

## 内置高精度电压、电流检测电路，双节锂电池、磷酸锂电池保护 IC

## 器件概述

FH7202 系列是一款适合于两串锂离子、锂聚合物、磷酸铁锂电池的保护芯片，内置有高精度电压检测电路和电流检测电路。

FH7202 系列支持过充电、过放电、放电过电流、短路、充电过电流的检测。

## 应用领域

- 锂离子可充电电池
- 两节串联磷酸铁锂可再充电电池

## 封装形式

- SOT-23-6L

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
FH7202	SOT-23 (6L)	2.90mm × 1.60mm

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

## 典型应用电路

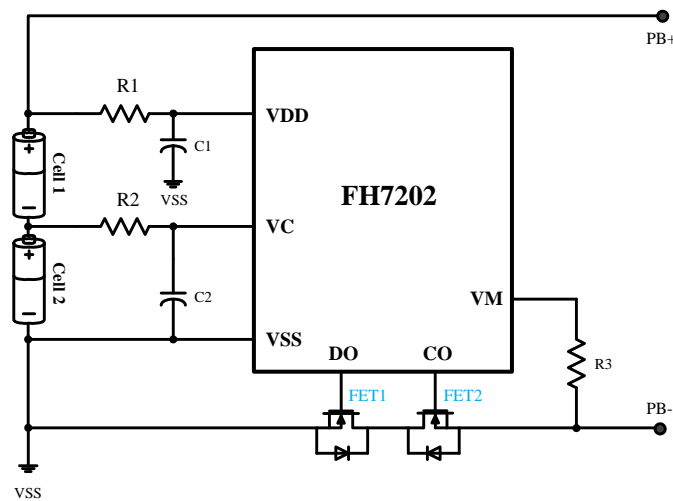


表 1. 应用电路 BOM 清单

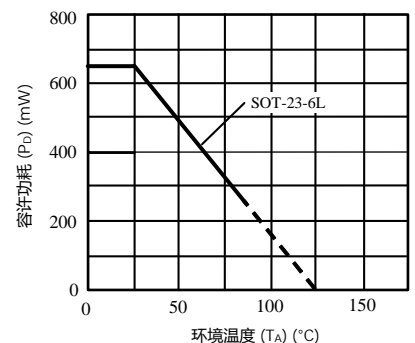
器件标识	典型值	参数范围	单位
R1	1.0	1.0 ~ 1.5	k $\Omega$
R2	2.0	1.0 ~ 3.0	k $\Omega$
C1	0.1	$\geq 0.1$	$\mu$ F
FET1	放电控制	N MOSFET	
FET2	充电控制	N MOSFET	

注：  
1. 上述参数有可能不经预告而作更改。  
2. 上述 IC 的原理图以及参数并不作为保证电路工作的依据，请在实际的应用电路上进行充分的实测后再设置参数。

