TP5000 (2A switching 4.2V lithium battery / 3.6V LiFePO4 Charger)

Description

TP5000 is a switching buck single manganese lithium battery / LiFePO4 battery charge management chip. Its QFN16 ultra-compact package with simple peripheral circuit, making the TP5000 is ideal for portable equipment large current charging management applications. Meanwhile, TP5000 built-in input overcurrent, undervoltage protection, over temperature protection, short circuit protection, battery temperature monitoring, reverse battery protection.
TP5000 has a wide input voltage, divided into three stages Trickle pre-charge, constant current, constant voltage trickle charge the battery pre-charge current, constant current charging current adjusted through an external resistor, the maximum charging current of 2A. TP5000 switching frequency of 800kHz operating mode so that it can use smaller external components and smaller heat remains in the high current charging. TP5000 Built-power the PMOSFET, anti-intrusion circuit, so there is no need anti-intrusion perimeter protection Schottky diodes. TP5000 constant current function can also be used dry batteries in 2 strings of lithium batteries or 4 string input, constant current drive 0.5-7W white LED.

Characteristic

■ Single 4.2V lithium manganese or 3.6V LiFePO4 battery charge
■ Built-in power MOSFET, switching mode,
The devices less heat, simple peripheral
■ programmable charge current, 0.1A--2A
■ programmable pre-charge current, 10% - 100%
■ eliminates the need for an external Schottky diode anti-intrusion
■ Wide operating voltage up to 9V
■ Two LED charge status indicator
■ chip temperature protection, overcurrent protection, undervoltage protection
■ battery temperature protection, reverse battery shutdown, short-circuit protection
■ switching frequency 800KHz, available inductor 2.2uH-10uH
■ automatic recharge function
■ less than 1% of the charging voltage control precision
■ paragraph Trickle, constant current, constant voltage charging to protect the battery
■ QFN16 4mm * 4mm ultra-small package

Absolute Maximum Ratings

■ input supply voltage (VIN): 10V
■ BAT:-4.2V ~ 9V
■ BAT short duration: continuous
■ Maximum Junction Temperature: 145 ° C
■ Operating ambient temperature range: -40 ° C to 85 ℃
■ Storage temperature range: -65 ℃ ~ 125 ℃
■ Lead Temperature (Soldering, 10 sec): 260 ℃

Application

■ portable devices, various chargers
■ smartphones, PDAs, mobile cellular phone
■ MP4, MP5 player, Tablet PC
■ miner's lamp
■ power tools
■ White LED Driver

