Support PD3.0 and other fast charge input protocol, support 2~6 series batteries
Integrated buck-boost drive, Charging management chip with a maximum charging power of 140W

1 Features

- **Charging specifications**
  - ✧ Integrated BUCK-BOOST, power NMOS diver
  - ✧ Maximum charging power 140W
  - ✧ Adaptive charging current adjustment
  - ✧ External resistor can set full voltage,The full voltage of a single lithium battery can be set in 3.65V/4.1V/4.2V/4.35V/4.4V
  - ✧ External resistance selection 2/3/4/5/6 series battery cell charging
  - ✧ External resistor can set maximum charging power, maximum support 140W
  - ✧ supports 0V battery charging
- **Quick charge specifications**
  - ✧ Integrated FCP input fast charge protocol
  - ✧ Integrated AFC input fast charge protocol
  - ✧ Integrated DRP Try. SRC agreement, quick charge agreement PD3.1 input and output
  - ✧ Integrated QC2.0/QC3.0/QC3.0+ output fast charge protocol
- **Power display**
  - ✧ 4/2/1LED Power indicator
  - ✧ Customization supports the I2C function
  - ✧ Standby Power Loss 5μA
  - ✧ EN waking function
- **Multiple protection, high reliability**
  - ✧ Input over-voltage and under-voltage protection
  - ✧ Output over-current and short-circuit protection
  - ✧ Battery overcharge, over-discharge, over-current protection
  - ✧ IC over temperature protection
  - ✧ Rechargeable battery temperature NTC protection
  - ✧ ESD 4KV, input（CC1/CC2 pin）Withstand voltage 30V
- **Package：5mm × 5mm 0.4pitch QFN40**

2 Application Products

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

3 Overview

IP2366 is a lithium battery charging and discharging management chip integrating AFC/FCP/PD2.0/ PD3.0/PD3.1 input/output fast charging protocols and synchronous voltage converter, with charging and discharging power up to 140W.

IP2366 has high integration and rich functions, only one inductor is needed to realize synchronous voltage reduction and boost function, and only few peripheral devices are needed in application, which effectively reduces the overall solution size and BOM cost.

IP2366 supports 2/3/4/5/6 series cells and the number of series cells can be selected by external resistance Settings. The IP2366 supports an external resistor with configurable battery type and a full voltage of 3.65V/4.1V/4.2V/ 4.35V/4.4V.

IP2366 Built-in IC temperature, battery NTC temperature and input voltage control detection loop, can be identified according to the charger power, intelligent regulation of charging current.

The IP2366 supports low power mode. After entering low power mode, the standby current is reduced to 5μA. After entering the low power mode, the charger can be plugged in to wake up the charging automatically. You need to press the button to wake up the external discharge.

IP2366 built-in 14bit ADC, can accurately measure input voltage and current, battery voltage and current, etc. The charging and discharging voltage and charging current of IP2366 can be obtained through I2C.

The IP2366 supports four power indicators, which can display the power and charging and discharging status.

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

Contents

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

4 Record

Note: The page numbers of previous versions may be different from those of the current version.

Change page numbers for version V1.19 to V1.20(September 2024)	Page
● Change the format of the silk screen	29
Change page numbers for version V1.18 to V1.19(July 2024)	**Page**
● The maximum charge and discharge power is modified to 140w	1
Change page numbers for version V1.17 to V1.18(June 2024)	**Page**
● Charging function Added 0V battery charging description	14
Change page numbers for version V1.16 to V1.17(June 2024)	**Page**
● Added the description of overcurrent short-circuit protection	23
Change page numbers for version V1.15 to V1.16 (April 2024)	**Page**
● Modify some pin limit parameters	9
Change page numbers for version V1.14 to V1.15 (March 2024)	**Page**
● Added the description of discharge NTC parameters	19
Change page numbers for version V1.13 to V1.14 (January 2024)	**Page**
● Modify some pin limit parameters	9
● Modify the input current of different voltages in the electrical characteristics	10
● Modified key function description	23
Change page numbers for version V1.12 to V1.13 (July 2023)	**Page**
● Expanding the limits of other pin parameters	9
● Refining the inductors, driving resistors, and RC parameters in the application schematic	24
● Revising the BOM	26
Change page numbers for version V1.11 to V1.12 (May 2023)	**Page**
● Added the description of the NTC function	19
Change page numbers for version V1.10 to V1.11 (March 2023)	**Page**
● Modify the solid-state capacitance and inductance parameters in the application schematic diagram	23
● Modify solid state capacitor and inductor parameters in the bom	25
Change page numbers for version V1.00 to V1.10 (March 2023)	**Page**
● Added the PIN option function to set the maximum power, battery string, and battery type	18
● Added the description of light display, NTC, and button functions	19
● Added application schematics for standard models and I2C models	23
First release V1.00 (November 2022)	