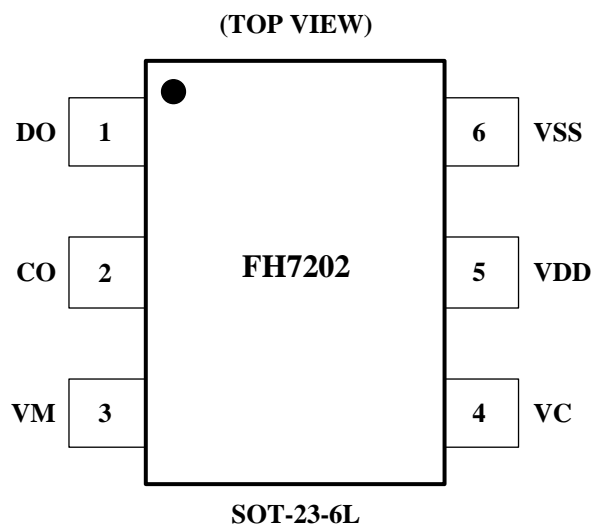
图一、电池保护 IC 应用电路示例

## 电气特性

- 器件耐高压：33.0V (VDD~CS)
- 高精度电压检测功能
  - ▲ 过充电保护电压：3.500V ~ 4.500V (精度  $\pm 25$ mV)
  - ▲ 过充电解除电压：3.200V ~ 4.300V (精度  $\pm 50$ mV)
  - ▲ 过放电保护电压：2.000V ~ 2.900V (精度  $\pm 80$ mV)
  - ▲ 过放电解除电压：2.500V ~ 3.100V (精度  $\pm 100$ mV)
- 两段放电过电流保护功能
  - ▲ 过电流保护电压：0.050V ~ 0.300V (精度  $\pm 15$ mV@ $\leq 0.10$ V) (精度  $\pm 30$ mV@ $> 0.10$ V)
  - ▲ 短路保护电压：0.5V, 1.0V (精度  $\pm 0.2$ V)
- 充电过流保护电压：-0.080V ~ -0.220V (精度  $\pm 30$ %)
- 充电器检测、负载检测功能
- 支持 0V 充电功能：可以选择“允许”或“禁止”
- 休眠功能：两种选择“有”或“无” (详见器件选型表)
- 过放自恢复功能：两种选择“有”或“无” (详见器件选型表)
- 低电流消耗
  - ▲ 工作模式：3.5 $\mu$ A (typ.) ( $T_a = +25^\circ\text{C}$ )
  - ▲ 过放模式：3.0 $\mu$ A (typ.) ( $T_a = +25^\circ\text{C}$ )
  - ▲ 休眠模式：0.1 $\mu$ A (typ.) ( $T_a = +25^\circ\text{C}$ )
- 器件无铅、无卤素、RoHS
- 工作温度范围：-40 $^\circ\text{C}$  ~ +85 $^\circ\text{C}$



## 引脚排列



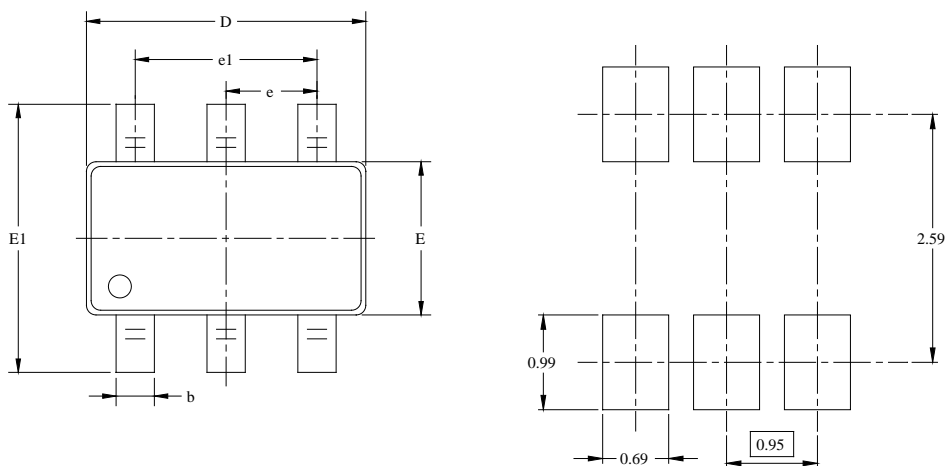
## 引脚功能

表 2

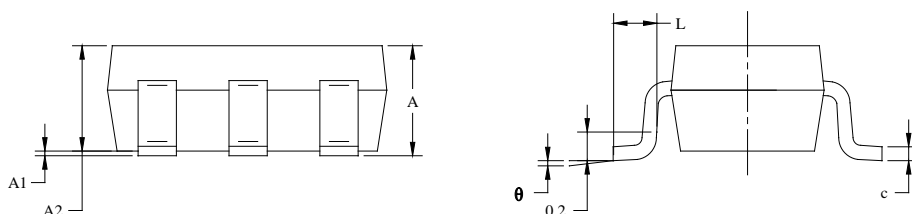
引脚序号	符号	功能描述
1	DO	放电控制用 MOSFET 门极连接端子
2	CO	充电控制用 MOSFET 门极连接端子
3	VM	过电流检测输入 (VM-GND 间) 端子, 充电器检测端子
4	VC	电池 1 的负电压、电池 2 的正电压连接端子
5	VCC(VDD)	电源输入端, 与供电电源( 电池 1) 的正极连接
6	VSS(GND)	接地端, 负电源输入端子, 电池 2 负电压连接端子

## 封装信息

- 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	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