Typical applications

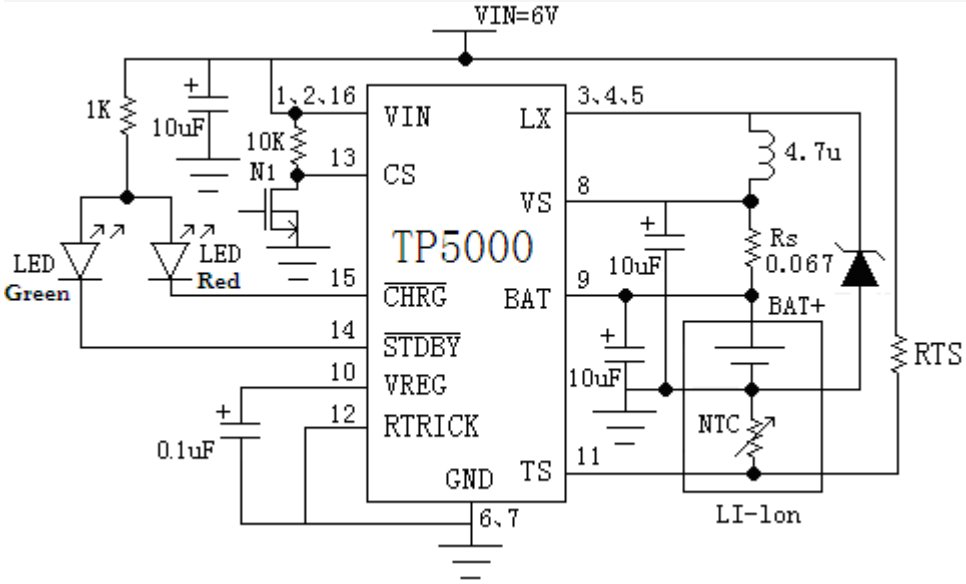


Figure 1 TP5000 4.2V lithium-ion battery charging 1.5A (150MA prefilled) Application Diagram

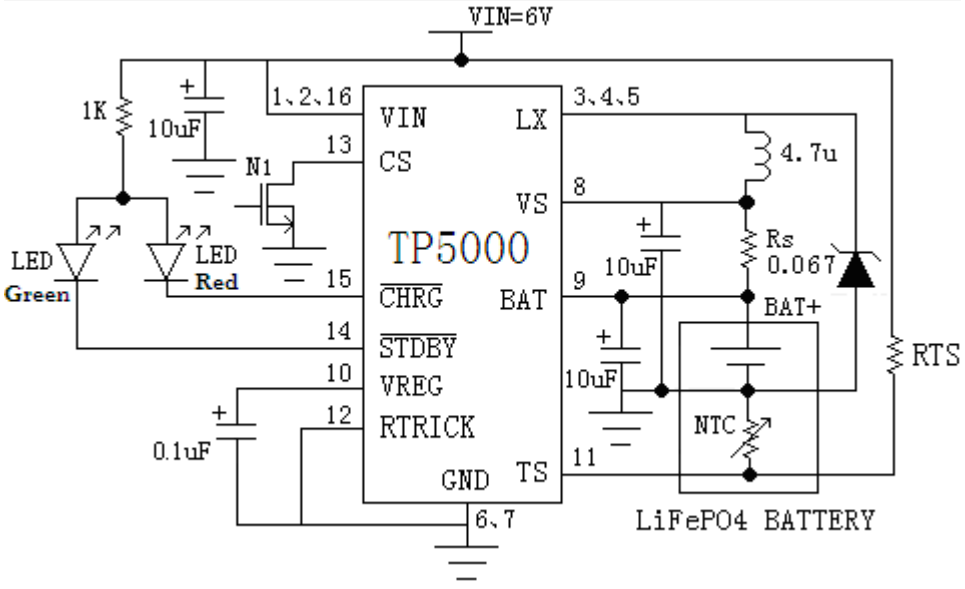
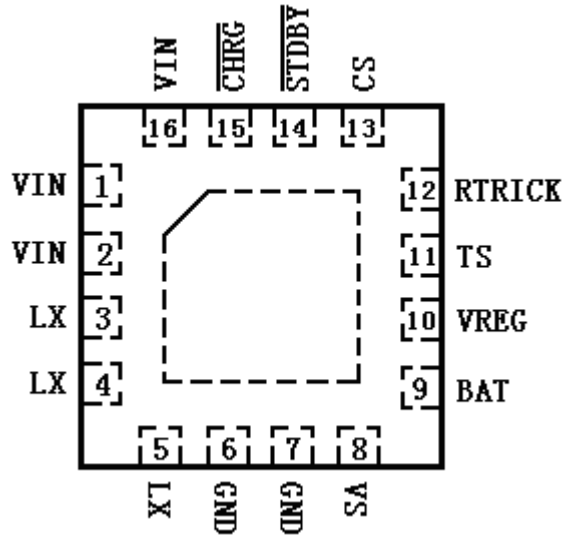


