Standalone Linear Li-Ion Battery Charger

with Thermal Regulation Charge Current up 0.5A

General Description

The **FH5005** is a complete constant-current / constant-voltage linear charger for single cell lithium-ion batteries. Its Thin SOT package and low external component count make the FH5005 ideally suited for portable applications. Furthermore, the FH5005 is specifically designed to work within USB power specifications.

No external sense resistor is needed, and no blocking diode is required due to the internal MOSFET architecture. Thermal feedback regulates the charge current to limit the die temperature during high power operation or high ambient temperature. The charge voltage is fixed at 4.2V, and the charge current can be programmed externally with a single resistor. The FH5005 automatically terminates the charge cycle when the charge current drops to 1/10th the programmed value after the final float voltage is reached. When the input supply (wall adapter or USB supply) is removed, the FH5005 automatically enters a low current state, dropping the battery drain current to less than 2.0μA. The FH5005 can be put into shutdown mode, reducing the supply current to 25.0μA.

Other features include charge current monitor, under-voltage lockout, automatic recharge and a status pin to indicate charge termination and the presence of an input voltage.

Features

- Programmable charge current up to 500mA
- No MOSFET, sense resistor or blocking diode required
- Complete linear charger in thin SOT package for single cell lithium-ion batteries
- Constant-current/constant-voltage operation with thermal regulation to maximize charge rate without risk of overheating
- Charges single cell li-ion batteries directly from USB port
- Preset 4.20V charge voltage with 1% accuracy
- Charge current monitor output for gas gaugin
- Charge status output pin
- C/10 charge termination
- 25μA supply current in shutdown
- 2.9V trickle charge threshold (FH5005)
- Soft-start limits inrush current
- Available in 6-Lead SOT-23

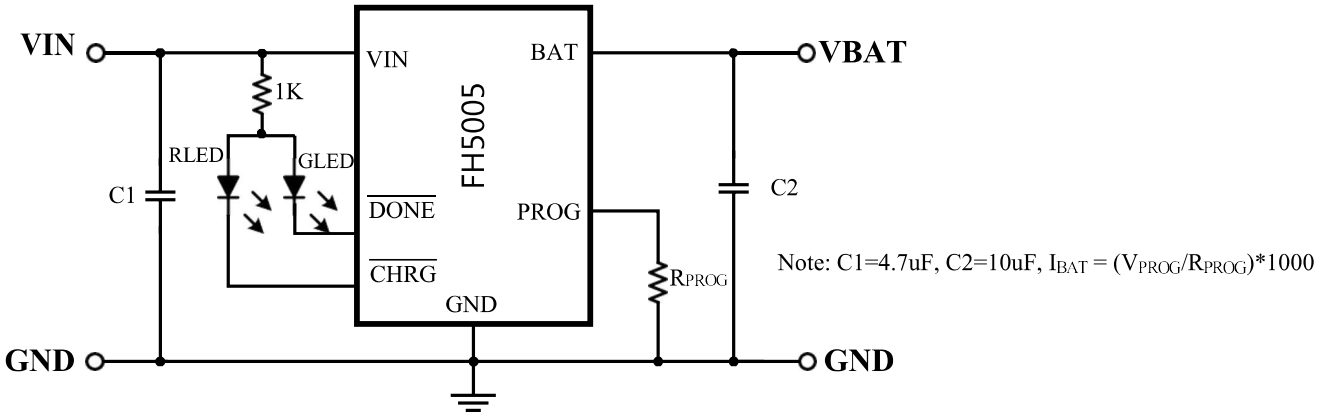
Package

- Type: SOT-23-6L

Applications

- Cellular Telephones, PDAs, MP3 Players
- Bluetooth Applications

Typical Application Circuit



Note: C1=4.7uF, C2=10uF, $I_{BAT} = (V_{PROG}/R_{PROG})*1000$

双LED显示状态 微型封装 线性电池充电管理芯片

■ 器件概述

FH5005 是一款完善的单节锂电池恒流/恒压线性充电管理芯片。较薄的尺寸和较小的封装使它适用于便携式产品的应用，FH5005 也适用于 USB 的供电电路。得益于内部的MOSFET 结构，在应用上不需要外部电阻和阻塞二极管。在高能量运行和外围温度较高时，热反馈电路可以控制充电电流以降低芯片的温度。

