

Desktop Charger Management IC

I. Overview

As a constant current/constant voltage desktop charger chip, SL4054 is mainly used for charging for single lithium batteries. With the MOSFET internal structure, it is not needed to connect it with an external sense resistor or an external backward diode.

SL4054 can adjust the charging current automatically in condition of high power and high environment temperature, so as to restrain the temperature of the chip. With the fixed charging voltage of 4.2V, the charging current can be adjusted by an external resistor. When it achieves the floating charging voltage and the charging current declines to 1/10 of the set circuit, SL4054 terminates charging automatically. When the input voltage is removed, SL4054 enters into the low-current mode automatically, and absorbs the current lower than 2uA from the battery. When SL4054 enters into the standby mode, the supply current is lower than 25uA.

SL4054 can also monitor the charging current, with the characteristics of voltage detection and auto-cycled charging; in addition, there is an indicating pin indicating the charging termination state and the input voltage state.

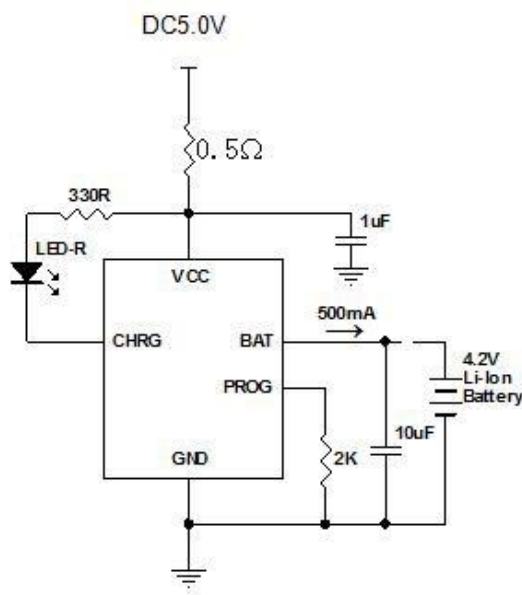
II. Characteristics

- The programmable charging current as high as 500mA;
- In no need of external MOSFET, sense resistors or backward diodes;
- Constant current/constant voltage mode operation, with the function of thermal protection;
- Charging for lithium batteries through the USB port;
- Preset charging voltage with the accuracy of 1%;
- The current of 20uA in the standby mode;
- The trickle charging voltage of 2.9V
- The limitation of the surge current with soft start
- The SOT23-5 package

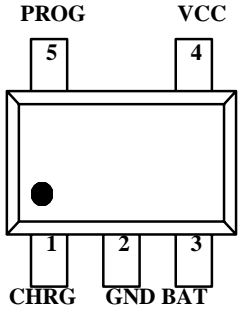
III. Product Application

- Cellphones, palm computers and MP3 players
- Bluetooth headsets

IV. Application Circuit



V. Diagram of Pins and Function Specifications

 <p style="text-align: center;">SOT23-5</p>	Symbols	Name	Function description
	1	CHRG	Charging indication end
	2	GND	Ground
	3	BAT	Charging current output end
	4	VCC	Power input end
	5	PROG	External programmable charging current end

VI. Absolute Maximum Rated Value

Parameters	Symbols	Rated value	Units
Input supply voltage	V_{CC}	7	V
PROG voltage	V_{PROG}	$V_{CC}+0.3$	V
BAT voltage	V_{BAT}	7	V
CHRG voltage	V_{CHRG}	7	V
BAT short circuit		Continuous	
Thermal resistance	θ_{JA}	250	$^{\circ}C/W$
BAT current	I_{BAT}	500	mA
PROG current	I_{PROG}	800	μA
Maximum junction temperature	T_J	110	$^{\circ}C$
Storage temperature	T_S	-65 to +125	$^{\circ}C$
Welding temperature (no more than 10 seconds)		260	$^{\circ}C$

- External programming for charging current: PROG (lead foot 5): the constant current charging current setting and the charging current monitoring end. An external resistance from the pin of PROG is connected to the ground end, to program for the charging current. During the pre-charging stage, the voltage of the pin is modulated at 0.1V; during the constant current charging stage, the voltage of the pin is fixed at 1V. In all the modes of the charging state, the charging current can be estimated when measuring the voltage of the pin according to the following formula:

Corresponding Table between the Rprog resistance and the charging current Ibat

Rprog	Ibat
$I_{bat}=1000/R_{prog}$	
10K	100mA
5K	200mA
3.3K	300mA
2.5K	400mA
2K	500mA