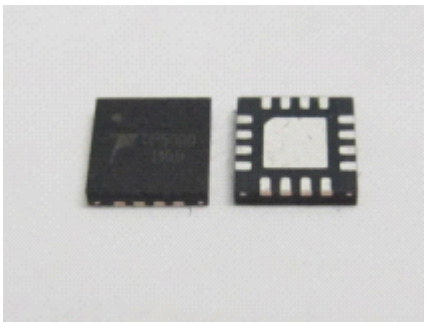
Figure 2 TP5000 3.6V LiFePO4 battery charging 1.5A (150MA prefilled) Application Diagram

Package / Ordering Information



16-pin 4mm * 4mm QFN 16 package top view
(Heat sink grounding can not be connected to other potential)

Orders Model
TP5000-QFN16
Device Marking
TP5000
Physical picture



TP5000 functional block diagram

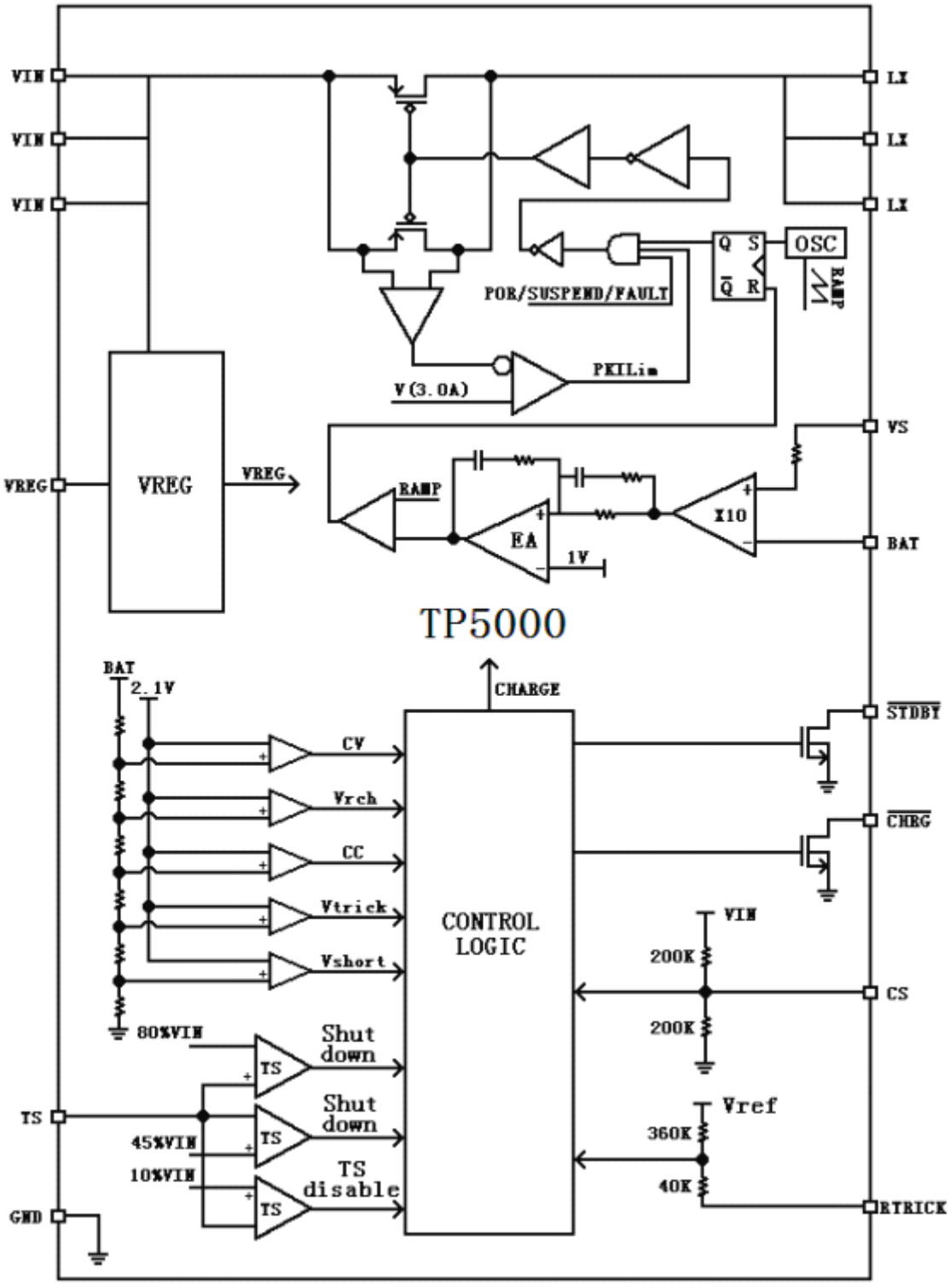


Figure 3 Functional block diagram of TP5000

Pin Function

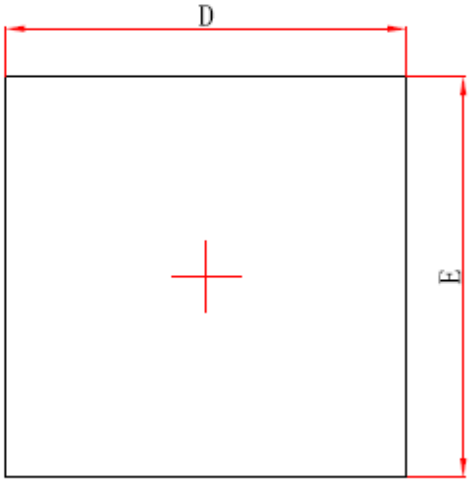
VIN (Pin 2, 16): the positive input terminal of the input voltage. The voltage on this pin for internal circuit power supply, and the VIN changes in the range of 4.5V to 9V and a 10μF tantalum capacitor bypass. When the VIN and VRBATR differential pressure is lower than 30mv, TP5000 enter shutdown mode, the dropped 4μA so IRBATR.
LX (Pin 3,4,5): built-in the PMOSFET power pipe drain connection. LX is TP5000 the current output terminal and is connected to the external inductor as the input terminal of the battery charging current.
GND (Pin 6,7): Power Ground.
VS (Pin 8): Output current sense positive input terminal.
BAT (Pin 9): battery voltage detection terminal. To the positive terminal of the battery is connected to this pin.
VREG (pin 10): internal power supply. The VREG is an internal power supply, external 0.1uF bypass capacitor to ground.
TS (Pin 11): The battery temperature detection input. TS pin to the NTC (negative temperature coefficient thermistor) sensor output terminal of the battery. If the TS pin voltage is less than 45% of the input voltage or greater than 80% of the input voltage, which means that the battery temperature is too low or too high, the charging is suspended. If TS is directly tied to GND, battery temperature detection function is canceled, the other charging function properly.
RTRICK (Pin 12): Trickle pre-charge current setting end. Pre the RTRICK pin to ground charging current set at 10% constant current, pre-charging current can be set by an external resistor. If RTRICK vacant then the pre-charge current is equal to the constant current.
CS (Pin 13): lithium-ion or LiFePO4 status chip select input. CS pin high input level will TP5000 is the lithium-ion battery charging a 4.2V voltage shutdown state. The CS left side in the TP5000 iron phosphate lithium-off voltage 3.6V. Low input level TP5000 is shutdown. CS client can be TTL or CMOS level driver.

$\overline{\text{STDBY}}$ (Pin 14): Battery Charge complete indication end. When the battery is fully charged, the internal switch is pulled low, the charging is completed. In addition, the pin will be in a high impedance state.

