

概述

PLC40561是一款完整的单节锂离子电池恒定电流/恒定电压线性充电器。小型DFN2x2-8L封装与较少的外部元件数目使得PLC40561成为便携式应用的理想选择。PLC40561可以适用于USB电源和适配器电源工作。器件采用了内部PMOSFET架构，加上防倒充电路，所以不需要外部隔离二极管。

PLC40561充电电流可通过一个电阻进行外部设置。芯片内部集成热反馈模块，可对充电电流进行自动调节，以便在大功率操作或高环境温度条件下对芯片温度加以限制。当充电电流在达到最终浮充电压之后降至设定值Iterm值时，PLC40561 将自动终止充电循环。当输入电压（交流适配器或USB电源）被拿掉时，PLC40561自动进入一个低电流状态，将电池漏电流降至1uA以下。

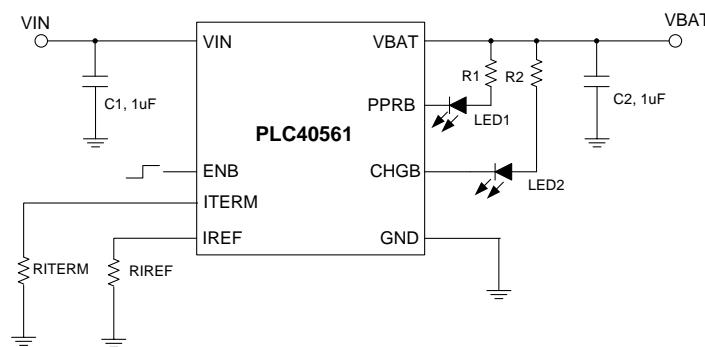


图 1 典型应用电路

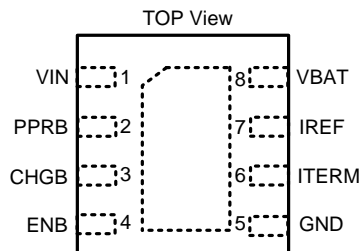


图 2 管脚定义排序（顶视图）

特性

- 32V最大输入耐压
- 4.5-5.5V输入电压工作范围
- 预充电电压: 精度±1%(0-85°C)  
PLC40561:4.2V  
PLC40561B:4.35V  
PLC40561C:4.4V  
PLC40561D:3.6V
- 10mA-500mA可配置充电电流
- 5.9V的输入过压保护功能,精度±3%
- 无需外置MOSFET、检测电阻器或隔离二极管
- 自动再充电
- 充电电源拔出时<1uA的电池漏电
- 双LED显示电池充电状态
- 过温保护功能
- DFN2x2-8L

应用领域

- 移动电话, PDA
- 数码相机
- 电子词典
- GPS
- 便携式设备, 各种充电器

## 管脚定义

| 引脚 | 名称    | 描述  |
|----|-------|---|
| 1  | VIN   | USB 等充电电源输入脚  |
| 2  | PPRB  | 连接到芯片状态 LED 指示灯, 开漏输出。VIN 电压大于 VPOR 小于 OVP 电压且 $V_{IN} - V_{BAT} > V_{OS}$ 时拉低, 否则悬空。 |
| 3  | CHGB  | 连接到充电状态 LED 指示灯, 开漏输出。充电时拉低, 充满和待机时候悬空。   |
| 4  | ENB   | 芯片停止充电使能脚, 高电平有效。ENB=H, 停止充电; ENB=L, 正常充电。  |
| 5  | GND   | 电源地   |
| 6  | ITERM | 停充电流 Iterm 设定管脚。  |
| 7  | IREF  | 充电电流设定管脚。   |
| 8  | VBAT  | 电池输入脚   |

