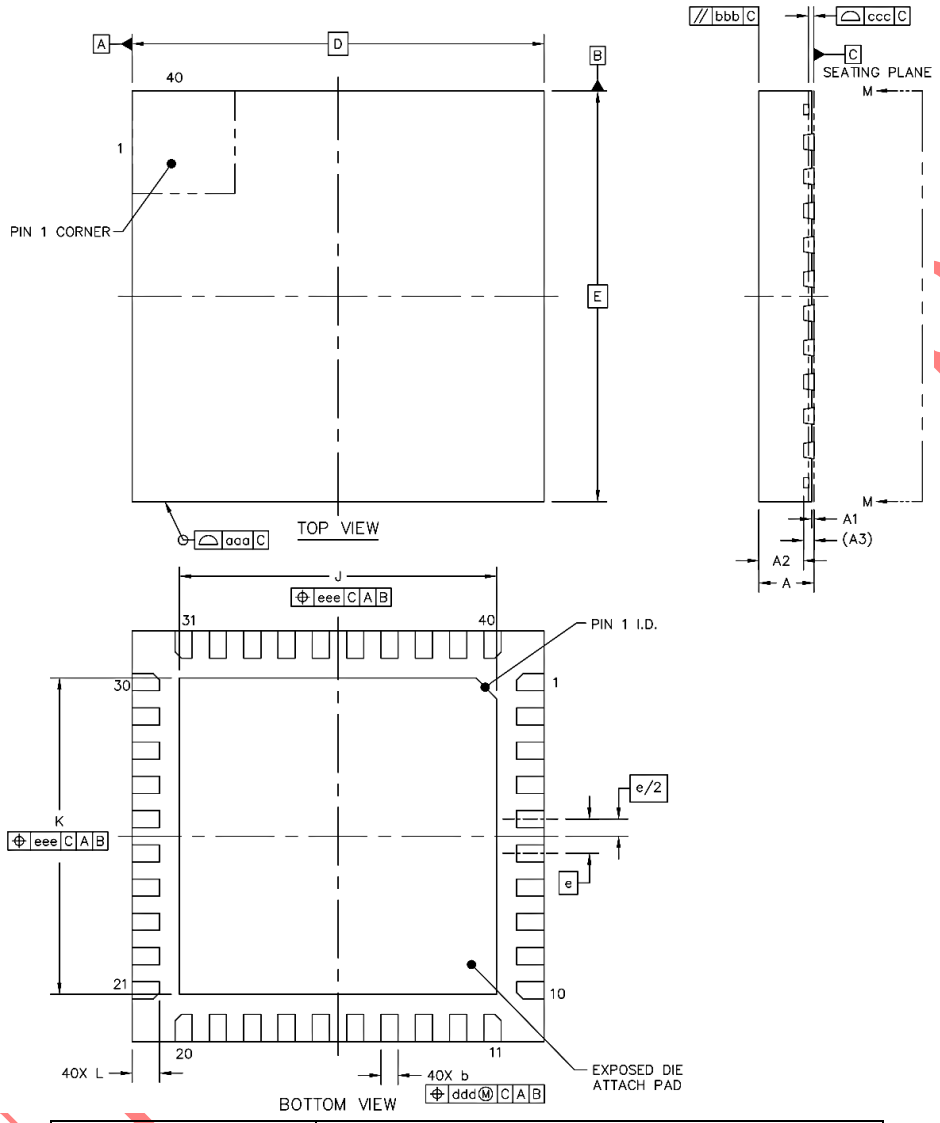
Index	Component name	Part number& spec	Unit	Num	Position
1	IC	QFN40 IP5318AQ	U1	1	

2	SMD Capacitor	0603 100nF 10% 25V	C2 C3 C4	3	
3	SMD Capacitor	0603 1uF 10% 25V	C5	1	
4	SMD Capacitor	0603 2.2uF 10% 16V	C1	1	
5	SMD Capacitor	0805 22uF 10% 16V	CP1 CP2 CP3	3	
6	SMD Capacitor	0805 22uF 10% 25V	CP4 CP5 CP6	3	
7	SMD Capacitor	0805 10uF 10% 25V	CP7 CP8 CP9	3	
8	Electrolytic Capacitor	220uF 25V 10%	CP12	1	
9	SMD Resistor	1206R 0.01R 1%	R1	1	
10	SMD Resistor	0603R 2R 5%	R3	1	
11	SMD Resistor	0603R 20R 5%	R4	1	Adjust brightness of Light
12	SMD Resistor	0603R 100R 5%	R5	1	
13	SMD Resistor	0603R 5.1K 5%	R2	1	
14	SMD Resistor	0603R 1K 5%	R6	1	
15	SMD Resistor	0603R 10K 5%	R7 R8 R9	3	
16	SMD Resistor	0603R 82K 5%	R10	1	
17	SMD Resistor	0603R 330K 5%	R15	1	
18	SMD Resistor	0603R 120K 1%	R13	1	NTC
19	SMD Resistor	0603R 169K 1%	R12	1	
20	NTC Resistor	100K@25℃ B=4200	RNTC	1	
21	SMD LED	0603 Blue LED	D1 D2 D3 D4	4	
22	SMD LED	0603 Green LED	D9	1	
23	SMD LED	0603 Red LED	D8	1	
24	Torch LED	5MM LED	D5	1	
25	Inductor	2.2UH 10*10	L1	1	
26	Schottky Diode	DO-214AB SS24	D6 D7	2	
27	PMOS	SOT23-3 SI2301	Q4 Q5	2	
28	PMOS	SOT23-3 VS3407A	Q1 Q2 Q3	3	Rds(on)<20m ohm I>=3A
29	Push Button	SMT 3*6 Push Button	SW1	1	
30	TypeA USB	AF10 8PIN USB	USB1 USB3	2	
31	Micro USB	MICRO-7-DIP-5.9	USB2	1	

Recommend Inductor Type

DARFON PIN	Thickness (mm)	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.	
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	

Package information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	-	0.035	0.05
A2	-	0.65	0.67
A3	-	0.125	-
b	0.2	0.25	0.30
e		0.5 BSC	
D		6 BSC	
E		6 BSC	
J	4.52	4.62	4.72
K	4.52	4.62	4.72
L	0.35	0.40	0.45
aaa		0.1	
bbb		0.1	
ccc		0.08	
ddd		0.1	
eee		0.1	