

Description

TN4054B is a complete single lithium ion battery with constant current/constant voltage linear charger. Its SOT package and small number of external components make the TN4054B ideal for portable applications. TN4054B can be suitable for USB power and adapter power supply work.

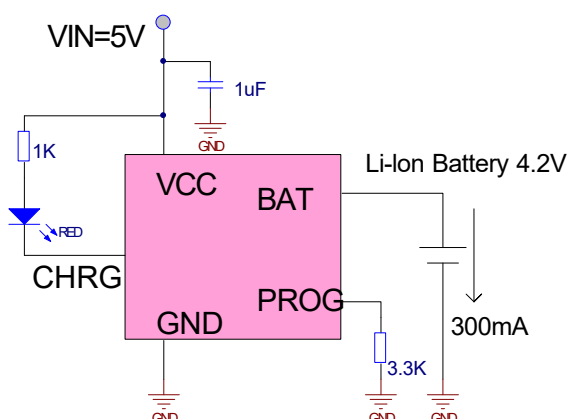
Due to the internal PMOSFET architecture, plus the anti-inverted charging circuit, there is no need for external detection resistor and isolation diode. Thermal feedback adjusts the charging current to limit chip temperature at high power operation or ambient temperature conditions. The charging voltage is fixed at 4.2V, and the charging current can be set externally through a resistor. When the charging current reaches the final floating charging voltage and drops to the set value of 1/10, TN4054B will automatically terminate the charging cycle.

When the input voltage (ac adapter or USB power supply) is removed, TN4054B automatically enters a low current state, reducing the battery leakage current below 2uA. TN4054B can also be placed in stop mode to reduce the power supply current to 45uA. Other features of the TN4054B include a charging current monitor, undervoltage latching, automatic recharging, and a status pin to indicate the end of charging and input voltage access.

Features

- 500mA programmable charging current
- No MOSFET, test resistor or isolation diode required
- A complete linear charger with SOT-23-5 package for single lithium ion battery
- Constant current/voltage operation, with thermal regulation function
- Charge single lithium ion battery directly from USB port
- 4.2V charging voltage is preset
- Output of charging current monitor for battery quantity detection
- C/10 Charge termination, automatic recharging
- Power supply current in standby mode is 50uA
- Soft boot limits the surge current
- 2.9V trickle charge device version