## 绝对最大额定值

| 参数             | 符号               | 数值         | 单位 |
|----------------|------------------|------------|----|
| 输入电压 (VIN脚)    | VIN              | -0.3 ~ 32  | V  |
| ENB输入电压 (ENB脚) | VENB             | -0.3 ~ 6.5 | V  |
| BAT输出电压 (BAT脚) | VBAT             | -0.3 ~ 6.5 | V  |
| 最大结温           | T <sub>J</sub>   | 150        | °C |
| 储存温度           | T <sub>STG</sub> | -55~150    | °C |

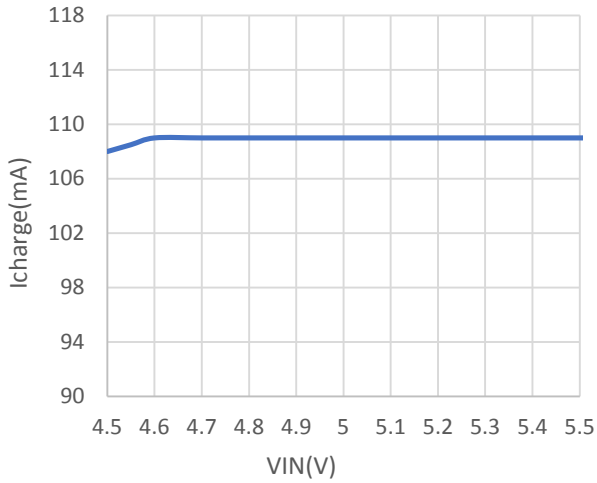
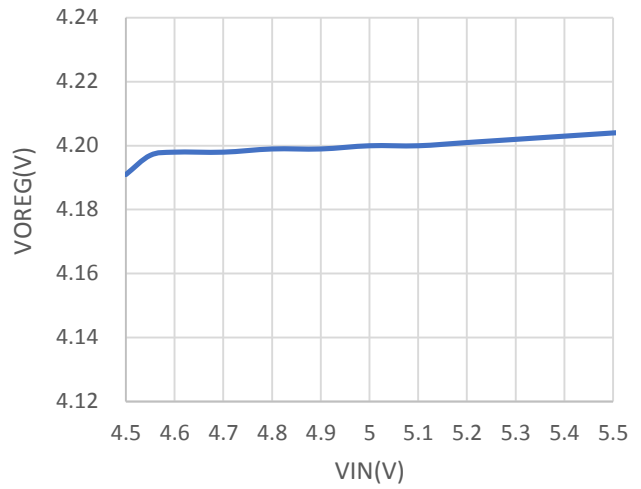
## 推荐工作条件

| 参数       | 符号               | 数值      | 单位 |
|----------|------------------|---------|----|
| 输入工作电压   | V <sub>IN</sub>  | 4.5~5.5 | V  |
| 最大输出充电电流 | I <sub>OUT</sub> | 500     | mA |
| 工作环境温度   | T <sub>OPR</sub> | -40~85  | °C |

