# Standalone Linear Li-Ion Battery Charger With Thermal Regulation in ThinSOT

## DESCRIPTION

The FH5002 is a complete constant-current / constant-voltage linear charger for single cell lithium-ion batteries. Its ThinSOT package and low external component count make the FH5002 ideally suited for portable applications. Furthermore, the FH5002 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 FH5002 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 FH5002 automatically enters a low current state, dropping the battery drain current to less than 2µA. The FH5002 can be put into shutdown mode, reducing the supply current to 25µA.

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

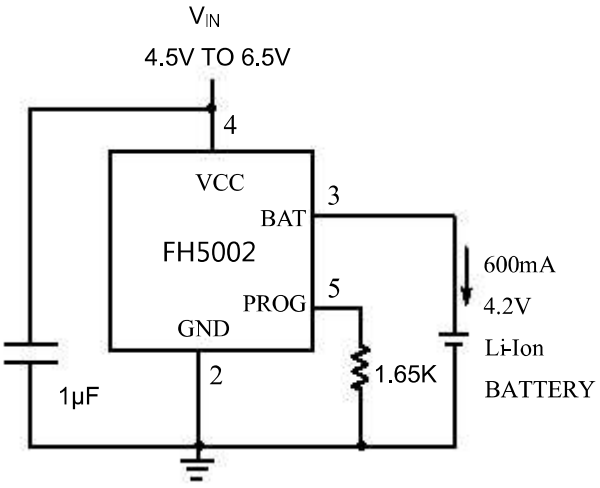
## FEATURES

- Programmable Charge Current Up to 700mA
- No MOSFET, Sense Resistor or Blocking Diode Required
- Complete Linear Charger in ThinSOT 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 4.2V Charge Voltage with ± 1% Accuracy
- Charge Current Monitor Output for Gas Gauging
- Automatic Recharge
- Charge Status Output Pin
- C/10 Charge Termination
- 25µA Supply Current in Shutdown
- 2.9V Trickle Charge Threshold (FH5002)
- Available Without Trickle Charge (FH5002)
- Soft-Start Limits Inrush Current
- Available in SOT-23-5 Package
- RoHS Compliant and 100% Lead (Pb)-Free

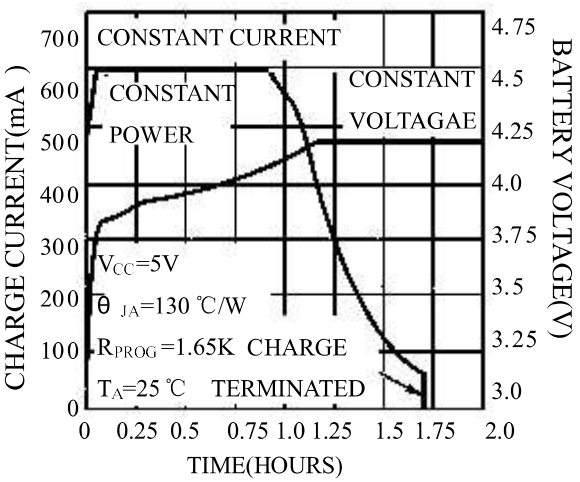
## APPLICATIONS

- Cellular Telephones/ PDAs/ MP3 Players
- Charging Docks and Cradles
- Bluetooth Applications

600mA Single Cell Li Ion Charger




Complete Charge Cycle (750mAh Battery)