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

5 Simplified application

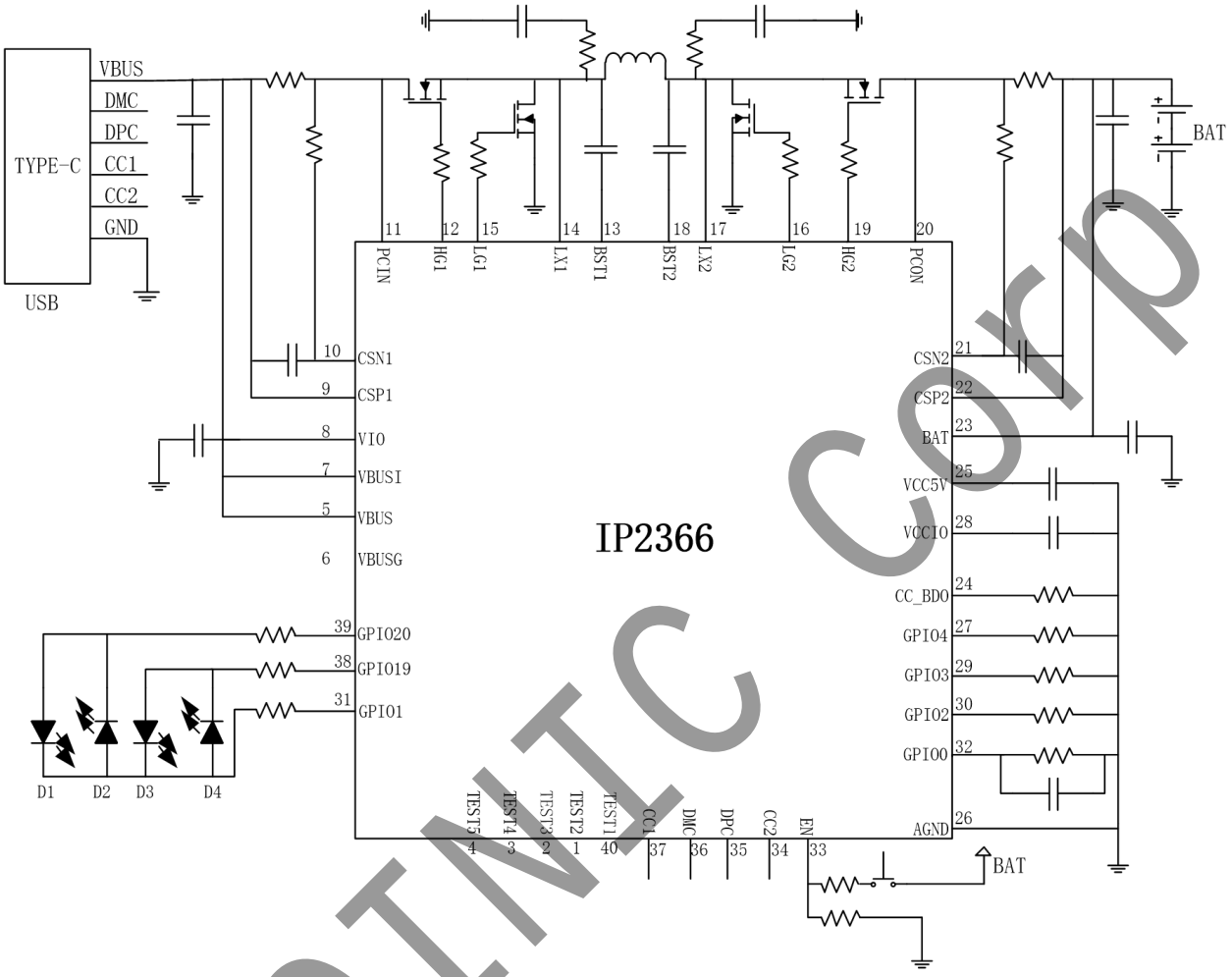


Figure 1 IP2366 Simplified application

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

6 Pin Description

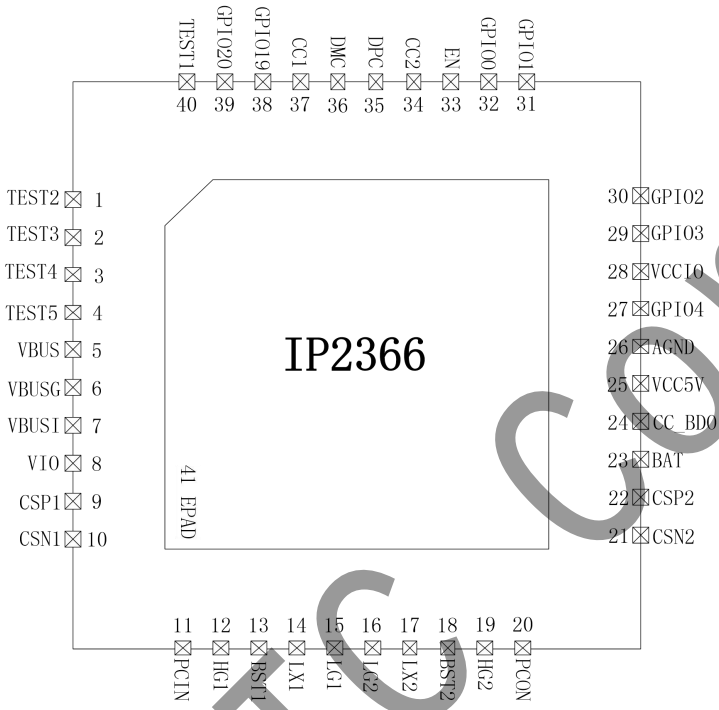


Figure 2 IP2366 pin diagram

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

6.1 Pin description

Pin Num	Pin Name	Definition
1	TEST2	Test point,NC
2	TEST3	Test point,NC
3	TEST4	Test point,NC
4	TEST5	Test point,NC
5	VBUS	VBUS input detection pin
6	VBUSG	VBUS input path NMOS control pin
7	VBUSI	VBUS input path current detection pin
8	VIO	Power input pin
9	CSP1	Input current sampling positive terminal
10	CSN1	Input current sampling negative terminal
11	PCIN	Input peak current sampling pin
12	HG1	The upper tube control pin at the input end of the H-bridge power tube
13	BST1	Bootstrap voltage pin of H-bridge power tube input terminal
14	LX1	Input terminal inductance connection pin
15	LG1	H-bridge power tube input end lower tube control pin
16	LG2	H-bridge power tube output battery end lower tube control pin
17	LX2	Battery terminal inductance connection pin
18	BST2	Bootstrap voltage pin of H-bridge power tube battery terminal
19	HG2	The upper tube control pin of the battery end of the H-bridge power tube
20	PCON	Battery peak current sampling pin
21	CSN2	Average battery current sampling negative terminal
22	CSP2	Battery terminal current sampling positive terminal
23	BAT	Battery side power supply pin
24	CC_BDO	Standby TYPEC mode selection, grounding default discharge DFP, suspended or high default charging UFP
25	VCC5V	System 5V power supply, to supply power to the internal analog circuit of the IC
26	AGND	Analog ground
27	GPIO4	BAT_NUM Set the number of batteries in series and connect the resistance to the ground
28	VCCIO	System 3.3V power supply, to supply power to the internal digital circuit of the IC
29	GPIO3	PSET Set the maximum charge and discharge power of the

INJOINIC corp.

 Copyright © 2024, Injoinic Corp.

		system and connect the resistance to the ground
30	GPIO2	VSET Set a single battery charging voltage, connect resistance to the ground
31	GPIO1	LED3（The I2C model serves as the I2C_INT）
32	GPIO0	NTC set protection temperature, connected with NTC resistor
33	EN	EN wake up pin, connected to the key to realize startup wake up and shutdown
34	CC2	USB C port detection and fast charge communication pin CC2
35	DPC	USB C port fast charge and intelligent recognition of DP
36	DMC	USB C port fast charge and intelligent identification DM
37	CC1	USB C port detection and fast charge communication pin CC1
38	GPIO19	LED2（The I2C model serves as the I2C_SDA）
39	GPIO20	LED1（The I2C model serves as the I2C_SCL）
40	TEST1	Test point,NC
41	GND	System ground and heat dissipation ground, need to keep good contact with GND

