

Linear Battery Management Chip, 1.0A is compatible with the USB interface

General Description

The FH4053 is a constant-current/constant-voltage charger circuit for single cell lithium-ion batteries. The device includes an internal power transistor, does not need external current sense resistor and blocking diode in applications. FH4053 requires minimal external components, and meet the USB bus specification, is very suitable for portable applications in the field.

Thermal modulation circuit controls the chip temperature in a safe range when the device power dissipation is relatively large or the ambient temperature is higher. Within a fixed constant charge voltage 4.2V, can also be adjusted by an external resistor. Charge current set by an external resistor.

When the input voltage (AC adapter or USB power supply) power is lost, FH4053 automatically enters a low power sleep mode, and then the battery current consumption is less than 3.0 μ A. Built-in protection circuits against overcharge, when the battery voltage is higher than the input voltage, automatically turn off built-in power MOSFET. Other features include low input voltage latch, automatic recharge, the battery temperature protect and charge status /charge status indication functions. FH4053 uses thermally enhanced 8-pin small outline package ESOP-8L.

Typical Application Circuit

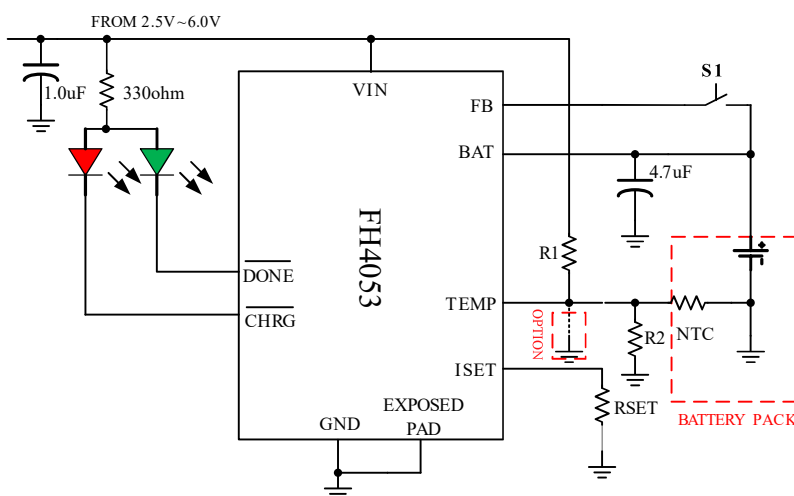


Figure. FH4053 Application Circuit

Features

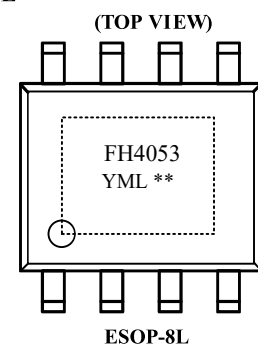
- Programmable charge current up to 1.0A
- No MOSFET, sense resistor or blocking diode required
- Complete linear charger in small package for single cell lithium-ion batteries
- Constant-current/constant-voltage operation with thermal regulation to maximize charge rate without risk of overheating
- Charges single cell li-ion batteries directly from USB port
- Preset 4.20/3.65V charge voltage with $\pm 1\%$ accuracy, also can be adjusted by FB
- Monitor output charge current
- Automatic recharge
- Charge status output pin
- 1/10 charge current termination
- Supply current in shutdown: 25.0 μ A
- Trickle charge threshold : 2.90/2.40V(Match different battery)
- Soft-Start limits inrush current
- Output with protection against anti-irrigation
- Available in ESOP-8L Package

Applications

- Mobile phones
- Digital cameras
- MP4 player
- Bluetooth applications
- Electronic dictionary
- Portable devices
- All kinds of charger

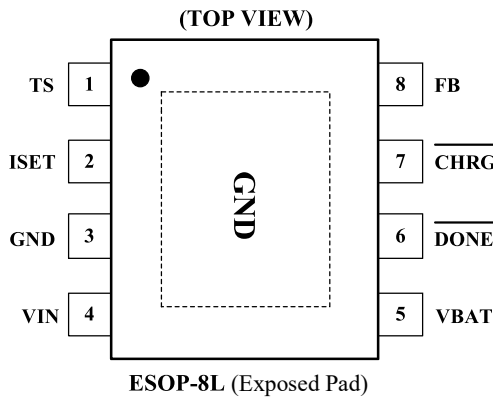
Package Type

- ESOP-8L



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There are defined inside the company,
as the quality of the tracking information.

