

## Standalone 2.0A Li-Ion DC-DC Buck Switch Mode Battery Charger

PRELIMINARY DATASHEET

*Datasheet brief*

### Description

The FH5204 is a complete switch battery charger controller for one cell lithium-ion battery(4.20V/4.35V). The FH5204 provides a small, simple and efficient solution to fast charge Li-ion battery.

An external sense resistor sets the charge current with high accuracy. An internal resistor divider and precision reference set the final float voltage to (4.20V/4.35V) per cell with  $\pm 1\%$  accuracy.

When the input supply is removed, the FH5204 automatically enters a low current sleep mode, dropping the battery drain current to 1.0 $\mu$ A.

After the charge cycle ends, If the battery voltage drops below 4.10V/4.15V per cell, a new charge cycle will automatically begin.

### Typical Applications

- Li-ion battery powered devices
- Portable Media Player
- Portable Hand-held Solution
- Portable Computers

### Typical Application Circuit

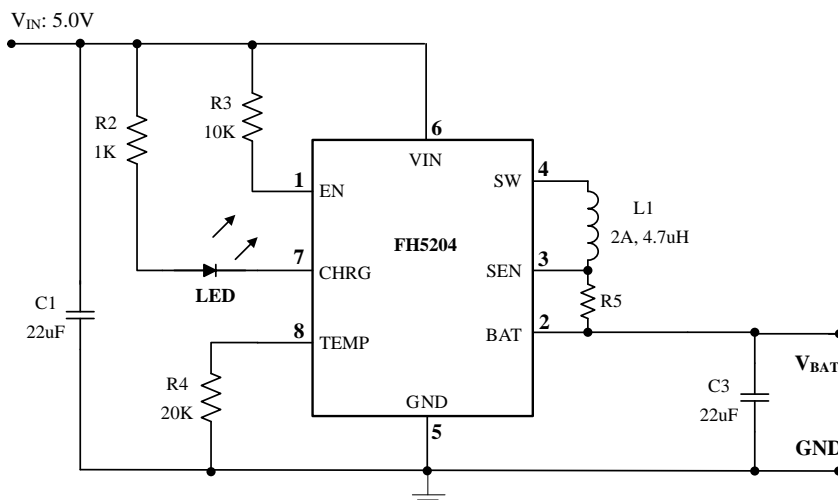


Figure 1. Typical charge cycle (1000mAh battery)

### Key Features

- Input Supply Range: 4.7V ~ 5.5V
- Charge current programmable, up to 2.0A
- High Efficiency Current Mode Buck PWM Controller
- End Charge Current Detection Output
- 750kHz Switching Frequency
- Constant Switching Frequency for Minimum Noise
- Preset 4.20V/4.35V charge voltage with  $\pm 1\%$  accuracy
- Automatic Recharge
- Automatic Shutdown When Input Supply is Removed
- Automatic Trickle Charging of Low Voltage
- Stable with Ceramic Output Capacitor
- Battery Temperature Sensing
- Operating Temperature: -40°C to +85°C
- Lead-free, RoHS-Compliant

