IP2369 supports multiple fast charging input and output protocols such as **PD3.1 ,** and supports **2 to 6** series connection

Battery integrated buck-boost power **MOS** power management chip with a maximum charge and discharge power of **45W**

1 IP2369 Features

ÿCharge and discharge specificationsÿBuilt-in BUCK-BOOST step-up and step-down power NMOSÿCharge and discharge power up to 45WÿAdaptive charge current regulationÿExternal resistor can set battery type, full voltage 3.65V/4.1V/4.2V/4.3V/4.35V/4.4V ÿ External resistor sets the number of battery cells in series: 2/3/4/5/6 ÿ External resistor can set the maximum charge and discharge power, supporting up to 45W charge and discharge ÿ Supports **2 USB** ports at the same time ÿ 1 USB-A port output ÿ 1 USB-C port input and output ÿ Fast charging specifications ÿ Integrated FCP input and output fast charging protocol ÿ Integrated AFC input and output fast charging protocol ÿ Integrated DRP Try.SRC protocol, PD3.1 input and output fast charging protocol ÿ Integrated QC2.0/QC3.0/QC3.0+ output fast charging protocol

Other features: 4/2/1 LED power indicator light, I2C support, 100ÿA standby power consumption , EN wake-up function , multiple protections and high reliability

ÿ Input overvoltage and undervoltage protection ÿ Output overcurrent and short circuit protection ÿ Battery overcharge, overdischarge, and overcurrent protection ÿ IC overtemperature protection ÿ Charge and discharge battery temperature NTC protection ÿ ESD 4KV, input (including CC1/CC2 pins) withstand voltage 30V ÿ **Package specifications: QFNWB-7*7-60L 0.4pitch**

2 IP2369 Application Products

2~6 series lithium battery/lithium iron phosphate battery charging and discharging

3 Introduction to IP2369

The IP2369 is a lithium battery charge and discharge management chip that integrates input and output fast-charging protocols such as AFC/FCP/PD2.0/PD3.0/PD3.1 and a synchronous buck-boost converter, offering a charge and discharge power of up to 45W. The IP2369's

high integration and rich functionality include an internal buck-boost power NMOS module, enabling synchronous buck-boost functionality with only a single inductor. This minimizes the need for external components, effectively reducing the overall solution size and bill of materials (BOM) cost.

IP2369 supports 2/3/4/5/6 series cells, and the number of battery cells in series can be selected by external resistor setting; IP2369 supports external resistor to set battery type, full charge voltage is 3.65V/4.1V/4.2V/ 4.35V/4.4V

IP2369 has built-in IC temperature, battery NTC temperature and input voltage The voltage control detection loop can intelligently adjust the charging current according to the identified charger power.

The standby power consumption of IP2369 can be as low as no more than 100uA.

The IP2369 has a built-in 14-bit ADC that can accurately measure input voltage and current, battery voltage and current, etc. Information such as the IP2369's charge and discharge voltage, and charge current can be obtained via I2C.

IP2369 supports 4 power indicator lights to display the power level and charging and discharging status.

Table of contents

4 IP2369 modification records

Note: Page numbers in previous versions may differ from those in the current version.

Changed page number for version **V1.23** to **V1.24 (May** 2024)

ÿ Correct the short circuit problem between VIO_P/BAT_P and LX in the demo application schematic.....4

Changed page number for version **V1.22** to **V1.23 (April** 2024)

ÿ Corrected TEST4 pin numbering and synchronization demo application schematics.....4

Changed page number for version **V1.21** to **V1.22 (March** 2024)

ÿ Pin definition and pin description synchronous demo schematic diagram.....5

Changed page number for version **V1.20** to **V1.21 (March** 2024)

ÿ Modify electrical characteristics such as charging current, ripple, etc. Parameters.....10

Changed page numbers for versions **V1.11** to **V1.20 (March** 2024)

ÿ Corrected the pin definitions of pins 28 and 31, refer to the demo schematic.....5

Changed page number for version **V1.10** to **V1.11 (March** 2024)

ÿ Added discharge NTC parameter description.....17

Changed page numbers for versions **V1.00** to **V1.10 (March** 2024)

ÿ Deleted the low power consumption 10uA description and changed the standby power consumption to 100uA.....1

ÿ Add a 10uF capacitor to port A in the schematic diagram.……22

Initial release **V1.00 (February** 2024)