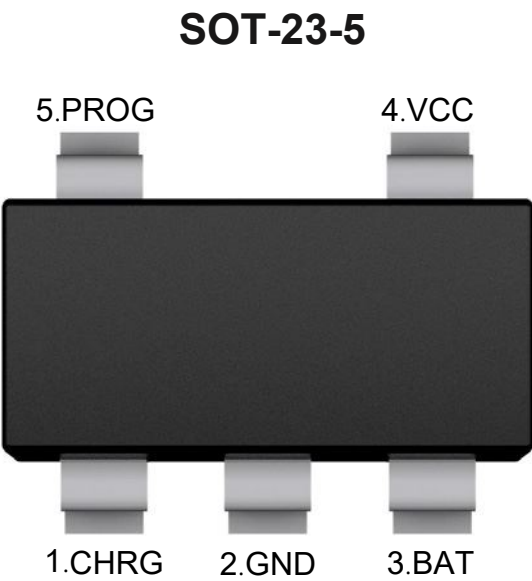
Applications



**Rprog resistance and charging current
Ibat corresponding table**

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

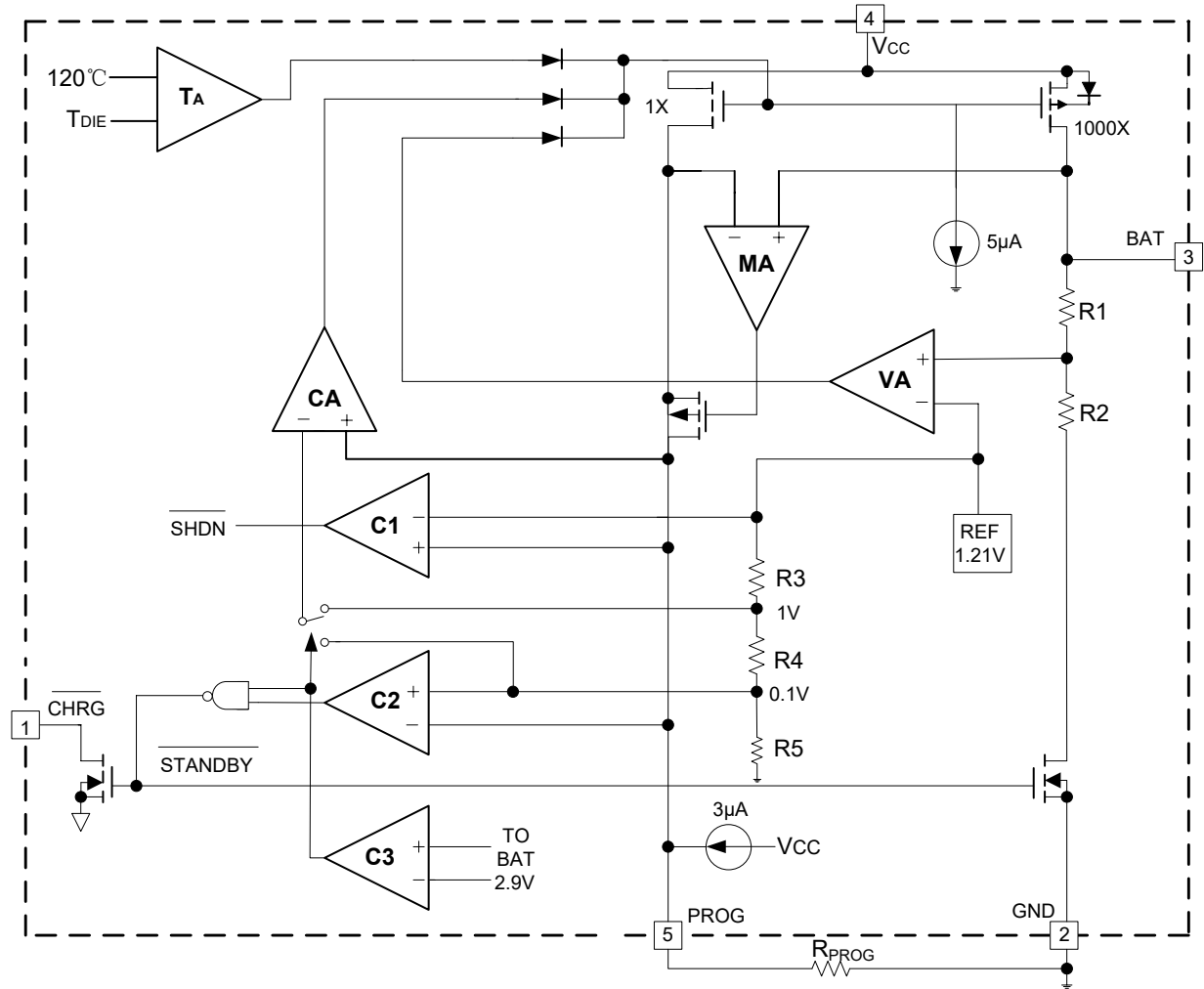
Pin Distribution



Pin Function

Pin No.	Symbol	Pin Function
1	CHRG	Output of open drain charging state. The CHRG pin is pulled to low level by an internal N-channel MOSFET during battery charging. When the charging cycle ends, CHRG pin is off and all lights are off. When TN4054B detects an under voltage blocking condition, the CHRG pin is forced to a high impedance state.
2	GND	Ground pin
3	BAT	Charging current output.The pin provides charging current to the battery and adjusts the final floating charging voltage to 4.2V. A precise internal resistance voltage divider of the pin sets the floating charging voltage. In the shutdown mode, the internal resistance voltage divider is disconnected.
4	VCC	Positive input power voltage.This pin supplies power to the charger.VCC shall vary from 4.25V to 6.5V and shall be bypassed by at least one 1uF capacitor.When the VCC drops to less than 30mV of BAT pin voltage,TN4054B enters the stop mode, and the Ibat falls below 2uA.
