

### GENERAL DESCRIPTION

The ACP6054 is a complete constant-current and constant-voltage linear charger for single cell lithium-ion and Lithium-Polymer batteries. Its SOT23-5 package and low external component count make ACP6054 ideally suited for portable applications. Furthermore, the ACP6054 is specially designed to work within USB power specification. At the same time, ACP6054 can also be used in the standalone lithium-ion and Lithium-Polymer battery charger. The charge voltage is fixed at 4.2V, and the charge current can be programmed externally with a single resistor. Also thermal feedback regulated the charge current to limit the die temperature.

When the input supply is removed, the chip automatically enters a low current stage, dropping the battery drain current to less than 2uA. The ACP6054 can be put into shutdown mode, reducing the supply current to 25uA.

Other features include charge current monitor, under voltage lockout, automatic recharge and a status pin to indicate termination and the presence of an input voltage.

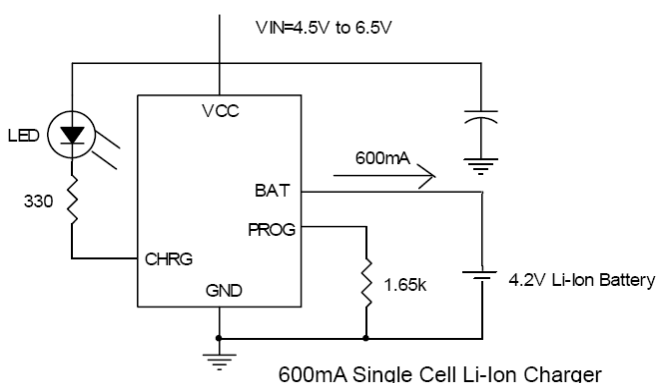
### FEATURES

- Programmable Charge Current Up to 800mA
- Simple Application Circuit
- Thermal Protection Reduce Overheating Risk
- Directly Charge from USB Port Is Available
- With  $\pm 1\%$  Accuracy at 4.2V Charging
- 25uA Supply Current in Shutdown
- 2.9V Trickle Charge Threshold
- Without Trickle Charge is Available
- Soft Start Limits Inrush Current
- Tiny 5-pin SOT23-5 Package

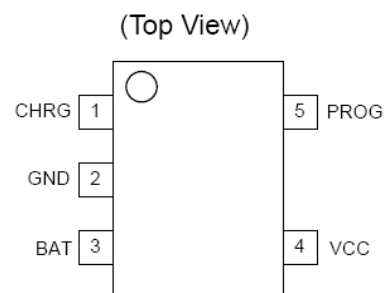
### APPLICATION

- Cellular Phone
- GPS,DSC,MP4,PDA
- Charging Docks and Cradles
- Bluetooth Application