5 IP2369 simplified application schematic

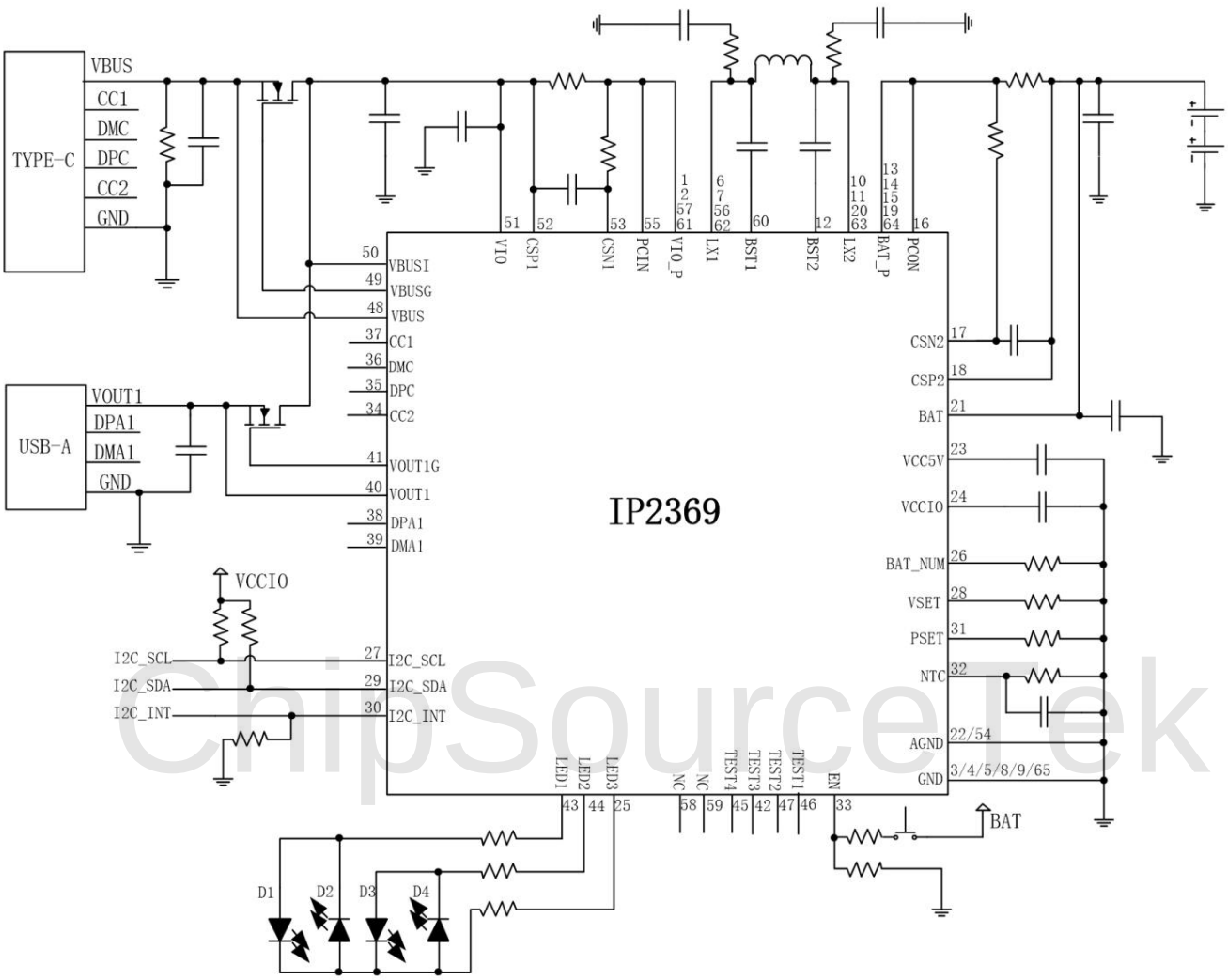


Figure **1 IP2369** simplified application schematic

6 IP2369 Pin Definition

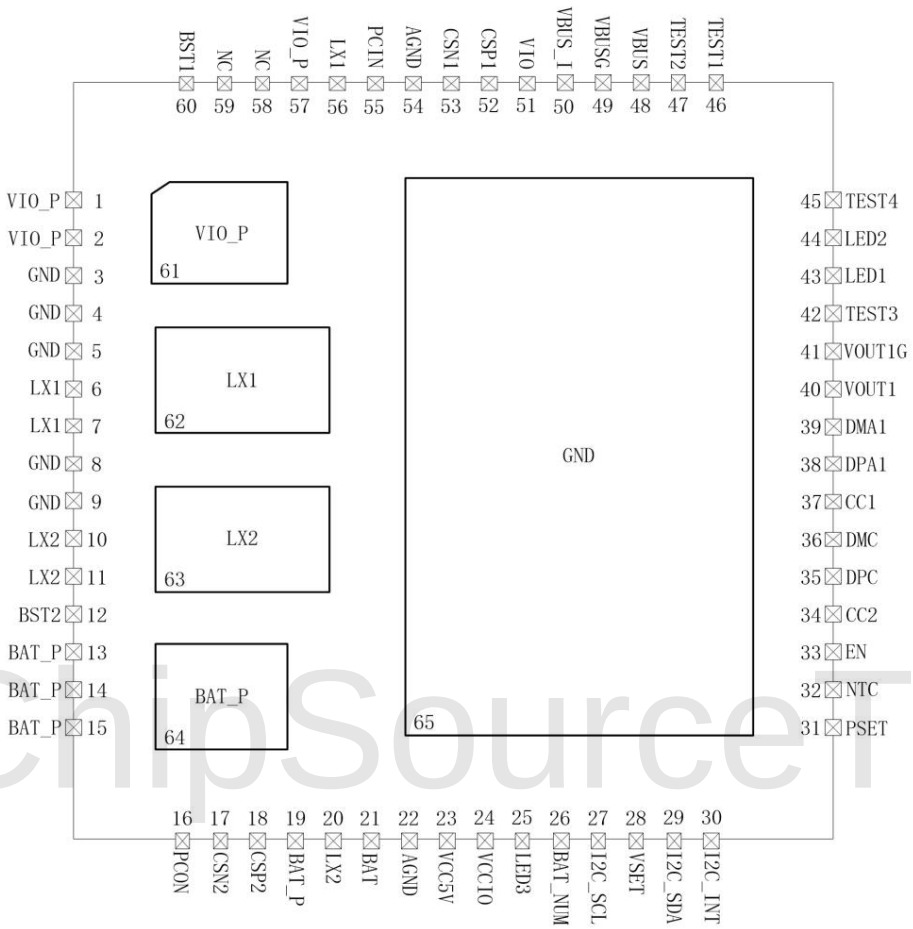


Figure **2 IP2369** pin diagram

6.1 Pin Description

Pin Num	Pin Name	PIN Definition
1	VIO_P	VIO power pin
2	VIO_P	VIO power pin
3	GND Power	ground
4	GND Power	ground
5	GND Power	ground
6	LX1	VIO terminal inductor connection pin
7	LX1	VIO terminal inductor connection pin

8	GND Power ground	
9	GND Power ground	
10	LX2	BAT terminal inductor connection pin
11	LX2	BAT terminal inductor connection pin
12	BST2	H-bridge power BAT end bootstrap voltage pin
13	BAT_P	BAT power pin
14	BAT_P	BAT power pin
15	BAT_P	BAT power pin
16	PCON BAT peak current sensing pin	
17	CSN2	BAT terminal current sampling negative terminal
18	CSP2	BAT terminal current sampling positive terminal
19	BAT_P	BAT power pin
20	LX2	BAT terminal inductor connection pin
21	ONE	BAT power supply pin
22	AGND analog ground	
23	VCC5V system 5V power supply, powering the analog circuit inside the IC	
24	VCCIO system 3.3V power supply, powering the IC internal digital circuit	
25	LED3 LED3 pin	
26	BAT_NUM BAT_NUM sets the number of batteries in series and connects the resistor to ground	
27	I2C_SCL I2C_SCL pin	
28	VSET VSET sets the fully charged voltage of a single battery string, connected to the ground by a resistor	
29	I2C_SDA I2C_SDA pin	
30	I2C_INT	I2C_INT pin
31	PSET	PSET sets the maximum charging and discharging power of the system, and connects the resistor to the ground
32	NTC	NTC sets the protection temperature, connect NTC resistor
33	IN	EN wake-up pin, connected to a button to wake up and shut down the device
34	CC2	USB C port detection and fast charging communication pin CC2
35	DPC	USB C port fast charging intelligent identification DP
36	DMC	USB C port fast charging intelligent DM recognition
37	CC1	USB C port detection and fast charging communication pin CC1
38	DPA1	A port fast charge output identification DP
39	DMA1 A port fast charge output identification DM	
40	VOUT1 A port output detection pin	
41	VOUT1G Port A output path NMOS control pin	
42	TEST3 test point	
43	LED1 LED1 pin	
44	LED2 LED2 pin	

45	TEST4 test point	
46	TEST1 test point	
47	TEST2 test point	
48	VBUS VBUS input and output detection pin	
49	VBUSG C port input and output path NMOS control pin	
50	VBUS_I VIO input and output path current detection pin	
51	SAW	VIO power pin
52	CSP1	VIO terminal current sampling positive terminal
53	CSN1	VIO terminal current sampling negative terminal
54	AGND analog ground	
55	PCIN	VIO peak current sensing pin
56	LX1	VIO terminal inductor connection pin
57	VIO_P	VIO power pin
58	NC	
59	NC	
60	BST1	H-bridge power VIO bootstrap voltage pin
61	VIO_P	VIO power pin
62	LX1	VIO terminal inductor connection pin
63	LX2	BAT terminal inductor connection pin
64	BAT_P	BAT power pin
65	GND System ground and heat dissipation ground, need to maintain good contact with GND	

TEL: +86-0755-27595155 27595165
FAX: +86-0755-27594792
WEB:Http://www.ChipSourceTek.com
Email: Sales@ChipSourceTek.com Tony.Wang@ChipSourceTek.com