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

7 Internal block diagram of the chip

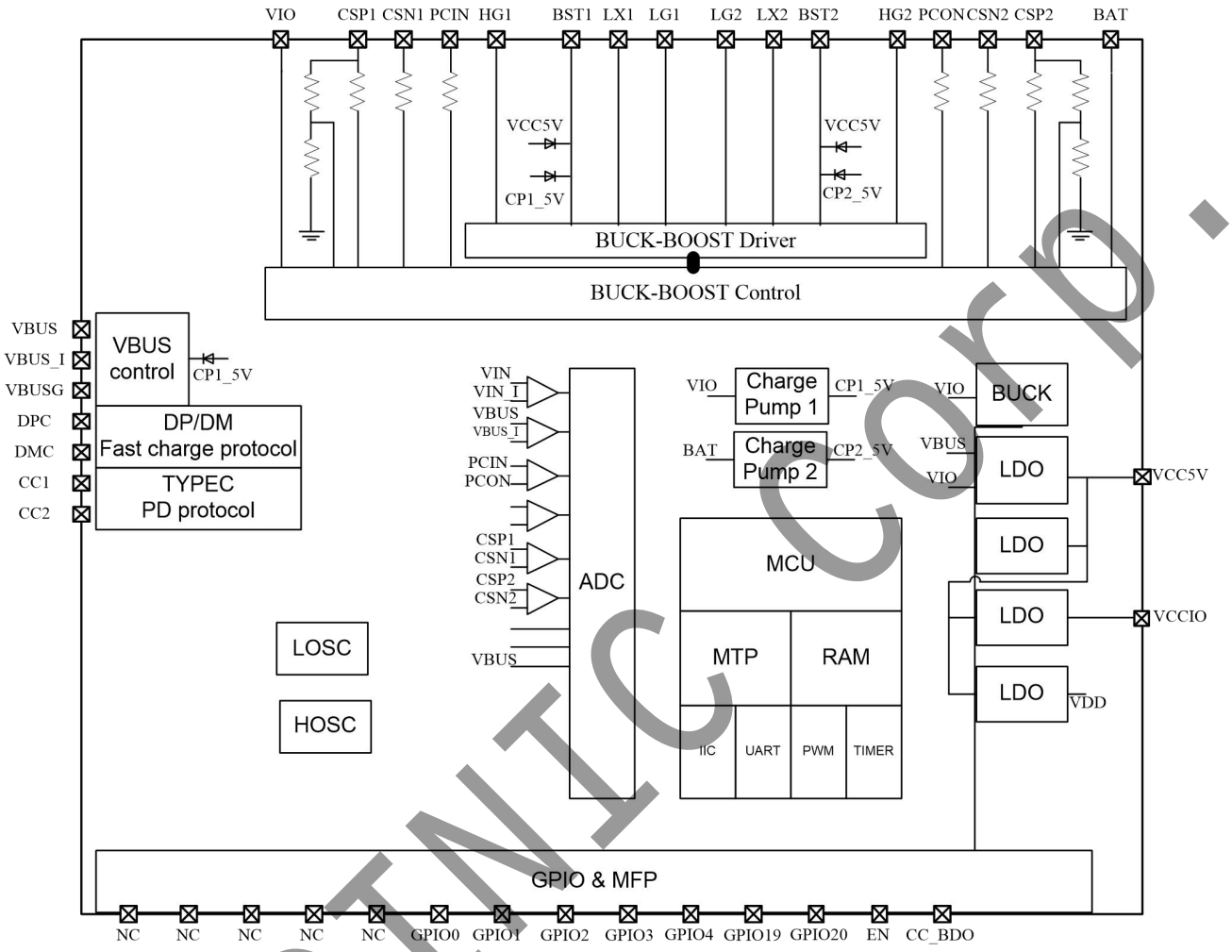


Figure 3 Internal block diagram of the chip

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

8 Limit parameters

Parameter	Symbol	Value	Unit
BAT voltage range	V_{BAT}	-0.3 ~ 35	**V**
VBUS voltage range	V_{VBUS}	-0.3 ~ 30	**V**
BST1/HG1-LX1 voltage range	$V_{BST1/HG1-LX1}$	-0.3 ~ 6	**V**
BST2/HG2-LX2 voltage range	$V_{BST2/HG2-LX2}$	-0.3 ~ 6	**V**
VIO voltage range	V_{VIO}	-0.3 ~ 30	**V**
LX1/BST1/HG1/LX2/BST2/HG2 voltage range	$V_{LX1/BST1/HG1}$ $V_{LX2/BST2/HG2}$	（-4V for 25ns）-0.3 ~ 50	**V**
CSP2/CSN2/PCIN voltage range	$V_{CSP2/CSN2/PCIN}$	-0.3 ~ 35	**V**
CSP1/CSN1/PCON voltage range	$V_{CSP1/CSN1/PCON}$	-0.3 ~ 30	**V**
CC1/CC2 voltage range	$V_{CC1/CC2}$	（-1V for 300ns）-0.3 ~ 30	**V**
DMC/DPC voltage range	$V_{DMC/DPC}$	（-1V for 300ns）-0.3 ~ 30	**V**
Other pins voltage range	$V_{GPIO/CC\_BDO/TEST/LG}$	-0.3 ~ 8	V
Junction temperature range	T_J	-40 ~ 125	℃
Storage temperature range	Tstg	-60 ~ 150	℃
Thermal resistance (junction temperature to environment)	θ_{JA}	45	**℃/W**
Human Body Model (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.

9 Recommended working conditions

Parameter	Symbol	Min	Typical	Max	Unit
Input voltage	VBUS	4.5		28	V
battery voltage	VBAT			32	V
Working temperature	T_A	-40		85	℃

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

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

10 Electrical characteristics

Unless otherwise specified, TA=25℃, L=10uH

Parameter	Symbol	Test Conditions		Min	Typical	Max	Unit
Charging system							
Input voltage	V_{BUS}			4.5	5/9/12/15/20/28	30	V
Input over-voltage	V_{BUS}	Rising voltage		28.5	29	30	V
Peak current	I_{L_PK}	Inductance peak current limit				15	A
Trickle charge current	I_{TRKL}	V_{VBUS}=5V, V_{BAT}<2.5V		30	50	70	mA
		V_{VBUS}=5V, 2.5V<=V_{BAT}<V_{TRKL}		100	200	300	mA
Trickle cut-off voltage	V_{TRKL}	The number of batteries is N, V_{TRGT} is not 3.65V		N*2.9	N*3	N*3.1	V
		The number of batteries is N, V_{TRGT} is 3.65V		N*2.7	N*2.75	N*2.85	V
Charge constant voltage	V_{CV}	The number of batteries is N, R_{VSET} = 18K		N*4.36	N*4.40	N*4.44	V
		The number of batteries is N, R_{VSET} = 13K		N*4.21	N*4.35	N*4.39	V
		The number of batteries is N, R_{VSET} = 9.1K		N*4.16	N*4.20	N*4.24	V
		The number of batteries is N, R_{VSET} = 6.2K		N*4.06	N*4.10	N*4.14	V
		The number of batteries is N, R_{VSET} = 3.6K		N*3.6	N*3.65	N*3.7	V
Charge current	I_{CHRG}	VBUS=5V，input current		2.7	3.0	3.3	A
		VBUS=9V, PD fast charge, Input current	PMAX>=30W	2.7	3.0	3.3	A
		VBUS=9V, Not PD fast charge, Input current	PMAX>=30W	1.8	2.0	2.2	A
		VBUS=12V, PD fast charge, Input current	PMAX=30W	2.0	2.25	2.5	A
			PMAX>=45W	2.7	3.0	3.3	A
		VBUS=12V, Not PD fast charge, Input current	PMAX>=27W	1.3	1.5	1.7	A
		VBUS =15V, PD	PMAX=30W	1.8	2.0	2.2	A

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

		and not PD, input current	PMAX>=45W	2.7	3.0	3.3	A
		VBUS=20V, PD fast charge, Input current	PMAX=30W	1.3	1.5	1.7	A
			PMAX=45W	2.0	2.25	2.5	A
			PMAX=60W	2.7	3.0	3.3	A
			PMAX=65W	3.0	3.25	3.6	A
			PMAX>=100W	4.3	4.7	5.1	A
		VBUS=20V, Not PD fast charge, Input current	PMAX=30W	1.3	1.5	1.7	A
			PMAX=45W	2.0	2.25	2.5	A
			PMAX>=60W	2.7	3.0	3.3	A
		VBUS=28V, Not PD fast charge, Input current	PMAX=140W	4.3	5.0	5.3	A
Stop charging current	I_{STOP}				100		mA
Recharge threshold	V_{RCH}	The number of battery cells is N			V_{TRGT} – N*0.1		V
Charging timeout	T_{END}				48		Hour
Discharge system							
Battery working voltage	V_{BAT}	The number of battery cells is N		N*2.75		N*4.5	V
Switch working battery input current	I_{BAT}	VBAT=6*3.7V, VOUT=5.0V, fs=250kHz, Iout=0mA			12		mA
DC output voltage	QC2.0 V_{OUT}	V_{OUT}=5V@1A		4.75	5.00	5.25	V
		V_{OUT}=9V@1A		8.70	9	9.30	V
		V_{OUT}=12V@1A		11.60	12	12.40	V
	QC3.0/ QC3+ V_{OUT}	@1A		3.6		12	V
	QC3.0 Step				200		mV
	QC3+ Step				20		mV
Output voltage ripple	ΔV_{OUT}	VBAT=6*3.7V, VOUT=5.0V, fs=250KHz, Iout=1A			150		mV
		VBAT=6*3.7V, VOUT=9.0V ,			150		mV