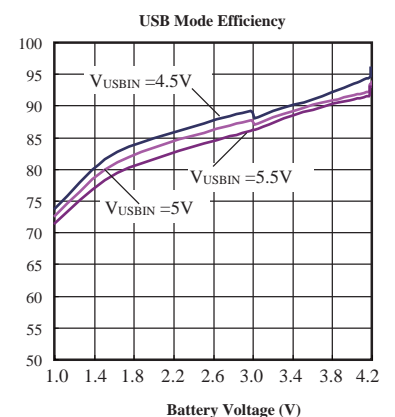
### Package Type

- 8-pin ESOP-8L

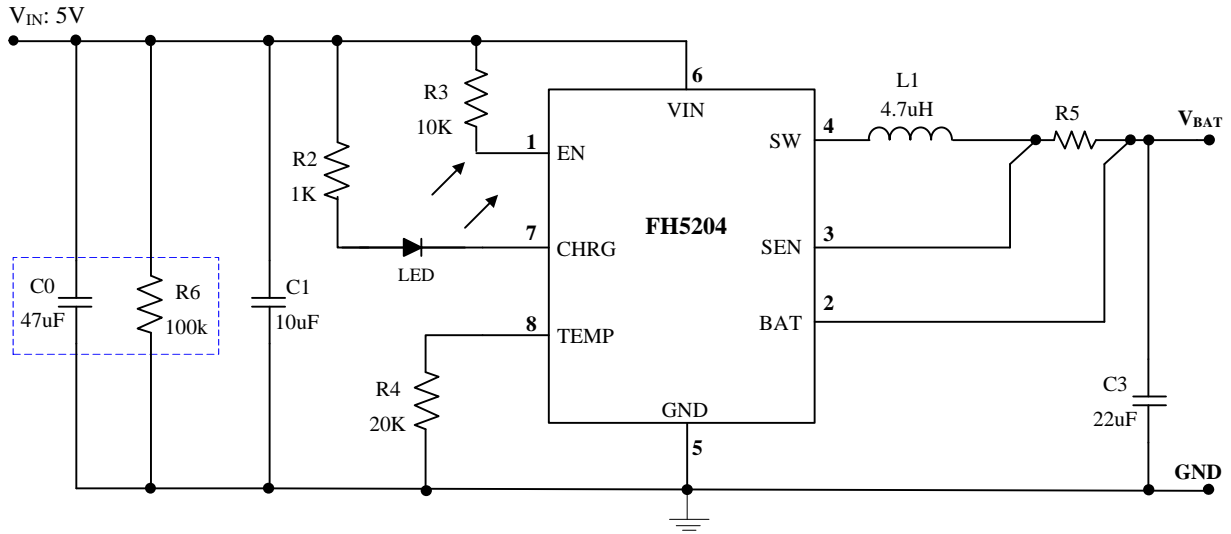
#### Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
FH5204A	ESOP (8L)	4.90mm × 3.91mm
FH5204D	(Exposed pad)	

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



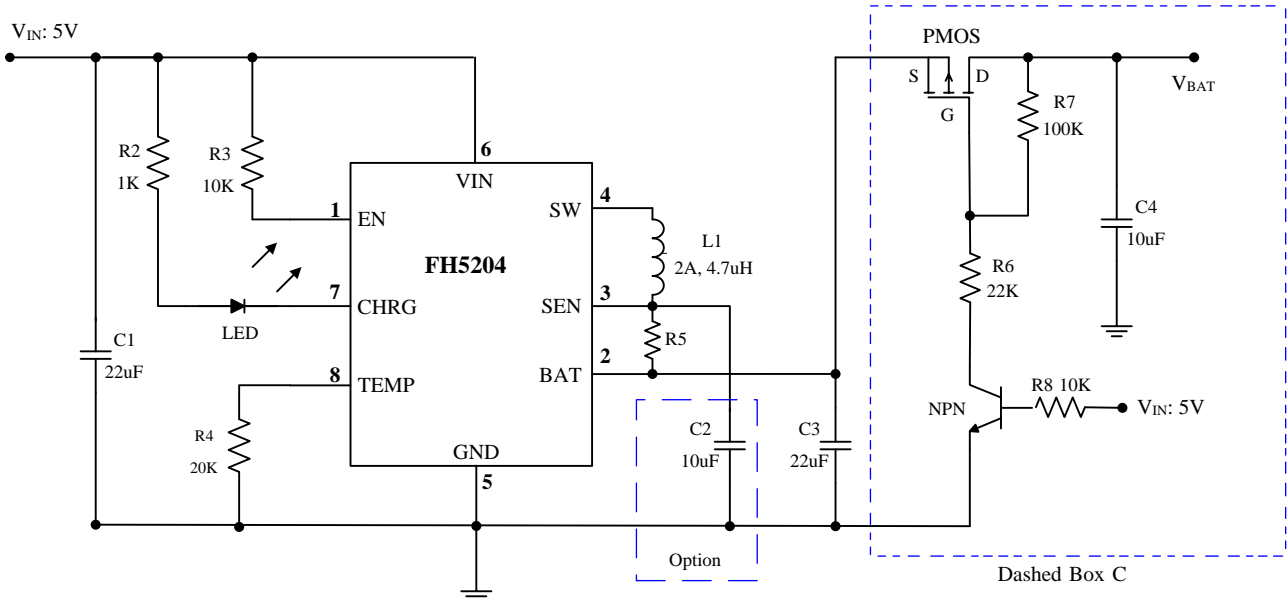
## Typical Application Circuit



**Figure 2. Typical Application Circuit**

Note:

- (1) C0 in the dotted box is the electrolytic capacitor, which needs to be added in the input hot plug application.
- (2) To prevent "virtual potential" after the input is unplugged, a 100K resistor can be added to the input.



**Figure 3. Added application Circuit**

Note: The dashed box components are optional

- (1) The dashed box was used to prevent the current flow backward.
- (2) The dashed box C was used for protection of battery cell reverse connection when VIN no connection.