5	PROG	Charging current setting, charging current monitoring and stop pin.The charging current can be set by connecting a 1% precision resistor Pprog between the pin and the ground.When charging in constant current mode, the voltage of this pin is maintained at 1V. In all modes, the voltage on this pin can be used to calculate the charging current. The formula is Ibat=(Vprog/Rprog)*1000.Short connect the set resistor to the ground, and an internal 2.5uA current pulls the PROG pin to a high level.When the voltage of this pin reaches the stop threshold voltage of 1.22V, the charger enters the stop mode, the charging stops and the input power current drops to 45uA.Reconnecting the Rprog to the ground will restore the charger to normal operation.

Block Diagram



Absolute Maximum Ratings

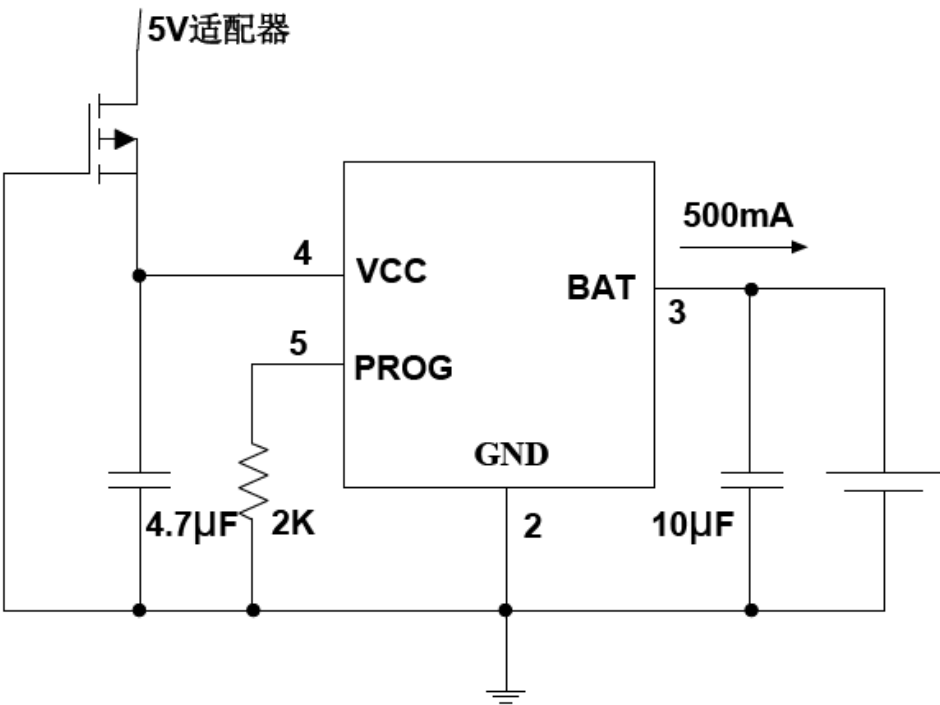
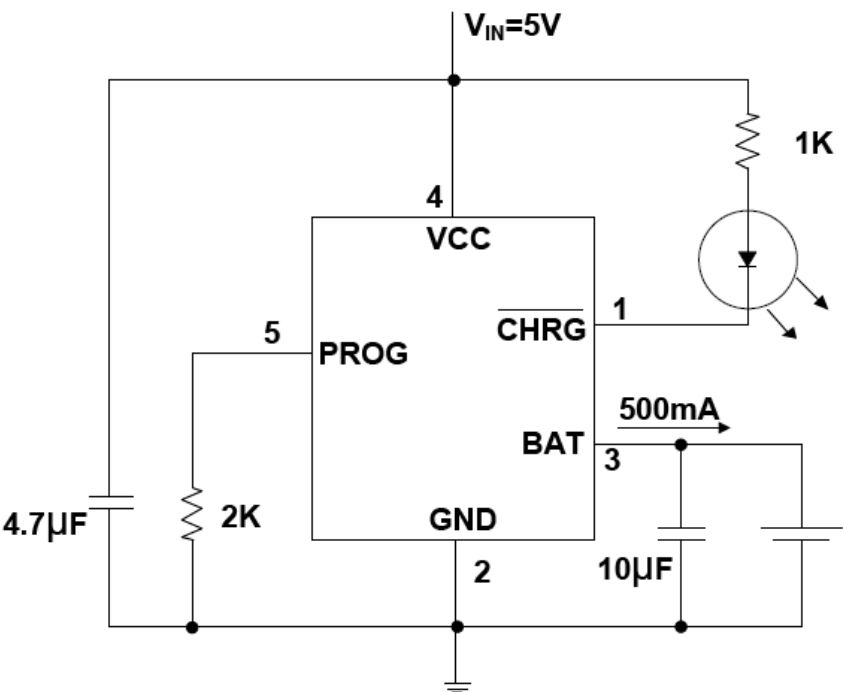
Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Rating
Input Voltage	4.5V~6V
PROG	-0.3V~VCC+0.3V
BAT	-0.3V~+7V
CHRG	-0.3V~+7V
BAT short-circuit period	Continue
BAT Pin Current	500mA
PROG Pin Current	800uA
Junction Temperature	145°C
Operating Temperature Range	-40°C~85°C
Storage Temperature	-65°C~125°C
Pin temperature (welding time: 10s)	260°C