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

		fs=250KHz, Iout=1A				
Output voltage ripple	ΔV_{OUT}	VBAT=6*3.7V，VOUT=12V，fs=250KHz, Iout=1A		150		mV
		VBAT=6*3.7V，VOUT=15V，fs=250KHz, Iout=1A		150		mV
		VBAT=6*3.7V，VOUT=20V，fs=250KHz, Iout=1A		150		mV
		VBAT=6*3.7V，VOUT=28V，fs=250KHz, Iout=1A		200		mV
Maximum output power of the discharge system	Pmax	PD protocol			140	W
Discharge system efficiency	η_{out}	V_{BAT}=6*3.0V, V_{OUT}=28V, I_{OUT}=5A		96.0		%
		V_{BAT}=6*3.7V, V_{OUT}=28V, I_{OUT}=5A		96.5		%
		V_{BAT}=6*4.2V, V_{OUT}=28V, I_{OUT}=5A		96.5		%
		V_{BAT}=6*3.0V, V_{OUT}=20V, I_{OUT}=5A		96.0		%
		V_{BAT}=6*3.7V, V_{OUT}=20V, I_{OUT}=5A		96.5		%
		V_{BAT}=6*4.2V, V_{OUT}=20V, I_{OUT}=5A		96.5		%
Output shutdown current	I_{shut}	VBAT=N*3.7V, output 5V	3.0	3.3	3.6	A
		VBAT= N*3.7V, output 9V not PD protocol	2.4	2.7	3.0	A
		VBAT= N*3.7V, output 12V, not PD protocol	1.8	2.0	2.2	A
		VBAT= N*3.7V, output PD protocol		PDO * 1.1		A
Output overcurrent detection time	T_{UVD}	output voltage is continuously lower than 2.4V		30		ms
Output short detection time	T_{OCD}	output voltage is continuously lower than 2.2V		40		μs
Control System						
Frequency	fs	Discharge switching frequency		250		kHz

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

		Charging switching frequency		250		kHz
VCC5V output voltage	V_{CC5V}		4.75	5	5.25	V
VCC5V output current					30	mA
VCCIO output voltage	V_{CCIO}		3.15	3.3	3.45	V
VCCIO output current	I_{CCIO}				30	mA
standby current	I_{STB}	VBAT=22V, Average current after one minute shutdown		5	10	μA
LED Pin drive current	I_{L1} I_{L2} I_{L3}	Voltage drop 10%	5	7	10	mA
Thermal shutdown temperature	T_{OTP}	Rising temperature	110	125	140	℃
Thermal shutdown temperature hysteresis	ΔT_{OTP}			40		℃

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

11 Function description

11.1 Charging function

The IP2366 has a constant-current, constant-voltage lithium battery charge management system that supports a synchronous voltage switch structure.

IP2366 adopts switching charging technology with switching frequency of 250kHz.

IP2366 resistance can be set in different cell types, full of charging voltage and power, can support 2/3/4/5/6 / battery set, can support full voltage of 3.65 V / 4.1 V / 4.2 V / 4.35 V / 4.4 V the different types of batteries; The maximum input charging power can reach 28V/5A(140W), the highest charging efficiency to 96%;

IP2366 supports the trickle-constant-current-constant-voltage charging process:

When the battery voltage 0V≤BAT≤ 2.5V, small current trickle charging, battery charging current about 50mA;

When the battery voltage is 2.5V <VBAT≤ VTRKL, trickle charging, battery charging current is about 200mA;

When the battery voltage VTRKL<VBAT< VCV, for constant current charging, according to the set constant current charging current to charge the battery;

When the battery voltage VBAT = VCV, the battery voltage rises to close to full voltage, the charging current will slowly decline and enter the constant voltage charging.

After entering constant voltage charging, when the battery charging current is less than ISTOP and the battery voltage is close to constant voltage, stop charging and enter full state.

After the battery is fully charged, it continues to check the battery voltage. When the battery voltage is lower than VBAT <VRCH, it starts charging again；

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

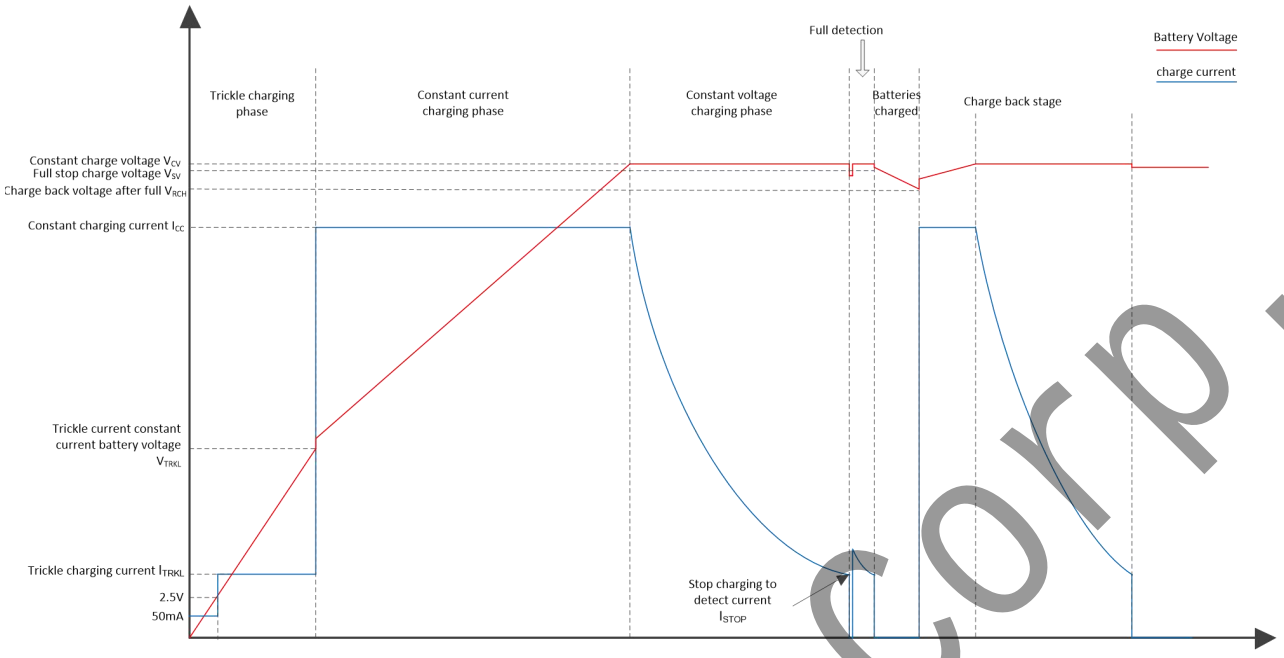


Figure 4 Battery charging process diagram

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

IP2366 integration has an AFC/FCP/PD2.0 PD3.0 / PD3.1 input quick charge agreement, can through the Type - C mouth of DPC/DMC/CC1 / CC2 to fast was electrical application fast charging pressure, automatically adjust the charging current size, to adapt to different load capacity of the charger.

When charging with a charger without a fast charge or a DC power supply, the IP2366 sets the charging current according to the input voltage:

Input voltage	Maximum input current for constant current charging
4.5<VBUS≤6.5V	3A
6.5<VBUS≤9.5V	2A
9.5<VBUS≤13.5V	1.5A
13.5<VBUS≤16.5V	5A
16.5<VBUS≤24V	5A
24<VBUS≤29V	5A

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

IP2366 supports Huawei FCP and Samsung AFC fast charge input protocol, when using Huawei FCP and Samsung AFC charger input charging, IP2366 will apply for the highest input voltage, constant current charging current is set according to the above input voltage gear;

IP2366 supports PD2.0/PD3.0/PD3.1 input protocol. When charging with PD fast charge adapter, IP2366 will read the PD information packet sent by the adapter, and then apply for charging voltage and set charging current according to the received PD information packet. When the power of the received PD packet is less than the set power required for charging, the charging current will be actively reduced so that the maximum power of the input terminal is less than or equal to the PD broadcast power given by the adapter;

11.2 Discharge function

IP2366 integrates USB Type_C input and output recognition interface, automatically switches the built-in pull-down resistor, and automatically identifies the charge and discharge properties of the inserted device. With the Try.SRC function, when connected to a DRP device, the device preferentially charges the DRP.

