# 2A Charging / 2.4A Discharging Power Bank SOC With Integrated Digital Tube Drive

## 1. Features

- **Switch buck charger and boost**
  - ✧ 2.4A synchronous boost conversion
  - ✧ Up to 93% boost efficiency
  - ✧ Up to 92% charging efficiency
  - ✧ Built-in power path management supports charging and discharging at the same time
  - ✧ Supports line compensation
- **Charge**
  - ✧ Adjusts charging current automatically to adapt to different load capacity adapters
  - ✧ 2A synchronous switch charging
  - ✧ Supports 4.20V, 4.30V, 4.35V and 4.4V batteries
- **Battery indicator**
  - ✧ Built-in 14bitsADC and accurate coulomb calculation method
  - ✧ Support 5/4/3/2/1 LED power or digital tube display
  - ✧ Support digital tube display, 1A/2A output port identification
  - ✧ Supports selecting battery initial capacity by external PIN
  - ✧ Supports self calibration of battery capacity
- **Feature-rich**
  - ✧ Built-in illuminator driver
  - ✧ Automatically load insertion and removal detection
- **Low-power dissipation**
  - ✧ Intelligently identify the load and automatically enter standby
  - ✧ Standby power consumption is less than 100 μA
- **Simplified BOM**
  - ✧ Built-in power MOS, 1uH single inductor to achieve charge and discharge
  - ✧ Built-in various digital tube drive circuits
- **Multiple protection, high reliability**
  - ✧ Output over current, over voltage and short circuit protection
  - ✧ Input over voltage protection
  - ✧ Battery over charge, over discharge and over current protection
  - ✧ Over temperature protection
  - ✧ ESD 4KV ,Vin transient withstand up to 18V
- **In-depth customization**
  - ✧ Flexible and low-cost customized program
- **Package: QNF32 5mm*5mm**

## 2. Applications

- **Power Bank**
- **Mobile phones, tablets and other portable devices**
- **Hydrator/hand warmer**

## 3. Description

IP5508 is a multi-functional power management SOC for total solution on Power Bank. It also integrates with boost converter, lithium battery charging management and battery level indicators.

IP5508 is highly integrated with abundant functions, which makes the total solution size minimized and BOM costed down.

IP5508 requires only one inductor to achieve buck and boost functions, DC-DC converter works at 500KHz and can support low-cost inductors and capacitors.

The synchronous boost system of IP5508 provides rated 2.4A output current with conversion efficiency up to 93%. When there is no load, it will automatically enter the standby state, and the static current will drop to less than 100uA.

IP5508's switch charging system supplies 2A charging current with charging efficiency up to 92%. According to the IC temperature and input voltage, IP5508 can intelligently adjust charging current.

IP5508 contains 14bits ADC, which can accurately measure battery's voltage and current. The built-in coulomb meter algorithm of IP5508 can accurately obtain the battery power information.

IP5508 can support digital tube display and illuminator function.

The package of IP5508 is QNF32.



