



AiP4054

500mA Standalone Linear Li-Ion Battery Charger with Thermal Regulation

Product Specification

Specification Revision History:

Version	Date	Description
2020-03-A1	2020-03	New
2023-02-B1	2023-02	Update the template
2023-03-B2	2023-03	Modify the typical application circuit
2023-04-B3	2023-04	Modify the typical application circuit
2023-05-B4	2023-05	Modify the parameters
2023-06-B5	2023-06	Modify the content
2025-03-B6	2025-03	Modify the parameters
2025-05-B7	2025-05	Add Product List



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**1、General Description**

The AiP4054 is a single-cell Li-ion battery charger with thermal regulation that adopts trickle/constant current/constant voltage charging mode. The charging voltage is set at 4.2V, and the charging current can be set through external resistors. When the battery voltage reaches the set value and charging current drops to 1/10 of set value, AiP4054 automatically terminates charging and enters standby mode (<100uA supply current). In power-off state, the IC achieves <1uA battery leakage current. Integrated features include undervoltage lockout (UVLO), autonomous charging control and status indication.

Features:

- Programmable charging current: up to 500mA
- Trickle/constant current/constant voltage charging mode
- Pre-charge voltage: 4.2V $\pm$ 1%
- Charge status indication
- C/10 charge termination
- Overtemperature protection for charging
- Package form: SOT23-5

Product List

Product Name	Fully charged voltage
AiP4054	4.2V
AiP4054A	4.25V
AiP4054B	4.3V
AiP4054C	4.15V
AiP4054D	4.1V

**Ordering Information:****Reel packing specifications:**

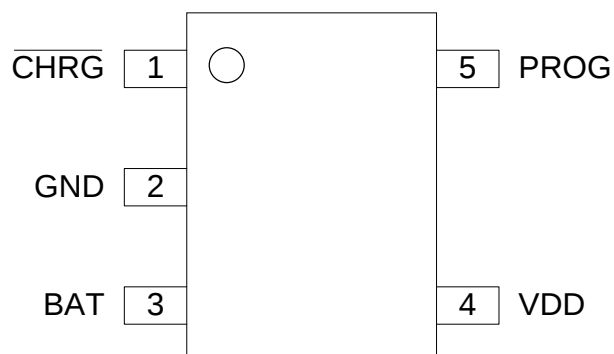
Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP4054GB235.TR	SOT23-5	4054	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP4054AGB235.TR	SOT23-5	4054	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP4054BGB235.TR	SOT23-5	4054	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP4054CGB235.TR	SOT23-5	4054	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm
AiP4054DGB235.TR	SOT23-5	4054	3000PCS/reel	30000PCS/box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.



2、Pin Description

2.1、Pin Configurations



2.2、Pin Description

Pin No.	Pin Name	Description
1	CHRG	Charging status indicator pin, open-drain output
2	GND	Ground
3	BAT	Battery port
4	VDD	Power supply
5	PROG	Charging current setting port

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, unless otherwise specified)

Characteristic	Symbol	Conditions	Value	Unit
Storage Temperature	T _{stg}	-	-65 to 150	℃
Junction temperature	T _J	-	150	℃
Operating Temperature	T _{amb}	-	-40 to 85	℃
Soldering Temperature	T _L	10s	260	℃



