Sola IC

SLM4055-4.2

Standalone Linear Li-Ion Battery Charger

Green, RoHS Compliant, and Pb-Free Product

Package Style: SOT-23-5L

RoHS

Description

The SLM4055 is a complete constant-current /constant-voltage linear charger for single cell lithium-ion batteries. Its SOT-23-5L package and low external component cout make the SLM4055ideally suited for portable applications. Furthermore, the SLM4055is specifically designed to work within USB power specifications.

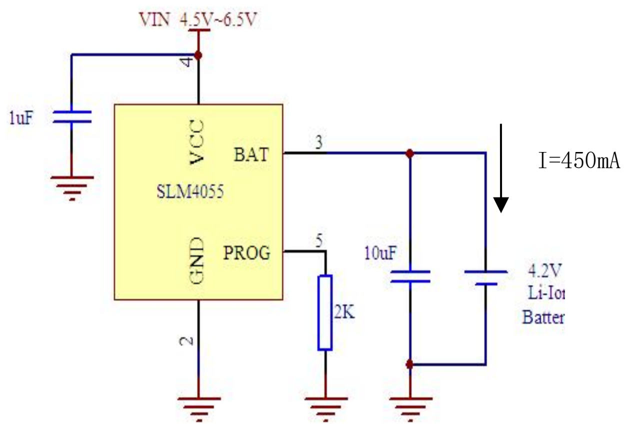
Application

- Cellular Telephones/ PDAs/ MP3 Players
- Charging Docks and Cradles
- Bluetooth Applications

Features

- Programmable Charge Current Up to 800mA
- No MOSFET, Sense Resistor or Blocking Diode Required
- Battery Reversal Protection
- Constant-Current/Constant-Voltage Opera--tion with Thermal Regulation
- Charges Single Cell Li-Ion Battery Directly from USB Port
- Preset 4.2V Charge Voltage with ±1% Accuracy
- 2.9V Trickle Charge Threshold
- Available Without Trickle Charge
- Soft-Start Limits Inrush Current
- RoHS Compliant and 100% Lead (Pb)-Free SOT-23-5L Package

Typical Application



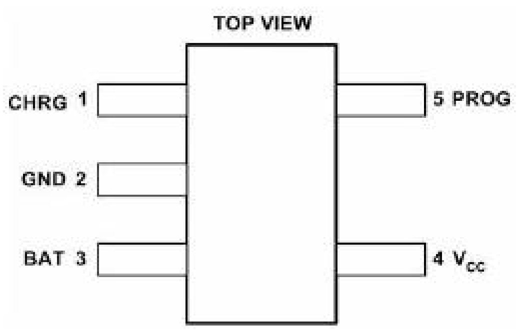


Figure 1.Package

Pin Configurations

No.	PIN	DESCRIPTION
1s	CHRG	Open-Drain Status Output
2	GND	Ground
3	BAT	Charge Currrent Output
4	VCC	Postitve Input Supply Voltage
5	PROG	Charge Currrent Program,Monitor and Shutdown Pin

CHRG(PIN 1): Open-Drain Charge Status Output. When the battery is charging, the CHRG pin is pulled low by an internal N-channel MOSFET. When the charge cycle is completed, CHRG is pulled high.
GND (PIN 2): Ground.
BAT (PIN 3): Charge Current Output. Provides charge current to the battery and regulates the final float voltage to 4.2V. An internal precision resistor divider from this pin sets the float voltage which is disconnected in shutdown mode.
VCC (PIN 4): Positive Input Supply Voltage. Provides power to the charger. VCC can range from 4. 5V to 6.5V and should be bypassed with a 0.1uF-1μF capacitor.
PROG (PIN 5): Charge Current Program, Charge Current Monitor and Shutdown Pin. The charge current is programmed by connecting a 1% resistor, RPROG, to ground. When charging in constant- -current mode, this pin servos to 1V. In all modes, the voltage on this pin can be used to meas- -ure the charge current using the following formula:

$$I_{BAT} = 900 V_{PROG} / R_{PROG}$$

The PROG pin can also be used to shutdown the charger. Disconnecting the program resistor from ground allows a 3μA current to pull the PROG pin high. When it reaches the 1.94V shutdown threshold voltage, the charger enters shutdown mode, charging stops and the input supply current drops to 25μA.