7 IP2369 chip internal block diagram

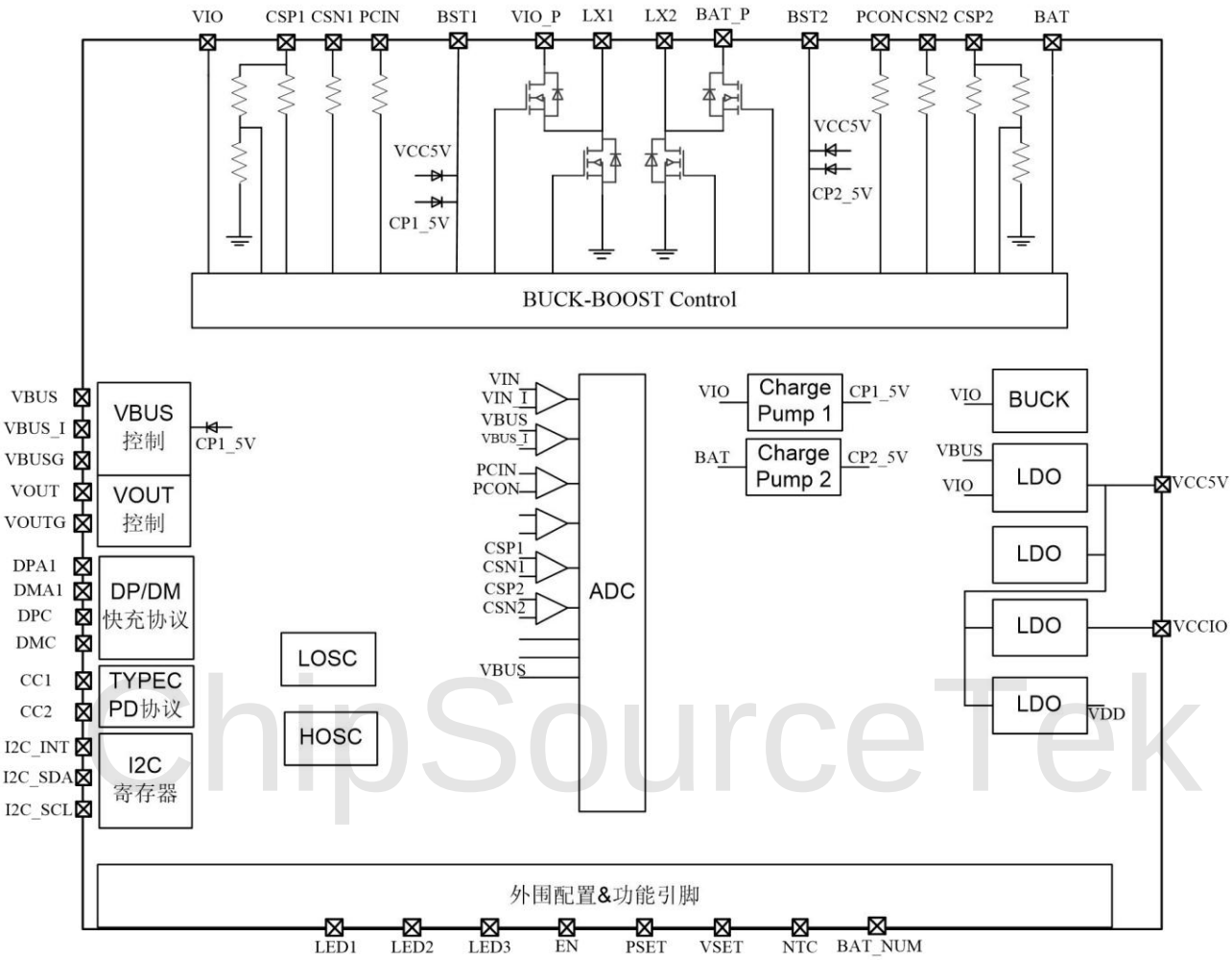


Figure **3** Chip internal block diagram

TEL: +86-0755-27595155 27595165 FAX:
+86-0755-27594792 WEB:Http://
www.ChipSourceTek.com E-mail:
Sales@ChipSourceTek.com Tony.Wang@ChipSourceTek.com

8 IP2369 limit parameters

parameter	symbol	value	unit
BAT voltage range	VBAT	-0.3 ~ 35	In
VBUS/VIN voltage range	VVBUS/VIN	-0.3 ~ 30	In
VIO voltage range	VVIO	-0.3 ~ 30	In
LX1/BST1/LX2/BST2 voltage range VLX1/BST1/LX2/BST2		ÿ-3V for 10nsÿ-0.3 ~ 50	In
CSP2/CSN2/PCIN voltage range	VCSP2/CSN2/PCIN	-0.3 ~ 35	In
CSP1/CSN1/PCON voltage range	VCSP1/CSN1/PCON	-0.3 ~ 30	In
CC1/CC2 voltage range	VCC1/CC2	-0.3 ~ 30	In
DMC/DPC voltage range	VDMC/DPC	-0.3 ~ 22	In
Other functions & configuration pin voltage range	VLED/EN/TEST/PSET	-0.3 ~ 8	In
I2C interface voltage range	VI2C_INT/SDA/SCL	-0.3~8	In
Junction temperature range	TJ	-40 ~ 125	ÿ
Storage temperature range	Test	-60 ~ 150	ÿ
Thermal resistance (junction to ambient)	ÿJA	45	ÿ/W
Human Body Model (HBM)	ESD	4	KV

* Stresses exceeding those listed under the Absolute Maximum Ratings section may cause permanent damage to the device.

Exposure for too long may affect the reliability and service life of the device

9 IP2369 recommended operating conditions

parameter	symbol	Minimum	Typical values	Maximum	unit
Input and output voltage VBUS/VOUT1		4.5		25	In
Battery voltage	VBAT			32	In
Working environment temperature	FACING	-40		85	ÿ

*Device operational characteristics are not guaranteed outside these operating conditions.

10 IP2369 electrical characteristics

Unless otherwise specified, TA = 25°C, L = 4.7ÿH

Parameter	symbol	Test conditions		Min.	Typ.	Max.	Unit
charging system							
Input voltage	VBUS			4.5	5/9/12/15/ 20	25	In
Input overvoltage voltage	VBUS rising voltage			28.5	29	30	In
Peak current	IL_PK inductor peak current limit					12	A
Trickle charge current	ITRKL	VVBUS=5V, VBAT<2.5V		30	50	70	mA
		VVBUS=5V, 2.5V<=VBAT<VTRKL Number		100	200	300	mA
Trickle cut-off voltage	VTRKL	of cells is N, VTRGT is not 3.65V Number of		N*2.9	N*3	N*3.1	In
		cells is N, VTRGT=3.65V Number of cells		N*2.7	N*2.75	N*2.85	V
Charging constant voltage	VCV	is N, RVSET = 27Kÿ Number of cells is N,		N*4.35	N*4.40	N*4.45	V
		RVSET = 18Kÿ Number of cells is N,		N*4.20	N*4.35	N*4.40	V
		RVSET = 13Kÿ Number of cells is N,		N*4.25	N*4.30	N*4.35	V
		RVSET = 9.1Kÿ Number of cells is N,		N*4.15	N*4.20	N*4.25	V
		RVSET = 6.2Kÿ Number of cells is N,		N*4.05	N*4.10	N*4.15	V
		RVSET = 3.6Kÿ VBUS=5V, input current		N*3.6	N*3.65	N*3.7	In
Charging current	ICHRG			2.70	3.00	3.30	A
		VBUS=9V, PD fast charge, Input current	PMAX=20W	2.00	2.22	2.44	A
			PMAX>=27W	2.70	3.00	3.30	A
		VBUS=9Vÿ Non-PD fast charging, Input current	PMAX>=20W	1.80	2.00	2.20	A
		VBUS=12V , PD Fast charging, Input current	PMAX=20W	1.50	1.67	1.84	A
			PMAX=27W	2.03	2.25	2.47	A
			PMAX=30W	2.25	2.50	2.75	A
			PMAX>=36W	2.70	3.00	3.30	A
		VBUS=12V , No PD fast charging, Input current	PMAX>=20W	1.35	1.50	1.65	A
		VBUS =15VÿPD and non-PD, input power flow	PMAX=20W	1.12	1.25	1.37	A
			PMAX=27W	1.53	1.70	1.87	A
			PMAX=30W	1.71	1.90	2.09	A
			PMAX=36W	2.07	2.30	2.53	A
			PMAX=45W	2.56	2.85	3.13	A
		VBUS =20VÿPD Fast charging and non-PD fast	PMAX=20W	0.85	0.95	1.04	A
			PMAX=27W	1.15	1.28	1.40	A