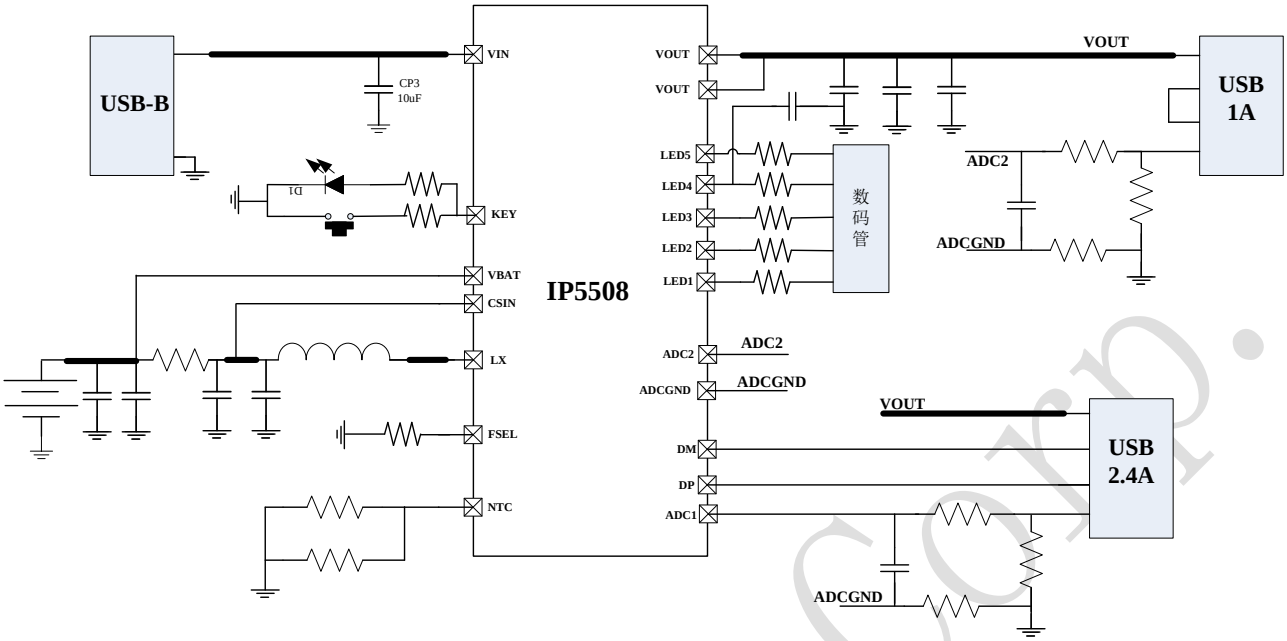



**Figure 1 IP5508 simplified application schematic diagram (digital tube displays power)**

## 4 Pin definition

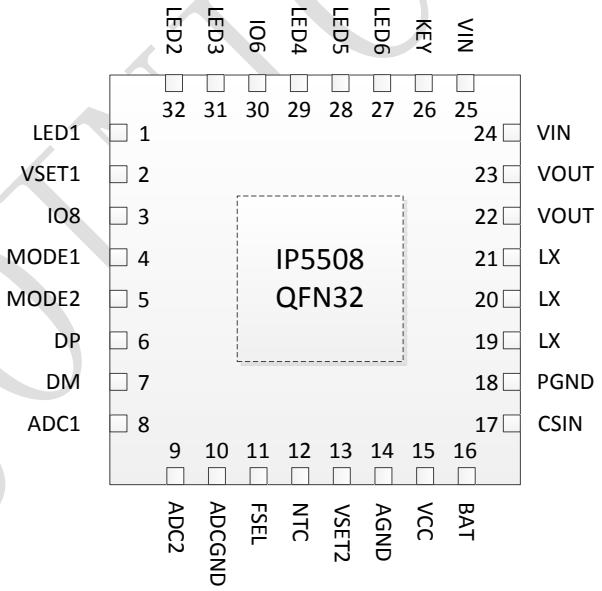



**Figure 2 IP5508 pin diagram**



| PIN | | description |
|---|---|---|
| PIN NUM | PIN Name | |
| 1 | LED1 | digital tube/LED driver pin1 |
| 2 | VSET1 | Full battery voltage setting pin1 |
| 3、 | IO8 | ordinary GPIO pin |
| 4、 | MODE1 | key mode selection pin1 |
| 5 | MODE2 | key mode selection pin2 |
| 6 | DP | DCP function pin |
| 7 | DM | DCP function pin |
| 8 | ADC1 | ADC1 input |
| 9 | ADC2 | ADC2 input |
| 10 | ADCGND | System GND |
| 11 | FSEL | Initial battery setting pin |
| 12 | NTC | NTC funtiaon pin |
| 13 | VSET2 | Full battery voltage setting pin2 |
| 14 | AGND | System GND |
| 15 | VCC | LDO 3.1V Output |
| 16 | BAT | Battery voltage sampling pin |
| 17 | CSIN | System power and bat voltage sampling pin |
| 18 | PGND | Power GND |
| 19 | LX | DCDC switch node, connect inductance |
| 20 | LX | DCDC switch node, connect inductance |
| 21 | LX | DCDC switch node, connect inductance |
| 22 | VOUT | DC-DC 5V boost output pin |
| 23 | VOUT | DC-DC 5V boost output pin |
| 24 | VIN | DC-DC 5V charge input pin |
| 25 | VIN | DC-DC 5V charge input pin |
| 26 | KEY | Key and WLED pin |
| 27 | LED6 | digital tube/LED driver pin6 |
| 28 | LED5 | digital tube/LED driver pin5 |
| 29 | LED4 | digital tube/LED driver pin4 |
| 30 | IO6 | ordinary GPIO pin |
| 31 | LED3 | digital tube/LED driver pin3 |
| 32 | LED2 | digital tube/LED driver pin2 |
| 33 | EPAD/PGND | Power and dissipation ground, maintain good contact with GND |



## 5. IP Series Products List

| IC Part No. | Charge /Discharge | | Features | | | | | | | | Package | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dis-charge | Charge | LED Num | Lighting | Keys | I2C | DCP | USB C | QC Certificate | PD3.0/ PPS | Package | Compatibility |
| **IP5303** | 1.0A | 1.2A | 1,2 | √ | √ | - | - | - | - | - | eSOP8 | PIN2PIN |
| **IP5305** | 1.0A | 1.2A | 1,2,3,4 | √ | √ | - | - | - | - | - | eSOP8 | |
| **IP5306** | 2.4A | 2.1A | 1,2,3,4 | √ | √ | - | - | - | - | - | eSOP8 | |
| **IP5206** | 2A(Max) | 1.5A | 3,4,5 | √ | √ | - | - | - | - | - | eSOP16 | PIN2PIN |
| **IP5108E** | 2.0A | 1.0A | 3,4,5 | √ | √ | - | - | - | - | - | eSOP16 | |
| **IP5108** | 2.0A | 2.0A | 3,4,5 | √ | √ | √ | - | - | - | - | eSOP16 | |
| **IP5207** | 1.2A | 1.2A | 3,4,5 | √ | √ | - | - | - | - | - | QFN24 | PIN2PIN |
| **IP5207T** | 1.2A | 1.2A | 1,2,3,4 | √ | √ | √ | √ | - | - | - | QFN24 | |
| **IP5109** | 2.1A | 2.1A | 3,4,5 | √ | √ | √ | - | - | - | - | QFN24 | |
| **IP5209** | 2.4A | 2.1A | 3,4,5 | √ | √ | √ | √ | - | - | - | QFN24 | |
| **IP5219** | 2.4A | 2.1A | 1,2,3,4 | √ | √ | √ | √ | √ | - | - | QFN24 | |
| **IP5310** | 3.1A | 3.0A | 1,2,3,4 | √ | √ | √ | √ | √ | - | - | QFN32 | |
| **IP5506** | 2.1A | 2.4A | Digital tube | √ | √ | - | - | - | - | - | eSOP16 | |
| **IP5508** | 2.1A | 2.4A | Digital tube | √ | √ | - | √ | - | - | - | QFN32 | |
| **IP5330** | 3.1A | 3A | Digital tube | √ | √ | - | √ | √ | - | - | QFN32 | |
| **IP5322** | 18W | 4.0A | 1,2,3,4 | √ | √ | √ | √ | - | √ | - | QFN32 | |
| **IP5328P** | 18W | 4.0A | 1,2,3,4 | √ | √ | √ | √ | √ | √ | √ | QFN40 | |

## 6. Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Input Voltage Range | $V_{IN}$ | -0.3 ~ 12 | **V** |
| Junction Temperature Range | $T_J$ | -40 ~ 150 | ℃ |
| Storage Temperature Range | Tstg | -60 ~ 150 | ℃ |
| Thermal resistance (from junction to ambient air) | $\theta_{JA}$ | 40 | **℃/W** |
| ESD (Human Body Model) | ESD | 4 | **KV** |

*Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to Absolute Maximum Rated conditions for extended periods may affect device reliability.

*Voltages are referenced to GND unless otherwise noted.

## 7. Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Voltage | $V_{IN}$, $V_{BUS}$ | 4.5 | 5 | 5.8 | V |
| Operating Temperature | $T_A$ | 0 | -- | 70 | ℃ |

*Devices' performance cannot be guaranteed when working beyond those Recommended Operating Conditions.

## 8 Electrical Characteristics

Unless otherwise specified, TA=25℃， L=1uH

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| 充电系统 | | | | | | |
| Input Voltage | $V_{IN}$ | VBAT=3.7V | 4.5 | 5 | 5.8 | V |
| Input Over Voltage | $V_{INOV}$ | | 5.6 | 5.8 | 6 | V |
| Input Under Voltage | $V_{INUV}$ | | 4.4 | 4.5 | 4.6 | V |
| Constant Charge Voltage | $CV_{4.2V}$ | VSET[2:1]=2b00 | 4.18 | 4.21 | 4.24 | V |
| | $CV_{4.30V}$ | VSET[2:1]=2b01 | 4.28 | 4.31 | 4.34 | V |
| | $CV_{4.35V}$ | VSET[2:1]=2b10 | 4.33 | 4.36 | 4.4 | V |
| | $CV_{4.4V}$ | VSET[2:1]=2b11 | 4.38 | 4.41 | 4.44 | V |
| Charge Stop Current | $Ivin_{stop}$ | Input voltage =5V | 200 | 300 | 500 | mA |
| Charge Current | $I_{VIN}$ | VIN Port charging current input terminal current, VBAT=3.7V | 1.7 | 2 | 2.3 | A |
| Trickle Charge Stop Voltage | $I_{TRKL}$ | VIN=5v，BAT=2.7v | 100 | 200 | 300 | mA |
| Trickle Charge Stop Voltage | $V_{TRKL}$ | | 2.9 | 3 | 3.1 | V |
| Recharge Voltage Threshold | $V_{RCH}$ | | 4.07 | 4.1 | 4.13 | V |
| Charge Cut-Off Time | $T_{END}$ | | 20 | 24 | 28 | Hour |
| **Boost System** | | | | | | |
| Battery Operation Voltage | $V_{BAT}$ | | 3 | 3.7 | 4.4 | V |
| Low Power Shutdown Voltage | $V_{BATLOW}$ | IOUT=2A | 2.9 | 2.95 | 3.0 | V |
| Battery input | $I_{BAT}$ | VBAT=3.7V，VOUT=5.1V,fs=500KHz | | 2 | 6 | mA |