## 器件目录：电气参数选择表

## 检测电压表

产品编码	过充电保护电压 $V_{OC}$	过充电解除电压 $V_{OCR}$	过放电保护电压 $V_{OD}$	过放电解除电压 $V_{ODR}$	放电过流保护电压 $V_{EC}$	短路保护电压 $V_{SHORT}$	充电过流保护电压 $V_{CHA}$
FH7202-B	4.350V	4.150V	2.300V	3.100V	0.200V	1.000V	-0.210V
FH7202-L	4.425V	4.225V	2.500V	3.050V	0.200V	0.500V	-0.150V
FH7202-N	4.280V	4.080V	2.800V	2.950V	0.200V	1.000V	-0.210V
FH7202-Q	4.475V	4.275V	2.450V	2.950V	0.200V	0.500V	-0.150V
FH7202-C	4.280V	4.080V	2.900V	3.100V	0.200V	1.000V	-0.210V
FH7202-D	4.280V	4.080V	2.350V	2.850V	0.200V	1.000V	-0.210V
FH7202-E	4.250V	4.150V	2.800V	3.050V	0.100V	0.500V	-0.100V
FH7202-H	4.225V	4.025V	2.400V	2.900V	0.100V	0.500V	-0.100V
FH7202-J	3.650V	3.480V	2.050V	2.350V	0.200V	1.000V	-0.200V
FH7202-K	4.250V	4.050V	2.400V	2.900V	0.200V	0.500V	-0.200V
FH7202-M	4.280V	4.080V	2.500V	3.050V	0.200V	0.500V	-0.170V
FH7202-P	4.225V	4.125V	2.500V	3.000V	0.200V	0.500V	-0.170V

功能代码	产品编码											
	FH7202-B	FH7202-L	FH7202-N	FH7202-Q	FH7202-C	FH7202-D	FH7202-E	FH7202-H	FH7202-J	FH7202-K	FH7202-M	FH7202-P
延迟时间代码	A	A	A	A	A	A	B	A	A	A	A	A
功能代码	1	5	2	2	1	1	2	3	1	4	5	5

## 器件目录：电气参数选择表 (续.)

## 延迟时间代码说明

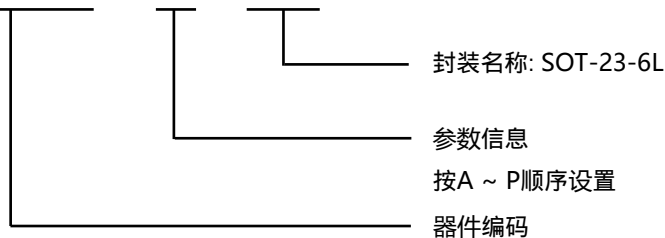
延迟时间代码	过充电保护延时 $T_{OC}$	过放电保护延时 $T_{OD}$	放电过流延时 $T_{EC}$	充电过流延时 $T_{CHA}$	短路延时 $T_{SHORT}$
A	1000ms	128ms	10ms	8ms	250us
B	1000ms	1000ms	1000ms	8ms	250us

## 功能代码说明

功能代码	过充自恢复功能	休眠功能	向 0V 电池充电功能
1	无	有	允许
2	有	无	允许
3	无	有	禁止
4	无	无	允许
5	有	有	允许
6	有	有	禁止