		Charging, input current	PMAX=30W	1.28	1.43	1.57	A
			PMAX=36W	1.53	1.70	1.87	A
			PMAX=45W	1.92	2.14	2.35	A
Charging and stopping current ISTOP					100		m.a.
The recharge threshold VRCH battery number is N					VTRGT – N*0.1		In
Charging deadline TEND					48		Hour
Discharge system							
Battery operating voltage VBAT battery number is N				N*2.70		N*4.45 V	
Switch working battery Input current	DIFFERENT	VBAT=6*3.7V, VOUT=5.0V, fs=250kHz, Iout=0mA			12		m.a.
DC output voltage	QC2.0 VOUT	VOUT=5V@1A		4.75	5.00	5.25	In
		VOUT=9V@1A		8.70	9	9.30	In
		VOUT=12V@1A		11.60	12	12.40 V	
	QC3.0/ QC3+ VOUT	@1A		3.6		12	In
	QC3.0 Step				200		mV
	QC3+ Step				20		mV
Output voltage ripple ÿVOUT		VBAT=4*3.7V, VOUT=5.0V, fs=250KHz, Iout=1A			85		mV
		VBAT=4*3.7V, VOUT=9.0V fs=250KHz, Iout=1A			100		mV
		VBAT=4*3.7Vÿ VOUT=12Vÿfs=250KHz, Iout=1A			100		mV
		VBAT=4*3.7Vÿ VOUT=15Vÿfs=250KHz, Iout=1A			120		mV
		VBAT=4*3.7Vÿ VOUT=20Vÿfs=250KHz, Iout=1A			200		mV
Discharge system maximum Output power	Pmax PD protocol					45 W	
Discharge system efficiency ÿout		VBAT=2*3.0V, VOUT=20V, IOUT=1.5A			92.0		%
		VBAT=4*3.0V, VOUT=20V, IOUT=2.25A			95.0		%

		VBAT=6*3.0V, VOUT=20V, IOUT=2.25A		96.0		%
Discharge system overcurrent Shutdown current	Ishut	VBAT=N*3.7V, output 5V	3.0	3.3	3.6	A
		VBAT=N*3.7V, output 9V, non-PD state 2.4 VBAT=N*3.7V, output 12V, non-		2.7	3.0	A
		PD state 1.8 VBAT=N*3.7V, output PD state		2.0	2.2	A
				PDO * 1.1		A
Load overcurrent detection time	TUVD output voltage is continuously lower than 2.4V			30		ms
Load short-circuit detection time	TOCD output voltage is continuously lower than 2.2V			40		ÿs
control system						
Switching frequency	fs	Discharge switching frequency		250		kHz
		Charging switching frequency		250		kHz
VCC5V output Voltage	VCC5V		4.75	5	5.25	In
VCC5V output Current					30	m.a.
VCCIO output Voltage	VCCIO		3.15	3.3	3.45	In
VCCIO output Current	ICCIO				30	m.a.
Battery standby power flow	ISTB VBAT=22V, average current after shutdown for 1 minute			80	100	ÿA
LED display driver Current	IL1 IL2	Voltage drops by 10%	5	7	10	m.a.
Thermal shutdown temperature TOTP rising temperature Thermal			110	125	140	ÿ
shutdown temperature delay stagnation	ÿTOTP			40		ÿ
Built-in H-bridge power MOS on-resistance	RDSÿONÿ VGS=4.5VÿID=5A			7	10 mÿ	

11 IP2369 Function Description

11.1 Charging Function

IP2369 is charged via Type-C input. The IP2369 has

a constant current and constant voltage lithium battery charging management system that supports a synchronous buck-boost switch structure.

IP2369 adopts switching charging technology with a switching frequency of 250kHz.

The IP2369 can be configured with external resistors for different battery types, full charge voltages, and charging power. It supports 2/3/4/5/6 battery strings and supports full charge voltages of 3.65V/4.1V/4.2V/4.3V/4.35V/4.4V. The maximum input charging power can reach 20V/2.25A (45W), with a charging efficiency of up to 96%.

The IP2369 supports trickle-constant current-constant voltage charging:

When the battery voltage VBAT ÿ 2.5V, it uses a low-current trickle charge with a battery charging current of approximately 50mA. When

the battery voltage is 2.5V < VBAT ÿ VTRKL, it uses a trickle charge with a battery charging current of approximately 200mA. When the

battery voltage VTRKL < VBAT < VCV, it uses constant current charging and charges the battery at the set constant current. When the battery voltage

VBAT = VCV, as the battery voltage rises to near the full charge voltage, the charging current slowly decreases and constant voltage charging begins. After entering constant voltage charging, when the battery charging current is less than ISTOP and the battery voltage approaches the constant voltage, charging stops and enters the full charge state. After entering the full charge state, the battery voltage will continue to be detected. When the battery voltage falls below VBAT < VRCH, charging will resume.

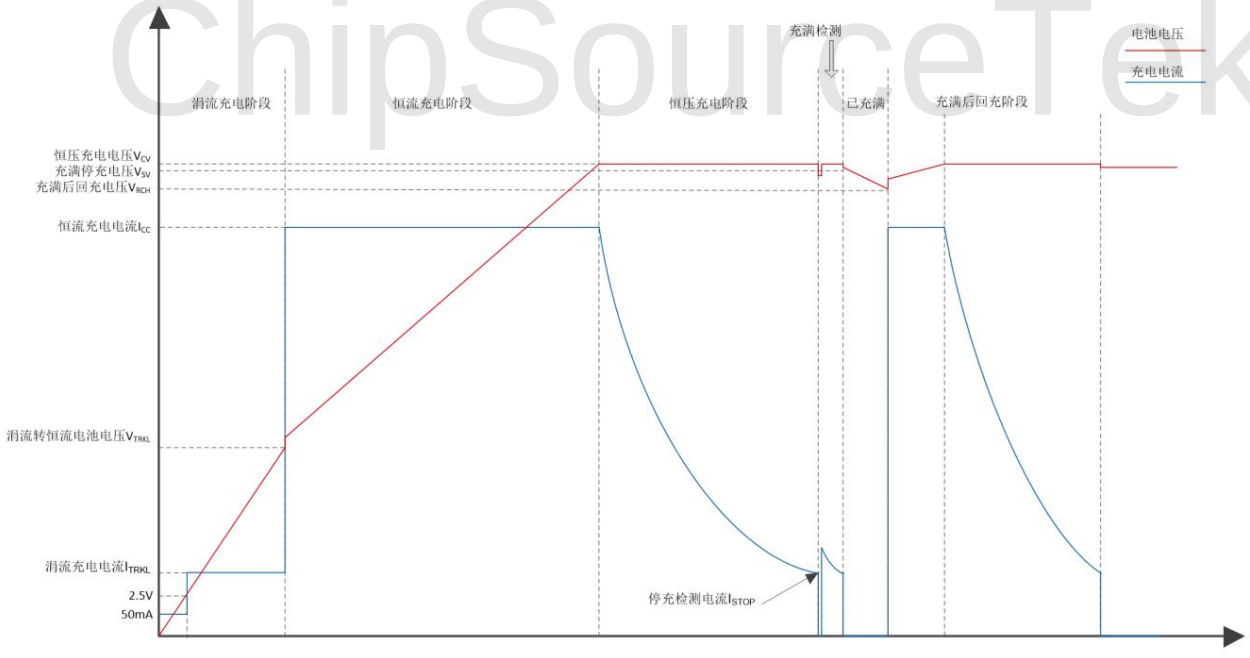


Figure **4** Schematic diagram of battery charging process

IP2369 integrates AFC/FCP/PD2.0/PD3.0/PD3.1 input fast charging protocols, which can be connected via the Type-C port.

DPC/DMC/CC1/CC2 to apply for fast charging voltage from the fast charging charger, which will automatically adjust the charging current to adapt to chargers with different load capacities.

Electrical appliances.

When charging with a charger without fast charging or a DC power supply, IP2369 will set the charging current according to the input voltage:

Input voltage	Maximum input current during constant current charging
4.5<VBUSÿ6.5V	3A
6.5<VBUSÿ9.5V	2A
9.5<VBUSÿ13.5V	1.5A
13.5<VBUSÿ16.5V	3A
16.5<VBUSÿ24V	2.25A

Note: When the actual charging power is greater than the set maximum input power limit, the charging current will also be reduced;

IP2369 supports Huawei FCP and Samsung AFC fast charging input protocols. When using a charger that supports Huawei FCP and Samsung AFC, it can be charged.