The IP2366 supports various specifications of fast charge: PD2.0/PD3.0/PD3.1, QC2.0/QC3.0/QC3+, FCP, AFC, Apple.

IP2366 Supports identification of EMARK cables.

The IP2366 supports PD2.0, PD3.0, and PD3.1 output protocols, and supports a maximum of 140W power output.

IP2366 supports the identification of EMARK cables. Based on the identified cable information, the IP2366 broadcasts different PD packets. The PD packets in different power Settings are as follows:

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

Maximum output power	No E-mark cable is identified	After identifying the E-mark cable
140W	5V/3A,9V/3A,12V/3A,15V/3A,20V/3A	5V/3A,9V/3A,12V/3A,15V/3A,20V/5A,28V/5A
100W	5V/3A,9V/3A,12V/3A,15V/3A,20V/3A	5V/3A,9V/3A,12V/3A,15V/3A,20V/5A
65W	5V/3A,9V/3A,12V/3A,15V/3A,20V/3A	5V/3A,9V/3A,12V/3A,15V/3A,20V/3.25A
60W	5V/3A,9V/3A,12V/3A,15V/3A,20V/3A	
45W	5V/3A,9V/3A,12V/3A,15V/3A,20V/2.25A	
30W	5V/3A,9V/3A,12V/2.5A,15V/2A,20V/1.5A	

The IP2366 supports QC2.0/QC3.0/QC3+, FCP, AFC, as well as iPhone 2.4A mode and BC1.2 common Android phone 1A mode through DP/DM pins.

11.3 State transition specification

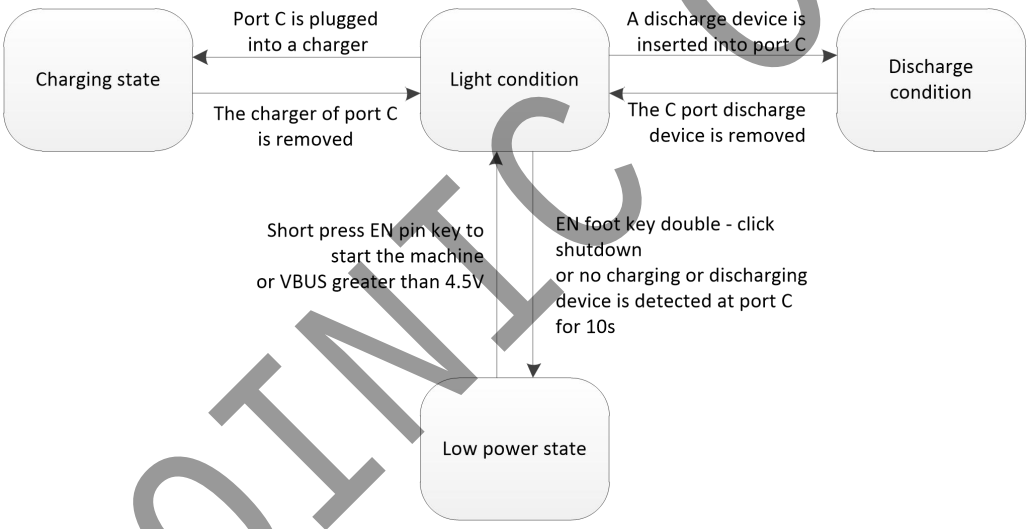


Figure 5 System state transition diagram

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

11.4 Input and output maximum power setting

IP2366 determines the maximum power of input and output of the system by determining the resistance value of the PSET pin connection.

RPSET	Corresponding to the set maximum power PMAX
27k	140W
18k	100W
13k	65W
9.1k	60W
6.2k	45W
3.6k	30W

11.5 Set the number of batteries in series

IP2366 determines the number of batteries in series by determining the resistance value of BAT_NUM pin connection.

RBAT_NUM	Corresponding to the set number of batteries in series
27k	6 bunch
18k	6 bunch
13k	5 bunch
9.1k	4 bunch
6.2k	3 bunch
3.6k	2 bunch

11.6 Battery type setting

IP2366 determines the battery type by determining the resistance value of the VSET pin connection.

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

Note: When the RVSET is connected to the 27k resistor, the VSET pin will enable the print out function.

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

11.7 NTC function

IP2366 integrates the NTC function to detect the battery temperature. When IP2366 works, it generates a constant current source on the NTC pin and generates voltage with the external pull-down NTC thermistor. The chip determines the current battery temperature by detecting the voltage of the NTC pin internally.

* A 100nF capacitor in parallel with GND at the NTC pin should be placed close to the chip pin.

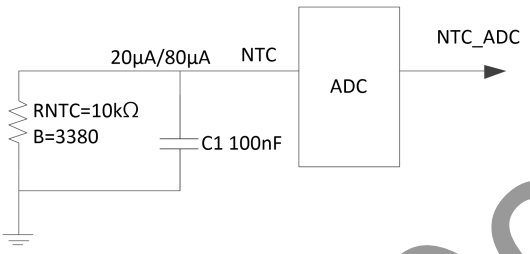


Figure 6 Comparison of battery NTC

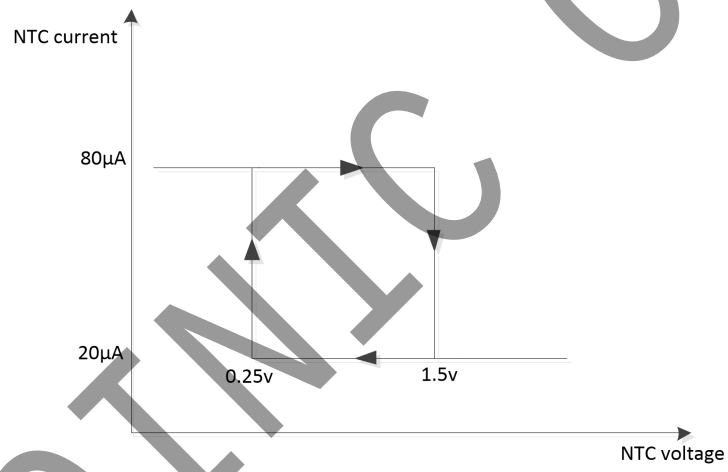


Figure 7 NTC voltage and outgoing current relationship

In order to accurately distinguish the temperature of the battery NTC, IP2366 adopts the current switching type NTC detection module. The chip detects the current output by the NTC pin and the voltage generated by the external pull-down NTC thermistor to determine the current battery temperature.

When the output current of the NTC pin is 80μA and the voltage of the NTC pin is detected to be higher than 1.5V, the output current of the NTC pin is adjusted to output 20μA.

When the output current of the NTC pin is 20μA and the voltage of the NTC pin is detected to be lower than 0.25V, the output current of the NTC pin is adjusted to output 80μA.

Charging state: NTC temperature below 0 degrees (0.55V) stop charging, 0~45 degrees between normal charging, temperature over 45 degrees (0.39V) stop charging.

Discharge state: When the temperature is lower than -20 degrees (1.39V), stop discharging, normal discharge between -20 degrees and 60 degrees, and stop discharging above 60 degrees (0.24V).