3.2、Electrical Characteristics

(T_{amb}=25℃, VDD=5V, unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating voltage	VDD	-	4.25	-	5.5	V
Input supply current	I _{VDD}	Charging mode, R _{PROG} =10KΩ	-	100	500	μA
		Standby mode (Charge termination)	-	45	100	
		Shutdown mode (VDD<V _{BAT} OR VDD<V _{UV})	-	45	100	
Floating charge voltage	V _{FLOAT}	AiP4054	4.158	4.2	4.242	V
		AiP4054A	4.207	4.25	4.292	V
		AiP4054B	4.257	4.3	4.343	V
		AiP4054C	4.108	4.15	4.191	V
		AiP4054D	4.059	4.1	4.141	V
BAT output current	I _{BAT}	R _{PROG} =10KΩ, V _{BAT} =3.6V	90	100	110	mA
		R _{PROG} =2KΩ, V _{BAT} =3.6V	450	500	550	
		Standby mode, V _{BAT} =4.2V	0	-2.5	-5	
		Shutdown mode, R _{PROG} off	-	±1	±2	μA
		Sleep mode, VDD=0V	-	±1	±2	
Trickle charging current	I _{TRIKL}	V _{BAT} <V _{TRIKL} , R _{PROG} =2KΩ	40	50	60	mA
Trickle charging threshold voltage	V _{TRIKL}	R _{PROG} =10KΩ, V _{BAT} rise	2.8	2.9	3.0	V
Trickle charging hysteretic voltage	V _{TRHYS}	R _{PROG} =10KΩ	100	200	300	mV
VDD undervoltage lockout threshold voltage	V _{UV}	VDD from Low to High	3.5	3.6	3.8	V
VDD undervoltage lockout hysteretic voltage	V _{UVHYS}	-	100	170	270	mV
VDD-VBAT lockout threshold voltage	V _{ASD}	VDD from Low to High	60	100	150	mV
		VDD from High to Low	60	100	150	
Charge termination current	I _{TERM}	R _{PROG} =10KΩ	0.08	0.1	0.12	mA / mA
		R _{PROG} =2KΩ	0.08	0.1	0.12	
PROG port voltage	V _{PROG}	R _{PROG} =10KΩ, constant current mode	0.9	1	1.1	V
CHRG output Low level voltage	V _{CHRG}	I _{CHRG} =5mA	-	80	150	mV
Recharging voltage difference	ΔV _{RECH}	V _{FLOAT} -V _{RECH}	80	100	120	mV
Overtemperature protection	OTP	temperature rise	-	170	-	℃



4、Function Description

The AiP4054 is a single-cell Li-ion battery charger with thermal regulation that adopts trickle/constant current/constant voltage charging mode. It is configured with a 4.2V charging voltage ($\pm 1\%$ accuracy) and supports charging current up to 500mA.

4.1、Charging Process

When the power supply VDD is powered on, charging begins when VDD rises above the UVLO threshold. When the BAT voltage is less than 2.9V, the chip enters the trickle charging mode. When the BAT voltage is greater than 2.9V, the chip enters the constant current charging mode with the charging current set as the specified current. When the BAT voltage approaches the charging voltage, the chip enters the constant voltage charging mode and the charging current begins to decrease. When the charging current drops to 1/10 of the set value, charging is completed.

4.2、Charging Current Programming

Charging current is set via external PROG-to-ground resistor. The formula for the charging current is as follows:

$$I_{CHG} = \frac{1000V}{R_{PROG}}$$

4.3、Charging Status Indication ($\overline{CHRG}$)