Absolute Maximum Ratings (1)

Parameter	Rating
Input Supply Voltage (VCC)	-0.3V to +8V
PROG (VPROG)	VCC +0.3V
BAT (VBAT)	+8V
CHRG(VCHRG)	+10V
BAT Short-Circuit Duration (IBAT)	850mA
PROG Pin Current (IPROG)	800uA
Maximum Junction Temperature	+125° C
Operating Ambient Temperature Range	-65° C to +125° C
Storage Temperature Range	-40° C to +85° C
Lead Temperature (Soldering, 10s)	+300° C

Operating Ambient Range (2)

Parameter	Sysmbol	Range	Unit
Input Supply Voltage	Vcc	-0.3~+8	V
Junction Temperature	Tj	-40~+80	℃

Electrical Characteristics

(VCC = 5V, TJ= 25 °C, unless otherwise noted)

Parameter	Sysmbol	CONDITIONS	MIN	TYP	MAX	UNITS
Input Supply Voltage	VCC		4.25		6	V
Input Supply Current	ICC	Charge Mode , RPROG = 10k		190		μA
		Standby Mode		85		
		Shutdown Mode (RPROG Not Connected,VCC < VBAT, or VCC < VUV)		45		

Regulated Output (Float) Voltage	VFLOAT	0°C≤TJ≤85°C，IBAT=40mA	4.158	4.2	4.242	V
BAT Pin Current	IBAT	RPROG = 10k, Current Mode		90		mA
		RPROG = 2k, Current Mode		450		mA
		Standby Mode, VBAT = 4.2V		2.5		μA
		Shutdown Mode (RPROG Not Connected)		±0.1		μA
		Sleep Mode, VCC = 0V		±0.1		μA
Trickle Charge Current	ITRIKL	VBAT<VTRIKL, RPROG= 10K		10		mA
Trickle Charge Threshold Voltage	VTRIKL	RPROG = 10k, VBAT Rising		2.9		V
Manual Shutdown Threshold Voltage	VMSD	PROG Pin Rising			1.25	V
		PROG Pin Falling			1.2	
VCC – VBAT Lockout Threshold Voltage	VASD	VCC from Low to High		100		mV
		PROG Pin Falling		30		
C/10 Termination Current Threshold	ITERM	RPROG= 10K(4)		10		mA
		R PROG= 2K		45		
PROG Pin Voltage	VPROG	RPROG=10K,充电		1.03		V
CHRG Pin Weak Pull-Down Current	ICHRG	VCHRG=5V		0		uA
CHRG Pin Output Low Voltage	VCHRG	ICHRG=5mA		0.35		V
Recharge Battery Threshold Voltage	ΔVRHRG	VFLOAT－ VRECHRG		150		mV
Junction Temperatur	TLIM			120		℃
Soft-Start Time	tss	IBAT=0至1000V/RPROG		100		uS
Recharge Comparator Filter Time	tRECHRG	VBAT Low to High		2		mS
Termination Comparator Filter Time		IBAT to ICHRG /10		1000		uS
PROG Pin Pull-Up Current	IPROG			1		uA

Note1: Absolute Maximum Ratings are those values beyond which the life of the device may be impaired.

Note2: The SLM4055are NOT guaranteed to meet performance specifications OUT of this Range.

Note3: Supply current includes PROG pin current (approximately 100uA) but does not include any current delivered to the battey through the BAT pin (approximately 100mA).

Note4: I_{TERM} is expressed as a fraction of measured full charge current with indicated PROG resistor.

Application Information

Stability Considerations

The constant-voltage mode feedback loop is stable without an output capacitor provided a battery is connected to the charger output. With no battery present, an output capacitor is recommended to reduce ripple voltage.