| | | | | | | |
|---|---|---|---|---|---|---|
| current | | (no digital tube, no LED display, Vout no load) | | | | |
| DC Output Voltage | $V_{OUT}$ | VBAT=3.7V @0A | 5.0 | 5.12 | 5.25 | V |
| | | VBAT=3.7V @2.4A | 4.85 | 5 | 5.35 | V |
| Output Voltage Ripple | $\Delta V_{OUT}$ | VBAT=3.0V~4.4V | 50 | 100 | 150 | mV |
| Boost Output Current | $I_{vout}$ | VBAT=3.0V~4.4V | 0 | | 2.4 | A |
| Boost Overcurrent Shut Down Threshold | $I_{vout}$ | VBAT=3.0V~4.4V | 2.45 | 2.8 | 3.2 | A |
| Load Overcurrent Detect Time | $T_{UVD}$ | The output voltage is continuously below 4.2V | | 30 | | ms |
| **Control System** | | | | | | |
| Switch Frequency | fs | Boost Switching frequency | 450 | 500 | 550 | KHz |
| | | Charge Switching frequency | 450 | 500 | 550 | KHz |
| PMOS On Resistance | $r_{DSON}$ | | | 40 | | mΩ |
| NMOS On Resistance | | | | 35 | | mΩ |
| VOUT and VIN PMOS On Resistance | | VIN=5V | | 90 | | mΩ |
| Vout Pmos Overcurrent | $I_{IDOCP}$ | VIN=5V | | 3 | | A |
| VCC voltage | VCC | Vbat=3.7V | 3.05 | 3.1 | 3.15 | V |
| Battery Input Standby Current | $I_{STB}$ | VIN=0V，VBAT=3.7V | | 80 | 120 | uA |
| LED Light Driving Current | Ilight | | 5 | 10 | 15 | mA |
| IO Driving Current | $I_{Gpio}$ | | 4 | 5 | 8 | mA |
| Light Load Shut Down Detect Time | $T_{loadD}$ | The load current is continuously less than 50 | 27 | 30 | 33 | s |
| Light Load Shut Down Current | $I_{plout}$ | VBAT=3.7V | 20 | 50 | 70 | mA |
| Short Press On Key Wake Up Time | $T_{OnDebounce}$ | | 100 | | 300 | ms |
| Long Press On Key Wake Up Time | $T_{Keylight}$ | | 2 | | 3 | s |



| | | | | | | |
|---|---|---|---|---|---|---|
| Thermal Shut Down Temperature | $T_{OTP}$ | Rising temperature | 130 | 140 | 150 | ℃ |
| Thermal Shut Down Hysteresis | $\Delta T_{OTP}$ | | 30 | 40 | 50 | ℃ |

## 9. Function Description

## System Diagram

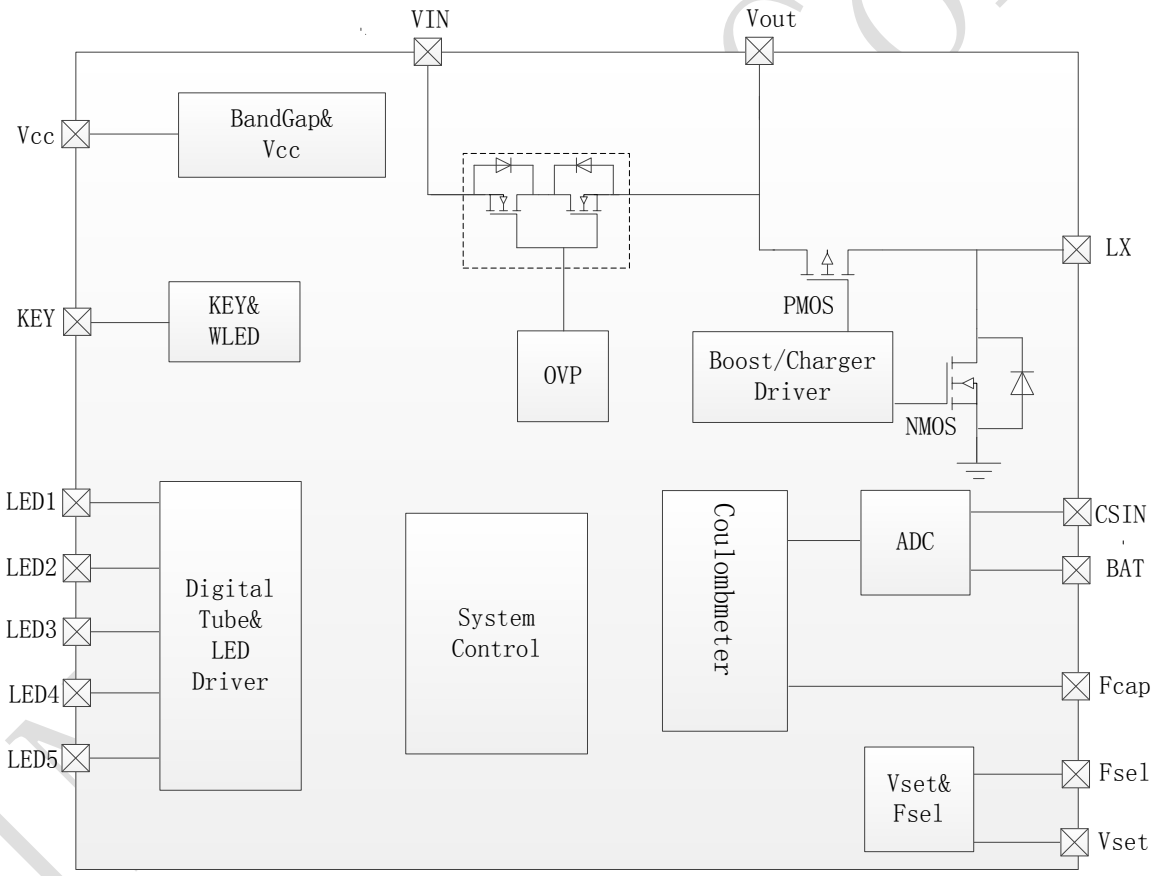



**Figure 3 IP5508 Internal System Diagram**

## Boost

IP5330 integrates a boost dc-dc converter with 5V/2.4A output. Switching frequency: 500KHz; input: 3.7V; efficiency @ 5V/1A output: 94%. Built-in soft start function, to prevent the shock current at the start. Integrated output over current, short circuit, over voltage, over temperature and other protections, to ensure the system stable and reliable. The output current of the boost system can be automatically adjusted with the temperature to

ensure that the IC is below the setted temperature.