## Typical Application Circuit

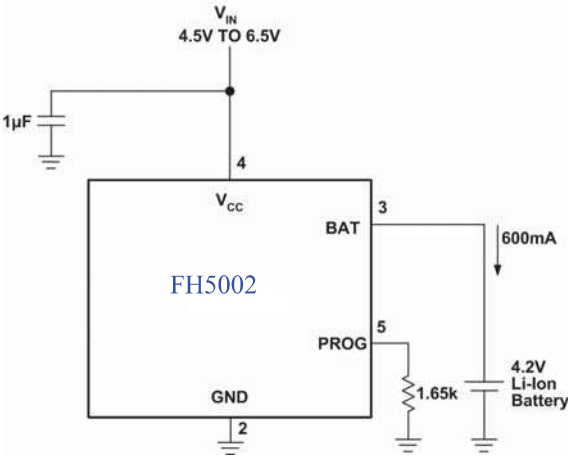



Figure 1. 600mA Single Cell Li-ion Charger

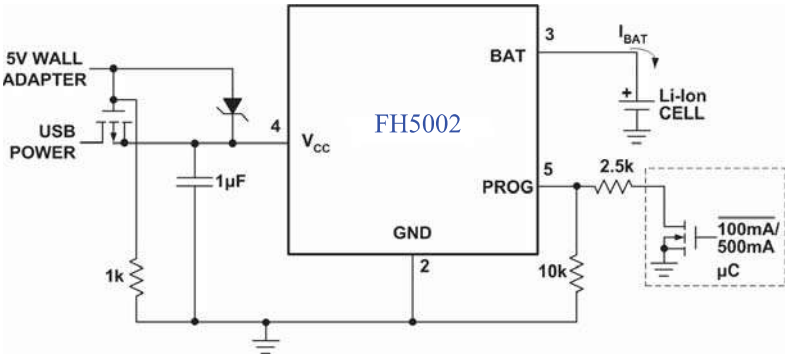



Figure 2. USB/Wall Adapter Power Li-Ion Charger

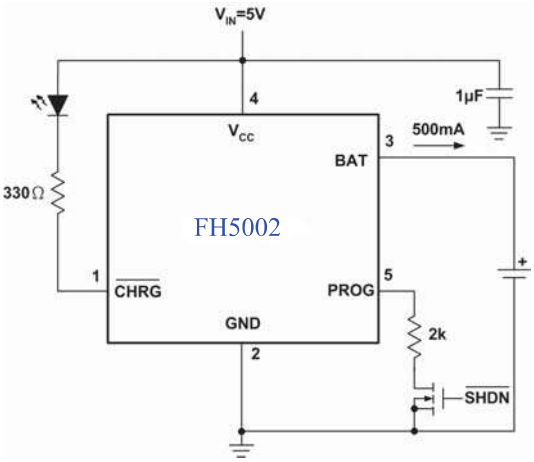



Figure 3. Full Featured Single Cell Li-Ion Charger

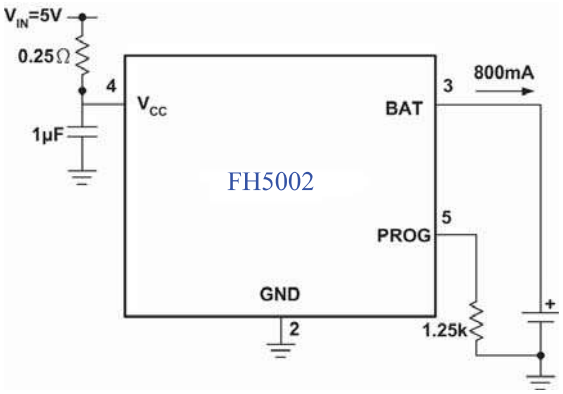



Figure 4. 800mA Li-Ion Charger with External Power Dissipation

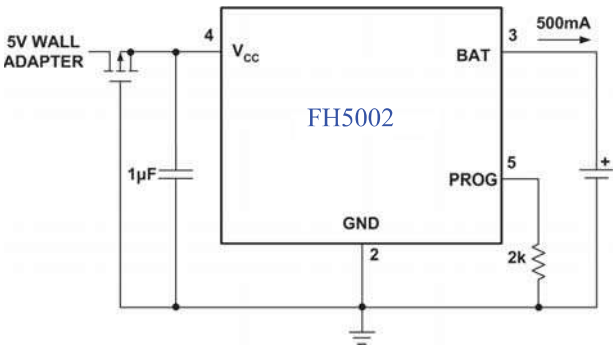
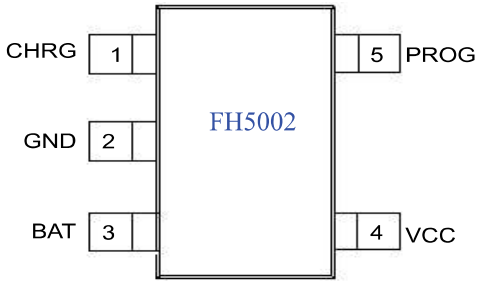