Electrical Characteristics(V_{CC}=5V, T_A=25°C , unless otherwise noted.)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage	VCC		4.5	5	6	V
Input Current	ICC	charging mode, Rprog=10K	--	160	500	μA
		standby mode (Charge termination)	--	50	150	
		stop mode (RPROG ununited) VCC<Bbat o r VCC<Vuv	--	50	150	
Stable Output Voltage	VFLOAT	0°C≤T _A ≤85°C , Ibat=40mA	4.137	4.2	4.263	V
BAT Pin Current	IBAT	RPROG=10K,current mode	85	100	115	mA
		RPROG=2K,current mode	425	500	575	
		standby mode, Vbat=4.2V	0	-2.5	-6	μA
		stop mode (RPROG ununited)	--	±1	±2	
		sleep mode, VCC=0	--	-1	-2	
Trickle Charging Current	ITRIKL	VBAT<VTRIKL, Rprog=2K	85	100	115	mA
Trickle Charging Threshold Voltage	VTRIKL	RPROG=10K, Vbat up	2.7	2.85	3	V
Trickle Charging Hysteresis Voltage	VTRHYS	RPROG=10K,Vbat Down	60	150	200	mV
VCC Undervoltage Locking Threshold	VUV	VCC from low to high	3.7	3.8	3.99	V
VCC Undervoltage Atresia Hysteresis	VUVHYS	VCC from high to Low	150	250	300	mV
Manual Shutdown Threshold Voltage	VMSD	PROG pin level up	0.96	1.05	1.1	V
		PROG pin level down	0.9	1	1.1	
Blocking Threshold Voltage	VASD	VCC from low to high	70	120	180	mV
		VCC from high to low	5	40	120	
C/10 Termination Current Threshold	ITERM	RPROG=10K	0.085	0.1	0.115	mA
		RPROG=2K	0.085	0.1	0.115	
PROG Pin Voltage	VPROG	RPROG=10K, current mode	0.9	1	1.08	V
Pin Output Low Voltage	VCHRG	ICHRG=5mA	0.1	0.35	0.6	V
Recharging Battery Threshold Voltage	ΔV _{RECHRG}	VFLOAT~VRECHRG	100	120	200	mV
Recharging Comparator Filter Time	t _{RECHARGE}	VBAT from high to low	0.75	2	4	mS
Stop Comparator Filter Time	t _{TERM}	IBAT below Ichg/10	0.8	1.8	4	mS
PROG Pin Pull Current	I _{PROG}		--	3	--	μA