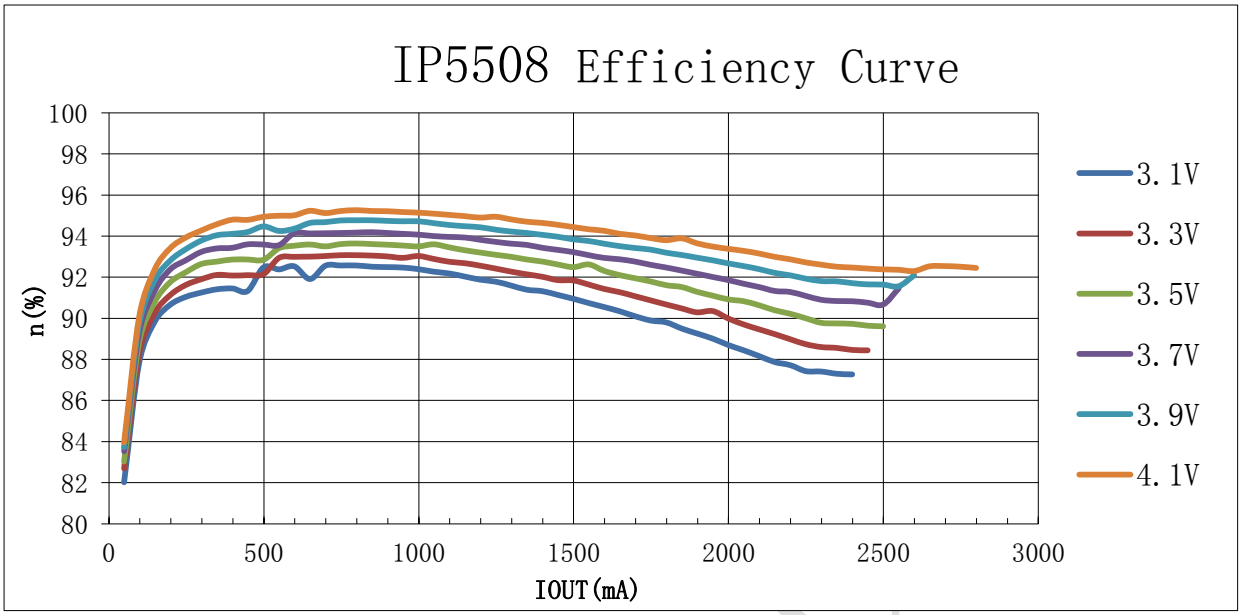



**Figure 4 IP5508 Efficiency Curve**

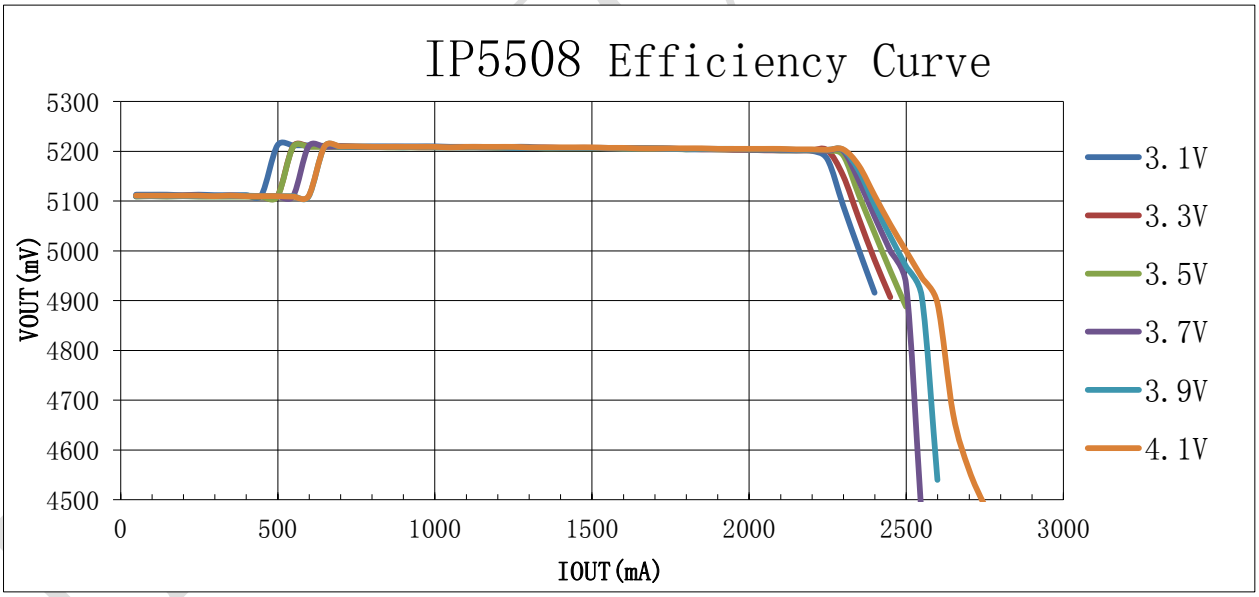



**Figure 5 IP5508 Output V-I Curve**

## Charge

IP5508 has a constant current, constant voltage lithium battery charger with a synchronous switch structure. When the battery voltage is less than 3v, 200mA slip current charging is used; when the battery voltage is greater than 3V, it enters constant current charging, and the VIN input current limiting loop works; when the battery

voltage is greater than 4.2V/4.3V/4.35V/4.4V, it enters constant voltage charging.After the charging is completed, if the battery voltage is lower than 4.1V, restart the battery charging

IP5508 supports 5V/2A charging current, and simultaneously detects the input voltage and IC temperature to automatically adjust the charging current.

IP5508 has built-in power path management, supports charging and discharging while charging. Turn on the PMOS tube of input VIN and output VOUT to charge external devices. At the same time, IP5508 will detect whether the VOUT output voltage is high voltage 4.55V. Charge the battery cell with the maximum current. If it is lower than 4.55V, the charging current will be reduced to automatically adapt to the load output capacity of the adapter. The PMOS tube with input VIN and output VOUT when IP5508 is charging and discharging has the functions of over temperature, 3A over current, short circuit protection and so on. When charging and discharging, priority is given to charging external loads such as mobile phones, and then charging the internal battery of the mobile power supply.