■ Pin Configuration



Pin No.	Pin Name
1	TS
2	ISET
3	GND
4	VIN

Pin No.	Pin Name
5	VBAT
6	$\overline{\text{DONE}}$
7	$\overline{\text{CHRG}}$
8	FB

■ Pin Function

- **TS (Pin 1):** The TS pin to the battery of the NTC sensor output. If the TS pin voltage is less than the input voltage of 30% or greater than 60% of the input voltage means the battery temperature is too low or too high, then the charge will be suspended. If the TS input voltage between 30% and 60%, then the battery fault condition will be cleared, the charge will continue. Battery temperature sensing feet, when not use, please contact GND.

- **ISET (Pin 2):** Charge current programming, charge current monitoring and close pin. Charge current is controlled by a resistor of precision of 1% to the ground. In the constant charge current state, this port provides 1.0V voltage. In all conditions, this port charge current can be calculated using the following formula:

$$I_{BAT} = (V_{ISET}/R_{ISET}) \times 1250$$

ISET port can also be used to turn off the charger. Resistance to side with the separation of programming can pull the 3 μ A current source to increase ISET port voltage. When the suspension reached the limit voltage 1.21V, the device enters stop state, after charging the input current drop to 25 μ A. This port pinch - off voltage is about 2.40V. If supply this port voltage more than pinch-off voltage, the current will be 1.5mA. Through combining ISET pin to the ground, the charger will back to normal.

- **GND (Pin 3):** Ground terminal
- **VIN (Pin 4):** Supply positive input voltage. Power supply for the charger. VCC can be 4.25V to 6.50V and must have at least 1.0uF bypass capacitor. If the BAT pin voltage of VCC down to within 30mV, FH4052 into the suspension state, and make BAT Current less than 2.0uA.
- **BAT (Pin 5):** Make the battery's positive terminal connected to this pin. When the power supply voltage lower than the threshold latch voltage or sleep mode voltage, BAT pin current is less than 2.0 μ A. BAT pin provide the battery charge current and constant voltage charging voltage.
- **DONE (Pin 6):** When charging end, DONE pin is pulled low by internal switch represents that charge has ended; otherwise DONE pin is high impedance state.
- **CHRG (Pin 7):** When the charger to the battery charging, CHRG pin is pulled low by the internal switch, represents charging being; otherwise CHRG pin is in high impedance state.
- **FB (Pin 8):** This pin foot iron phosphate power battery access. When FB and BAT shorted, the output is 3.65V. If connect a resistor between the FB pin and BAT pin, constant charging voltage can be adjusted.

单节电池充电电流达1.0A兼容USB接口线性充电管理芯片

■ 产品概述

FH4053 是对单节可充电锂电池和磷酸铁锂电池进行恒流/恒压充电的充电管理芯片。该器件内部包括功率晶体管，应用时不需要外部的电流检测电阻和阻流二极管。FH4053 只需要极少的外围元器件，并且符合 USB 总线技术规范，非常适合于便携式应用的领域。

热调制电路可以在器件的功耗比较大或者环境温度比较高的时候将芯片温度控制在安全范围内。内部固定的恒压充电电压为 4.2V/3.65V (对应不同的电池标准)；也可以通过一个外部的电阻调节。充电电流通过一个外部电阻设置。当输入电压 (交流适配器或者 USB 电源) 掉电时，FH4053 自动进入低功耗的睡眠模式，此时电池的电流消耗小于 3 微安。内置防反灌保护电路，当电池电压高于输入电压时，自动关闭内置功率 MOSFET。其它功能包括输入电压过低锁存，自动再充电，温度保护以及充电状态/充电结束状态指示等功能。FH4053 采用散热增强型的 8 管脚小外形封装 ESOP-8L。

