

4.0A Multi-Chemistry Battery Charger With Photovoltaic Cell MPPT Function

General Descriptions

The FH5402 is a PWM switch-mode multi-chemistry battery charger controller that can be powered by photovoltaic cell with maximum power point tracking function using few external components.

The FH5402 is specially designed for charging lithium-ion, LiFePO4 or Lithium Titanate batteries with constant current and constant voltage mode. In constant voltage mode, the regulation voltage is set by 2 external resistors. The constant charging current is programmable with a single current sense resistor.

Deeply discharged batteries are automatically trickle charged at 17.5% of the programmed constant charging current until the cell voltage exceeds 66.5% of constant voltage. The charge cycle is terminated once the charging current drops to 16% of full-scale current, and a new charge cycle automatically restarts if the charge current rises above 58.8% of full-scale charge current.

FH5402 will automatically enter sleep mode when input voltage is lower than battery voltage. Other features include under voltage lockout, battery over voltage protection, status indication, etc.

FH5402 is available in a space-saving 10-pin SSOP package.

Package Type

- Type: SSOP-10L (3000PCS/Reel)

Typical Application Circuit

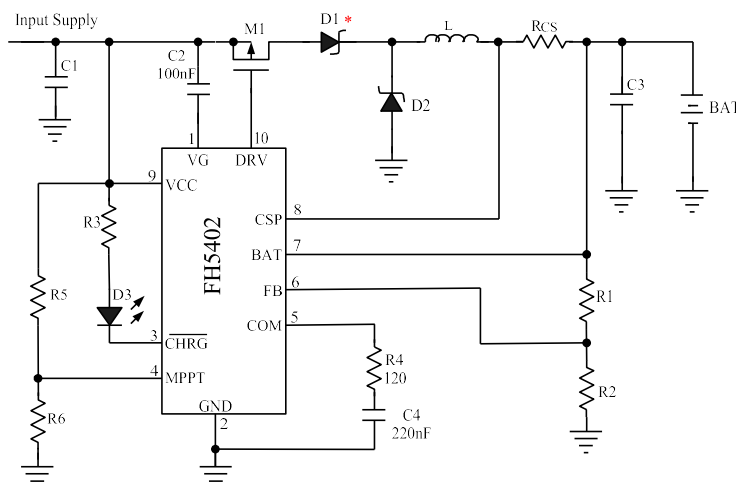


Figure 1 Typical Application Circuit

* : Diode D1 can be omitted, refer to section "Diode Selection" on Page 9.

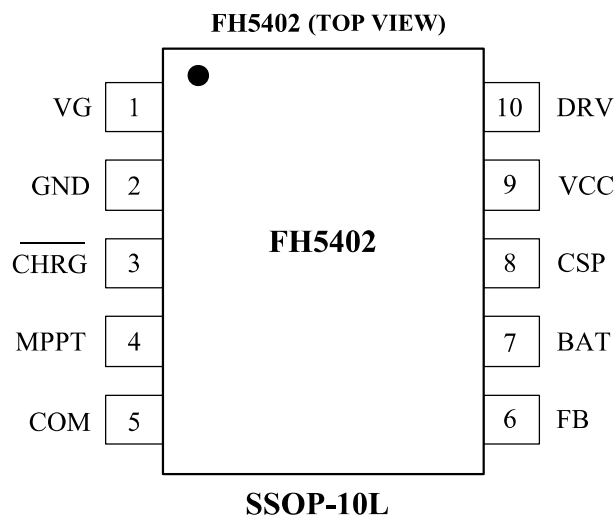
Features

- Photovoltaic Cell Maximum Power Point Tracking
- Wide Input Voltage: 6.6V to 30.0V
- Complete Charge Controller for Single or Multi-cell Lithium ion, LiFePO4 or Lithium Titanate Batteries
- Charge Current Up to 4.0A
- PWM Switching Frequency: 310KHz
- Can be used as Voltage Source when Battery is Absent
- Charging Current is programmed with a current sense resistor
- Automatic Conditioning of Deeply Discharged Batteries
- Automatic Recharge
- Charging Status Indication
- Soft-Start
- Battery Overvoltage Protection
- Operating Ambient Temperature: - 40°C to +85°C
- Available in 10-Pin SSOP Package
- Pb-free, RoHs Compliant, Halogen Free