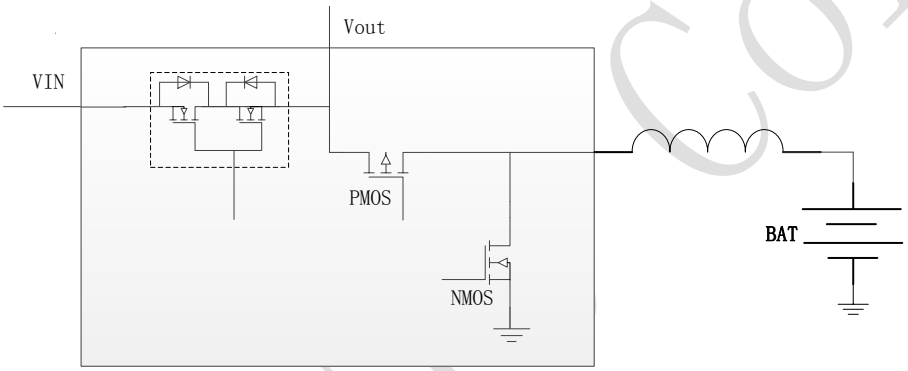



**Figure 6 Schematic diagram of IP5508 path management**

The configuration of battery voltage:

| Vset[2:1] | R14 | R15 | R16 | R18 | Battery voltage |
|---|---|---|---|---|---|
| 2b00 | NC | 0R | NC | 0R | 4.20V |
| 2b01 | NC | 0R | 0R | NC | 4.30V |
| 2b10 | 0R | NC | NC | 0R | 4.35V |
| 2b11 | 0R | NC | 0R | NC | 4.40V |

Note: When actually PCB layout, R14/R15/R16/R18 can be omitted, just short to Vcc or GND.



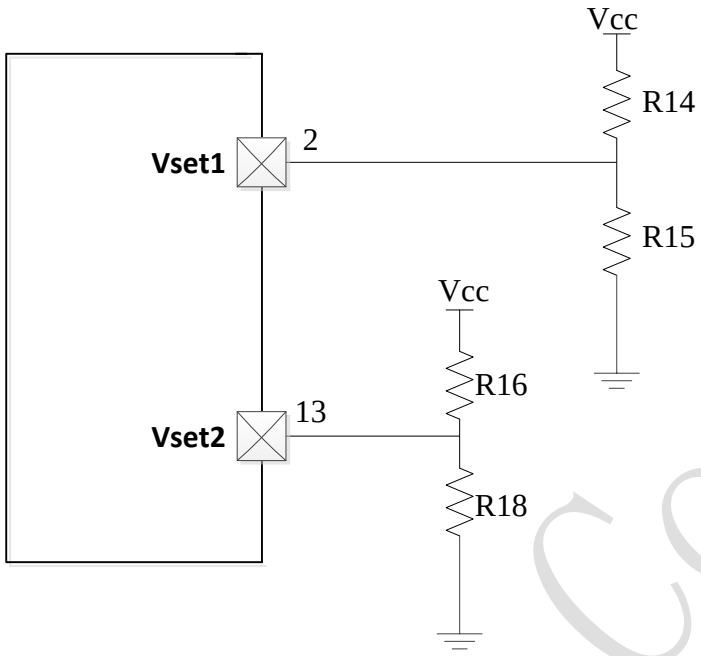



**Figure 7 Vset battery voltage configuration circuit**

## Key and WLED

IP5330 has built-in Key and WLED function, which supports external PIN selection, Key startup & shutdown and switch lighting. Specific reference is as follows:

| Mode[2:1] | R17 | R24 | R25 | R26 | Key mode description |
|---|---|---|---|---|---|
| 2b00 | NC | 0R | NC | 0R | Short press to boost ,short press twice to power off, long press 2s to switch WLED |
| 2b01 | NC | 0R | 0R | NC | Short press to boost, long press to switch WLED, without key shutout function |
| 2b10 | 0R | NC | NC | 0R | Short press to boost ,short press twice to switch WLED, without key shutout function |
| 2b11 | 0R | NC | 0R | NC | Short press to boost, short press twice to switch WLED ,long press to shut out |

Note: When actually PCB layout, R17/R24/R25/R26 can be omitted, just short to Vcc or GND.



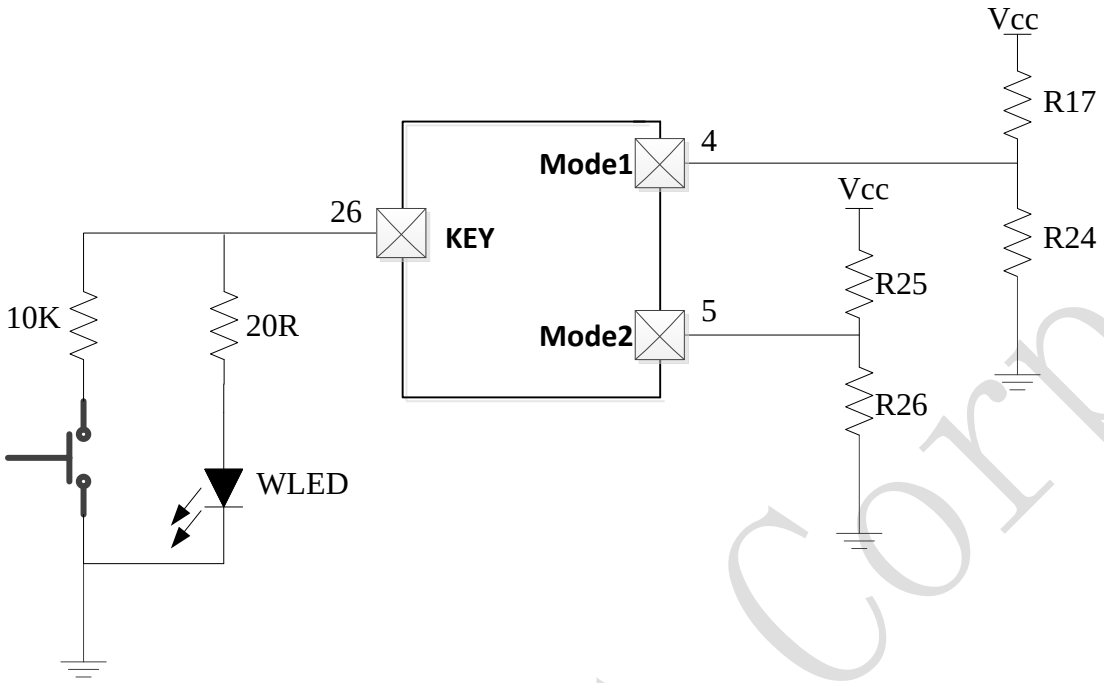



**Figure 8 Key and WLED**

## Coulombmeter and battery level display

P5508 has built-in accurate coulomb electricity meter algorithm, according to the battery capacity accurately display the remaining battery power.

IP5508 can be customized to support LED lamp, type 88, type 188, type 888 digital tube and other power display.

