

LiFePO4 Linear Battery Charger for Solar-Powered Systems

PRELIMINARY DATASHEET

General Description

The FH4058 is a complete constant-current /constant voltage linear charger for single cell LiFePO4 batteries. The device contains an on-chip power MOSFET and eliminates the need for the external sense resistor and blocking diode.

An on-chip adaptive cell can adjust charging current automatically based on the output capability of input power supply, so FH4058 is ideally suited for solar powered system. Thermal feedback regulates the charge current to limit the die temperature during high power operation or high ambient temperature.

The regulation voltage is internally fixed at 3.63V with $\pm 1\%$ accuracy, it can also be adjusted upwards with an external resistor. The charge current can be set externally with a single resistor. When the input supply is removed, the FH4058 automatically enters a low power sleep mode, dropping the battery drain current to less than 3.0uA.

Other features include undervoltage lockout, automatic recharge, battery temperature sensing and charging/termination indicator.

The FH4058 is available in a thermally enhanced 8-pin SOP package.

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
FH4058	ESOP-8L	4.90mm × 3.91mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Typical Application Circuit

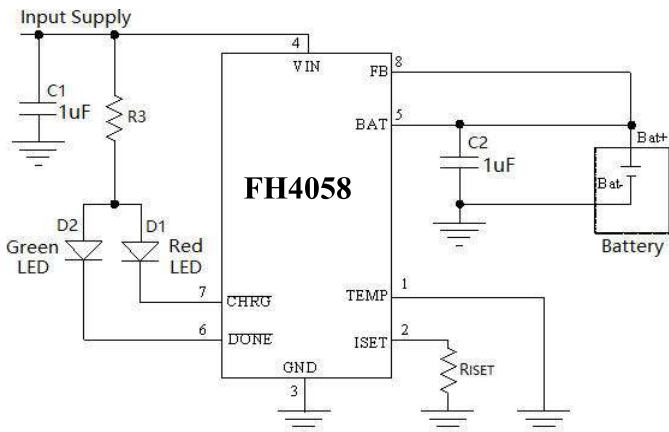


Figure 1. FH4058 Typical Application Circuit

(Constant Voltage Level 3.63V)

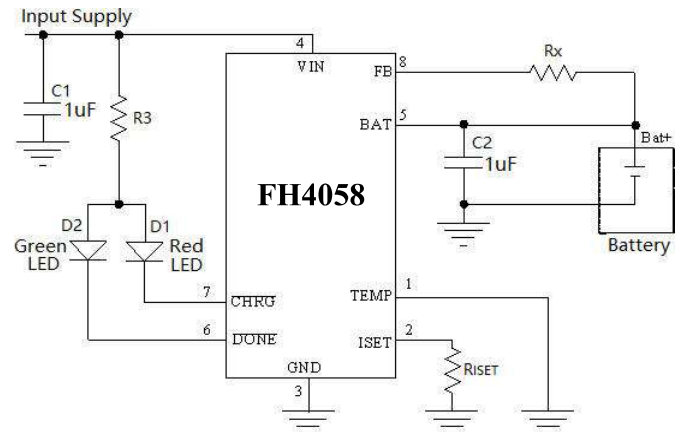


Figure 2. FH4058 Application Circuit

(Adjust Constant Voltage Level with Rx)

In Figure 2, the BAT pin's voltage in constant voltage mode is given by the following equation: $V_{REG} = 3.63 + 3.707 \times 10^{-6} \times R_x$

Where, V_{REG} is in volt R_x is in ohm

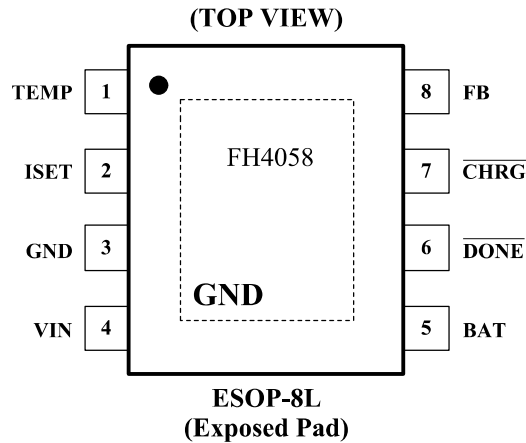
Features

- Automatic charge current adjustment based on the output capability of input power supply
- Suitable for Solar-Powered System
- On-chip Power MOSFET
- No external Blocking Diode or Current Sense Resistors Required
- Preset 3.63V regulation voltage with 1% accuracy, upwards adjustable with a resistor
- Precharge Conditioning for Reviving Deeply Discharged Cells and Minimizing Heat Dissipation During Dissipation During Initial Stage of Charge
- Continuous Charge Current Up to 1.0A
- Constant-Current/Constant-Voltage Operation with Thermal Regulation to Maximize Charge Rate Without Risk of Overheating
- Automatic Low-Power Sleep Mode When Input Supply Voltage is Removed
- Status Indication for LEDs or uP Interface
- C/10 Charge Termination
- Automatic Recharge
- Battery Temperature Sensing
- Available in ESOP-8L Package
- Pb-free, Rohs-Compliant and Halogen Free