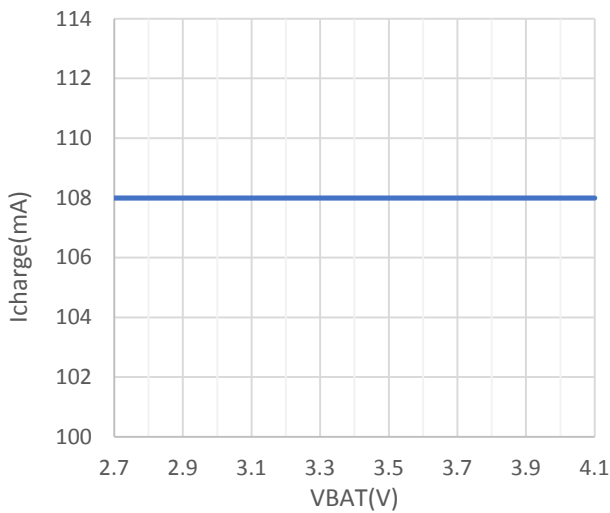
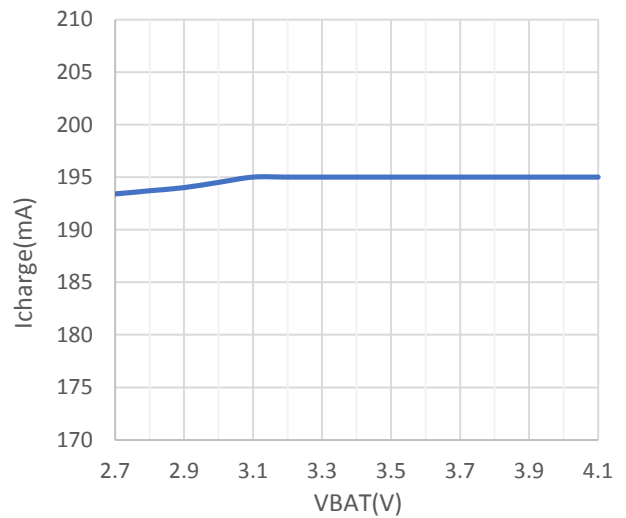
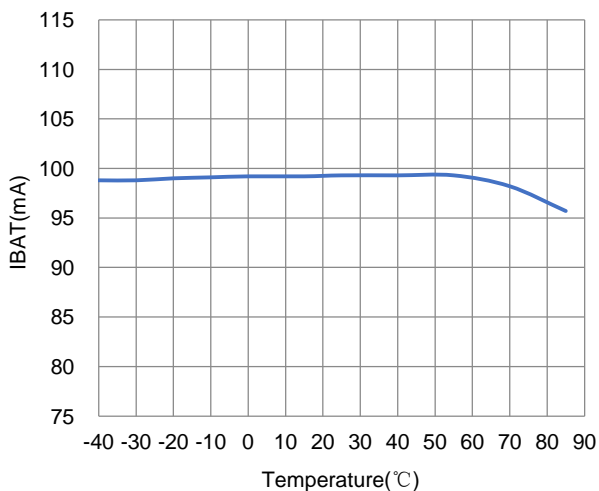
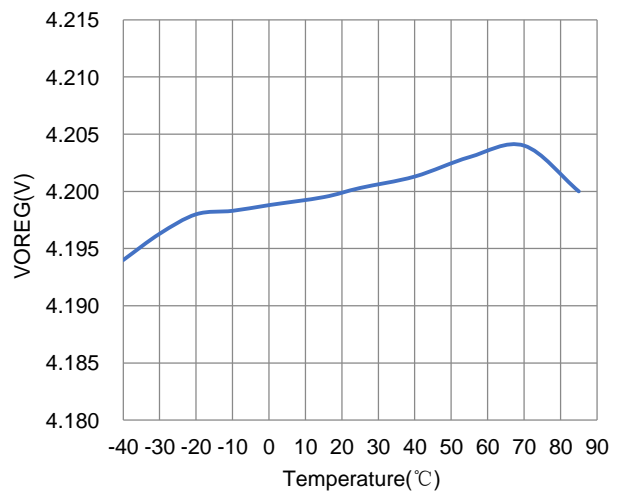
## 电特性

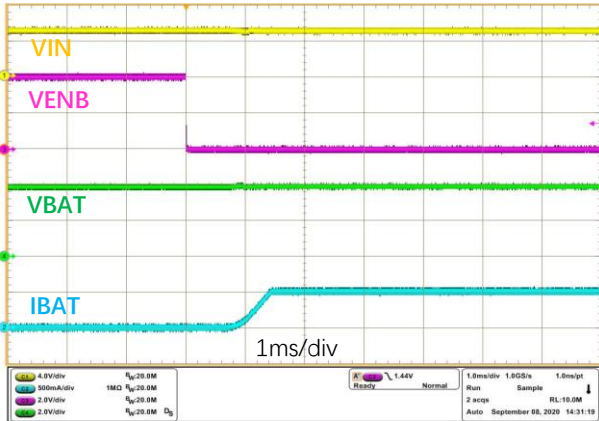
(没有特殊说明, 以下数值均为VIN=5.0V, 室温TA=25°C下测试结果)