The specific corresponding models are as follows:

IP5508_BZ_LED Support 1/2/3/4/5 LEDs

IP5508_BZ_188 Support 5pin188 type digital tube (if you need to support other types of digital tube, please inquire our sales or FAE)



## LED Display Mode

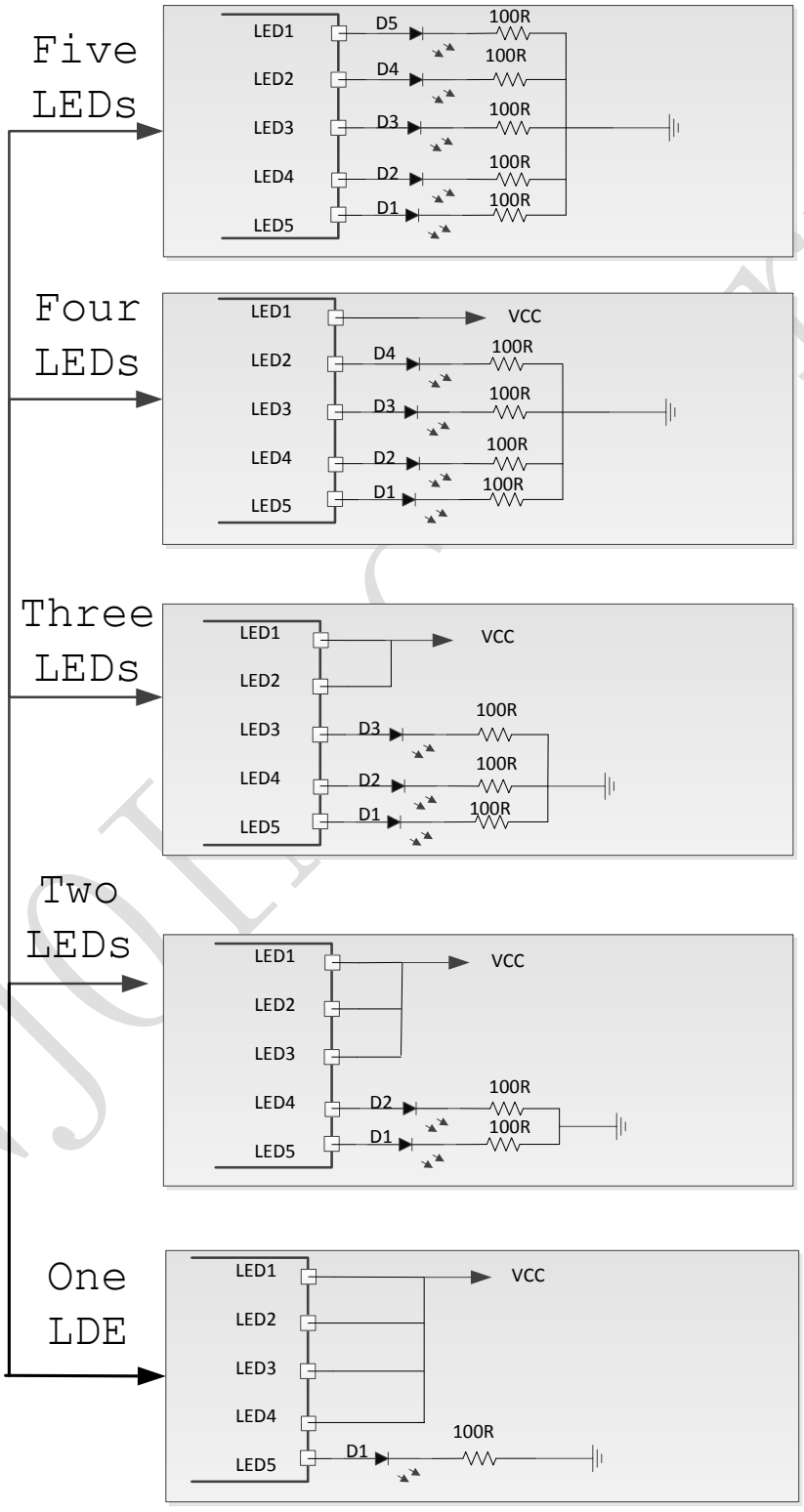



**Figure 9 LED display configuration circuit**



■ Five LEDs mode

Boost

| SOC(%) | D1 | D2 | D3 | D4 | D5 |
|---|---|---|---|---|---|
| C≥80% | ON | ON | ON | ON | ON |
| 60%≤C＜80% | ON | ON | ON | ON | OFF |
| 40%≤C＜60% | ON | ON | ON | OFF | OFF |
| 20%≤C＜40% | ON | ON | OFF | OFF | OFF |
| 3%≤C＜20% | ON | OFF | OFF | OFF | OFF |
| 0%＜C＜3% | 1Hz blink | OFF | OFF | OFF | OFF |

Charge

| SOC(%) | D1 | D2 | D3 | D4 | D5 |
|---|---|---|---|---|---|
| Full | ON | ON | ON | ON | ON |
| C≥80% | ON | ON | ON | ON | 0.5Hz blink |
| 60%≤C＜80% | ON | ON | ON | 0.5Hz blink | OFF |
| 40%≤C＜60% | ON | ON | 0.5Hz blink | OFF | OFF |
| 20%≤C＜40% | ON | 0.5Hz blink | OFF | OFF | OFF |
| ＜20% | 0.5Hz blink | OFF | OFF | OFF | OFF |

■ Four LEDs mode

Boost

| SOC(%) | 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% | 1Hz blink | OFF | OFF | OFF |

Charge

| SOC(%) | D1 | D2 | D3 | D4 |
|---|---|---|---|---|
| Full | ON | ON | ON | ON |
| 75%≤C | ON | ON | ON | 0.5Hz blink |
| 50%≤C＜75% | ON | ON | 0.5Hz blink | OFF |
| 25%≤C＜50% | ON | 0.5Hz blink | OFF | OFF |
| C＜25% | 0.5Hz blink | OFF | OFF | OFF |



■ Three LEDs mode

Boost

| SOC(%) | D1 | D2 | D3 |
|---|---|---|---|
| C≥66% | ON | ON | ON |
| 33%≤C＜66% | ON | ON | OFF |
| 3%≤C＜33% | ON | OFF | OFF |
| 0%＜C＜3% | 1Hz blink | OFF | OFF |

Charge

| SOC(%) | D1 | D2 | D3 |
|---|---|---|---|
| 75%≤C | ON | ON | ON |
| 66%≤C＜100% | ON | ON | 0.5Hz blink |
| 33%≤C＜66% | ON | 0.5Hz blink | OFF |
| C＜33% | 0.5Hz blink | OFF | OFF |

■ Two LEDs mode

| | State | D1 | D2 |
|---|---|---|---|
| Charge | In charging | 0.5Hz blink | OFF |
| | Full | ON | OFF |
| discharge | In discharging | OFF | ON |
| | Low Battery | OFF | 1Hz blink |

■ One LED mode

| | State | D1 |
|---|---|---|
| Charge | In charging | 0.5Hz blink |
| | Full | ON |
| discharge | In discharging | ON |
| | Low Battery | 1Hz blink |