VII. Electrical Characteristics (VIN=5V; TJ=25°C, unless otherwise noted)

Symbols	Parameters	Conditions	Min. value	Typical value	Max. value	Units
VCC	Input supply voltage		4.5	5.0	5.5	V
ICC	Input supply current	In the charging mode ⁽³⁾ , R _{PROG} =10K		170	500	μA
		Standby mode (charging termination)		70		μA
		Turn-off mode (R _{PROG} not connected, VCC < VBAT, VCC < VUV)		38	50	μA
V _{FLOAT}	Adjustable output (floating charging) voltage	I _{BAT} =30 mA, I _{CHRG} =5 mA A: 4.16-4.24V; B: 4.2-4.28V	4.16	4.20	4.28	V
I _{BAT}	BAT end current	R _{PROG} = 10k, current mode	90	110	130	mA
		R _{PROG} = 2k, current mode	465	500	535	mA
		VBAT=4.2V, standby mode	0	+/-1	+/-5	μA
		Turn-off mode, R _{PROG} not connected		+/-0.5	+/-5	μA
		Sleep mode, VCC=0V		+/-1	+/-5	μA
I _{TRIKL}	Trickle charging current	VBAT < V _{TRIKL} , R _{PROG} = 10k		15		mA
V _{TRIKL}	Trickle charging threshold voltage	R _{PROG} = 10k, V _{BAT} Rising	2.8	2.9	3.0	V
V _{UV}	VCC under voltage locking threshold value			3.4		V
V _{UVHYS}	VCC under voltage locking hysteresis	From VCC Low to High		100		mV
V _{ASD}	VCC-VBAT threshold voltage	VCC from low to high		100		mV
		VCC, from high to low		30		mV
I _{TERM}	C/10Z termination current threshold value	R _{PROG} = 10k ⁽⁴⁾		0.1		mA/mA
		R _{PROG} = 2k		0.1		mA/mA
V _{PROG}	PROG end voltage	R _{PROG} = 10k, current mode	0.9	1.03	1.1	V
ΔV _{RECHRG}	Battery threshold voltage	V _{FLOAT} - V _{RECHRG}		100		mV
T _{LIM}	Thermal protection temperature			130		°C

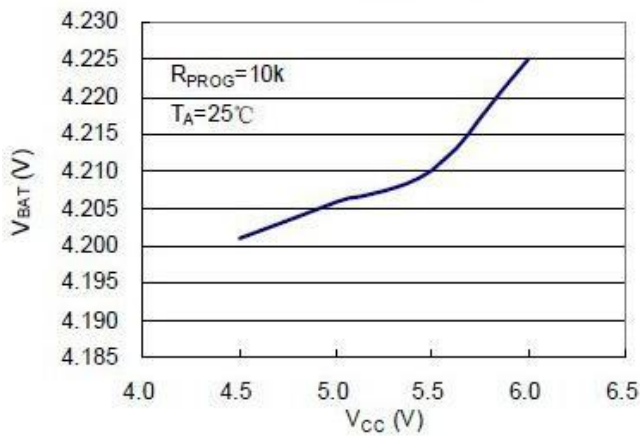
t_{SS}	Software start-up time	$I_{BAT} = 0$ to $1000V/R_{PROG}$		100		μs
t_{RECHRG}	Recharging comparator filtration time	V_{BAT} High to Low		1		ms
t_{TERM}	Termination comparator filtration time	I_{BAT} Falling Below $I_{CHG}/10$		1000		μs

Notes:

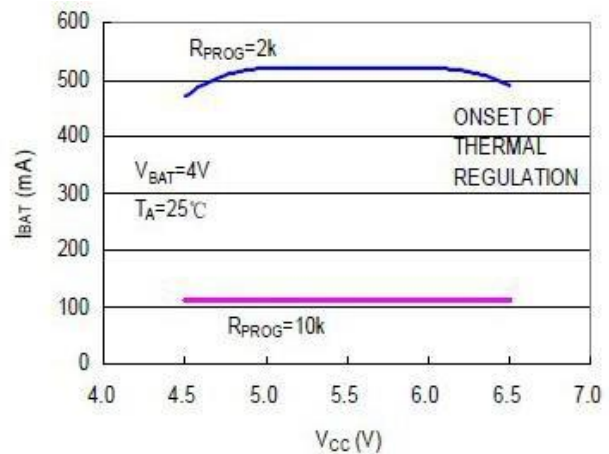
1. It may lead to damages to the chip when exceeding the maximum operating range.
2. The normal functions cannot be guaranteed when exceeding the limit of the operating parameters of the device.
3. The supply current includes the PROG end current (about 100uA), but not the other current transmitted to the battery through the BAT end.
4. The charging termination current is generally set as 0.1 time of the set charging current.