Applications

- Hand-held Equipment
- Emergency Lamp and Camping Lamp
- Battery-Backup Systems
- Portable Industrial and Medical Equipment
- Standalone Chargers for Lithium ion, LiFePO4 or Lithium Titanate Batteries

Pin Assignment



Pin Description

Pin No.	Name	Descriptions
1	VG	Internal Voltage Regulator. VG internally supplies power to gate driver, connect a 100nF capacitor between VG pin and VCC pin.
2	GND	Ground. Negative terminal of input supply.
3	$\overline{\text{CHRG}}$	Open-Drain Charge Status Output. When the battery is being charged, this pin is pulled low by an internal switch. Otherwise this pin is in high impedance state.
4	MPPT	Photovoltaic Cell Maximum Power Point Tracking Pin. Connect this pin to the external resistor divider for maximum power point tracking. In maximum power point tracking status, the MPPT pin's voltage is regulated to 1.205V.
5	COM	Loop Compensation Input. Connect a 220nF capacitor in series with an 120 Ω resistor from this pin to GND.
6	FB	Battery Voltage Feedback Input. Generally this Pin is connected to the external feedback resistor divider to sense the battery voltage.
7	BAT	Negative Input for Charge Current Sensing. This pin and the CSP pin measure the voltage drop across the sense resistor R_{cs} to provide the current signals required.
8	CSP	Positive Input for Charge Current Sensing. This pin and the BAT pin measure the voltage drop across the sense resistor R_{cs} to provide the current signals required.
9	VCC	External DC Power Supply Input. VCC is also the power supply for internal circuit. Bypass this pin with capacitors.
10	DRV	Gate Drive Pin. Drive the gate of external P-channel MOSFET.

4.0A 具有太阳能电池最大功率点跟踪功能的多节电池充电管理集成电路

器件概述

FH5402 是一款可使用太阳能板供电的 PWM 降压模式多节电池充电管理集成电路，独立对多节电池充电进行管理，具有封装外形小，外围元器件少和使用简单等优点。

FH5402 具有涓流，恒流和恒压充电模式，非常适合锂电池，磷酸铁锂电池和钛酸锂电池充电管理。在恒压充电模式，FH5402 将电池电压调制在外部反馈电阻所设置的电压；在恒流充电模式，充电电流通过一个外部电阻设置。当用太阳能板供电时，内部电路能够自动跟踪太阳能板的最大功率点，用户不需要考虑最坏情况，可最大限度地利用太阳能板的输出功率，非常适合利用太阳能板供电的应用。

对于深度放电的锂电池，当电池电压低于恒压充电电压的 66.5%(典型值)时，FH5402 用所设置的恒流充电电流的 17.5% 对电池进行涓流充电。在恒压充电阶段，充电电流逐渐减小，当充电电流降低到恒流充电电流的 16%时，充电结束。在充电结束状态，如果充电电流再上升到恒流充电电流的 58.8%以上，自动开始新的充电周期。当输入电源掉电或者输入电压低于电池电压时，FH5402 自动进入睡眠模式。其它功能包括输入低电压锁存，电池端过压保护和充电状态指示等。

FH5402 采用 10 管脚SSOP 封装。

主要特点

- 太阳能板最大功率点跟踪功能
- 可对单节或多节锂电池，磷酸铁锂电池或钛酸锂电池进行完整的充电管理
- 宽输入电压范围：6.6V 到 30V
- 电池没有连接时，可作为恒压源使用
- 充电电流可达 4.0A
- PWM 开关频率：310KHz
- 恒压充电电压由外部电阻设置
- 恒流充电电流由外部电阻设置
- 对深度放电的电池进行涓流充电
- 自动再充电功能
- 充电状态指示
- 软启动功能
- 电池端过压保护
- 工作环境温度：-40°C 到 +85°C
- 采用 10 管脚SSOP 封装
- 产品无铅，满足 RoHs，不含卤素