When the input voltage is set to the highest, IP2369 will apply for the highest input voltage, and the constant current charging current will be set according to the input voltage level above.

IP2369 supports PD2.0/PD3.0/PD3.1 input protocols. When charging with a PD fast charging adapter, IP2369 will read the

Then it applies for charging voltage and sets charging current according to the received PD information packet; when the power of the received PD packet is less than the set

When the charging power required by the adapter is reached, the charging current will be reduced to make the maximum power at the input end less than or equal to the PD broadcast power given by the adapter.

11.2 Discharge Function

IP2369 integrates USB Type-C input and output identification interface, automatically switches built-in pull-up and pull-down resistors, and automatically identifies the charging and discharging status of the inserted device

With the Try.SRC function, when connected to a DRP device, it can give priority to external discharge and charging the other party.

IP2369 supports multiple fast charging formats: PD2.0/PD3.0/PD3.1, QC2.0/QC3.0/QC3+, FCP, AFC, and Apple.

IP2369 supports PD2.0/PD3.0/PD3.1 output protocols and supports a maximum power output of 45W;

Set the maximum output power	Output voltage and current
45W	5V/3A,9V/3A,12V/3A,15V/3A,20V/2.25A
36W	5V/3A,9V/3A,12V/3A,15V/2.4A,20V/1.8A
30W	5V/3A,9V/3A,12V/2.5A,15V/2A,20V/1.5A
27W	5V/3A,9V/3A,12V/2.25A,15V/1.8A
20W	5V/3A,9V/2.22A,12V/1.67A

IP2369's USB-A1 and USB-C can support QC2.0/QC3.0/QC3+, FCP, AFC, and Apple

Mobile phone 2.4A mode, BC1.2 ordinary Android phone 1A mode.

11.3 Charge and Discharge Path Management

11.3.1 Standby & Light Load Shutdown

If the USB-C port is plugged into a charging power source, charging can be started directly. If a USB-C UFP device is plugged into the USB-C or a power-consuming device is plugged into the USB-A1, the discharge function can be automatically turned on. If there is a key action, it will only be turned on when a load is connected to the USB-A1 or USB-C, otherwise it will remain off. When in multi-port output mode, if the output current of any output port is less than about 80mA (MOS Rds_ON@15mohm), the port will be automatically closed after 16 seconds. When the number of power-consuming devices is reduced to only one power-consuming device, all output ports will be closed first after about 16 seconds, and the high-voltage fast charging function will be turned on.
Then open the output port of the last power-consuming device to reactivate the device and request fast charging.

When only one output port is turned on and the total output power is less than 350mW for about 32 seconds, the output port and discharge function will be turned off and the device will enter standby mode. Under the PD protocol, the light load shutdown time is 16 minutes.

11.3.2 Discharge

When no key is pressed on the IP2369, only the output ports connected to the power-consuming devices will be turned on; the output ports that are not connected to the devices will remain closed.

USB-A1 and USB-C both support the output fast charging protocol. However, since this solution is a single inductor solution, it can only support one voltage output.
Fast charging is only supported when one of the output ports is enabled. When both output ports are used at the same time, the fast charging function will be automatically disabled.

Connect as shown in the "Typical Application Schematic Diagram". When any output port has entered the fast charge output mode, when other output ports are connected to power-consuming devices, all output ports will be closed first, the high-voltage fast charge function will be turned off, and then the output port with the device will be opened. At this time, all output ports only support Apple, BC1.2 mode charging.

11.3.3 Charging

The USB-C can be charged by plugging it into a power source. It supports fast charging mode that automatically identifies the power source and matches the appropriate charging voltage and current.

11.3.4 Charging and Discharging

When both a charging power source and a powered device are connected simultaneously, the device automatically enters simultaneous charge-discharge mode. In this mode, the chip automatically disables internal fast-charge input requests. To ensure proper charging of the powered device, the IP2369 raises the charging undervoltage loop to above 4.9V, prioritizing power to the powered device. If the VIO voltage is only 5V, the discharge path is enabled to power the powered device. For safety reasons, the discharge path is disabled if the VIO voltage is greater than 5.6V.

If the power source is unplugged during the simultaneous charging and discharging process, the IP2369 will disable the charging function and restart the discharging function to power the device. For safety reasons and to enable the device to reactivate the fast charging request, the output voltage will drop to 0V for a period of time during the transition.

During simultaneous charging and discharging, if the device is unplugged, fully charged, or stops drawing power for approximately 16 seconds, the IP2369 automatically shuts down the corresponding discharge path. When both discharge paths are shut down and the device returns to single-charge mode, the undervoltage loop is lowered and fast charging is automatically reactivated, accelerating the charging process.

11.4 Input and output maximum power setting

IP2369 sets the maximum input and output power of the system by judging the resistance value connected to the PSET pin.

RPSET	Corresponding to the set maximum power **PMAX**
18k	45W
13k	36W
9.1k	30W
6.2k	27W
3.6k	20W

11.5 Setting the number of batteries in series

IP2369 sets the number of batteries in series by judging the resistance value connected to the BAT_NUM pin.

RBAT_NUM	Corresponding to the set number of batteries connected in series
18k	6 skewers
13k	5 skewers
9.1k	4 skewers
6.2k	3 skewers
3.6k	2 skewers

11.6 Battery Type Setting

IP2369 sets the battery type by judging the resistance value connected to the VSET pin.

RVSET	Corresponding battery type (single battery full voltage)
27k	4.4V
18k	4.35V
13k	4.3V
9.1k	4.2V
6.2k	4.1V
3.6k	3.65V

11.7 NTC Function

IP2369 integrates NTC function to detect battery temperature. When IP2369 is working, it generates a constant current source on the NTC pin, which is connected to the external The NTC thermistor generates a voltage, and the chip determines the current battery temperature by internally detecting the voltage at the NTC pin. * A 100nF capacitor is connected in parallel between the NTC pin and GND. The capacitor must be placed close to the chip pin.

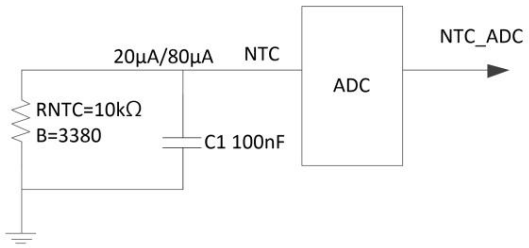


Figure **5** Battery **NTC** comparison

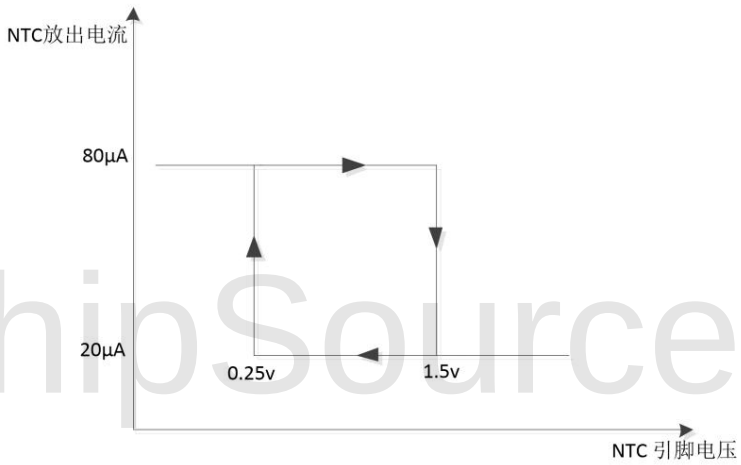


Figure **6 Relationship between NTC** voltage and discharge current

To accurately distinguish the battery's NTC temperature, the IP2369 uses a current-switching NTC detection module. The chip internally detects the current output by the NTC pin and the voltage generated by an external pull-down NTC thermistor to determine the current battery temperature. When the NTC pin's output current is 80ÿA and the voltage detected on the NTC pin is above 1.5V, the NTC pin's output current is adjusted to 20ÿA. When the NTC pin's output current is 20ÿA and the voltage detected on the NTC pin is below 0.25V, the NTC pin's output current is adjusted to 80ÿA.