Applications

- Solar Powered System
- Flashlight and Lighting
- Portable Devices
- Chargers

Pin Assignment



Pin Description

FH4058		Function Description
Pin No.	Name	
1	TEMP	<p>Temperature Sense Input. Connecting TEMP pin to NTC thermistor's output in battery pack. If TEMP pin's voltage is below 45% or above 80% of supply voltage VIN, this means that battery's temperature is too high or too low, charging is suspended. If TEMP's voltage level is between 45% and 80% of supply voltage, battery fault state is released, and charging will resume. The temperature sense function can be disabled by grounding the TEMP pin.</p>
2	ISET	<p>Constant Charge Current Setting and Charge Current Monitor Pin. The charge current is set by connecting a resistor R_{ISET} from this pin to GND. When in precharge mode, the ISET pin's voltage is regulated to 0.12V. When in constant charge current mode, the ISET pin's voltage is regulated to 1.205V. In all modes during charging, the voltage on ISET pin can be used to measure the charge current as follows: $I_{CH} = (V_{ISET} / R_{ISET}) * 986$</p>
3	GND	Ground Terminal (Ground).
4	VIN	<p>Positive Input Supply Voltage. VIN is the power supply to the internal circuit. When VIN drops to within 10mV of the BAT pin voltage, FH4058 enters low power sleep mode, dropping BAT pin's current to less than 3.0uA.</p>
5	BAT	<p>Battery Connection Pin. Connect the positive terminal of the battery to BAT pin. BAT pin draws less than 3.0uA current in sleep mode. BAT pin provides charge current to the battery and provides regulation voltage.</p>
6	$\overline{\text{DONE}}$	<p>Open-Drain Charge termination Status Output. In charge termination status, $\overline{\text{DONE}}$ is pulled low by an internal switch; Otherwise $\overline{\text{DONE}}$ pin is in high impedance state.</p>
7	$\overline{\text{CHRG}}$	<p>Open Drain Charge Status Output. When the battery is being charged, the $\overline{\text{CHRG}}$ pin is pulled low by an internal switch, otherwise $\overline{\text{CHRG}}$ pin is in high impedance state.</p>
8	FB	<p>Battery Voltage Sense Input. This Pin can sense the battery voltage; Also the regulation voltage in constant voltage mode can be adjusted by connecting an external resistor between FB pin and BAT pin.</p>

可用太阳能板供电的磷酸铁锂电池线性充电管理芯片

PRELIMINARY DATASHEET

器件概述

FH4058是可以利用太阳能板供电的单节磷酸铁锂电池充电管理芯片。该器件内部包括功率晶体管，应用时不需要外部的电流检测电阻和阻流二极管。内容的充电电流自适应模块能够根据输入电源的电流输出能力自动调整充电电流，用户不需要考虑最坏情况，可最大限度地利用输入电源的电流输出能力，非常适合利用太阳能板等电流输出能力有限的电源供电的应用。

FH4058只需要极少的外围元器件，非常适合于便携式应用的领域。热调制电路可以在器件的功耗比较大或者环境温度比较高的时候将芯片温度控制在安全范围内。内部固定的恒压充电电压为3.63V，也可以通过一个外部的电阻向上调节。充电电流通过一个外部电阻设置。

当输入电压掉电时，FH4058自动进入低功耗的睡眠模式，此时电池的电流消耗小于3微安。其它功能包括输入电压过低锁存，自动再充电，电池温度监控以及充电状态/充电结束状态指示等功能。

FH4058采用散热增强型的8管脚小外形封装(ESOP8)。

充电状态指示

CHRG 管脚电平 (对应的LED状态)	DONE 管脚电平 (对应的LED状态)	状态说明
低电平 (红色LED常亮)	高阻态 (绿色LED灭)	正在充电
高阻态 (红色LED灭)	低电平 (绿色LED常亮)	充电结束状态
高阻态 (红色LED灭)	高阻态 (绿色LED灭)	三种可能异常状态: • 输入电压低于电源低电压锁存阈值, 或者 • 输入电压低于电池连接端BAT电压, 或者 • 电池温度异常

说明：当不用某个状态指示功能时，将不用的状态指示输出端接到地。

极限参数

管脚电压	-0.3V to 6.5V	最高结温	150°C
BAT 管脚短路持续时间	连续	工作温度	-40°C to 85°C
存储温度	-65°C to 150°C	热阻 (ESOP-8L)	TBD
焊接温度 (10秒)	260°C		