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

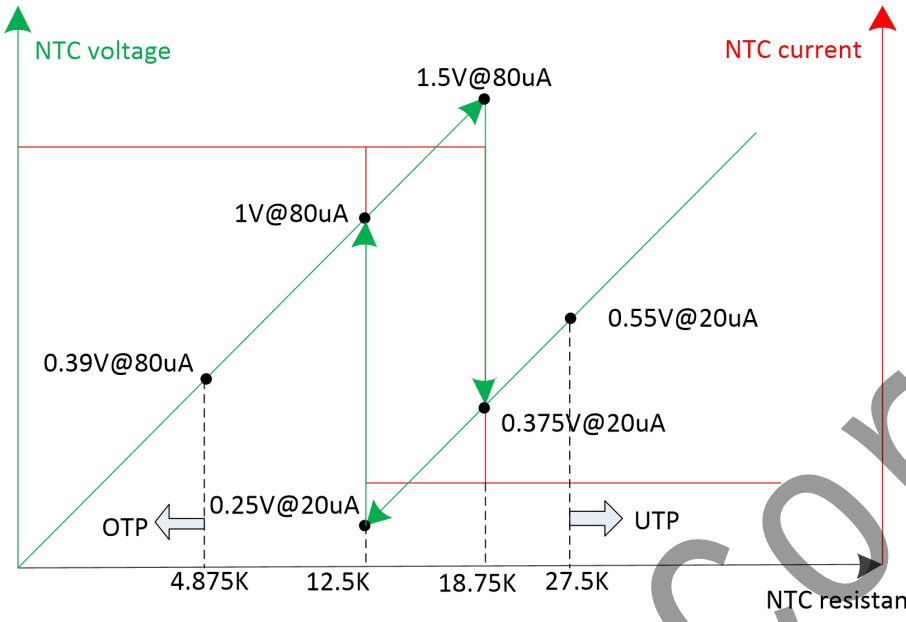
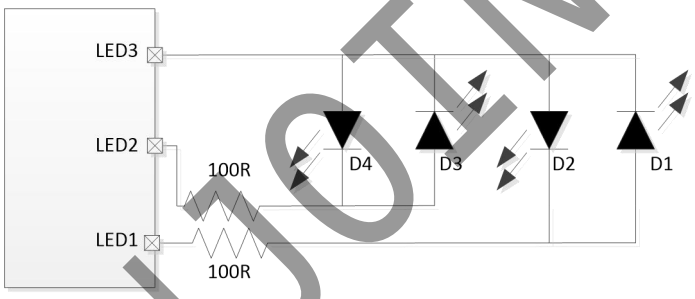


Figure 8 Relationship between NTC voltage and NTC resistance

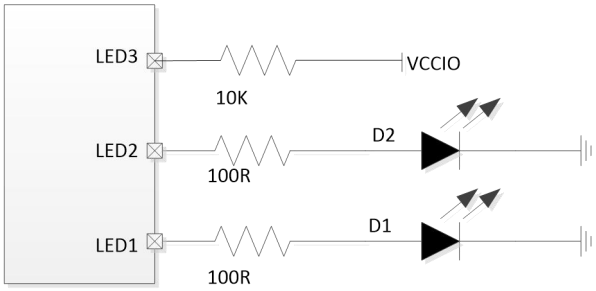
If the NTC function is not required in the solution, connect the NTC pin to the ground with a 10 kω resistor. Do not float the NTC pin or ground it directly.

11.8 Lamp display function

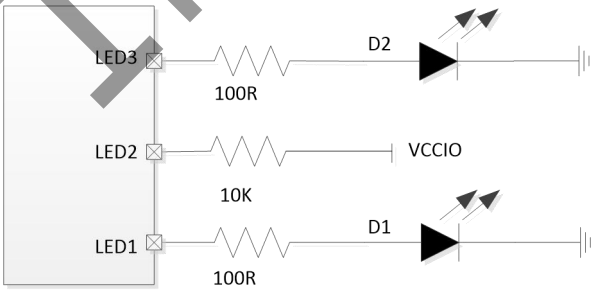
IP2366 Support 4, 2, and 1 battery indicator, the connection method is as follows.



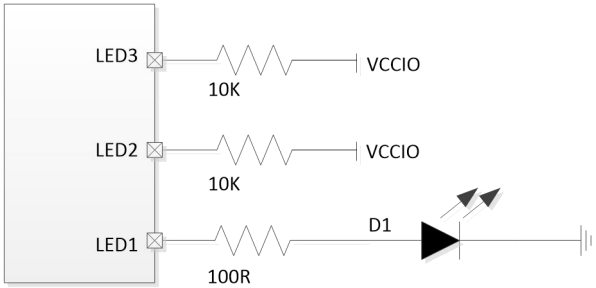
4-light mode



2-light mode 1



2-light mode 2



1-light mode

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

Figure 9 4, 2, 1LED connection mode

The display mode of 4 lights is:

When charging normally

Electricity C（%）	D1	D2	D3	D4
full	on	on	on	on
75%≤C	on	on	on	0.5HzFlashing
50%≤C＜75%	on	on	0.5HzFlashing	off
25%≤C＜50%	on	0.5HzFlashing	off	off
C＜25%	0.5HzFlashing	off	off	off

When discharging normally

Electricity C（%）	D1	D2	D3	D4
75%≤C	on	on	on	on
50%≤C＜75%	on	on	on	off
25%≤C＜50%	on	on	off	off
C＜25%	on	off	off	off
C=0	flash 4 times	off	off	off

After flashing 4 times (200ms on and 200ms off), stopping the discharge.

The display mode of 2 lamp mode 1 is two-color lamp:

When charging normally

Electricity C（%）	D1	D2
full	off	on
66%≤C＜100%	off	0.5HzFlashing
33%≤C＜66%	0.5HzFlashing	0.5HzFlashing
C＜33%	0.5HzFlashing	off

When discharging normally

Electricity C（%）	D1	D2
66%≤C＜100%	off	on
33%≤C＜66%	on	on
C＜33%	on	off
C=0	flash 4 times	off

After flashing 4 times (250ms on and 250ms off), stopping the discharge.

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

The display mode of 2 lamp mode 2 is:
D1 is on during charging, D2 is off, D1 is off when fully charged, and D2 is on; when charging is abnormal, D1 and D2 flash at the same time (on for 250ms and off for 250ms)
D1 is always on during discharge, and when C=0, D1 flashes 4 times (on for 250ms and off for 250ms) and then stops discharging.

The display mode of 1 light mode is:
D1 flashes during charging (1s on and 1s off), when fully charged, D1 is always on; D1 flashes quickly when charging is abnormal (250ms on and 250ms off)
D1 is always on during discharge, and when C=0, D1 flashes 4 times (on for 250ms and off for 250ms) and then stops discharging.

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

11.9 CC_BDO setting

The CC_BDO pin of IP2366 is used to set the default state of CC1/CC2 in the state of low power consumption: When the CC_BDO pin is suspended or when the power level is high, CC1/CC2 is pulled down by default, and IP2366 serves as the SINK device. When the CC_BDO pin is connected to the 1K resistance to the ground, CC1/CC2 is pulled up by default, and IP2366 acts as the SOUCRE device.

11.10 EN key function

IP2366 supports button function. The connection mode of button is shown in Figure 8.

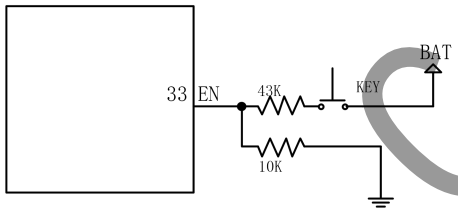


Figure 10 EN key connection mode

1.2V≤VEN < 3.3V indicates a high level, 0≤VEN < 1.2V indicates a low level, and the EN voltage should not exceed 5V.

The EN pin high level duration is greater than 100ms, less than 2s, that is, short press action; After entering the low-power mode, short press will turn on the power indicator and enter the no-load state. If the charging and discharging device is detected, it will enter the corresponding charging and discharging state. In the no-load state, if no charging or discharging device is detected at the port for 10s C, it will enter the low-power state. In the no-load state, press twice within 1s to shut down and enter the low-power state, and turn off the power indicator display and discharge output.

If the EN pin high level lasts longer than 10s, the system resets.

The EN foot cannot be suspended in the air and must be pulled down to the ground with 10K resistance.

11.11 Overcurrent short-circuit protection

IP2366 integrated output overcurrent and short circuit protection; When detecting that the output current is greater than the overcurrent protection threshold or the output short-circuit exists, the system will belch and restart at a period of 500ms to protect the system from damage.