During charging, charging stops if the NTC temperature drops below 0°C (0.55V), charging continues normally between 0°C and 45°C, and stops if the temperature exceeds 45°C (0.39V). In the discharge state: when the temperature is lower than -20 degrees (1.39V), the discharge stops; between -20 degrees and 60 degrees, the discharge is normal; above 60 degrees (0.24V), the discharge stops;

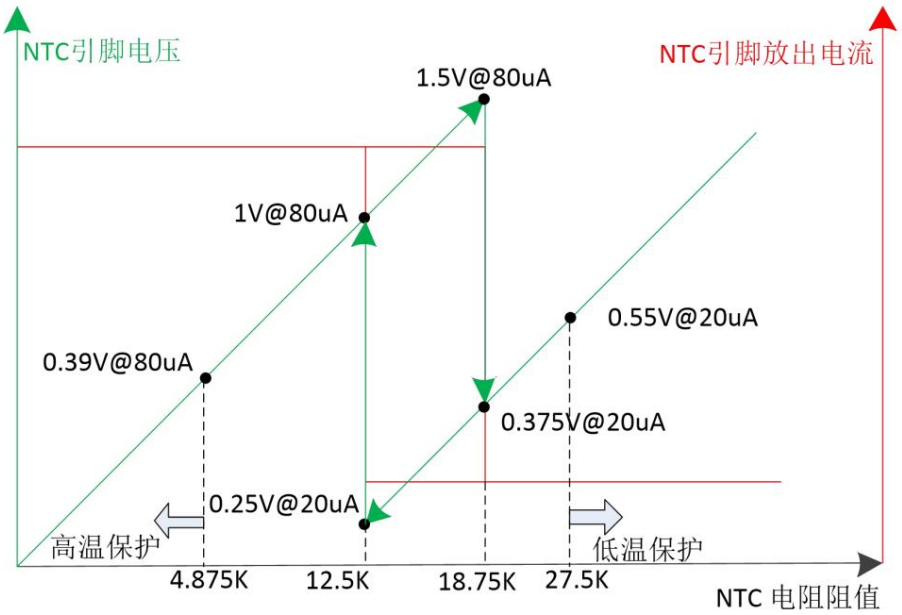


Figure **7 Relationship between NTC** voltage and **NTC** resistance

If the solution does not require the NTC function, a 10kÿ resistor must be connected to the ground from the NTC pin. The NTC pin cannot be left floating or connected directly to ground.

11.8 Light Display Function

IP2369 supports 4, 2, and 1 power indicator solutions. The connection method is as follows.

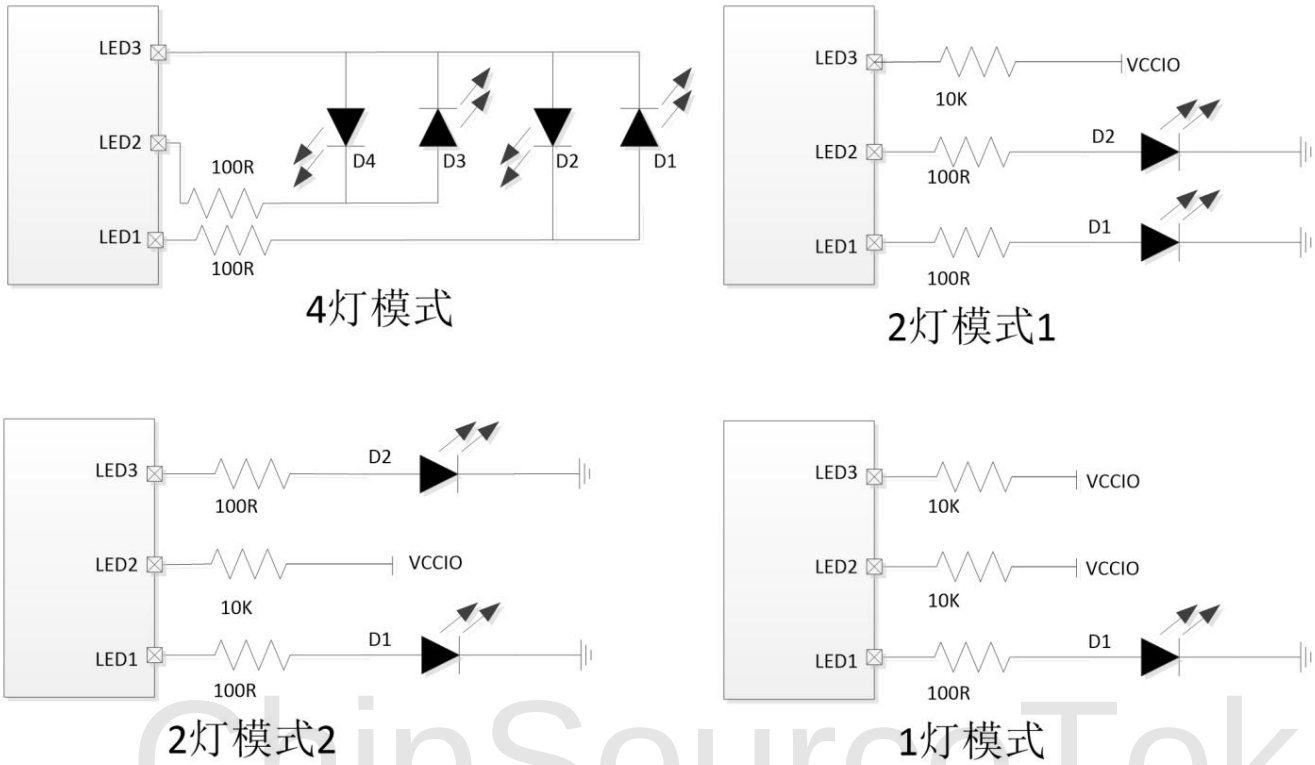


Figure **8 4, 2, 1 LED** connection method

4 The display mode of the light is:

During normal charging

Battery capacity C (%)	D1	D2	D3	D4
full	Bright	Bright	Bright	Bright
75%ÿC	Bright	Bright	Bright 0.5Hz flashing	
50%ÿCÿ75%	Bright	On 0.5Hz Flashing Off		
25%ÿCÿ50%	On 0.5Hz Flashing Off			Destruction
Cÿ25%	0.5Hz flashing off		Destruction	Destruction

During normal discharge

Battery capacity C (%)	D1	D2	D3	D4
75%ÿC	Bright	Bright	Bright	Bright
50%ÿCÿ75%	Bright	Bright	Bright	Destruction
25%ÿCÿ50%	Bright	Bright	Destruction	Destruction

Cÿ25%	Bright	Destruction	Destruction	Destruction
C=0	Flashes 4 times and turns off		Destruction	Destruction

The discharge stops after flashing 4 times (250ms on and 250ms off).

2. The display mode of light mode 1 is dual-color light:

During normal charging

Battery capacity C (%)	D1	D2
full	Destruction	Bright
66%ÿCÿ100%	Off 0.5Hz flashing	
33%ÿCÿ66%	0.5Hz flashing	0.5Hz flashing
Cÿ33%	0.5Hz flashing off	

During normal discharge

Battery capacity C (%)	D1	D2
66%ÿCÿ100%	Destruction	Bright
33%ÿCÿ66%	Bright	Bright
Cÿ33%	Bright	Destruction
C=0	Flashes 4 times and turns off	

The discharge stops after flashing 4 times (250ms on and 250ms off).