VIII. Oscillograph

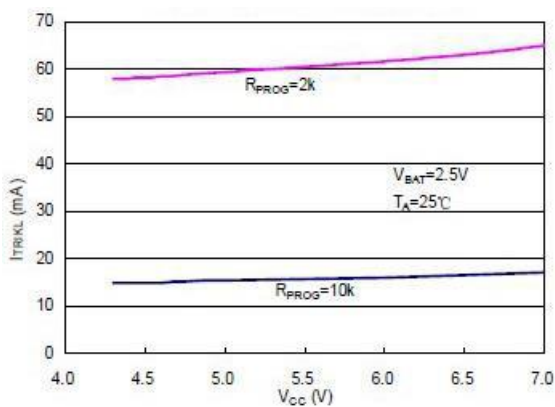
Floating voltage VS supply voltage



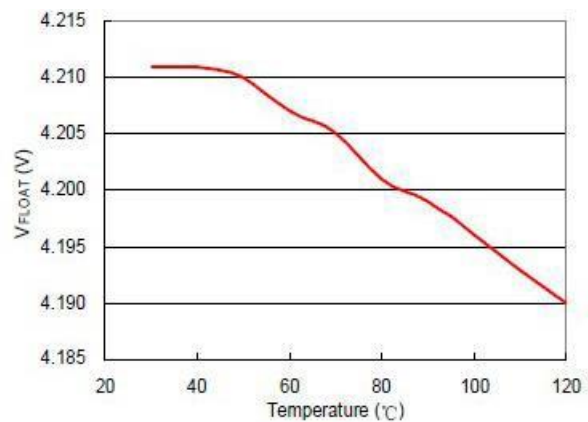
Charging current VS supply voltage



Trickle charging current VS supply voltage

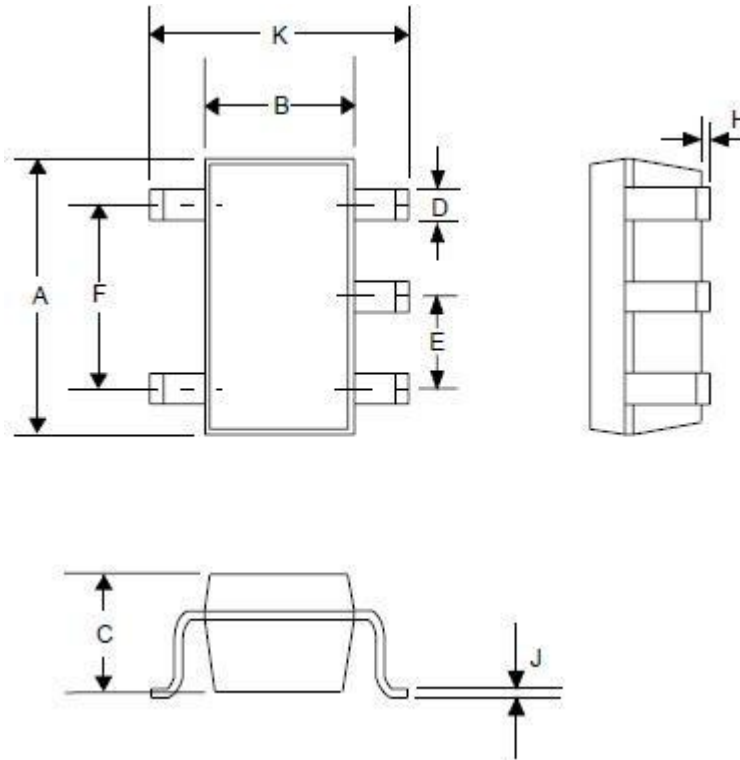


Floating voltage VS temperature



IX. Dimensional Drawing of Package

SOT23-5



Specification				
Dimension	Inch		mm	
	Min. value	Max. value	Min. value	Max. value
A	0.110	0.120	2.80	3.05
B	0.059	0.070	1.50	1.75
C	0.036	0.051	0.90	1.30
D	0.014	0.020	0.35	0.50
E	—	0.037	—	0.95
F	—	0.075	—	1.90
H	—	0.006	—	0.15
J	0.0035	0.008	0.090	0.20
K	0.102	0.118	2.60	3.00