## 750kHz, 单节2.0A降压开关型锂电池充电管理IC

## 器件概述

FH5204 是一款具有恒流、恒压充电模式的锂电池充电管理芯片。可以对单节 (4.20V/4.35V) 锂电池进行快速高效地充电。其采用电流模式 PWM 降压型开关控制结构, 为锂电池快速充电提供了微型、简单且高效的解决方案。

FH5204 内置防倒灌功能, 实际应用不需要输入端接二极管防倒灌。大大降低了系统成本。芯片内置过压保护功能, 当芯片的 VIN 电压超过 6.0V 之后, 芯片关闭; 此时芯片的 VIN 端可耐压 6.0V。

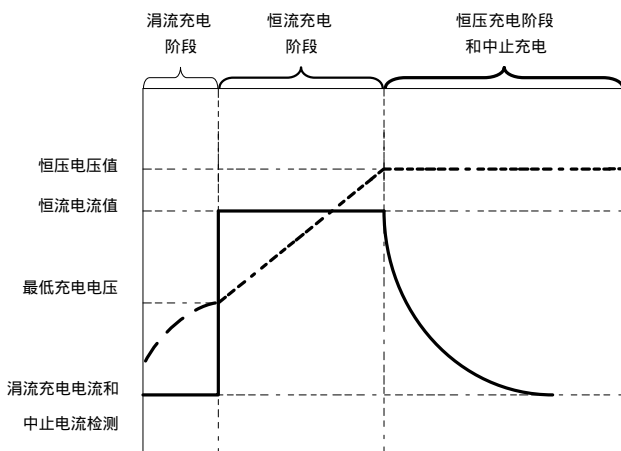
FH5204 由外部 Sense 检测电阻设定出高精度的充电电流, 内部由分压电阻和精准的参考电压将电池的浮充电压设定在 (4.20V/4.35V) 同时具有高达 $\pm 1\%$ 的精度。

当输入电源去掉后, 芯片会自动进入低电流休眠模式, 电池的漏电流低至 1.0 $\mu$ A。当充电周期结束后, 如果单节电池电压降到 4.10V/4.15V 后, 芯片将自动重新对电池进行充电。

## 应用领域

- 充电设备
- 便携式笔记本电脑
- 手持设备

## 充电流程图



图一、FH5204 充电流程示意图

## 电气参数

- 输入电源电压工作范围: 4.7V ~ 5.5V
- 内置防倒灌功能
- 内置过压保护, 过压保护电压值 6.0V
- 内置软启动, 防止上电瞬间的大电流过冲
- 高效电流模式 PWM 降压型开关控制结构
- 充电结束时电流检测输出
- 采用固定开关频率以保证最小的噪声
- $\pm 1\%$  充电电压 (4.2V/4.35V) 精度
- 自动再充电
- 输入电源去除自动进入休眠模式
- 电池电压较低时自动进入涪流充电模式
- 采用低 ESR 的陶瓷电容输出稳定
- 电池温度检测

## 封装形式

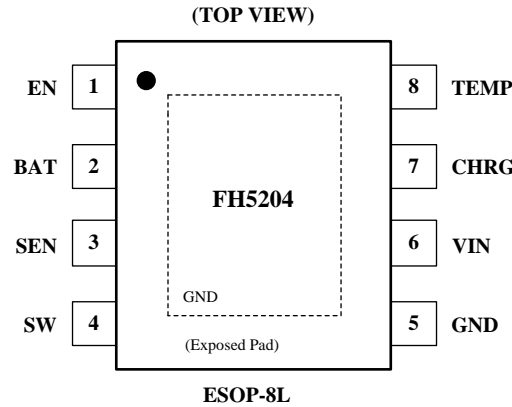
- 8-pin ESOP-8L(内嵌底部散热片)

## 绝对最大额定参数

参数	范围	单位
VIN, CHR, SW, SEN 电压	-0.3 ~ 6.0	V
SW 引脚电流	3.8	A
封装热阻(结到空气) $\theta_{JA}$	60	$^{\circ}\text{C}/\text{W}$
封装功耗	2.0	W
工作环境温度范围	-40 ~ +85	$^{\circ}\text{C}$
结温范围	-40 ~ +150	$^{\circ}\text{C}$
储存温度范围	-55 ~ +150	$^{\circ}\text{C}$
引脚温度和时间	+300 (10S)	$^{\circ}\text{C}$