| 参数                | 符号                     | 条件  | 最小值  | 典型值    | 最大值  | 单位 |
|-------------------|------------------------|---|------|--------|------|----|
| VIN (BUS)<br>静态电流 | I <sub>IN</sub>        | VIN=5.0V, VBAT=4.4V, ENB=GND,<br>Charger enable   |      | 267    | 350  | uA |
|                   |                        | VIN=5.0V, VBAT=3.0V, ENB=5.0V,<br>Charger disable |      | 2      | 5    | uA |
|                   |                        | VIN=5.0V, VBAT floating                           |      | 12     | 20   | uA |
| Sleep 模式静态电流      | I <sub>sleep</sub>     | VIN-VBAT < 0.1V                                   |      |        | 5    | uA |
| OVP 静态电流          | I <sub>DDQ1</sub>      | VIN=6.5V  |      | 83     | 200  | uA |
| 高压静态电流            | I <sub>DDQ2</sub>      | VIN=32V   |      | 277    | 350  | uA |
| ENB 脚漏电           | I <sub>DIS</sub>       | VIN=5.0V, VDIS=5V                                 |      | 25     |      | uA |
|                   |                        | VIN=5.0V, VDIS=0V                                 |      |        | 1    | uA |
| BAT 静态电流          | I <sub>QBAT</sub>      | VBAT=4.3V, 终止充电;                                  |      |        | 1    | uA |
|                   |                        | VBAT=4.3V, VIN floating                           |      |        | 1    | uA |
|                   |                        | VBAT=4.3V, Charger disable                        |      |        | 1    | uA |
| VIN 工作电压范围        | V <sub>BUS_VALID</sub> |   | 4.55 |        | 5.5  | V  |
| Power-on reset 阈值 | V <sub>POR</sub>       | VBAT=3.0V, VIN Rising                             | 3.21 | 4.10   | 4.55 | V  |
|                   |                        | VBAT=3.0V, VIN Falling                            | 2.86 | 3.80   | 4.35 | V  |
| VIN-BAT offset 电压 | V <sub>OS</sub>        | VBAT=4.5V, VIN Rising                             |      | 100    | 200  | mV |
|                   |                        | VBAT=4.5V, VIN Falling                            |      | 40     |      | mV |
| VBUS OVP          | V <sub>OVP</sub>       |   | 5.72 | 5.9    | 6.08 | V  |
| 过压迟滞              | V <sub>OVP_HYS</sub>   |   |      | 0.2    |      | V  |
| 目标电压              | V <sub>OREG</sub>      | 0-85 度, VOREG=4.2V 版本                             | 4.16 | 4.2    | 4.24 | V  |
| 回充迟滞              | V <sub>RECHYS</sub>    |   |      | 100    |      | mV |
| 预充电电流             | I <sub>PRE-CC</sub>    |   |      | ICC/10 |      | mA |
| 恒流充电电流精度          | I <sub>REF</sub>       | I <sub>REF</sub> 设置为 40mA                         | 34   | 40     | 46   | mA |
|                   |                        | I <sub>REF</sub> 设置为 100mA                        | 90   | 100    | 110  | mA |
| 停充电流精度            | I <sub>TERM</sub>      | I <sub>REF</sub> 设置为 4mA                          | 1    | 4      | 7    | mA |
| 涓流充电电压阈值          | V <sub>WAKE</sub>      |   |      | 2.55   |      | V  |
| 涓流充电电压迟滞          | V <sub>WAKEHYS</sub>   |   |      | 40     |      | mV |
| ENB 高电平阈值         | V <sub>DIS_H</sub>     |   | 1.4  |        |      | V  |
| ENB 低电平阈值         | V <sub>DIS_L</sub>     |   |      |        | 0.8  | V  |
| LED 指示管脚低电平导通电阻值  | R <sub>LED</sub>       | Pin voltage=1V                                    |      | 1.2    |      | kΩ |
| LED 指示管脚高阻时漏电     | I <sub>LED</sub>       | Pin voltage=5.5V                                  |      |        | 2    | uA |
| 热反馈调节温度阈值         | T <sub>FOLD</sub>      |   |      | 100    |      | °C |
| 过温保护温度            | OTP                    | VIN=5V, VBAT=3.8V, R <sub>ISNS</sub> =10K         |      | 150    |      | °C |
| 过温保护温度迟滞          | OTP_HYS                | VIN=5V, VBAT=3.8V, R <sub>ISNS</sub> =10K         |      | 20     |      | °C |