2 The display mode of light mode 2 is:

During charging, D1 is on and D2 is off. After full charge, D1 is off and D2 is on. If charging is abnormal, D1 and D2 flash at the same time (250ms on and 250ms off).

During discharge, D1 is always on. When C=0, D1 flashes 4 times (250ms on, 250ms off) and then stops discharging.

1. The display mode of light is:

During charging, D1 flashes (1s on, 1s off). After full charge, D1 is always on. If charging is abnormal, D1 flashes quickly (250ms on, 250ms off).

During discharge, D1 is always on. When C=0, D1 flashes 4 times (250ms on, 250ms off) and then stops discharging.

11.9 Button Functions

IP2369 supports key functions. The key connection method is shown in Figure 9.

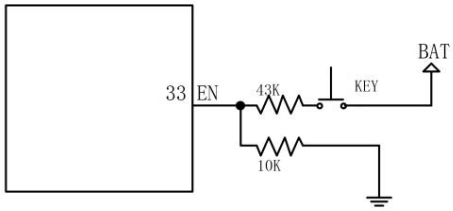


Figure **9 EN** button connection method

1.2VÿVENÿ3.3V is a high level, 0ÿVENÿ1.2V is a low level, and the EN voltage should not exceed 5V.

A short press is considered a high-level state of greater than 100ms and less than 2s. After entering low-power mode, a short press turns on the battery indicator and the device enters the no-load state. If a charging or discharging device is detected, the device enters the corresponding charging or discharging state. In the no-load state, if no charging or discharging device is detected at port C for 10 seconds, the device enters low-power mode. In the no-load state, two short presses within 1s will shut down the device and enter low-power mode, turning off the battery indicator

and discharge output. If the EN pin remains high for more than 10s, the system will reset.

The EN pin cannot be left floating and must be pulled down to ground via a 10K resistor.

12 IP2369 Application Schematic Diagram

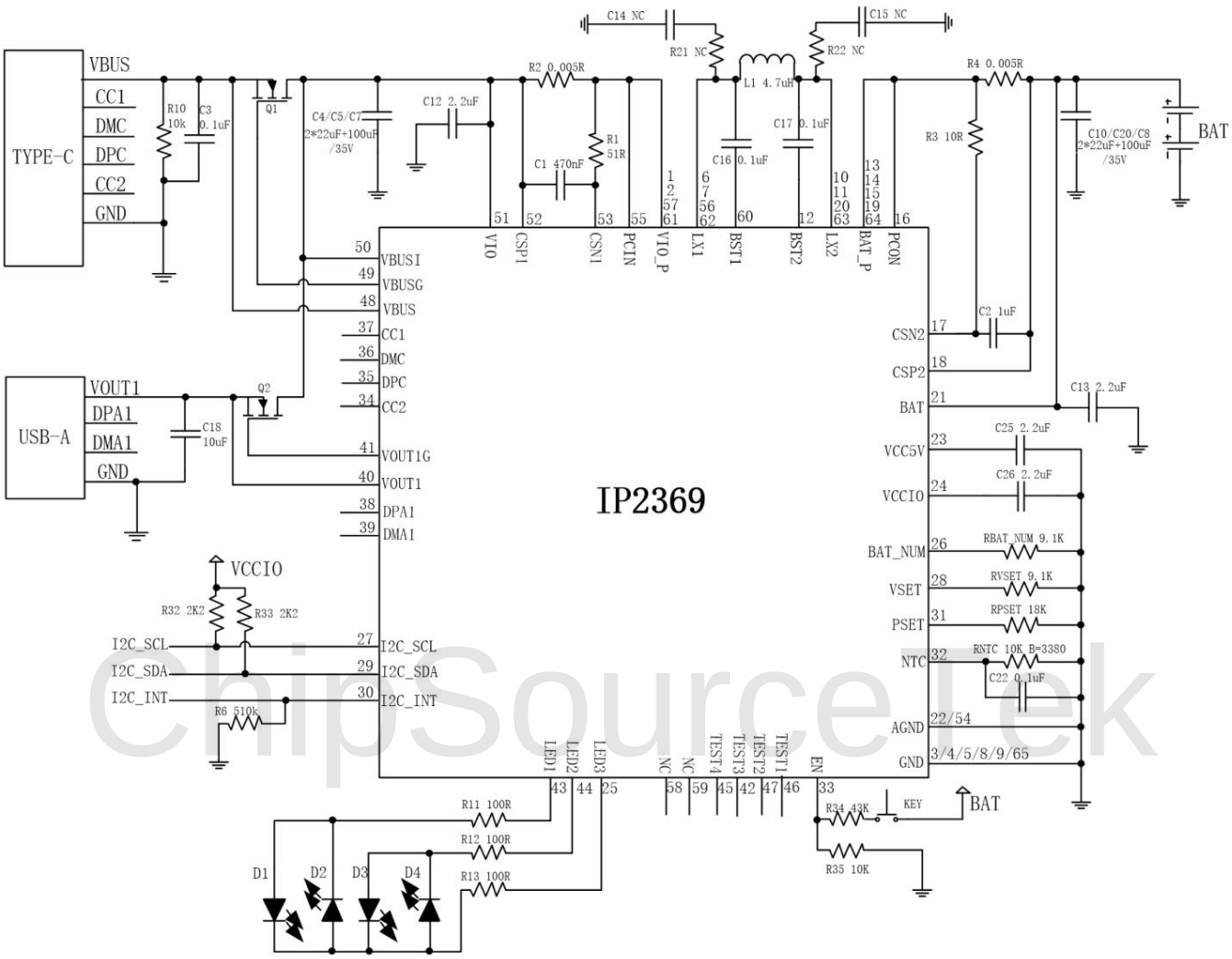
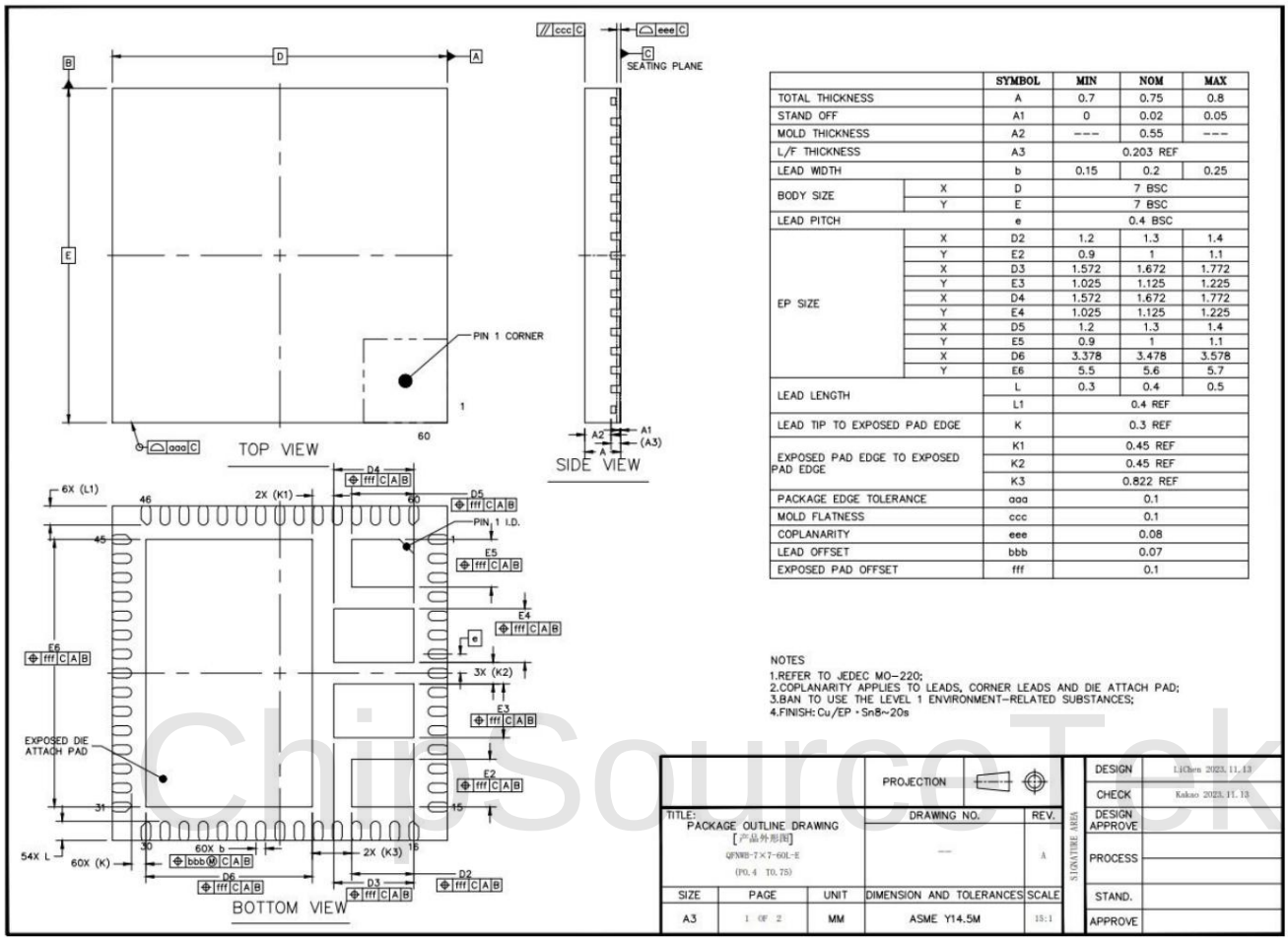


