

## 5V/3.6A 输入双节串联锂电池升压充电芯片

### FEATURES

- 输入工作电压范围 4.6V~6V，VIN 耐压 20V
- 升压充电效率 95%
- 最大支持 20W 功率
- 充电电池电压 2 串 8.4V
- 充电电压精度  $\pm 1\%$
- 涓流/恒流/恒压充电
- 恒流充电电流外部电阻可调
- 恒流充电精度  $\pm 10\%$
- 输入自适应充电 4.6V，自动调节输入电流，自适应适配器负载
- 支持充电 NTC 温度保护
- 电池反灌保护，静态功耗 0  $\mu$ A
- 750KHz 开关频率
- LED 充电显示
- ESD 4KV
- 封装：ESOP8, (DFN3\*3/DFN2\*3 待定), QFN4\*4
- 兼容 IP2325（ESOP8），IP2326（QFN4\*4 的简化应用）两节锂电应用；

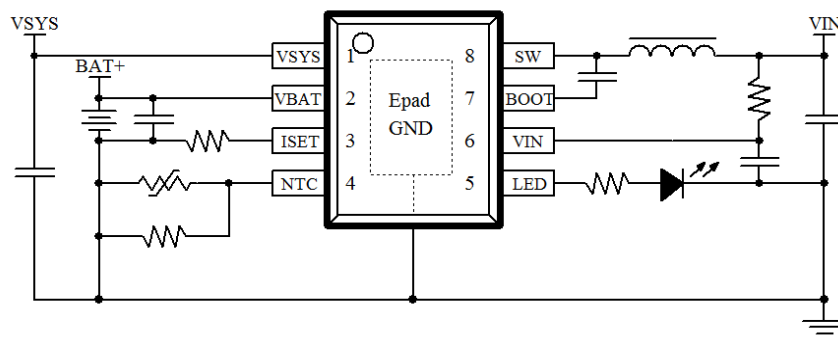
### APPLICATIONS

- 双节锂电池/锂离子电池充电

### DESCRIPTION

- BC915 是一款支持双节串联锂电池/锂离子电池的升压充电管理 IC。
- BC915 集成功率 MOS，采用同步开关架构，集成功率 MOS，使其在应用时仅需极少的外围器件，并有效减小整体方案的尺寸，降低 BOM 成本。
- BC915 的升压开关充电转换器工作频率 750KHz；5V 输入，8V/2A 输出转换效率 95%；
- BC915 具有输入限压功能，可以智能调节充电电流，自适应适配器负载能力。
- BC915 支持外接电阻来调整充电电压；BC915 集成 NTC 保护功能，配合 NTC 电阻。

### PACKAGE AND APPLICATION



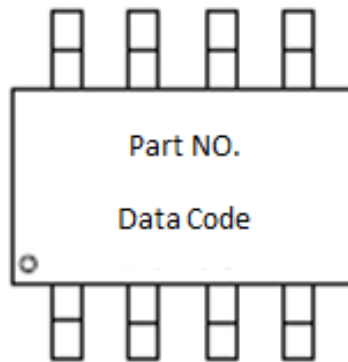
ESOP8 PACKAGE

## 5V/3.6A 输入双节串联锂电池升压充电芯片

### ORDERING INFORMATION

| Orderable Part Number | Package Type       | Package Qty | Op Temp(°C) |
|-----------------------|--------------------|-------------|-------------|
| BC915                 | ESOP8              | 3000        | -40~85      |
| BC915                 | DFN3*3_10/DFN2*3_8 | 3000        | -40~85      |
| BC915                 | QFN4*4             | 3000        | -40~85      |

### MARK INFORMATION



### ABSOLUTE MAXIMUM RATINGS (1)

Over recommended operating free-air temperature range (unless otherwise noted)

| 参数         | 值         | 符号        | 单位 |
|------------|-----------|-----------|----|
| 输入电压范围     | $V_{IN}$  | -0.3~18   | V  |
| 电池电压范围     | VBAT      | -0.3~8.4  | V  |
| 结温范围       | $T_J$     | -40 ~ 150 | °C |
| 存储温度范围     | $T_{stg}$ | -60 ~ 150 | °C |
| 人体模型 (HBM) | ESD       | 4K        | V  |