## Digital Tube Mode

| Digital Tube | charge | | boost | |
|---|---|---|---|---|
| | In charging | Full | SOC<5% | SOC>5% |
| 5pin 188 mode | 0-99%<br>''IN''0.5HZblink | Always bright<br>100% | Single digit<br>1HZblink 0-5% | Always bright<br>5%-100% |

The schematic diagram of 5pin188 digital tube is as follows:

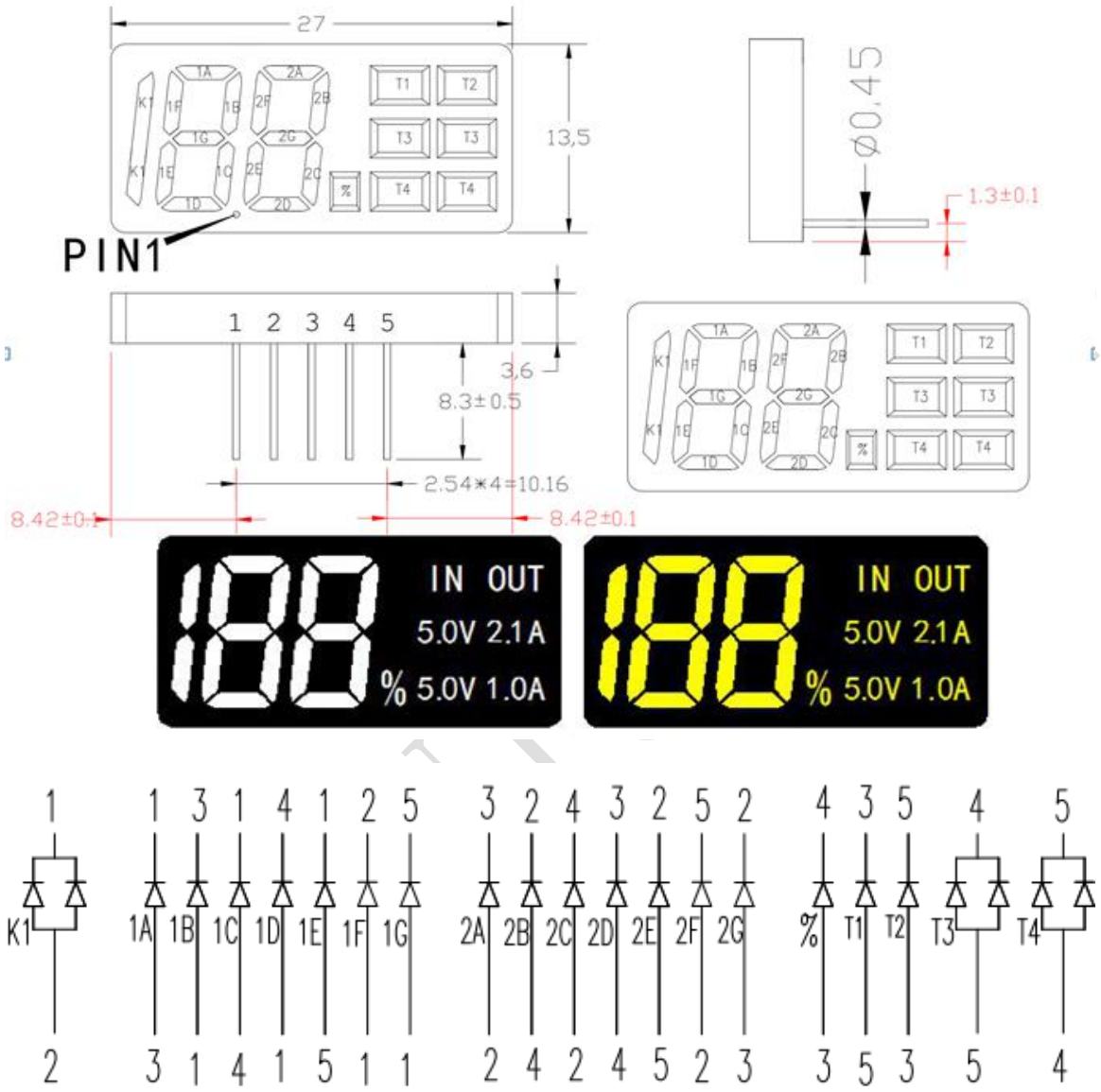



**Figure 10 5pin188 digital tube circuit diagram**

## Coulombmeter

IP5508 supports the external setting of the initial capacity of the battery. The residual capacity of the battery can be managed by integrating the current and time of the battery end, which can accurately display the current capacity of the battery. At the same time, IP5508 supports a complete charging process from 0% to 100% to automatically calibrate the total capacity of the current battery, so as to manage the actual capacity of the battery more reasonably.

IP5508 initial capacity formula setted by external PIN: battery capacity=$R_{19}$*0.2 (mAH) (Max：25000mAH)

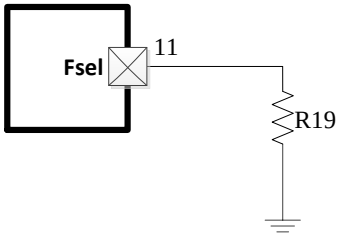



**Figure 11 Battery capacity configuration circuit diagram**

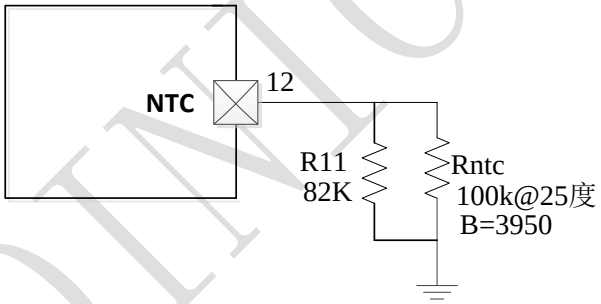
### Auto Detection On Phone Attachment And Enter Standby Mode Automatically With Light Load

After IP5508 detects the phone's insertion, it will immediately wake up from standby mode and turn on the boost 5V to charge the phone.

IP5508 automatically enters standby state when Vout end load current is less than 50mA and lasts for 30s.

## NTC

IP5508 integrated NTC, and can detect battery pack temperature. IP5508's NTCPIN will output 20uA current, then detect the voltage of NTC PIN to determine the temperature of the battery




Charge：

If NTC pin voltage>1.32V，it indicate the battery temperature is below 0°C ,charger is stopped.

If NTC pin voltage<0.56V，it indicate the battery temperature is higher 45°C ,half charging current is used.

If NTC pin voltage<0.49V，it indicate the battery temperature is higher 50°C ,charger is stopped.

Discharge：

If NTC pin voltage>1.44V，it indicate the battery temperature is below -10°C ,Output will be shutoff.

If NTC pin voltage<0.43V，it indicate the battery temperature is higher55°C ,Output will be shutoff.