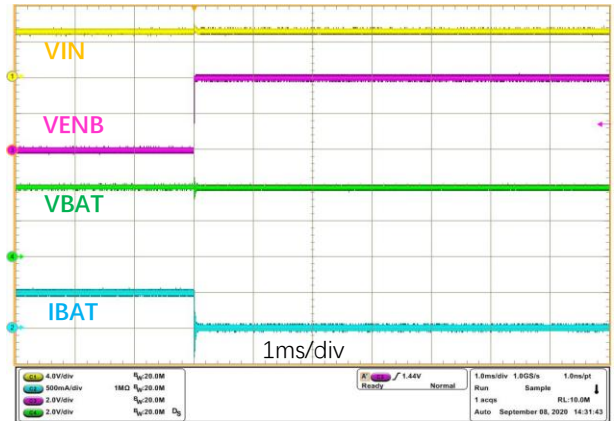
**典型性能特征**

 电流随 VIN 变化 (R<sub>REF</sub>=18K)


浮充电压随 VIN 变化

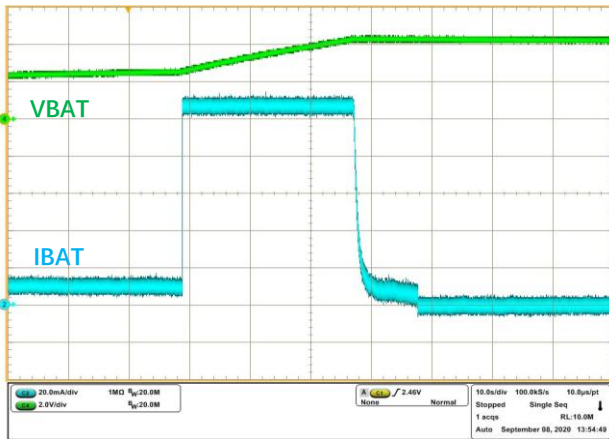

 充电电流随 VBAT 变化 (V<sub>IN</sub>=5V, R<sub>REF</sub>=18K)

 充电电流随 VBAT 变化 (V<sub>IN</sub>=5V, R<sub>REF</sub>=10K)

 电流精度随环境温度变化 (V<sub>IN</sub>=5V, R<sub>ISNS</sub>=19K)

 浮充电压随环境温度变化 (V<sub>IN</sub>=5V)



VENB 启动充电波形



VENB 关掉充电波形



充电波形

## 功能描述

### 充电电流设定

充电电流采用一个连接在IREF引脚与地之间的电阻来设定的。设定电阻和充电电流采用下列公式来计算：根据需要的充电电流来确定电阻阻值，

$$I_{BAT} = \frac{1920}{R_{IREF}}$$

电阻单位：kΩ 电流单位：mA

客户应用中，可根据需求选取合适大小的R<sub>IREF</sub>，R<sub>IREF</sub>与充电电流的关系确定可参考下表：

| R <sub>IREF</sub> (kΩ) | I <sub>BAT</sub> (mA) |
|------------------------|-----------------------|
| 200                    | 9.6                   |
| 43                     | 45                    |
| 18                     | 107                   |
| 10                     | 192                   |
| 3.9                    | 492                   |