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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### THERMAL CHARACTERISTICS

over operating free-air temperature range (unless otherwise noted)

| THERMAL METRIC |               |    | UNIT |
|----------------|---------------|----|------|
| 热阻 (ESOP8)     | $\theta_{JA}$ | 45 | °C/W |
| 热阻 (DFN3*3)    | $\theta_{JA}$ | 65 | °C/W |
| 热阻 (QFN4*4)    | $\theta_{JA}$ | 55 | °C/W |

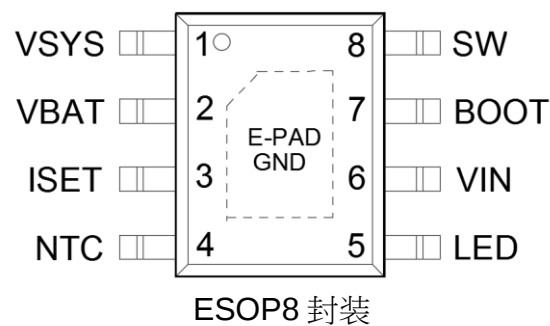
(1) The package thermal impedance is calculated in accordance with JESD 51-7.

### RECOMMENDED OPERATING CONDITIONS

| 参数   | 符号       | 最小值 | 典型值 | 最大值 | 单位 |
|------|----------|-----|-----|-----|----|
| 输入电压 | $V_{IN}$ | 4.5 | 5   | 6   | V  |

\*超出这些工作条件，器件工作特性不能保证。

### PINOUT



| Package |       |        | Name | Function         |
|---------|-------|--------|------|------------------|
| DFN10   | ESOP8 | QFN24  |      |                  |
| 1       | 1     | 19, 20 | VSYS | 输出电压端，外接 22uF 电容 |
| 2       | 2     | 21, 22 | VBAT | 电池端              |
| 3       | 3     | 11     | ISET | 充电电流设置端，外接电阻     |

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|      |      |                              |      |                                                                         |
|------|------|------------------------------|------|-------------------------------------------------------------------------|
| 4    | 4    | 4                            | NTC  | 电池温度检测，拉高或者拉低，终止充电，可以复用做均衡控制端，一旦外部均衡芯片检测到电池电压偏差较大，可以通过 NTC 来终止充电，或者开启充电 |
| 5    | 5    | 6                            | LED  | LED 显示端                                                                 |
| 6    | 6    | 13                           | VIN  | 充电输入端                                                                   |
| 7    | 7    | 14                           | BOOT | Bootstrap 端,自举电路引脚                                                      |
| 8    | 8    | 15, 16, 17                   | SW   | Switching 端, DC/DC 开关节点, 链接电感                                           |
| EPAD | EPAD | EPAD, 18                     | GND  | 系统地和功率地                                                                 |
|      |      | 1,2,3,5,7,8,9,10,12<br>23,24 | NC   |                                                                         |
|      |      |                              |      |                                                                         |

(1) G = Ground, I = Input, O = Output, P = Power

## ELECTRICAL CHARACTERISTICS

Conditions are  $-40^{\circ}\text{C} \leq (T_j = T_A) \leq 125^{\circ}\text{C}$  and  $4.5\text{ V} \leq V_{\text{IN}} \leq 5.5\text{ V}$  unless otherwise noted. Typical value is at  $25^{\circ}\text{C}$ . All voltages are with respect to GND unless otherwise noted. 除特殊说明外， $T_A=25^{\circ}\text{C}$ ， $L=2.2\mu\text{H}$ ， $V_{\text{IN}}=5\text{V}$ ， $V_{\text{OUT}}=7.4\text{V}$