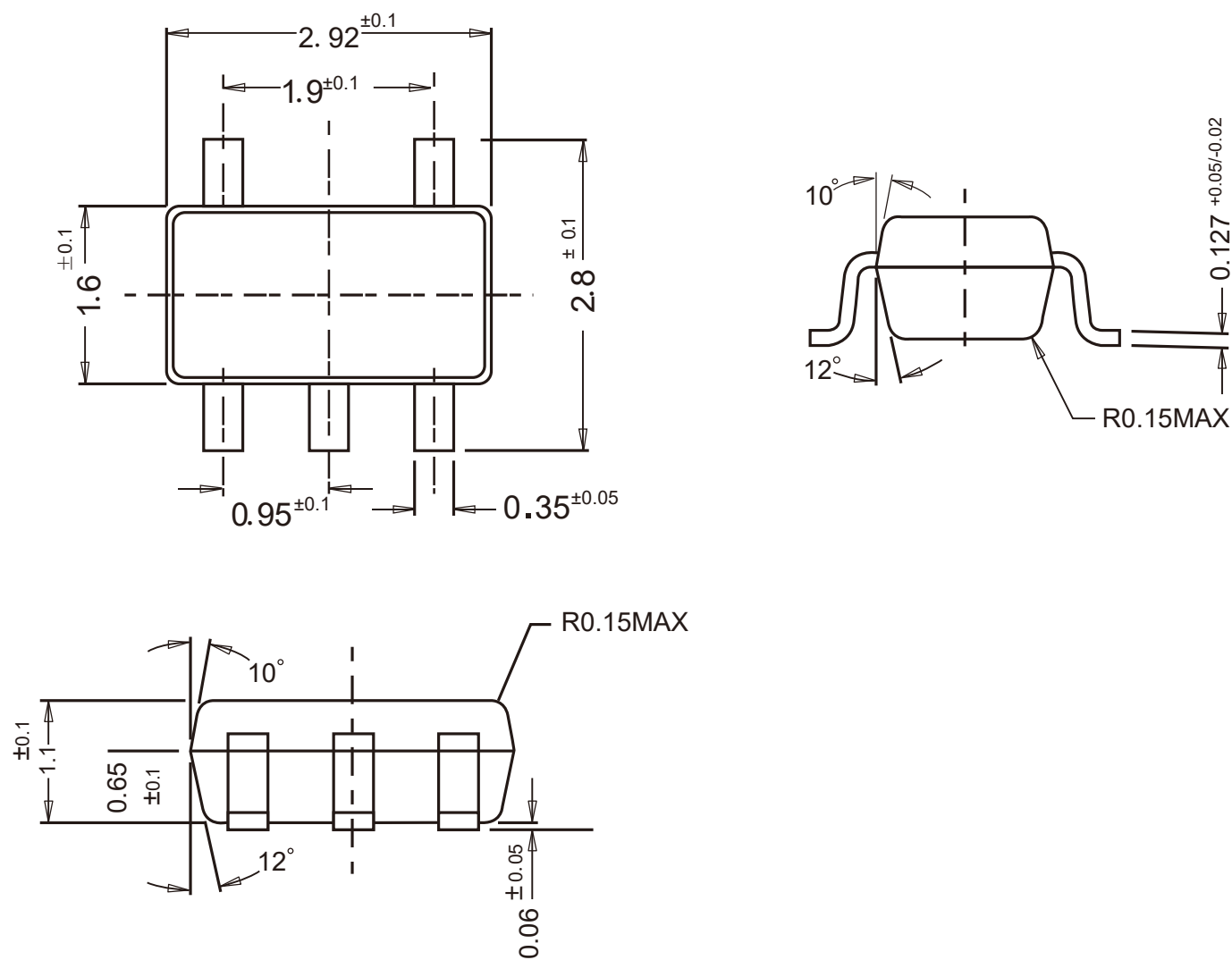
Typical Applications



Package Outline

SOT-23-5

Dimensions in mm



Ordering Information

Device	Package	Shipping
TN4054B	SOT-23-5	3,000PCS/Reel&7inches

Contact Information

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For additional information, please contact your local Sales Representative.

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Product Specification Statement

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The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. TANI shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations.

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