

TP4055 Standalone Linear Li-Ion Battery Charger with Thermal Regulation in SOT (Reverse battery protection)

DESCRIPTION

The TP4055 is a complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries, Reverse battery protection. Its SOT package and low external component count make the TP4055 ideally suited for portable applications. Furthermore, the TP4055 can work within USB and wall adapter.

No external sense resistor is needed, and no blocking diode is required due to the internal PMOSFET architecture and have prevent to negative Charge Current Circuit. Thermal feedback regulates the charge current to limit the die temperature during high power operation or high ambient temperature. The charge voltage is fixed at 4.2V, and the charge current can be programmed externally with a single resistor. The TP4055 automatically terminates the charge cycle when the charge current drops to 1/10th the programmed value after the final float voltage is reached.

When the input supply (wall adapter or USB supply) is removed, the TP4055 automatically enters a low current state, dropping the battery drain current to less than 2uA. The TP4055 can be put into shut down mode, reducing the supply current to 40uA. Other features include current monitor, under voltage lockout, automatic recharge and one status pin to indicate charge termination and the presence of an input voltage.

FEATURES

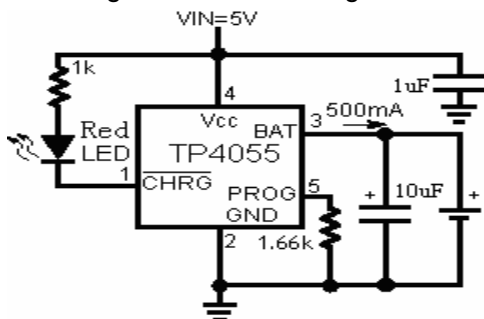
- lithium-ion batteries Reverse battery protection
- Programmable Charge Current Up to 500mA
- No MOSFET, Sense Resistor or Blocking Diode Required
- Complete Linear Charger in SOT23-6 Package for Single Cell Lithium-Ion Batteries
- Constant-Current/Constant-Voltage Operation with Thermal Regulation to Maximize Charge Rate Without Risk of Overheating
- Charges Single Cell Li-Ion Batteries Directly from USB Port
- Preset 4.2V Charge Voltage with 1% Accuracy
- Charge Current Monitor Output for Gas Gauging
- Automatic Recharge
- Charge Status Output Pin
- C/10 Charge Termination
- 40uA Supply Current in Shutdown
- 2.9V Trickle Charge Threshold (TP4055)
- Soft-Start Limits Inrush Current
- Available in 6-Lead SOT-23 Package

APPLICATIONS

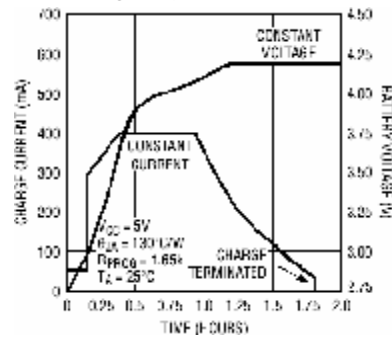
- Cellular Telephones, PDAs, MP3 Players
- Charging Docks and Cradles
- Blue tooth Applications

TYPICAL APPLICATION

500mA Single Cell Li-Ion Charger



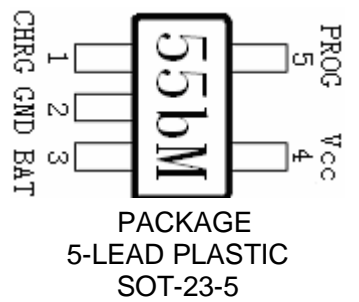
Complete Charge Cycle (600mAh Battery)



ABSOLUTE MAXIMUM RATINGS

- Input Supply Voltage(V_{CC}): $-0.3V \sim 9V$
- PROG: $-0.3V \sim V_{CC}+0.3V$
- BAT: $-4.2V \sim 7V$
- \overline{CHRG} : $-0.3V \sim 9V$
- BAT Short-Circuit Duration: Continuous
- BAT Pin Current: 500mA
- PROG Pin Current: 800uA
- Maximum Junction Temperature: $145^{\circ}C$
- Operating Ambient Temperature Range: $-40^{\circ}C \sim 85^{\circ}C$
- Storage Temperature Range: $-65^{\circ}C \sim 125^{\circ}C$
- Lead Temperature(Soldering, 10sec): $260^{\circ}C$