充电电压被设定在 4.20V，充电电流可以通过外部电阻调节。在达到目标充电电压后，当充电电流降低到设定值的1/10 时，FH5005 就会自动结束充电过程。当输入端（插头或USB 提供电源）拔掉后，FH5005 自动进入低电流状态， 电池漏电流将降到 2.0μA 以下。FH5005 还可被设置于停止工作状态，使电源供电电流降到 25.0μA。其余特性包括：充电电流监测，输入低电压闭锁，自动重新充电和充电已满及开始充电的标志。

■ 产品特点

- 可编程充电电流可达 500mA
- 无需要外置MOSFET，传感电阻和阻塞二极管
- 小尺寸实现对锂电池的完全线性充电管理
- 恒流/恒压运行和热度调节使得电池管理效力最高，没有热度过高的危险
- 从USB 接口管理单节锂电池
- 预设充电电压为 4.20V (±1%)
- 充电电流智能监测
- 充电状态指示标志(#2LED)
- 1/10 充电电流终止
- 停止充电时提供 25.0μA 电流
- 2.90V 涓流充电阈值电压
- 软启动限制浪涌电流

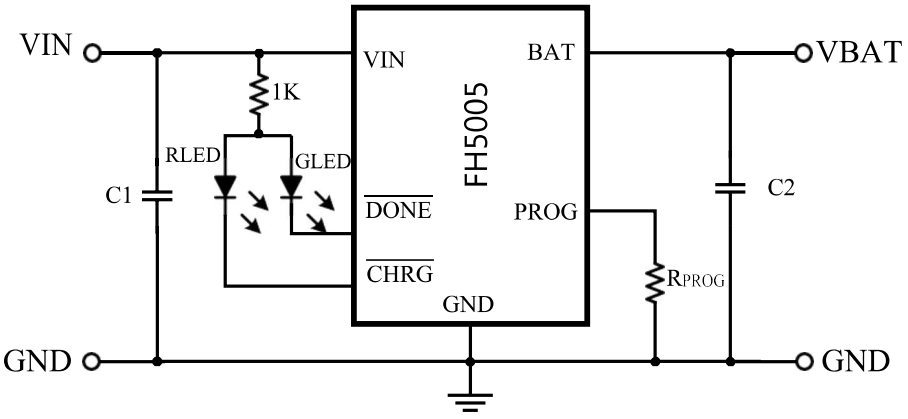
■ 封装

- SOT-23-6L

■ 应用范围

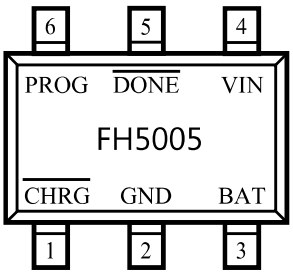
- 手机，PDA，MP3
- 蓝牙应用
- USB充电器

■ 典型应用电路



注：C1=4.7uF，C2=10uF，I_{BAT} = (V_{PROG}/R_{PROG})*1000

■ Pin Configuration



SOT-23-6L
(TOP VIEW)

■ Pin Assignment

Pin Number SOT-23-6L	Pin Name
1	$\overline{\text{CHRG}}$
2	GND
3	BAT
4	VIN
5	$\overline{\text{DONE}}$
6	PROG

■ Pin Function

$\overline{\text{CHRG}}$ (Pin 1): Open-Drain Charge Status Output. When the battery is charging, the CHRG pin is pulled low by an internal N-channel MOSFET. When the charge cycle is completed, a weak pull-down of approximately 20.0μA is connected to the CHRG pin, indicating an "AC present" condition. When the FH5005 detects an under voltage lockout condition, CHRG is forced high impedance.

GND (Pin 2): Ground.

BAT (Pin 3): Charge current output. Provides charge current to the battery and regulates the final float voltage to 4.20V. An internal precision resistor divider from this pin sets the float voltage which is disconnected in shutdown mode.