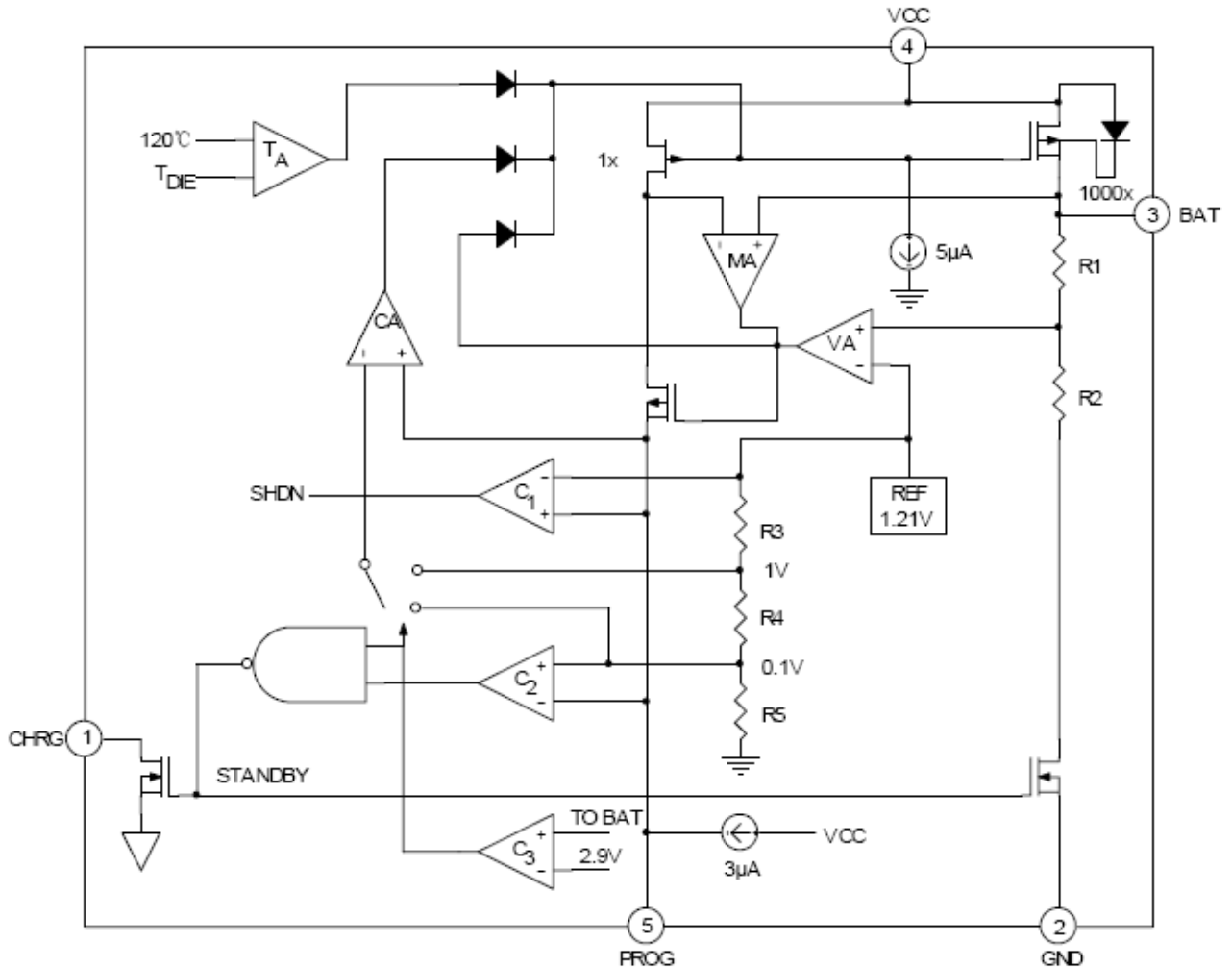
### TYPICAL APPLICATION CIRCUIT



### PIN CONFIGURATION



### BLOCK DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Input Supply Voltage	V <sub>CC</sub>	10	V
PROG Voltage	V <sub>PROG</sub>	V <sub>CC</sub> +0.3	V
BAT Voltage	V <sub>BAT</sub>	7	V
CHRG Voltage	V <sub>CHRG</sub>	10	V
BAT Pin Current	I <sub>BAT</sub>	800	mA
PROG Pin Current	I <sub>PROG</sub>	800	µA
Maximum Junction Temperature	T <sub>J</sub>	125	°C
Storage Temperature	T <sub>S</sub>	-65 to +125	°C
Lead Temperature(Soldering, 10 Sec.)		300	°C
Operating Temperature Range	T <sub>op</sub>	-40 to +80	°C

## ELECTRICAL CHARACTERISTICS

( $V_{IN}=5V$ ,  $V_{OUT}=1.8V$ ,  $T_J=25^{\circ}C$ , Unless Otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_{CC}$	Input Supply Voltage		4.5	5.0	6.5	V
$I_{CC}$	Input Supply Current	Charge Mode( <sup>note3</sup> ), $R_{PROG}=10K$		300		$\mu A$
		Standby Mode(Charge Terminated)		200		$\mu A$
		Shutdown Mode( $R_{PROG}$ Not Connected, $V_{CC} < V_{BAT}$ , or $V_{CC} < V_{UV}$ )		25		$\mu A$
$V_{FLOAT}$	Regulated Output (Float) Voltage	$0^{\circ}C \leq T_J \leq 85^{\circ}C$ , $I_{BAT}=40mA$	4.158	4.2	4.242	V
$I_{BAT}$	BAT Pin Current	Current Mode, $P_{PROG}=10K$	93	100	107	mA
		Current Mode, $P_{PROG}=2K$	265	300	335	mA
		Standby Mode, $V_{BAT}=4.2V$		7.5		$\mu A$
		Shutdown Mode, $P_{PROG}$ Not Connected		7.6		$\mu A$
		Sleep Mode, $V_{CC}=0V$		0.4		$\mu A$
$I_{TRIKL}$	Trickle Charge Current	$V_{BAT} < V_{TRIKL}$ , $P_{PROG}=10K$		39		mA
$V_{UV}$	$V_{CC}$ Under Voltage Lockout Hysteresis	From $V_{CC}$ Low to High		3.4		V
$V_{UVHYS}$	$V_{CC}$ Under Voltage Lockout Hysteresis			100		mV
$V_{MSD}$	Manual Shutdown Threshold Voltage	PROG Pin Rising	1.0	1.1	1.3	V
		PROG Pin Falling	0.9	1.0	1.1	V
$V_{ASD}$	$V_{CC}-V_{BAT}$ Lockout Threshold Voltage	$V_{CC}$ From Low to High		8		mV
		$V_{CC}$ from High to Low		80		mV
$I_{TERM}$	C/10 Termination Current Threshold	$R_{PROG}=2K$		111		mA
$V_{PROG}$	PROG Pin Voltage	Current Mode, $R_{PROG}=10K$	0.93	1.04	1.07	V
$I_{CHRG}$	CHRG Pin Output Low Voltage	$I_{CHRG}=5mA$		20		$\mu A$