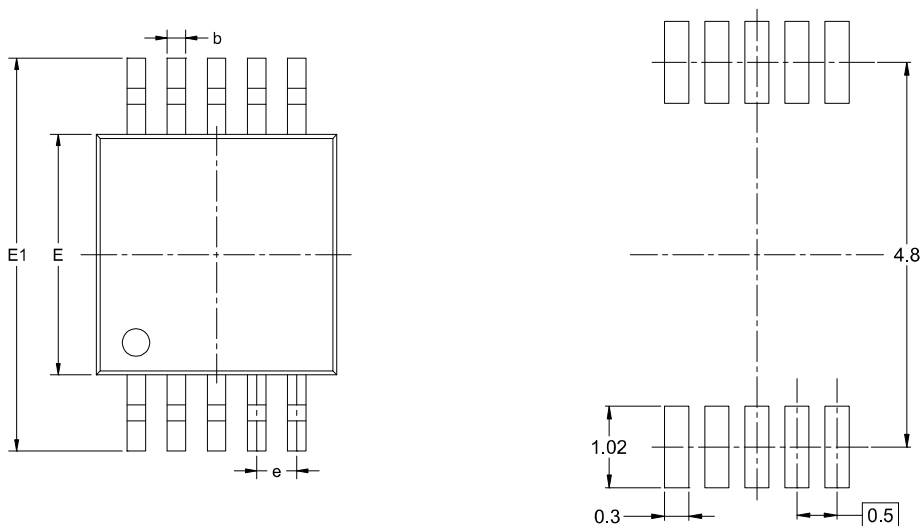
极限参数

VCC, CHRГ 到 GND 的电压	- 0.3V to 33V
VG, DRV 管脚到 VCC 管脚电压	-8.0V to VCC+0.3V
CSP, BAT 到 GND 的电压	- 0.3V to 27V
MPPT, COM, FB 到 GND 的电压	- 0.3V to 6.5V
存储环境温度	- 65°C ~ 150°C
工作环境温度	- 40°C ~ 85°C
焊接温度 (10秒)	260°C

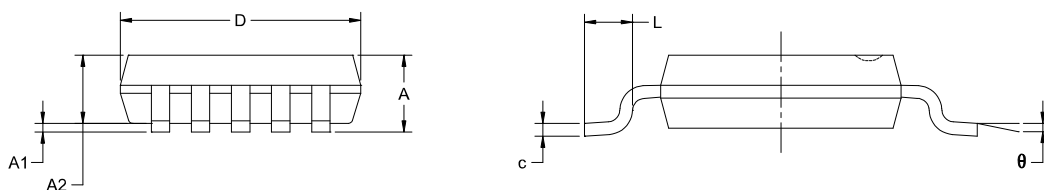
超出以上所列的极限参数可能造成器件的永久损坏。以上给出的仅仅是极限范围，在这样的极限条件下工作，器件的技术指标将得不到保证，长期在这种条件下还会影响器件的可靠性。

PACKAGE OUTLINE DIMENSIONS

• Type: SSOP-10L



RECOMMENDED LAND PATTERN(Unit: mm)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.300	0.450	0.012	0.018
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.000 BSC		0.039 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	1°	8°

Ordering Information

Part Number	Voltage Range	Features	Operating Temperature	Package Type	Top Mark	SPQ
FH5402S10	6.6V ~ 30.0V	<ul style="list-style-type: none"> • 310KHz Frequency • Duty Cycle: 94% • Multi-cell Li-ion LiFePO4 • Charge Current: 4.0A 	-40°C to 85°C	SSOP-10L	FH5402 YML xx	3000PCS/Reel

Note:

- FH5402 devices are Pb-free and RoHS compliant.
- The surface prints of our semiconductor devices are subject to change during the production process and do not involve changes in electrical parameters, and we will not separately state the notice.
- If you have any other custom purchase needs, please contact our sales department.



ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.



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▲ Update by Jan.2021