注意: 绝对最大额定值是本产品能够承受的最大物理伤害极限值, 请在任何情况下勿超出该额定值。

## Pin Configuration

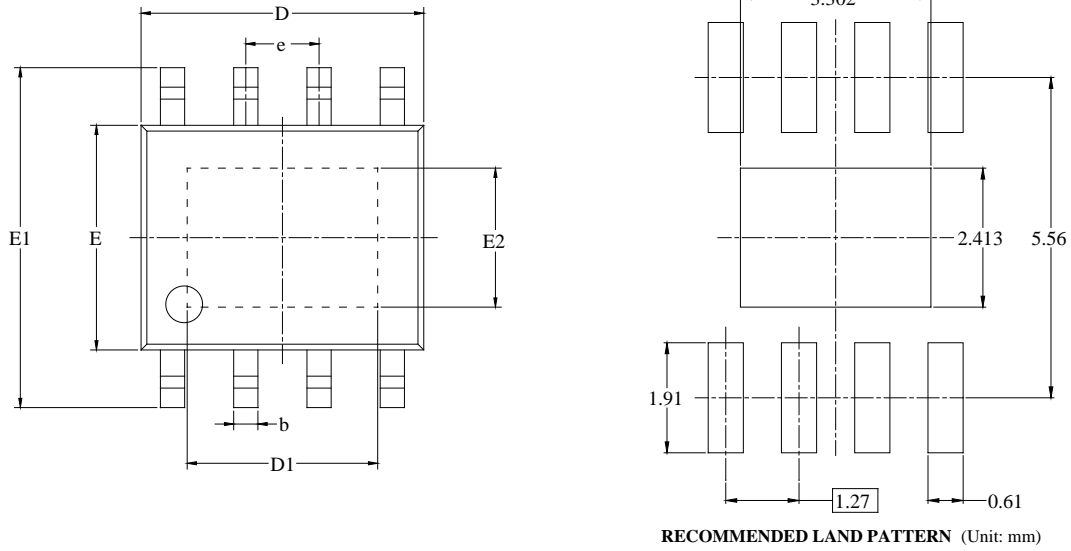


## Pin Assignment

Pin No.	Symbol	Description
1	EN	Chip enable pin. Charging when the pin is floating or connected to a high voltage. Discharge when the pin pull low.
2	BAT	Feedback Pin. Receives the feedback voltage from an external resistor across the output. (负反馈引脚。从通过输出外接电阻接受反馈电压，BAT 端热插拔应用建议额外增加 47uF 以上电解电容。)
3	SEN	Charge Current program. The output current is set by an external resistor according to the following formula: $I_{OUT} = 100mV/R5$ . (充电电流设置引脚。输出电流由外部电阻按公式计算。)
4	SW	Charge Current Output.
5	GND	Ground.
6	VIN	Positive Supply Voltage Input. VIN can range from 4.7V ~ 5.5V. A 10 $\mu$ F low ESR capacitor is required at the source pins of the power P-channel MOSFET. (电源输入引脚。VIN 输入电压工作范围 4.7 到 5.5V。需要 10 $\mu$ F 输入电容需靠 P 沟道的 MOSFET。VIN 端耐压 6.0V。输入端热插拔应用需要额外加 47uF 以上电解电容。)
7	CHRG	When the charge current drops below the End-of-Charge threshold for more than 120 $\mu$ s, the N-channel MOSFET turns off and a weak current source is connected from the CHRG pin to GND. When the input supply is removed, the weak current source is turned off and the CHRG pin becomes high impedance. (当充电电流比结束充电电流阈值低且时间超过 120 $\mu$ s，内置的 N 通道 MOSFET 关闭且一个弱电流源接入 CHRG 引脚到地。当输入电压被移除，弱电流源将关闭 CHRG 引脚变为高阻态。)
8	TEMP	Temperature sense. TEMP Thermistor Input. With an external 20K $\Omega$ , negative temperature coefficient thermistor to ground, this pin senses the temperature of the battery pack and stops the charger when the temperature is out of range. When the voltage at this pin drops below 520mV at hot temperature or rises above 2.3V at cold temperature, charging is suspended and the internal timer stops. The CHRG pin output is not affected during this hold state. To disable the temperature qualification function, ground the TEMP pin. (温度检测脚。热敏电阻输入，正常工作时外部接一个 20K $\Omega$ 电阻到地。这个脚检测电池组的温度，当温度超出范围时终止充电。当此电压在高温状态下低于 540mV 或低温状态下高于 2.3V，充电中止且内部计时器关闭。CHRG 脚输出不受这个状态影响。)
9	GND	Thermal PAD

## Packaging Information

- Type: ESOP-8L



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°

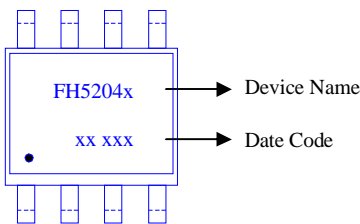
## Ordering Information

Part Number	Float Voltage	Operating Ambient Temperature Range	Package	Top Mark	SPQ
FH5204AS8	4.20V	-40 ~ +85°C	ESOP-8L	FH5204A ** **	3000EA/Reel (Antistatic vacuum packaged)
FH5204DS8	4.35V			FH5204D ** **	

Note:

- FH5204 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.

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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▲ Update by Nov.2024