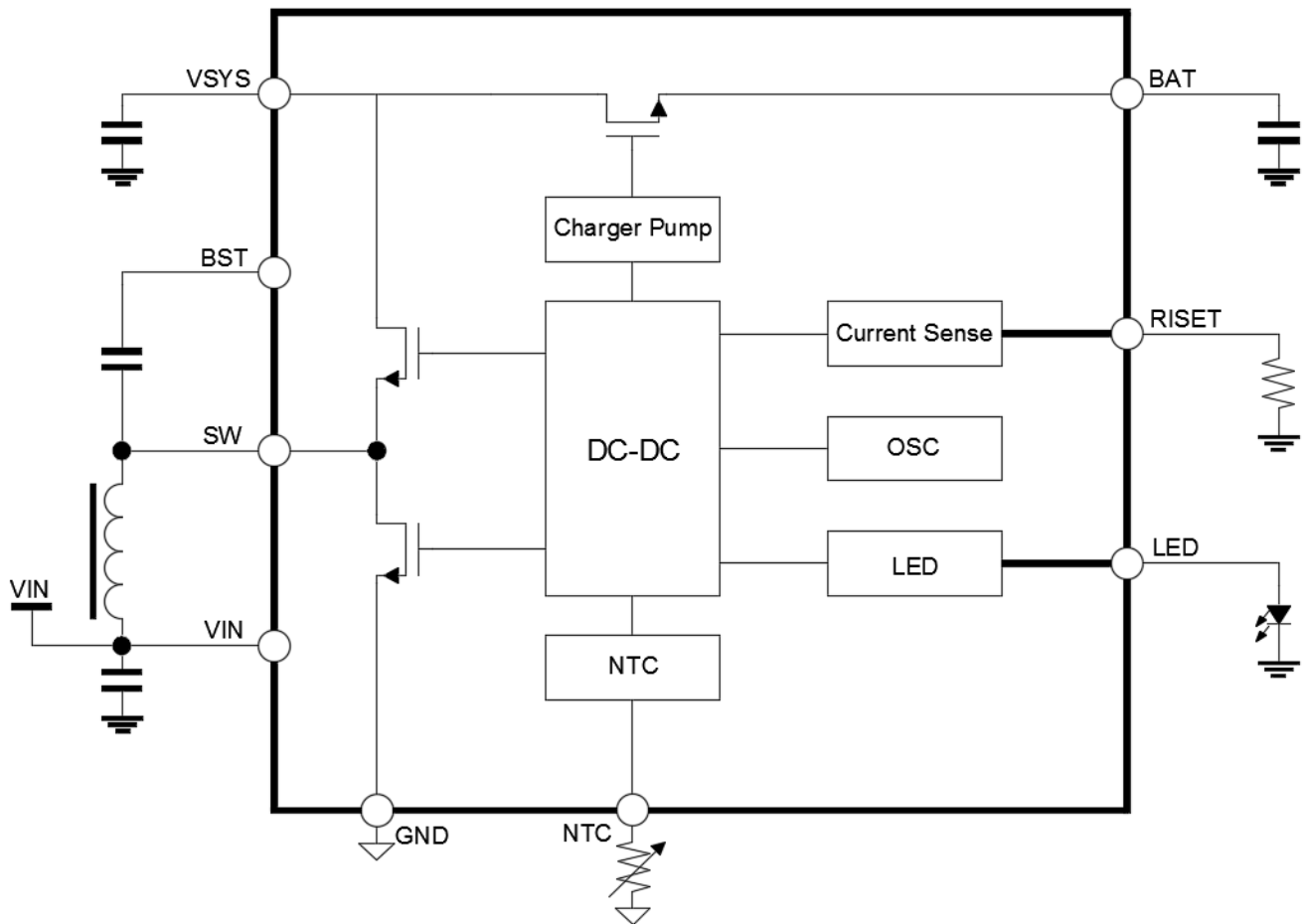
| 参数          | 符号                     | 测试条件                                                       | 最小值 | 典型值      | 最大值 | 单位  |
|-------------|------------------------|------------------------------------------------------------|-----|----------|-----|-----|
| 输入电压        | $V_{\text{IN}}$        |                                                            | 4.5 | 5        | 6   | V   |
| 输入欠压        | $V_{\text{IN\_UVLO}}$  |                                                            |     | 4.3      |     | V   |
|             | 迟滞                     |                                                            |     | 20       |     | mV  |
| 输入过压        | $V_{\text{IN\_OVP}}$   |                                                            |     | 5.8      |     | V   |
|             | 迟滞                     |                                                            |     | 0.2      |     | V   |
| 输入静态电流      | $I_{\text{Q}}$         | $V_{\text{IN}}=5\text{V}$ ， $V_{\text{BAT}}=10\mu\text{F}$ | 2   | 3        |     | mA  |
| 电池反灌电流      |                        | $V_{\text{IN}}=0\text{V}$ ， $V_{\text{BAT}}=8.4\text{V}$   |     | 0        |     | uA  |
| 开关频率        |                        |                                                            |     | 750      |     | KHZ |
| 涓流充电电流      | $I_{\text{trick}}$     | $V_{\text{BAT}} \leq 6\text{V}$                            |     | 100      |     | mA  |
| 涓流充电转恒流充电阈值 | $V_{\text{TRKL}}$      | $V_{\text{BAT}}$ rising                                    |     | 6        |     | V   |
|             | $V_{\text{TRKL\_HYS}}$ | $V_{\text{BAT}}$ falling                                   |     | 5.7      |     | V   |
| 短路电流        |                        |                                                            |     | 130      |     | mA  |
| 短路转涓流阈值     |                        |                                                            |     | 2        |     | V   |
| 迟滞          |                        |                                                            |     | 1.6      |     | V   |
| 恒流电流        |                        | $I_{\text{BAT}}(\text{RISET}=3\text{K})$                   |     | 1        |     | A   |
| 恒流充电电流精度    |                        |                                                            |     | $\pm 10$ |     | %   |