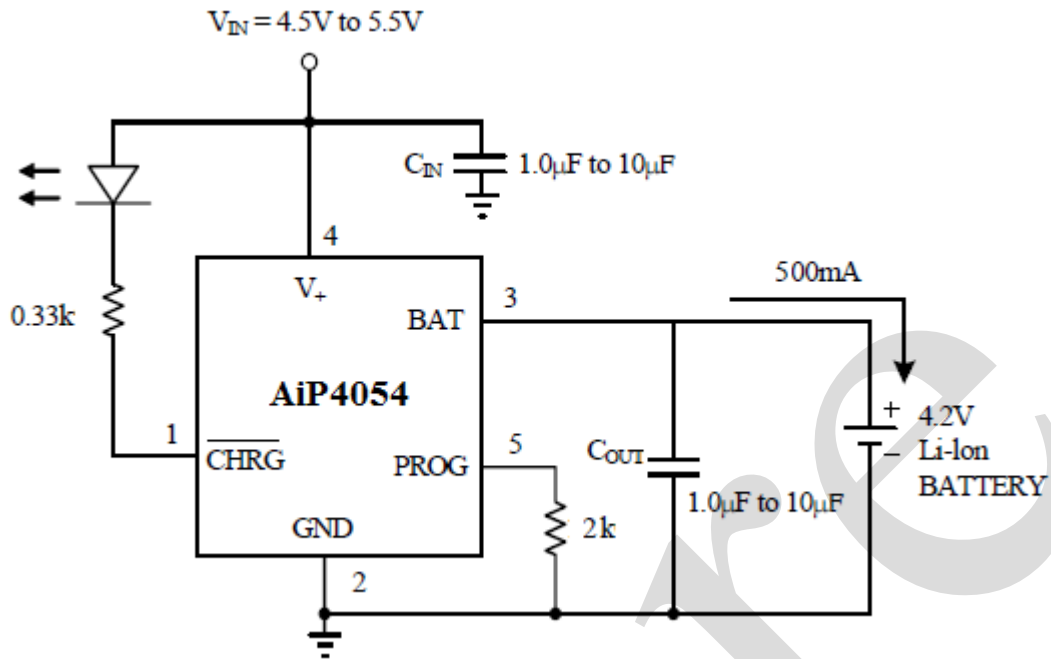
During charging, the $\overline{CHRG}$ port is pulled low by the built-in NMOS. When charging is completed, the $\overline{CHRG}$ port outputs a low narrow pulse.

4.4、Undervoltage Lockout (UVLO)

The AiP4054 is equipped with an undervoltage lockout function. When $VDD < V_{UVLO}$, the chip enters the shutdown mode until VDD rises above the undervoltage lockout threshold, and then the chip resumes charging.

4.5、Manual Shutdown

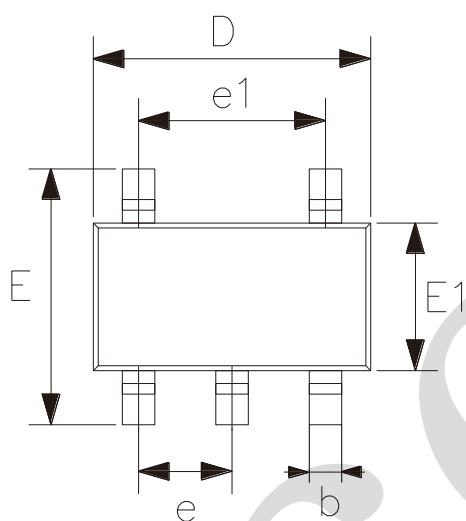
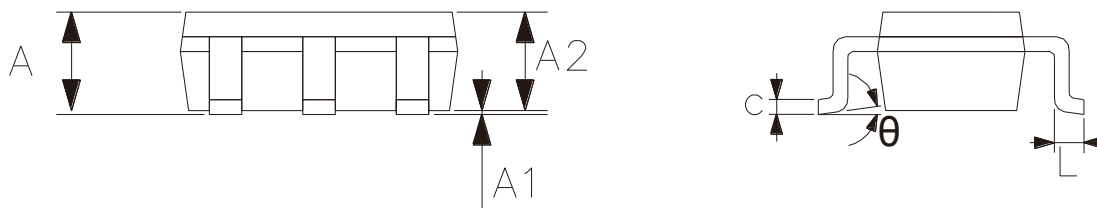
Removing PROG pin resistor enables shutdown mode. At this time, the battery current drops below 5 μ A and the power current is reduced to below 50 μ A. Reconnecting PROG resistor enables charging to continue.

**5、Typical Application Circuit**



6、Package Information

6.1、SOT23-5



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	—	1.26
A1	0.00	0.12
A2	1.00	1.20
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	2.60	3.00
E1	1.50	1.70
e	0.95	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°



7、Statements And Notes

7.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

7.2、Notes

We recommend you to read this chapter carefully before using this product.

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