VCC (Pin 4): Positive input supply voltage. Provides power to the charger. VCC should be bypassed with at least a 1.0μF capacitor. When VCC drops to within 30mV of the BAT pin voltage, the FH5005 enters shutdown mode, dropping IBAT to less than 2.0μA.

$\overline{\text{DONE}}$ (Pin5): Full indication output, when fully charged, DONE port is an internal N-channel MOSFET placed in low position. In the charging process, low-power lock condition is detected; the input is too high to detect locking conditions, DONE-Z state.

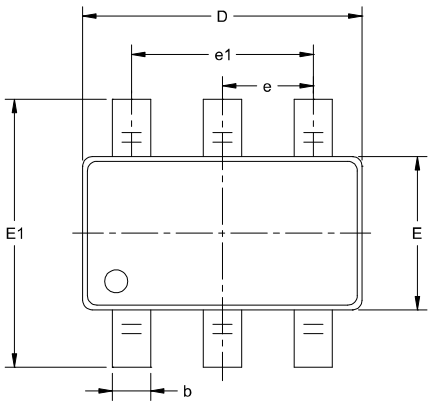
PROG (Pin 6): Charge current program, charge current monitor and shutdown pin. The charge current is programmed by connecting a 1% resistor, RPROG to ground. When charging in constant-current mode, this pin servos to 1.0V. In all modes, the voltage on this pin can be used to measure the charge current using the following formula:

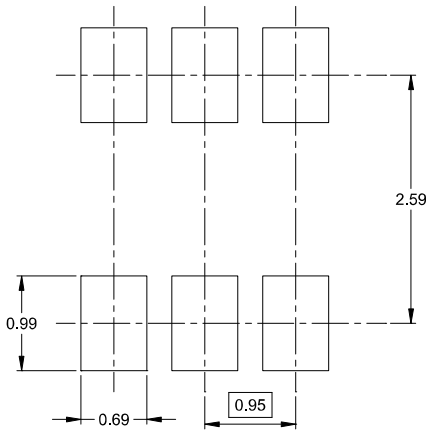
$$I_{BAT} = (V_{PROG}/R_{PROG}) \times 1000$$

The PROG pin can also be used to shut down the charger. Disconnecting the program resistor from ground allows a 3.0μA current to pull the PROG pin high. When it reaches the 1.21V shutdown threshold voltage, the charger enters shutdown mode, charging stops and the input supply current drops to 25.0μA. This pin is also clamped to approximately 2.40V. Driving this pin to voltages beyond the clamp voltage will draw currents as high as 1.5mA. Reconnecting RPROG to ground will return the charger to normal operation.

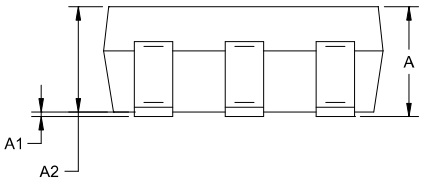
■ Package Information

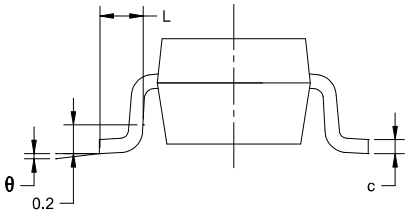
- Type: **SOT-23-6L**





RECOMMENDED LAND PATTERN (Unit: mm)





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

■ Ordering Information

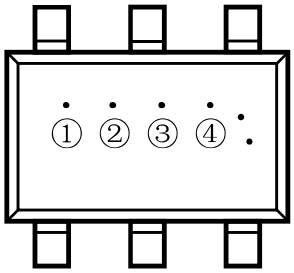
Part Number	Operating Ambient Temperature	Description	Packaging Types	Top Mark	SPQ
FH5005AM6	-40 ~ +85℃	A: Output Voltage: 4.20V	M6: SOT-23-6L	2 *** (2: Devices Code ***: Date Code)	3000PCS/Reel

- FH5005 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.

■ Marking Rule

- **SOT-23-6L**

(TOP VIEW)



SOT-23-6L

① **Represents the device code**

Symbol	Product Name
2	FH5005AM6

② **Product version**

③ ④ **Date Code**

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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Note:

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Update by Apr.2018