Figure 5. Basic Li-Ion Charger with Reverse Polarity Input Protection

## Pin Configurations

| PackageType | Pin Configurations |
|---|---|
| SOT-23-5 |  |



## Pin Description

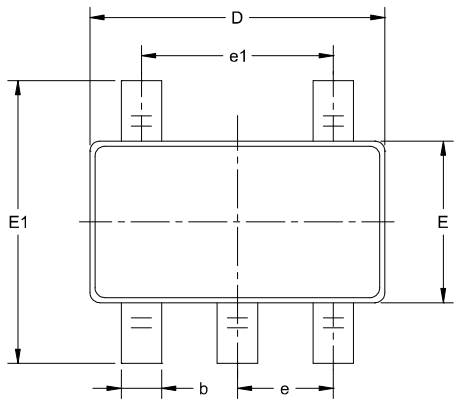
| PIN | SOT-23-5 | DESCRIPTION |
|---|---|---|
| $\overline{CHRG}$ | 1 | Open-Drain Status Output |
| GND | 2 | Ground |
| BAT | 3 | Charge Current Output |
| $V_{CC}$ | 4 | Positive Input Supply Voltage |
| PROG | 5 | Charge Current Program, Charge Current Monitor and Shutdown Pin. |

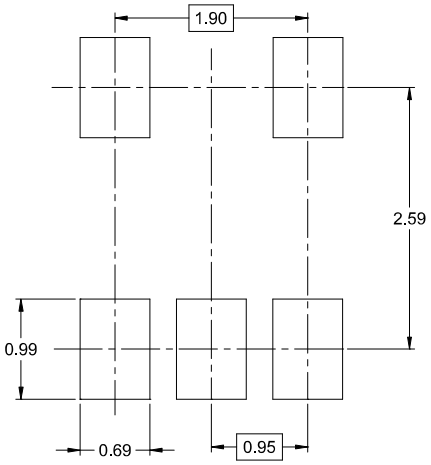
## Absolute Maximum Ratings

- Input Supply voltage, (Vcc) ---------- -0.3 to +6.5V
- PROG ---------- -0.3V to $V_{CC}$ +0.3V
- BAT ---------- -0.3 to +6.5V
- $\overline{CHRG}$ ---------- -0.3 to +6.5V
- BAT Short-Circuit Duration ---------- Continuous
- BAT Pin Current ---------- 700mA
- PROG Pin Current ---------- 800μA
- Maximum Junction Temperature, ---------- 125°C
- Operating Ambient Temperature Range (Note 2) ---------- -40°C to 85°C
- Storage Temperature Range ---------- -65°C to 125°C
- Lead Temperature (soldering, 10s) ---------- 300°C

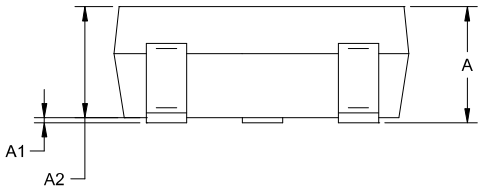
## Packaging Information

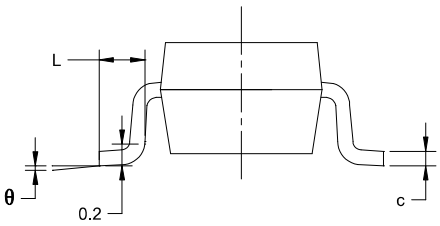
**SOT-23-5L**




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 | 1.90 0 BSC | | 0.075 BSC | |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

## ORDER INFORMATION

| Part Number | Charger Voltage | Mode | Package | Top Mark | SPQ |
|---|---|---|---|---|---|
| FH5002M5 | 4.20V | Linear | SOT-23-5L | * * * * | 3000PCS/Reel |

- FH5002 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.

**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.

Product Folder

Order Now

Technical Documents

Tools & Software

Support & Community

**Note:**

- The information described herein is subject to change without notice.
- ForDevices Inc. is not responsible for any problems caused by circuits or diagrams described herein whose related industrial properties, patents, or other rights belong to third parties. The application circuit examples explain typical applications of the products, and do not guarantee the success of any specific mass-production design.
- Use of the information described herein for other purposes and / or reproduction or copying without the express permission of FocDevice Inc. is strictly prohibited.
- The products described herein cannot be used as part of any device or equipment affecting the human body, such as exercise equipment, medical equipment, security systems, gas equipment, or any apparatus installed in airplanes and other vehicles, without prior written permission of ForDevices Inc.
- Although ForDevices Inc. exerts the greatest possible effort to ensure high quality and reliability, the failure or malfunction of semiconductor products may occur. The user of these products should therefore give thorough consideration to safety design, including redundancy, fire-prevention measures, and malfunction prevention, to prevent any accidents, fires, or community damage that may ensue.