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|             |                       |                            |  |      |  |    |
|-------------|-----------------------|----------------------------|--|------|--|----|
| 充电电压        | VBAT                  |                            |  | 8.4  |  | V  |
| 充电电压精度      |                       |                            |  | ±1   |  | %  |
| 充电截止电流      | Iterm                 | IBAT(RISET=3.9K) CC<br>10% |  | 100  |  | mA |
| 充电截止检测时间    | Tterm                 |                            |  | 1    |  | s  |
| Recharge 阈值 | VBAT <sub>rechg</sub> |                            |  | 8.05 |  | V  |
| 温度环路阈值      |                       |                            |  | 120  |  | °C |
| 芯片过温        |                       | OTP                        |  | 150  |  | °C |
|             |                       | 迟滞                         |  | 20   |  | °C |

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**FUNCTIONAL BLOCK DIAGRAM**



## 5V/3.6A 输入双节串联锂电池升压充电芯片

## 9 LED 显示模式

模式 1：单色灯

|      |    |    |       |
|------|----|----|-------|
|      | 充电 | 充满 | FAULT |
| LED1 | 常亮 | 灭  | 闪 1Hz |

## 10 充电电流设置

充电电流大小设置： $(I_{BAT} \cdot R_{ISET}) / 2K = 1.5A$ 

## 11 充电 NTC

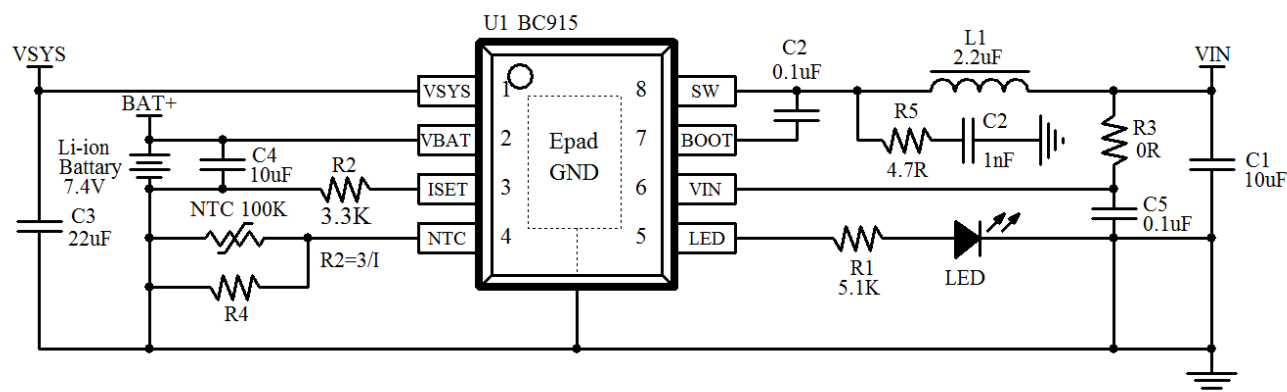
BC915 支持 NTC 保护功能，可配合 NTC 电阻来检测电池温度；BC915 通过 NTC 引脚放出 22uA 电流，然后检测该电流在 NTC 电阻上产生的电压，来判断温度高低，当检测温度超过设定的温度时，关闭充电。BC915 检测到 NTC 引脚电压在 0.45V，表示电池温度过高，停止充电。检测到 NTC 引脚电压上升到大于 1.84V，表示电池温度过低，停止充电。