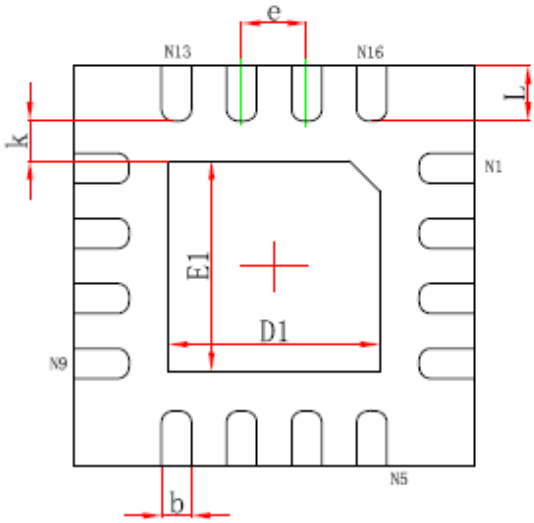
$\overline{\text{CHRG}}$ (Pin 15)： Charge indicator status. Charger to charge the battery, pin internal switch pulled low, indicating that charging is in progress; otherwise the pin is in a high impedance state.

Package Description

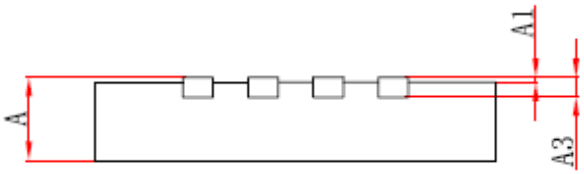
4mm * 4mm 16-pin QFN package



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	3.900	4.100	0.154	0.161
E	3.900	4.100	0.154	0.161
D1	2.000	2.200	0.079	0.087
E1	2.000	2.200	0.079	0.087
k	0.200MIN.		0.008MIN.	
b	0.250	0.350	0.010	0.014
e	0.650TYP.		0.026TYP.	
L	0.450	0.650	0.018	0.026

Package	Reel	Pcs/ disc	Tray / box	Boxes / carton	Pcs / box
QFN4*4	13 寸	5000	1	8	40000

The TP5000 other application circuit

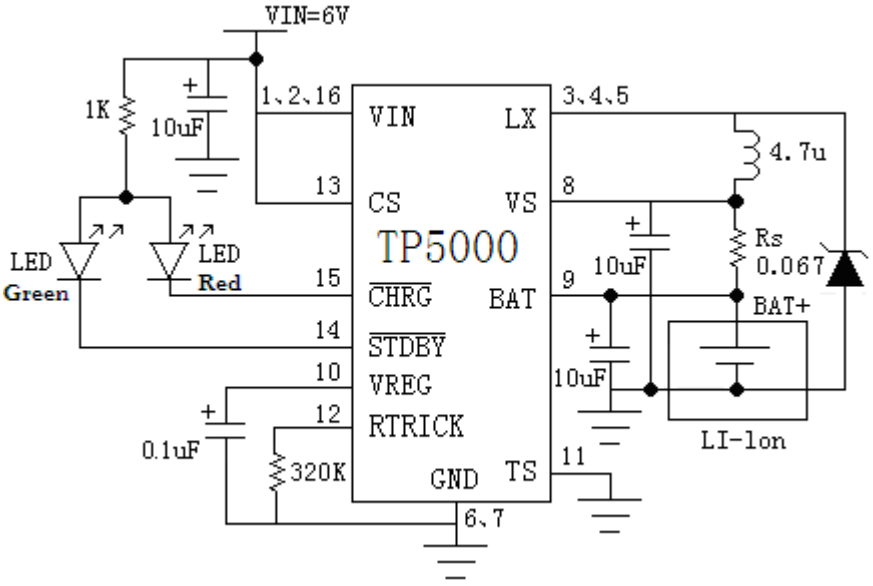


Figure 4 TP5000 4.2V lithium-ion battery battery temperature protection trickle 0.75A constant current 1.5A charging Application Diagram(CS pin high)