■ 应用领域

- 移动电话
- 数码相机
- MP4 播放器
- 蓝牙应用
- 电子词典
- 便携式设备
- 各种充电器

■ 产品特点

- 可编程使充电电流可达 1.0A
- 不需要外部 MOSFET，传感电阻和阻流二极管
- 小的尺寸实现对锂离子电池和磷酸铁锂电池的完全线性充电管理
- 恒电流/恒电压运行和温度调节使得电池管理效力最高，没有热度过高的危险
- 从 USB 接口管理单片锂离子电池
- 预设充电电压为 4.20V±1%/3.65±50mV，也可以通过 FB 进行调节
- 充电电流输出监控
- 充电状态指示标志和充满状态标志
- 1/10 充电电流终止
- 自动再充电
- 停止工作时提供 25μA 电流
- 2.9V/2.4V(对应不同的电池标准)涪流充电阈值电压
- 软启动限制浪涌电流
- 输出端具有防反灌保护功能



(FH4053 实物图)

■ 绝对最大额定值

参数	标号	最大额定值	单位
输入电压	V _{cc}	V _{SS} -0.3 ~ V _{SS} +7.0	V
ISET 端电压	V _{prog}	V _{SS} -0.3 ~ V _{cc} +0.3	
BAT 端电压	V _{bat}	V _{SS} -0.3 ~ 6.0	
DONE 端电压	V _{done}	V _{SS} -0.3 ~ V _{SS} +7.0	
CHAG 端电压	V _{chg}	V _{SS} -0.3 ~ V _{SS} +7.0	
ESD 放电能力	H _{bm}	3000	mA
BAT 端电流	I _{bat}	1500	
ISET 端电流	I _{prog}	1500	μA
工作外围温度	Topa	-40 ~ +85	°C
存储温度	T _{str}	-65 ~ +125	
引脚焊接温度 (10 秒)	-	300	