如果不需要 NTC 功能，将 NTC 引脚接 51K 电阻到地

举例：R<sub>NTC</sub>=100K 热敏电阻(B=4100)，R<sub>2</sub>=82K，对应的温度和 NTC 引脚电压

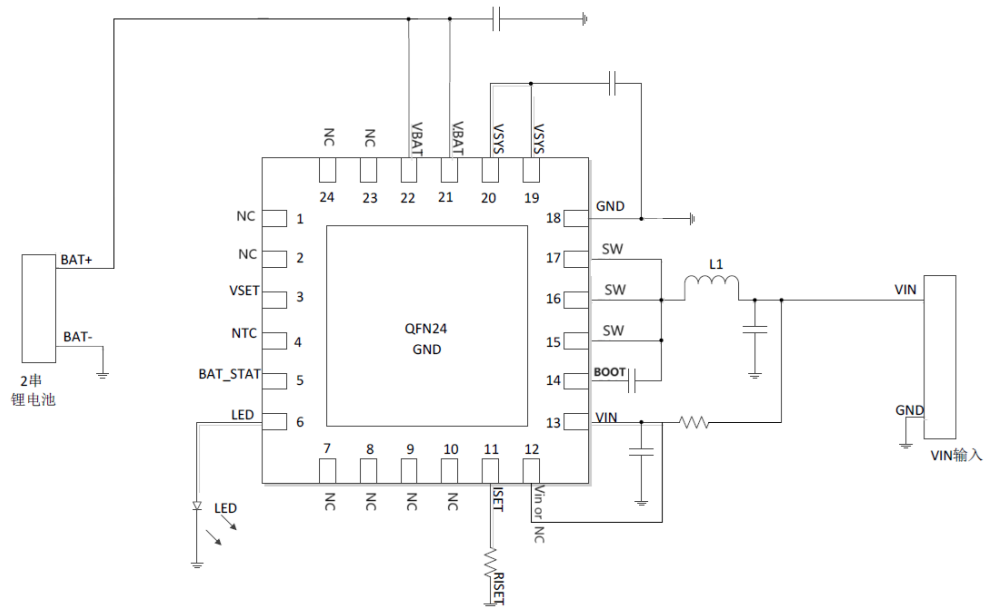
| 温度(度) | R <sub>NTC</sub> 电阻阻值 | R <sub>2</sub> /R <sub>NTC</sub> 阻值 | NTC 引脚电压 |
|-------|-----------------------|-------------------------------------|----------|
| 0     | 246.7K                | 66.3K                               | 1.84V    |
| 45    | 41.2K                 | 27.8K                               | 0.56V    |
| 55    | 28.4K                 | 21.1K                               | 0.45V    |