In constant-current mode, the PROG pin is in the feedback loop, not the battery. The constant-current mode stability is affected by the impedance at the PROG pin. With no additional capacitance on the PROG pin, the charger is stable with program resistor values as high as 20k. However, additional capacitance on this node reduces the maximum allowed program resistor.

Vcc Bypass Capacitor：

Many types of capacitors can be used for input bypassing, however, caution must be exercised when using multilayer ceramic capacitors. Because of the self-resonant and high Q characteristics of some types of ceramic capacitors, high voltage transients can be generated under some start-up conditions, such as connecting the charger input to a live power source. A 0.1uF or 1uF capacitor is recommended for VCC bypass capacitor.

Power Dissipation

The conditions that cause the SLM4055to reduce charge current through thermal feedback can be approximated by considering the power dissipated in the IC. Nearly all of this power dissipation is generated by the internal MOSFET!athis is calculated to be approximately:

$$PD=(VCC-VBAT)\ IBAT$$

The approximate ambient temperature at which the thermal feedback begins to protect the IC is:

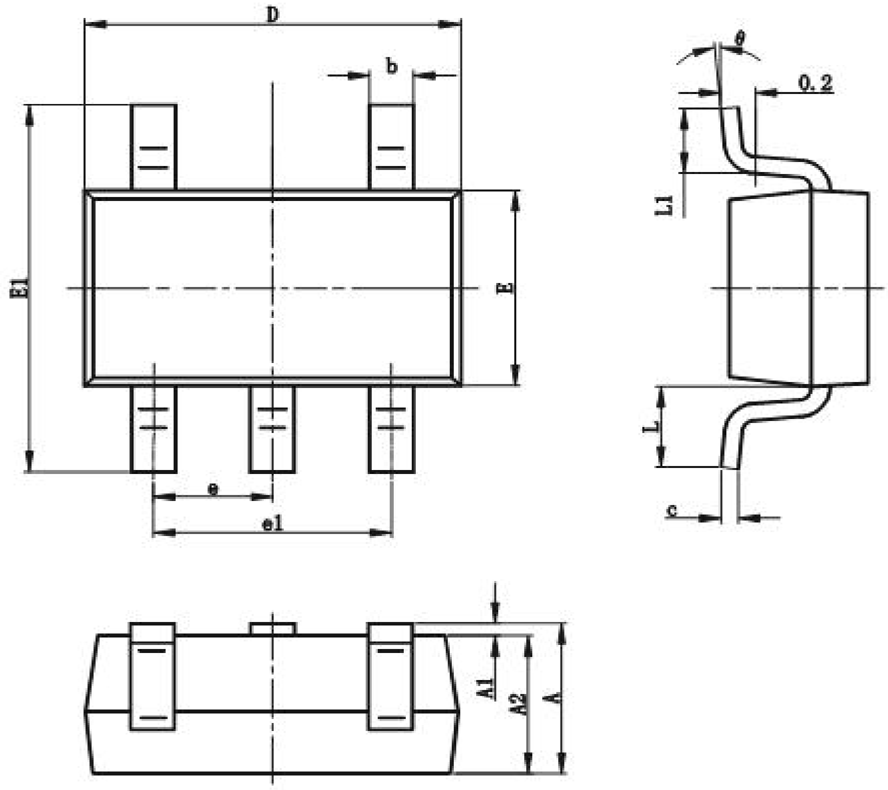
$$TA=120℃- PD\ JA = 120℃-(VCC—VBAT)\ IBAT\ \theta JA$$

Thermal Considerations

Because of the small size of the SOT-23-5L package, it is very important to use a excellent thermal PC board layout to maximize the available charge current. The thermal path for the heat generated by the IC is from the die to the copper lead frame, through the package leads, (especially the ground lead) to the PCB board copper. The PCB board copper is the heat sink. The footprint copper pads should be as wide as possible and expand out to larger copper areas to spread and dissipate the heat to the surrounding ambient. Other heat sources on the board, not related to the charger , must also be considered when designing a PCB board layout because they will affect overall temperature rise and the maximum charge current.

Package Information

SOT-23-5L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeter		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	0.400	0.012	0.016
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	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
?	0	8	0	8