When the output current exceeds the preset overcurrent threshold, the IP2366 enters the protection state, belches and restarts. If the output current is not lower than the overcurrent threshold for three consecutive times, the DCDC is shut down and the IP2366 enters the standby state.

When there is a short circuit in the output, the IP2366 will enter the protection state, belch and restart, and if it does not return to the normal state for three consecutive times, the DCDC will be shut down and enter the

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

standby state.

After entering the standby state due to overcurrent short circuit, the output can be awakened by pressing the key, and the non-low-power model (STB) can be awakened by re-plugging the output.

12 Application schematic diagram

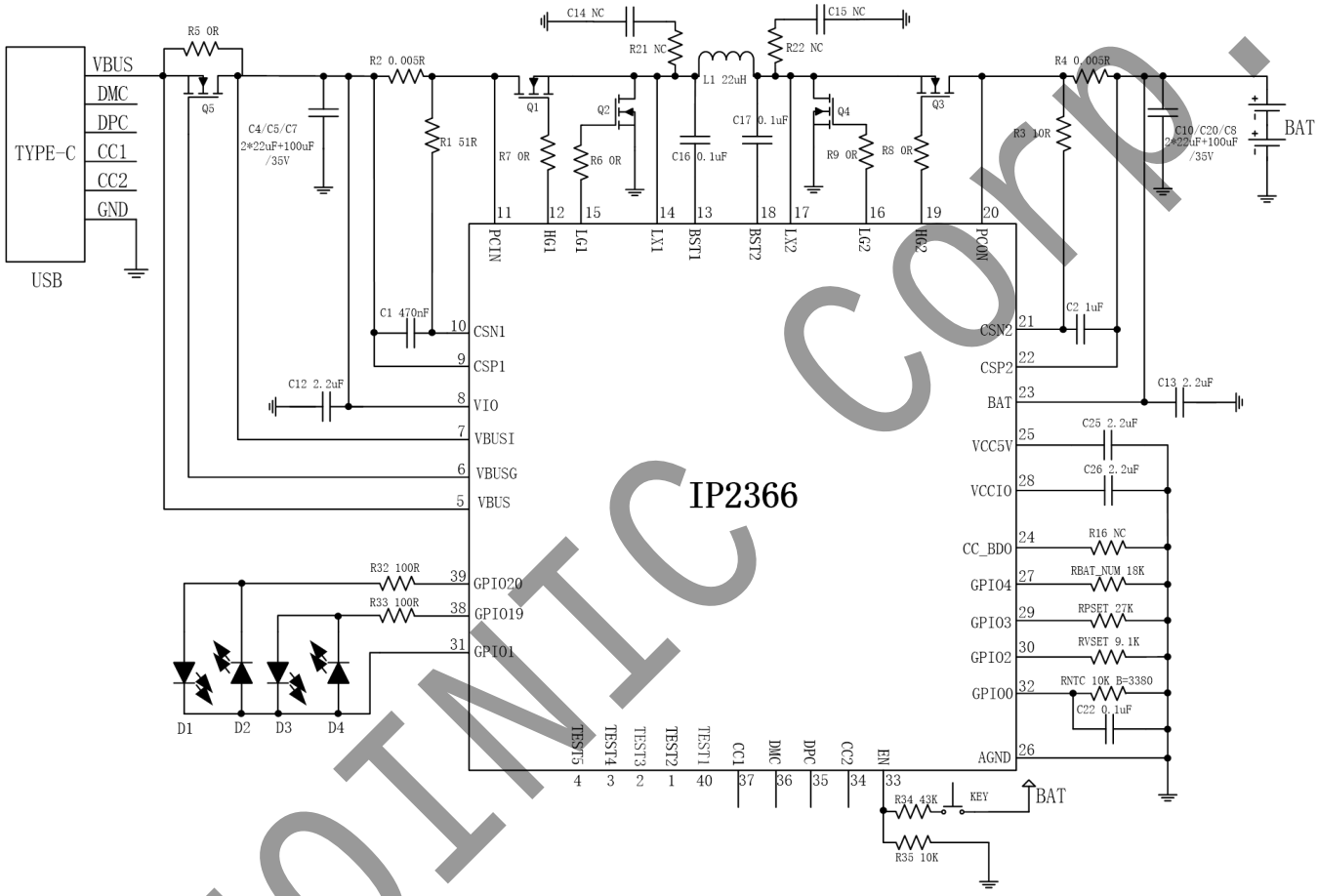


Figure 11 Application principle diagram of standard models

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

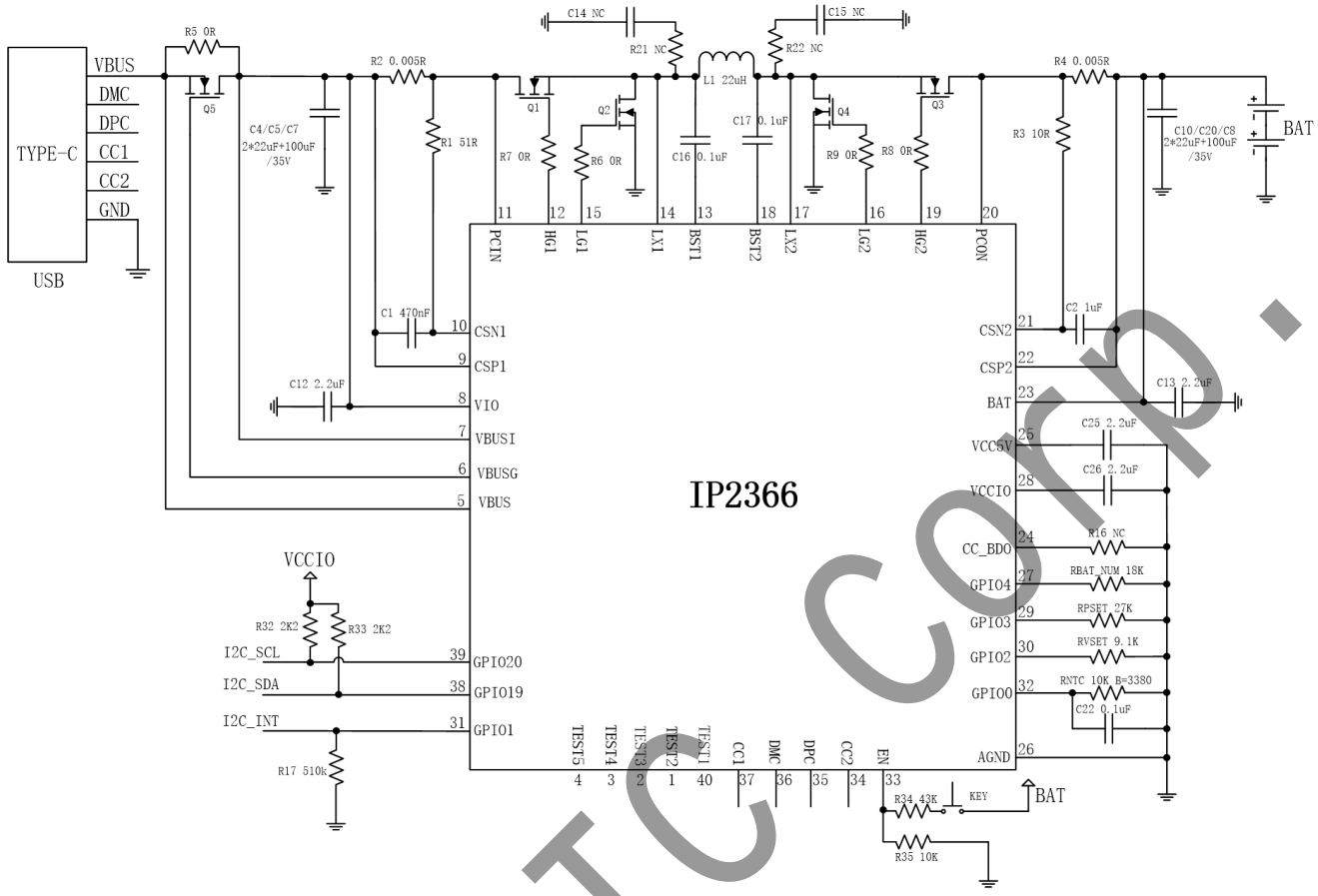


Figure 12 Application principle diagram of I2C model

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

13 BOM

Num	Component name	Model & Specification	Location	Dosage	Remark
1	Patch IC	QFN40 IP2366	U1	1	
2	SMD capacitors	0603 100nF 10% 50V	C3,C16,C17,C22	4	
3	SMD capacitors	0603 470nF 10% 35V	C1	1	
4	SMD capacitors	0603 1μF 10% 35V	C2	1	
5	SMD capacitors	0603 2.2μF 10% 35V	C12,C13,C25,C26	4	
6	SMD capacitors	1210 22μF 10% 35V	C4,C5,C10,C11	4	
7	Solid capacitor	100μF 35V 10%	C7,C8	2	
8	SMD resistor	1206 0.005R 1%	R2,R4	2	The sampling resistance requires a metal film resistance with high precision and low temperature
9	SMD resistor	0603 100R 5%	R32,R33,R17	3	I2C model NC
10	SMD resistor	0603 18K	RBAT_NUM	1	
11	SMD resistor	0603 27K	RPSET	1	
12	SMD resistor	0603 9.2K	RVSET	1	
13	SMD resistor	0603 10R 1%	R3	1	
14	SMD resistor	0603 43K	R34	1	
15	SMD resistor	0603 10K	R35,RNTC,R10	3	
16	SMD resistor	0603 0R	R6,R7,R8,R9,R23,R24	6	
17	SMD resistor	0603 51R	R1	1	
18	SMD LED	0603 LED	D1,D2,D3,D4	4	I2C model NC
19	SMD resistor	1206 0R	R5	1	NC when authenticated
20	Lifting voltage inductance	22μH 15A R_{DC}<5mR	L1	1	
21	USB C	USB C	USB	1	
22	Tactswitch	Tactswitch	SW1	1	
23	SMD MOS	AER4051AE	Q2,Q3,Q4,Q5	4	
24	SMD resistor	0603 510K	R11	1	NC for I2C models
25	SMD resistor	0603 1K	RCC_BDO	1	NC, used for certification
26	SMD MOS	RU3030M2	Q5	1	NC, used for certification

INJOINIC Corp.

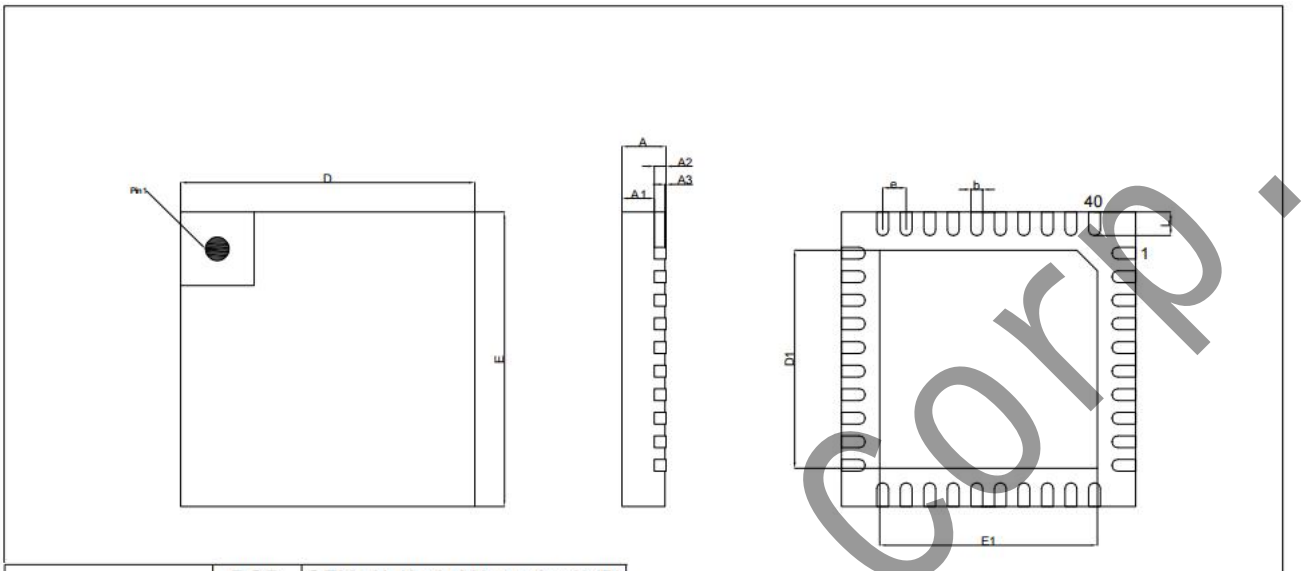
 Copyright © 2024, Injoinic Corp.