### 截止电流设定

充电电流采用一个连接在I<sub>TERM</sub>引脚与地之间的电阻来设定的。设定电阻和充电电流采用下列公式来计算：根据需要的充电电流来确定电阻阻值，

$$I_{BAT} = \frac{2400}{R_{I\text{TERM}}}$$

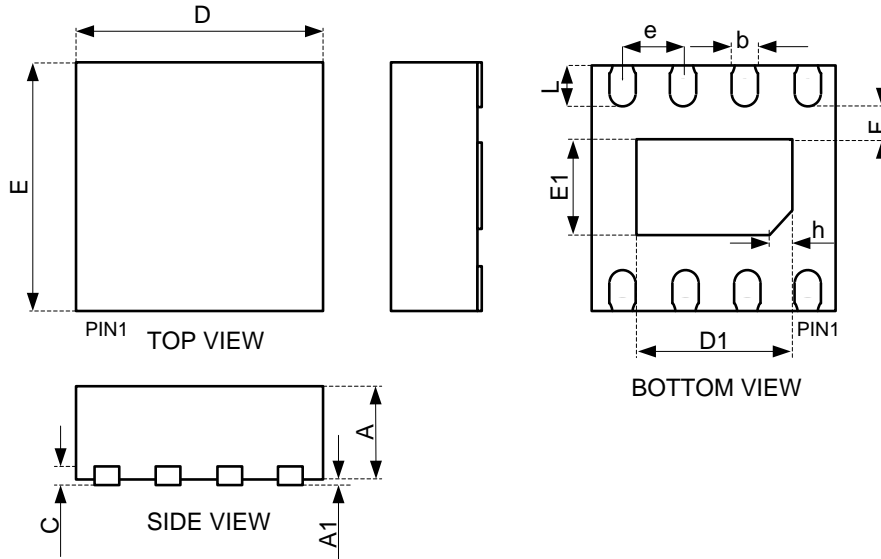
电阻单位：kΩ 电流单位：mA

客户应用中，可根据需求选取合适大小的R<sub>I<sub>TERM</sub></sub>，R<sub>I<sub>TERM</sub></sub>与充电电流的关系确定可参考下表：

| R <sub>I<sub>TERM</sub></sub> (kΩ) | I <sub>TERM</sub> (mA) |
|------------------------------------|------------------------|
| 560                                | 4.3                    |
| 100                                | 24                     |
| 51                                 | 47                     |
| 24                                 | 100                    |


### LED 状态显示

| 指示说明   | 条件   | 显示规则 |      |
|--------|--|------|------|
|        |  | LED1 | LED2 |
| PPR 指示 | V <sub>IN</sub> >V <sub>POR</sub> ,<br>V <sub>IN</sub> -V <sub>BAT</sub> >V <sub>OS</sub> ,<br>V <sub>IN</sub> <V <sub>OVP</sub> | ON   | -    |
| CHG 指示 | 电池充电中  | ON   | ON   |
|        | 电池充满   |      | OFF  |

**封装尺寸 (DFN2x2-8L)**


| Dim | Millimeters |       |       |
|-----|-------------|-------|-------|
|     | MIN         | Typ.  | MAX   |
| A   | 0.70        | 0.75  | 0.80  |
| A1  | 0.000       | 0.020 | 0.050 |
| b   | 0.200       | 0.250 | 0.300 |
| C   | 0.203REF    |       |       |
| D   | 1.900       | 2.000 | 2.100 |
| E   | 1.900       | 2.000 | 2.100 |
| D1  | 1.50        | 1.60  | 1.70  |
| E1  | 0.80        | 0.90  | 1.00  |
| e   | 0.475       | 0.500 | 0.525 |
| L   | 0.25        | 0.30  | 0.35  |
| F   | 0.15        | 0.25  | 0.35  |
| h   | 0.25REF     |       |       |


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