## 典型应用原理图



ESOP8 应用图

## 5V/3.6A 输入双节串联锂电池升压充电芯片



QFN24 应用简化图

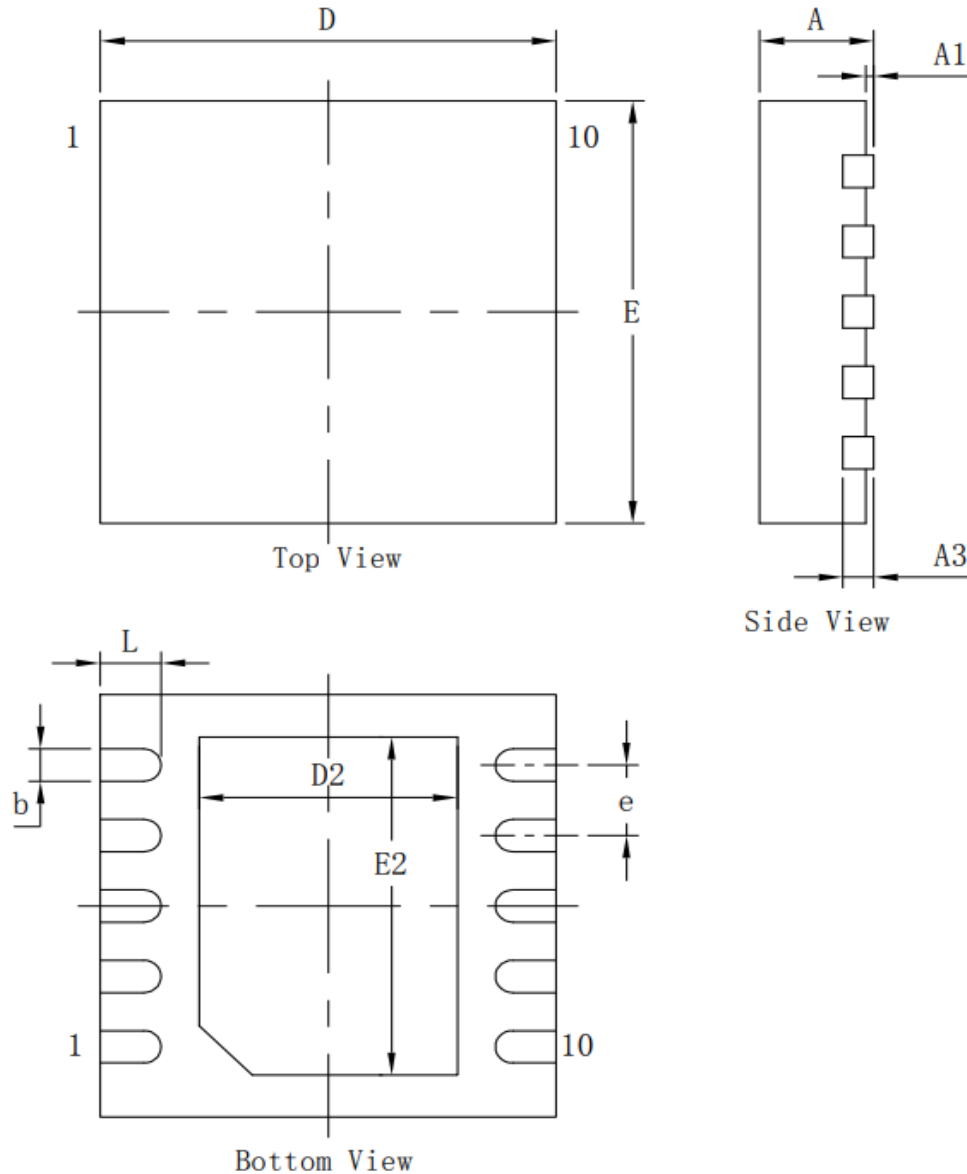
| 序号 | 元件名称   | 型号&规格              | 单位  | 用量 | 位置    | 备注                                                     |
|----|--------|--------------------|-----|----|-------|--------------------------------------------------------|
| 1  | IC     | BC915              | PCS | 1  | U1    |                                                        |
| 2  | 电感     | 0630 一体成型          | PCS | 1  | L1    | 饱和 Isat、温升电流 Idc 大于 5A, DCR 小于 20 毫欧, 感值 2.2uH @750KHz |
| 3  | 贴片电容   | 0805 10uF 25V 10%  | PCS | 3  | C1、C4 | 耐压值大于 16V, 需用贴片陶瓷电容                                    |
| 4  | 贴片电容   | 0603 1nF 50V 10%   | PCS | 1  | C2    | EMC 选用                                                 |
| 5  | 贴片电容   | 0805 22uF 25V 10 % | PCS | 2  | C3    | 耐压值大于 16V, 需用贴片陶瓷电容                                    |
| 6  | 贴片电容   | 0603 0.1uF 25V 10% | PCS | 1  | C5    |                                                        |
| 7  | 贴片电阻   | 0603 5.1K 5%       | PCS | 1  | R1    | 用于调整 LED 亮度                                            |
| 8  | 贴片电阻   | 0603 3.3K 1%       | PCS | 1  | R2    | 调整充电电流                                                 |
| 9  | 贴片电阻   | 0603 0R 5%         | PCS | 1  | R3    | 输入 RC 滤波                                               |
| 10 | 贴片电阻   | 0603 120K 1%       | PCS | 1  | R4    | 调整温度保护范围                                               |
| 11 | 贴片电阻   | 0603 4.7R 5%       | PCS | 1  | R5    | EMC 选用                                                 |
| 12 | 贴片 LED | 0603               | PCS | 1  | LED   | LED 指示灯, 最大驱动能力 5mA                                    |
| 13 | NTC 电阻 | NTC 电阻             | PCS | 1  | NTC   | 根据设计温度选择; 不使用时, 接 51K 电阻到地                             |