### APPLICATION HINTS

#### ■ STABILITY CONSIDERATIONS

The Constant-voltage mode feedback loop is stable without an output capacitor provided a battery is connected to the charge output. With no battery present, an output capacitor is recommended to reduce ripple voltage. When using high value, low ESR ceramic capacitors, it is recommended to add a 1Ω resistor in series with the capacitor. No series resistor is needed if tantalum capacitors are used.

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 this mode reduces the maximum allowed program resistor. The pole frequency at the PROG pin should be kept above 100KHz.

#### ■ V<sub>CC</sub> 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 charge input to a live power source. Adding a 1.5Ω resistor in series with a ceramic capacitor will minimize start-up voltage transients.

#### ■ POWER DISSIPATION

The conditions that cause the ACP6054 to 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- this is calculated to be approximately:  $P_D = (V_{CC} - V_{BAT}) * I_{BAT}$

#### ■ THERMAL CONSIDERATIONS

Because of the small size of the SOT23-5 package, it is very important to use a good 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 cooper lead frame, through the package leads,(especially the ground lead) to the PCB copper. The PCB 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 affect overall temperature rise and the maximum charge current.

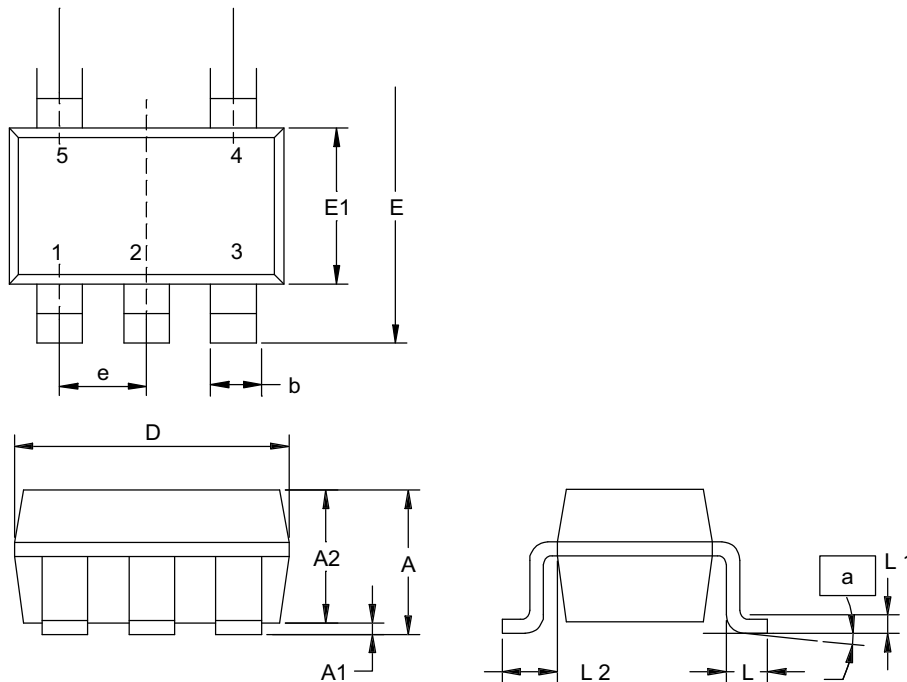
### ORDERING AND MARKING INFORMATION

Standard Part NO.	Package	Packing	Min. Quantity	RoHS
ACP6054-BTRAL	SOT23-5	Tape&Reel	3000PCS	Pb Free

Remark: for marking information, please see sample or contact our sales for more detail information.

### PACKAGE INFORMATION

#### SOT23-5



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.95	1.45	0.037	0.057
A1	0.05	0.15	0.002	0.006
A2	0.90	1.30	0.035	0.051
b	0.35	0.55	0.0138	0.0217
D	2.8	3.00	0.110	0.118
E	2.6	3.00	0.102	0.118
E1	1.5	1.70	0.059	0.067
e	0.95		0.037	
e1	1.90		0.075	
L	0.35	0.55	0.014	0.022
L1	0.20 BSC		0.008 BSC	
L2	0.5	0.7	0.020	0.028
a	0°	10°	0°	10°