If NTC function is not needed, the NTC pin should connect a 51K resistor to GND. The NTC pin cannot float otherwise may lead to abnormal.

## VCC

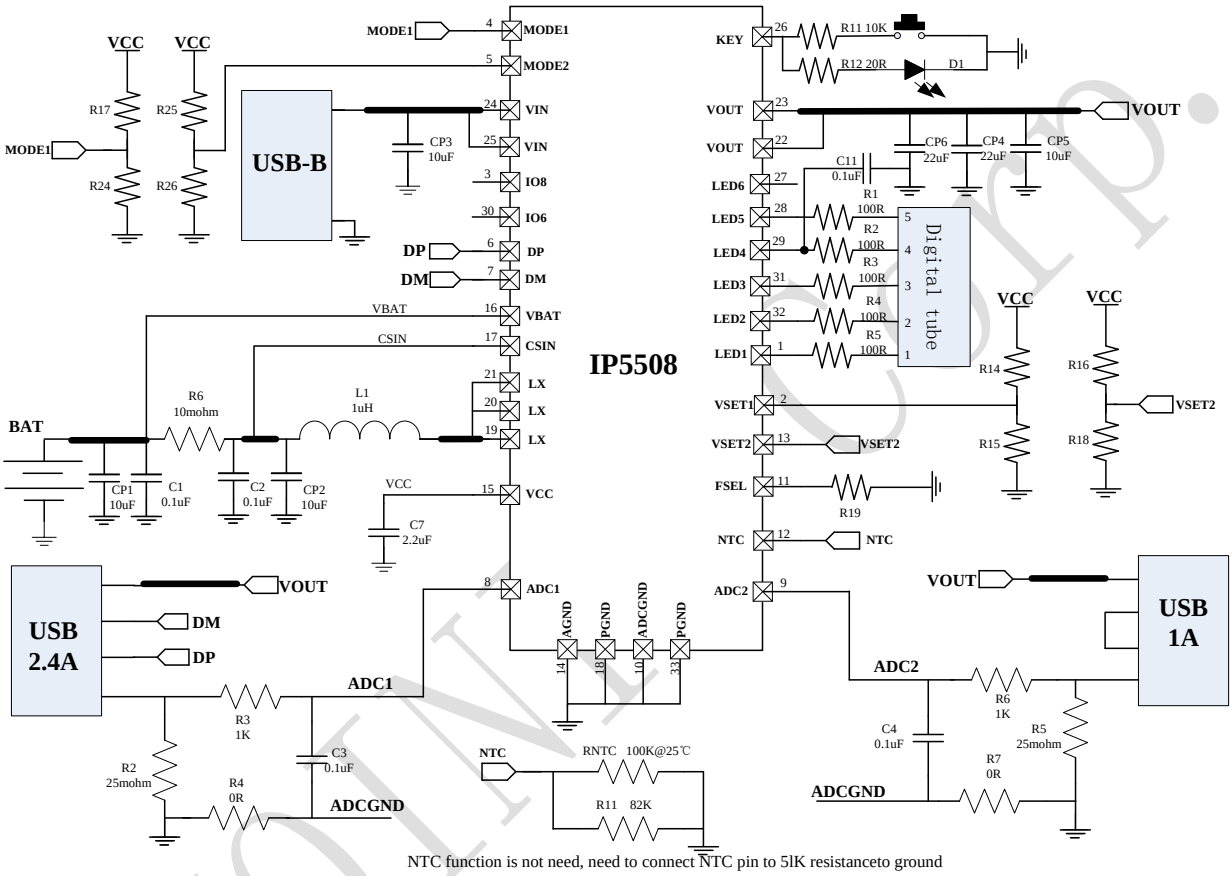
VCC is a normally opened 3.1V LDO. Load capacity is 50mA.



## 10. Typical Application Diagram

IP5508 only needs inductors, capacitors and resistors to realize the complete scheme of mobile power supply.




NTC function is not need, need to connect NTC pin to 5lK resistanceto ground

**Figure 12 Typical application principle diagram of IP5508 digital tube application**

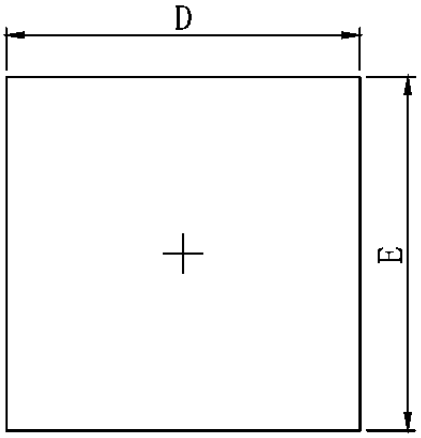
Recommended model of inductance ： SPM70701R0

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

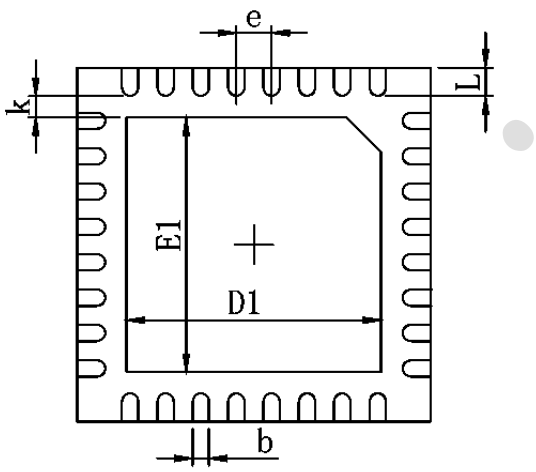
Recommended models of lithium battery protection IC

| INJOINIC | Pack age | Overcharge Detection Voltage [VCU] (V) | Overdischarge Detection Voltage [VDL] (V) | Overcurrent Detection Current [IOV] (A) |
|---|---|---|---|---|
| IP3005A | ESOP8 | 4.28V | 2.5V | 7A |

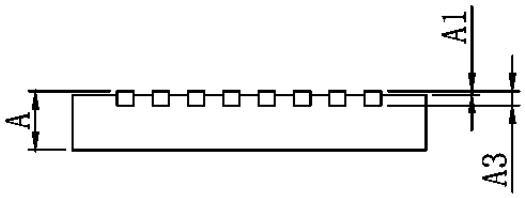
## 11. Package information




TOP VIEW




BOTTOM VIEW




SIDE VIEW

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.203REF. | | 0.008REF. | |
| D | 4.924 | 5.076 | 0.194 | 0.200 |
| E | 4.924 | 5.076 | 0.194 | 0.200 |
| D1 | 3.300 | 3.500 | 0.130 | 0.138 |
| E1 | 3.300 | 3.500 | 0.130 | 0.138 |
| k | 0.200MIN. | | 0.008MIN. | |
| b | 0.200 | 0.300 | 0.008 | 0.012 |
| e | 0.500TYP. | | 0.020TYP. | |
| L | 0.324 | 0.476 | 0.013 | 0.019 |

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