## ● 产品名称定义

FH7202 - X M6



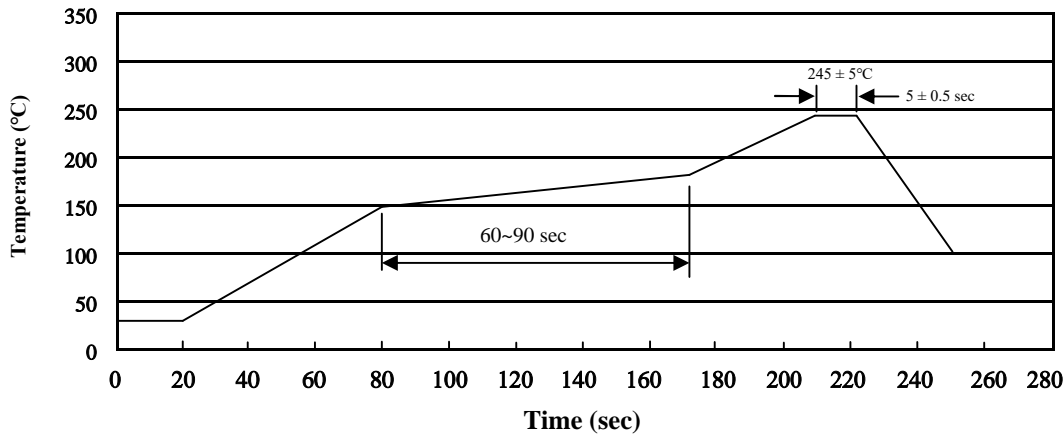
## ORDERING INFORMATION

Part Number	OCV [V <sub>oc</sub> ] (V)	OCR <sub>V</sub> [V <sub>ocr</sub> ] (V)	ODV [V <sub>od</sub> ] (V)	ODR <sub>V</sub> [V <sub>odr</sub> ] (V)	Operating Temperature	Package Type	Top Mark	SPQ
<b>FH7202BM6</b>	4.350±25mV	4.15±50mV	2.30±80mV	3.10±100mV	-40°C to +85°C	SOT-23-6L	20BB <u>Y M L</u>	3000EA/Reel
<b>FH7202LM6</b>	4.425±25mV	4.225±50mV	2.50±80mV	3.05±100mV	-40°C to +85°C	SOT-23-6L	1020L <u>Y M L</u>	3000EA/Reel
<b>FH7202NM6</b>	4.28±25mV	4.08±50mV	2.80±80mV	2.95±100mV	-40°C to +85°C	SOT-23-6L	20NB <u>Y M L</u>	3000EA/Reel
<b>FH7202QM6</b>	4.475±25mV	4.275±50mV	2.45±80mV	2.95±100mV	-40°C to +85°C	SOT-23-6L	1020Q <u>Y M L</u>	3000EA/Reel
<b>FH7202CM6</b>	4.28±25mV	4.08±50mV	2.90±80mV	3.10±100mV	-40°C to +85°C	SOT-23-6L	20CB <u>Y M L</u>	3000EA/Reel
<b>FH7202DM6</b>	4.28±25mV	4.08±50mV	2.35±80mV	2.85±100mV	-40°C to +85°C	SOT-23-6L	20DB <u>Y M L</u>	3000EA/Reel
<b>FH7202EM6</b>	4.25±25mV	4.15±50mV	2.80±80mV	3.05±100mV	-40°C to +85°C	SOT-23-6L	1020E <u>Y M L</u>	3000EA/Reel
<b>FH7002HM6</b>	4.225±25mV	4.025±50mV	2.40±80mV	2.90±100mV	-40°C to +85°C	SOT-23-6L	1020H <u>Y M L</u>	3000EA/Reel
<b>FH7002JM6</b>	3.65±25mV	3.48±50mV	2.05±80mV	2.35±100mV	-40°C to +85°C	SOT-23-6L	22AA <u>Y M L</u>	3000EA/Reel
<b>FH7202KM6</b>	4.25±25mV	4.05±50mV	2.40±80mV	3.05±100mV	-40°C to +85°C	SOT-23-6L	20DB <u>Y M L</u>	3000EA/Reel
<b>FH7202MM6</b>	4.28±25mV	4.08±50mV	2.50±80mV	3.05±100mV	-40°C to +85°C	SOT-23-6L	20MC <u>Y M L</u>	3000EA/Reel
<b>FH7002PM6</b>	4.225±25mV	4.125±50mV	2.50±80mV	3.00±100mV	-40°C to +85°C	SOT-23-6L	1020P <u>Y M L</u>	3000EA/Reel

## Note:

- **FH7202\*M6** 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.
- FOCMCU Inc. reserves the right to amend and legally interpret the electrical parameters of this chip device. (<http://www.fordevices.com>)

## 回流焊温度曲线图(无铅) / Temperature Profile for IR Reflow Soldering (Pb-Free)



说明：

- 1、预热温度 150 ~ 180°C，时间 60 ~ 90sec;
- 2、峰值温度 245±5°C，时间持续为 5±0.5sec;
- 3、焊接制程冷却速度为 2 ~ 10°C/sec.

Note:

1. Preheating: 150 ~ 180°C, Time: 60 ~ 90 sec.
2. Peak Temp.: 245 ± 5°C, Duration: 5 ± 0.5sec.
3. Cooling Speed: 2 ~ 10°C/sec.

## 耐焊接热试验条件 / Resistance to Soldering Heat Test Conditions

温度：260 ± 5°C

时间：10 ± 1 sec.

Temp.: 260 ± 5°C

Time: 10 ± 1 sec



### 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