27	SMD capacitors	0603 3.3nF 10% 35V	C14,C15	2	NC, used for certification
28	SMD resistor	0603 2R	R21,R22	2	NC, used for certification

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.

14 Package



	POD	QFN40L(0505X0.75-0.40)(B)		
		Size unit: mm		
	Symbol	Minimum	Normal	Maximum
Total Thickness	A	0.70	0.75	0.80
Molding Thickness	A1	-	0.55	-
LF Thickness	A2	0.18	0.20	0.25
Stand Off	A3	0.00	0.02	0.05
Body Size	D	4.90	5.00	5.10
	E	4.90	5.00	5.10
Exposed Pad Size	D1	3.60	3.70	3.80
	E1	3.60	3.70	3.80
Lead Width	b	0.15	0.20	0.25
Lead Length	L	0.35	0.40	0.45
Lead Pitch	e	0.40 BSC		

QFN40L(0505X0.75-0.40)(B)

Figure 13 Package

INJOINIC Corp.

Copyright © 2024, Injoinic Corp.

15 Silkscreen

Instructions:
1、 --Injoinic logo
2、IP2366 --Product name
3、XXXXXX --Product number
4、 ● --PIN 1 position

Figure 14 Silkscreen

INJOINIC Corp.

Copyright © 2024, Injoinic Corp.

16 IMPORTANT NOTICE

INJOINIC TECHNOLOGY and its subsidiaries reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to INJOINIC TECHNOLOGY's terms and conditions of sale supplied at the time of order acknowledgment.

INJOINIC TECHNOLOGY assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using INJOINIC TECHNOLOGY's components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of INJOINIC TECHNOLOGY's components in its applications, notwithstanding any applications-related information or support that may be provided by INJOINIC TECHNOLOGY. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify INJOINIC TECHNOLOGY and its representatives against any damages arising out of the use of any INJOINIC TECHNOLOGY's components in safety-critical applications.

Reproduction of significant portions of INJOINIC TECHNOLOGY's information in INJOINIC TECHNOLOGY's data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. INJOINIC TECHNOLOGY is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

INJOINIC TECHNOLOGY will update this document from time to time. The actual parameters of the product may vary due to different models or other items. This document voids all express and any implied warranties.

Resale of INJOINIC TECHNOLOGY's components or services with statements different from or beyond the parameters stated by INJOINIC TECHNOLOGY for that component or service voids all express and any implied warranties for the associated INJOINIC TECHNOLOGY's component or service and is an unfair and deceptive business practice. INJOINIC TECHNOLOGY is not responsible or liable for any such statements.

INJOINIC Corp.

 Copyright © 2024, Injoinic Corp.