Figure **10** Application Schematic

13 IP2369 GOOD

Component Name 1 Chip IC 2 Chip	Models & Specifications	Location	Dosage	Remark
capacitor 0603 100nF 10%	QFN60 IP2369	U1	1	
50V C3,C16,C17,C22 3 Chip capacitor 0603 470nF 10% 50V C1 4 Chip capacitor 0603 1ÿF 10% 35V C2 5 Chip capacitor			4	
0603 2.2ÿF 10% 35V C12,C13,C25,C26 6 Chip capacitor 0805 10ÿF 10% 35V C18 7 Chip			1	
capacitor 1210 22ÿF 10% 35V C4,C5,C10,C20 8 Solid capacitor 100ÿF 35V 10% C7,C8			1	
			4	
			1	
			4	
			2	
9 Chip resistor 1206 0.005R 1%		R2,R4	2	Sampling resistor, high precision is required Low temperature drift metal film resistor
10 0603 SMD Resistor 100R 5% 11 0603 SMD		R11,R12,R13	3	
Resistor 9.1K 12 0603 SMD Resistor 18K		RBAT_NUM	1	
13 0603 SMD Resistor 9.1K 14 0603		RPSET	1	
SMD Resistor 10R 1% 15 0603 SMD		RVSET	1	
Resistor 43K 16 0603 SMD Resistor 10K 17		R3	1	
0603 SMD Resistor 51R 18 0603 SMD		R34	1	
LED D1, D2, D3, D4 19 IP15N03M SMD		R35,R10,RNTC	3	
MOS Tube Q1, Q2 20 4.7ÿH 9A		R1	1	
RDC<10mR Buck-Boost Inductor L1 21 TYPE-C Socket TYPE-C Socket			4	
TYPE-C Socket 22 USB-A Socket USB-A Socket 23 Tactile switch			2	
24 0603 chip resistor 510K 25 0603 chip capacitor 3.3nF 10%			1	
35V C14, C15 26 0603 chip resistor 2R R21, R22			1	
		USB-A	1	
		SW1	1	
		R6	1	
			2 NC, for certification	
			2 NC, for certification	

14 IP2369 packaging information



		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	0.2	0.25
BODY SIZE	X	D		7 BSC	
	Y	E		7 BSC	
LEAD PITCH		e		0.4 BSC	
EP SIZE	X	D2	1.2	1.3	1.4
	Y	E2	0.9	1	1.1
	X	D3	1.572	1.672	1.772
	Y	E3	1.025	1.125	1.225
	X	D4	1.572	1.672	1.772
	Y	E4	1.025	1.125	1.225
	X	D5	1.2	1.3	1.4
	Y	E5	0.9	1	1.1
	X	D6	3.378	3.478	3.578
	Y	E6	5.5	5.6	5.7
LEAD LENGTH		L	0.3	0.4	0.5
		L1		0.4 REF	
LEAD TIP TO EXPOSED PAD EDGE		K		0.3 REF	
EXPOSED PAD EDGE TO EXPOSED PAD EDGE		K1		0.45 REF	
		K2		0.45 REF	
		K3		0.822 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	

NOTES
1.REFER TO JEDEC MO-220;
2.COPLANARITY APPLIES TO LEADS, CORNER LEADS AND DIE ATTACH PAD;
3.BAN TO USE THE LEVEL 1 ENVIRONMENT-RELATED SUBSTANCES;
4.FINISH: Cu/EP + Sn8~20s

PROJECTION				DESIGN	LiChen 2023.11.13
TITLE: PACKAGE OUTLINE DRAWING [产品外形图] QFN48-7×7-60L-E (P0.4 T0.75)		DRAWING NO.	REV.	CHECK	Kakao 2023.11.13
		---	A	DESIGN APPROVE	
				PROCESS	
SIZE	PAGE	UNIT	DIMENSION AND TOLERANCES	SCALE	STAND.
A3	1 OF 2	MM	ASME Y14.5M	15:1	APPROVE

SIGNATURE AREA

Figure **11** Package diagram

15 IP2369 silk screen instructions

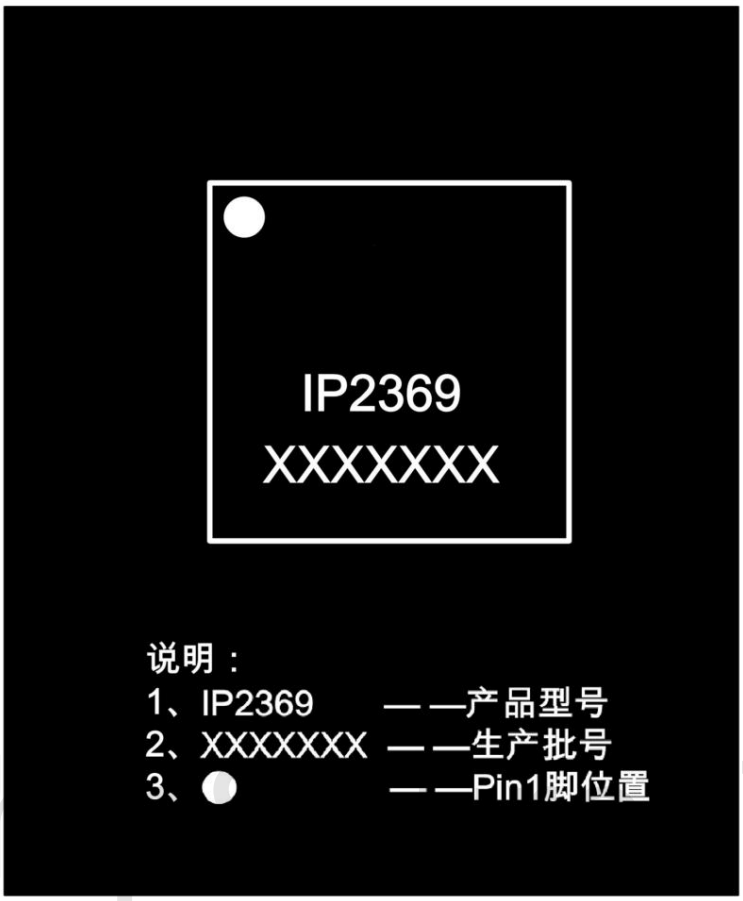


Figure **12** Silkscreen

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