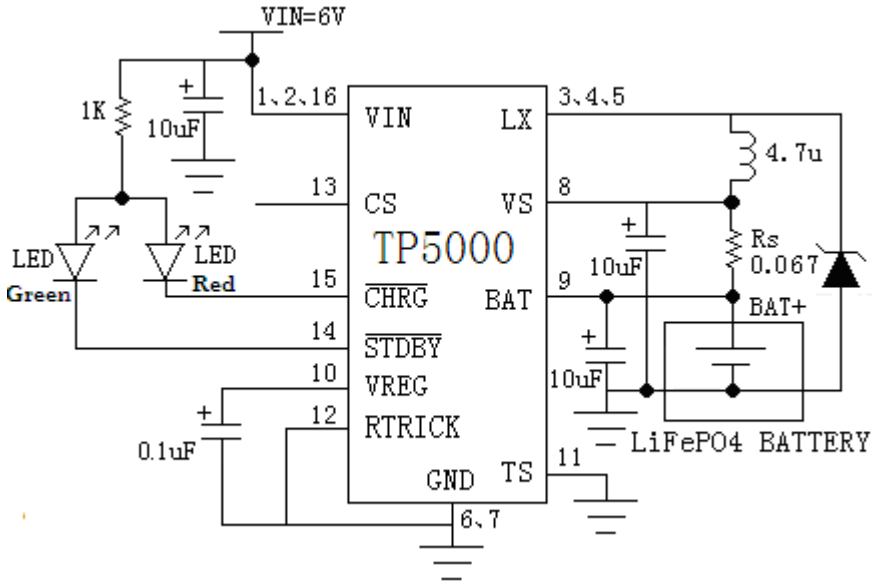


Figure 5 TP5000 LiFePO4 battery temperature protection the 1.5A charge Application Diagram (CS pin floating)

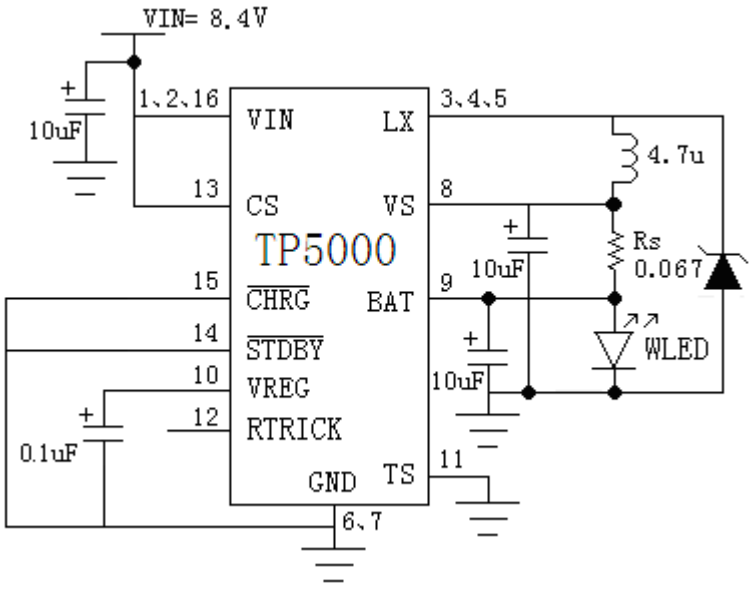


Figure 6 TP5000 The two connected lithium drive 5W LED Application Diagram
The (RTRICK pin unconnected)

TP5000 Note

1. The circuit capacitance should be as close as possible to the chip.
2. The the VS end of the VIN end and BAT end use of tantalum capacitors, X5R or X7R level ceramic capacitors or electrolytic capacitors plus 0.1uF ceramic capacitor.
3. The inductor selection of the current capacity is sufficient power inductor.
4. The Schottky diode choose conduction voltage drop current capability greater than or equal to 2A Schottky diode.
5. For VIN and LX should be wider than the ordinary signal lines through the traces of the current loop.
6. Pay attention to the the capacitive grounding line node location, and should try to make the ground point focused, well-grounded.
7. Use the chip in the high-current work, should be considered a good connection of the chips at the bottom of the heat sink and the PCB to ensure good heat dissipation.