PACKAGE DESCRIPTION

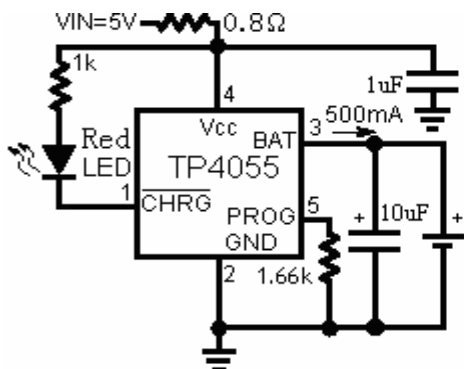
 <p>PACKAGE 5-LEAD PLASTIC SOT-23-5</p>	ORDER PART NUMBER
	TP4055-42-SOT
	25-R
	PART MARKING
	55bm

ELECTRICAL CHARACTERISTICS

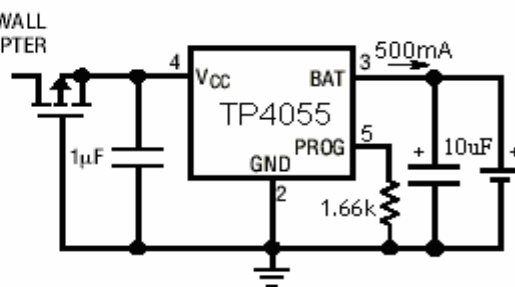
The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at $T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS	
V_{CC}	Input Supply Voltage		● 4.0	5	9.0	V	
I_{CC}	Input Supply Current	Charge Mode, $R_{PROG} = 10\text{k}$	●	150	500	μA	
		Standby Mode (Charge Terminated)	●	40	100	μA	
		Shutdown Mode (R_{PROG} Not Connected, $V_{CC} < V_{BAT}$, or $V_{CC} < V_{UV}$)	●	40	100	μA	
V_{FLOAL}	Regulated Output (Float) Voltage	$0^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$, $I_{BAT}=40\text{mA}$	4.158	4.2	4.242	V	
I_{BAT}	BAT Pin Current	$R_{PROG} = 10\text{k}$, Current Mode	●	90	110	mA	
		$R_{PROG} = 1.66\text{k}$, Current Mode	●	480	520	mA	
		Standby Mode, $V_{BAT} = 4.2\text{V}$	●	0	-2.5	-6	μA
		Shutdown Mode (R_{PROG} Not Connected)			± 1	± 2	μA
	Sleep Mode, $V_{CC} = 0\text{V}$			-1	-2	μA	
I_{TRIKL}	Trickle Charge Current	$V_{BAT} < V_{TRIKL}$, $R_{PROG}=10\text{K}$	● 10	15	20	mA	
V_{UV}	V_{CC} Undervoltage Lockout Threshold	From V_{CC} Low to High	● 3.4	3.6	3.8	V	
I_{TERM}	C/10 Termination Current Threshold	$R_{PROG}=10\text{K}$	●	8	12	mA	
		$R_{PROG}=1.66\text{K}$	●	30	50	mA	
V_{PROG}	PROG Pin Voltage	$R_{PROG}=10\text{K}$, Current Mode	● 0.9	1.0	1.1	V	
$V_{\overline{\text{CHRG}}}$	$\overline{\text{CHRG}}$ Pin Output Low Voltage	$I_{\overline{\text{CHRG}}} = 5\text{mA}$		0.3	0.6	V	
t_{ss}	Soft-Start Time	$I_{BAT} = 0$ to $I_{BAT} = 1000\text{V}/R_{PROG}$		20		ms	

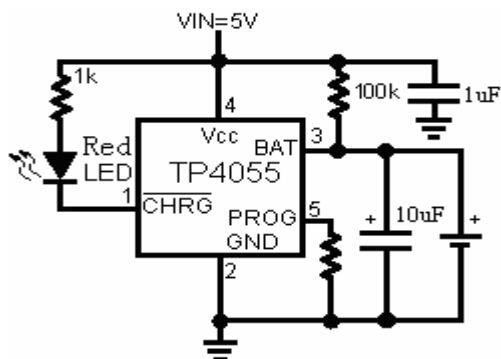
TYPICAL APPLICATIONS



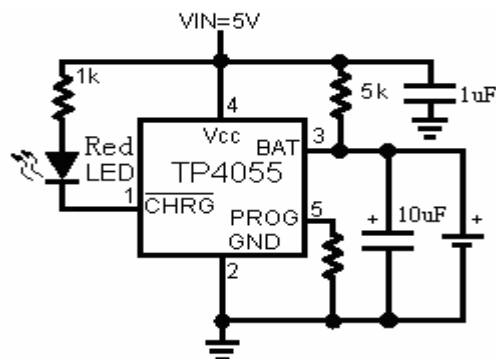
500mA Single Cell Li-Ion Charger



Low Loss Input Reverse Polarity Protection



No battery RED LED not flashing



Light body without battery