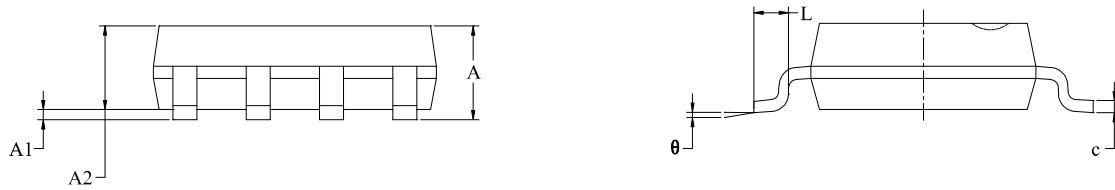
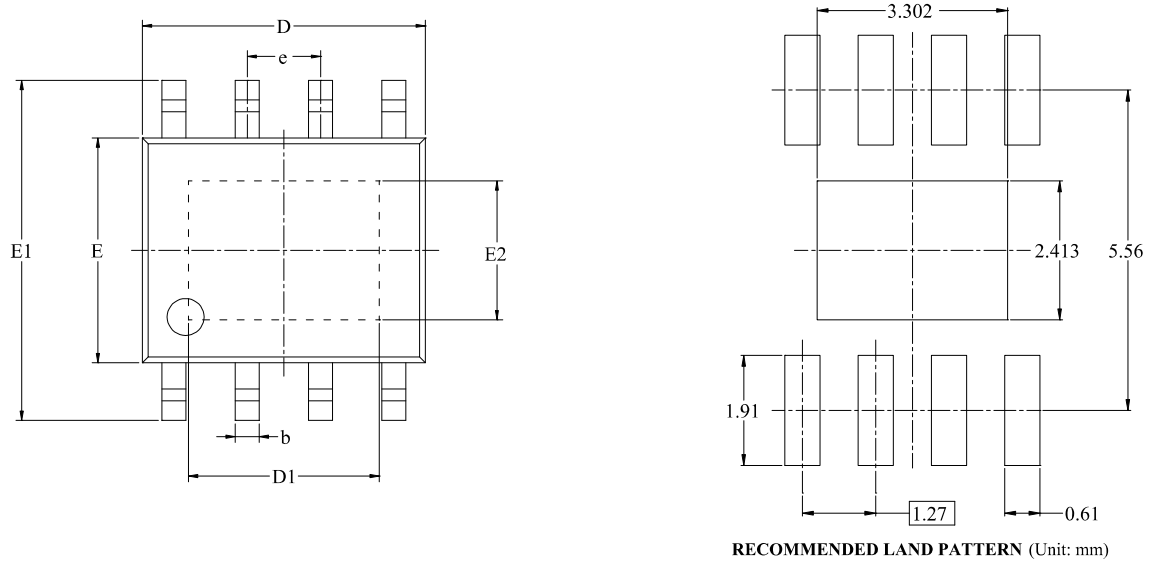
注：超出以上所列的极限参数可能造成器件的永久损坏。以上给出的仅仅是极限范围，在这样的极限条件下工作，器件的技术指标将得不到保证，长期在这种条件下还会影响器件的可靠性。

电气特点

- 内部集成有充电电流自适应模块，能根据输入电压源的电流输出能力自动调整充电电流
- 可利用太阳能板等输出电流能力有限的电压供电
- 输入电压范围：4.4V 到 6V
- 片内功率晶体管
- 不需要外部阻流二极管和电流检测电阻
- 恒压充电电压 3.63V，也可通过一个外部电阻向上调节
- 可作为电压源使用
- 内部软启动电路
- 为了激活深度放电的电池和减小功耗，在电池电压较低时采用涓流充电模式
- 可设置的持续恒流充电电流可达 1A
- 采用恒流/恒压/恒温模式充电，既可以使充电电流最大化，又可以防止芯片过热
- 电源电压掉电时自动进入低功耗的睡眠模式
- 充电状态和充电结束状态双指示输出
- C/10充电结束检测
- 自动再充电
- 电池温度监测功能
- 封装形式：ESOP-8L
- 器件无铅，满足RoHs，不含卤素

PACKAGE OUTLINE DIMENSIONS

- Type: ESOP-8 (Exposed Pad)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.700		0.067
A1	0.000	0.100	0.000	0.004
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

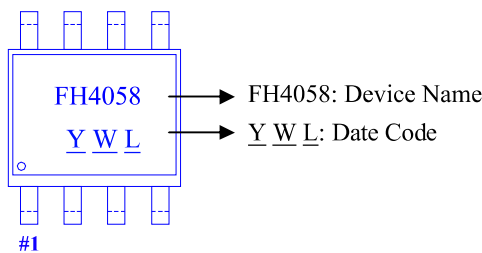
Ordering Information

Part Number	Input Voltage	Features	Operating Temperature	Package Type	Top Mark	SPQ
FH4058S8	4.4V ~ 6.0V	<ul style="list-style-type: none"> • LiFePO4 Battery Linear Charger • Preset Voltage: 3.63V • C/10 Charge Termination • Frequency: 345kHz • Output Current: 1.0A 	-40°C to +85°C	ESOP-8L	FH4058 <u>Y W L</u>	4000EA/Reel

Note:

- **FH4058** 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.
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Device Name: ESOP-8L



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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