■ Block Diagram

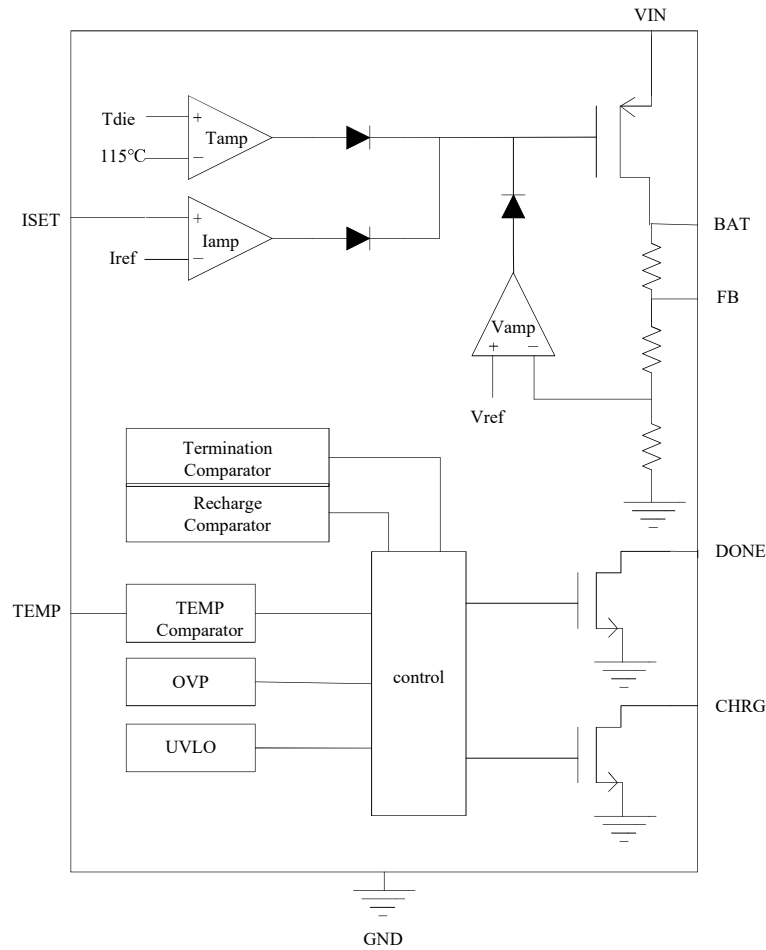


Figure 2. Function Block Diagram

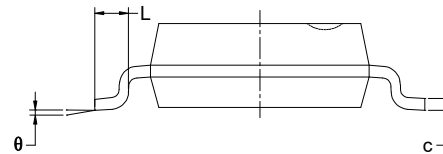
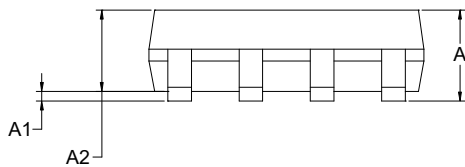
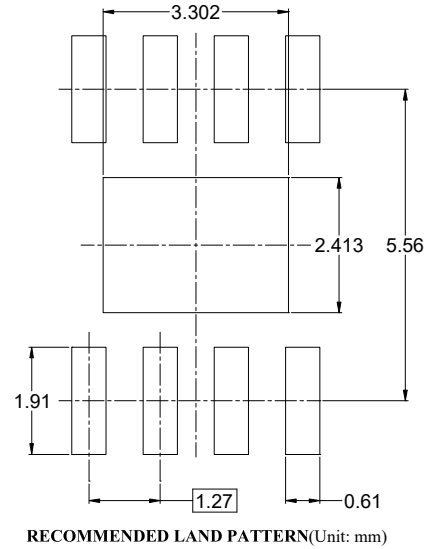
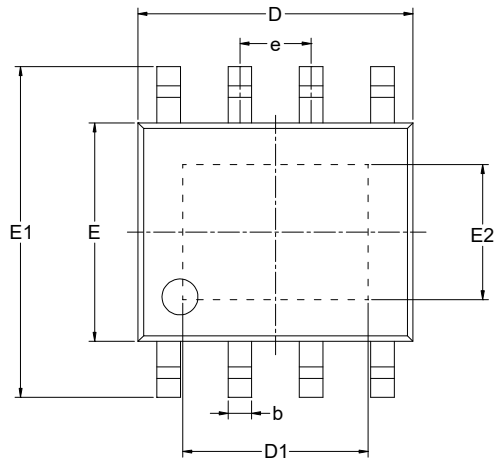
■ Absolute Maximum Ratings

Parameter	Symbol	Maximum Rating	Unit
Input supply voltage	V _{cc}	V _{SS} -0.3 ~ V _{SS} +7.0	V
ISET pin Voltage	V _{prog}	V _{SS} -0.3 ~ V _{cc} +0.3	
BAT pin Voltage	V _{bat}	V _{SS} -0.3 ~ 6.0	
DONE pin Voltage	V _{done}	V _{SS} -0.3 ~ V _{SS} +7.0	
CHAG pin Voltage	V _{chrg}	V _{SS} -0.3 ~ V _{SS} +7.0	
ESD discharge capability	H _{bm}	3000	
BAT pin current	I _{bat}	1500	mA
ISET pin current	I _{prog}	1500	uA
Operating ambient temperature	T _{opa}	-40 ~ +85	°C
Storage temperature	T _{str}	-65 ~ +125	
Pin soldering temperature (10s)	-	300	

Caution : The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

■ Package Information

- ESOP-8L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.002	0.006
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.200
D1	3.202	3.420	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

■ Ordering Information

Part Number	Description	Temperature Range	Package Type	Top Mark	SPQ
FH4053S8	Linear Battery Charger Charge Current: 1.0A Have trickle charge Output Voltage: 4.20V/3.65 (±1%)	-40 ~ +85°C	ESOP-8L	FH4053 YML***	2500PCS/Reel

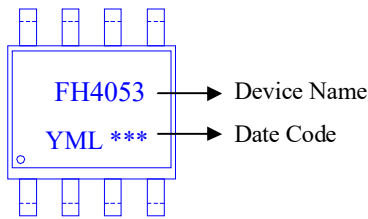
Note:

- FH4053 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.



■ Marking Rule

● ESOP-8L



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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