5V/3.6A 输入双节串联锂电池升压充电芯片

**PACKAGE INFORMATION**

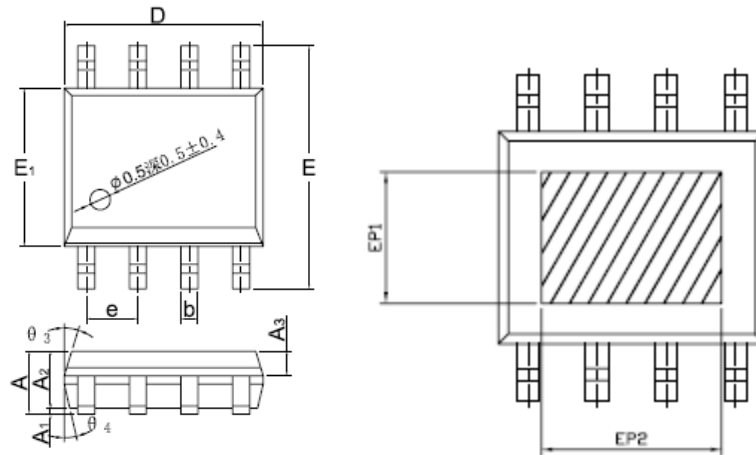
**DFN3\*3\_10**

| 标注 \ 尺寸 | 最小 (mm)   | 标准 (mm) | 最大 (mm) | 标注 \ 尺寸 | 最小 (mm)  | 标准 (mm) | 最大 (mm) |
|---------|-----------|---------|---------|---------|----------|---------|---------|
| A       | 0.70      | 0.75    | 0.80    | E       | 2.90     | 3.00    | 3.10    |
| A1      | -         | -       | 0.05    | D2      | 1.60     | 1.70    | 1.80    |
| A3      | 0.203 REF |         |         | E2      | 2.30     | 2.40    | 2.50    |
| b       | 0.18      | 0.23    | 0.28    | e       | 0.50 TYP |         |         |
| D       | 2.90      | 3.00    | 3.10    | L       | 0.35     | 0.40    | 0.45    |



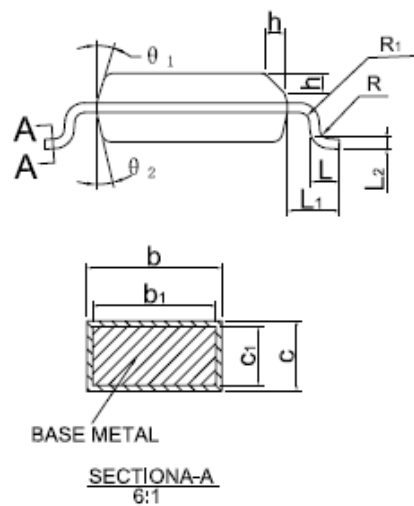
5V/3.6A 输入双节串联锂电池升压充电芯片

**ESOP8**



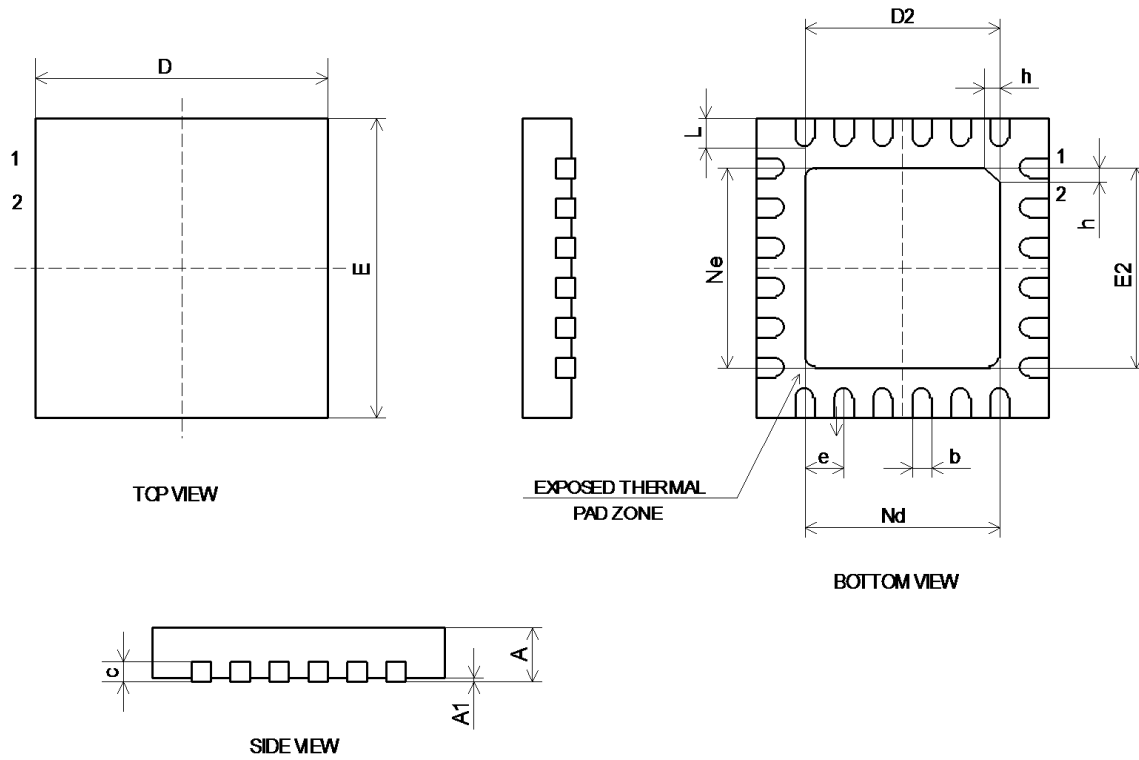
DIMENSIONS IN MILLIMETERS

| SYMBOL         | MIN     | NOM  | MAX  |
|----------------|---------|------|------|
| A              | 1.35    | 1.55 | 1.75 |
| A <sub>1</sub> | 0.00    | —    | 0.10 |
| A <sub>2</sub> | 1.25    | 1.40 | 1.65 |
| A <sub>3</sub> | 0.50    | 0.60 | 0.70 |
| b              | 0.39    | —    | 0.49 |
| b <sub>1</sub> | 0.28    | —    | 0.48 |
| c              | 0.10    | —    | 0.25 |
| c <sub>1</sub> | 0.10    | —    | 0.23 |
| D              | 4.80    | 4.90 | 5.00 |
| E              | 5.80    | 6.00 | 6.20 |
| E <sub>1</sub> | 3.80    | 3.90 | 4.00 |
| e              | 1.27BSC |      |      |
| L              | 0.45    | —    | 1.00 |
| L <sub>1</sub> | 1.04REF |      |      |
| L <sub>2</sub> | 0.25BSC |      |      |
| R              | 0.07    | —    | —    |
| R <sub>1</sub> | 0.07    | —    | —    |
| h              | 0.3     | 0.4  | 0.5  |
| θ <sub>1</sub> | 0°      | —    | 8°   |
| θ <sub>2</sub> | 11°     | 17°  | 19°  |
| θ <sub>3</sub> | 11°     | 13°  | 15°  |
| θ <sub>4</sub> | 15°     | 17°  | 19°  |
| θ <sub>5</sub> | 11°     | 13°  | 15°  |
| EP1            | 2.40    | —    | —    |
| EP2            | 3.30    | —    | —    |



5V/3.6A 输入双节串联锂电池升压充电芯片

**QFN4\*4**



| SYMBOL | MILLIMETER |      |      |
|--------|------------|------|------|
|        | MIN        | NOM  | MAX  |
| A      | 0.70       | 0.75 | 0.80 |
| A1     | -          | 0.02 | 0.05 |
| b      | 0.18       | 0.25 | 0.30 |
| c      | 0.18       | 0.20 | 0.25 |
| D      | 3.90       | 4.00 | 4.10 |
| D2     | 2.40       | 2.50 | 2.60 |
| e      | 0.50BSC    |      |      |
| Ne     | 2.50BSC    |      |      |
| Nd     | 2.50BSC    |      |      |
| E      | 3.90       | 4.00 | 4.10 |
| E2     | 2.40       | 2.50 | 2.60 |
| L      | 0.35       | 0.40 | 0.45 |
| h      | 0.30       | 0.35 | 0.40 |

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## REVISION HISTORY

### Document revision history

| Data        | Version | Changes                   |
|-------------|---------|---------------------------|
| 26-May-2024 | Ver0.2  | First release             |
| 12-May-2024 | Ver0.3  | Update the charge current |