TP4056 1A Standalone Linear Li-Ion Battery Charger with Thermal Regulation in SOP-8

DESCRIPTION

The TP4056 is a complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries. Its SOP package and low external component count make the TP4056 ideally suited for portable applications. Furthermore, the TP4056 can work within USB and wall adapter.

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 TP4056 automatically terminates the charge cycle when the charge current drops to 1/10th the programmed value after the final float voltage is reached.

TP4056 Other features include current monitor, under voltage lockout, automatic recharge and two status pin to indicate charge termination and the presence of an input voltage.

FEATURES

- Programmable Charge Current Up to 1000mA
- No MOSFET, Sense Resistor or Blocking Diode Required
- Complete Linear Charger in SOP-8 Package for Single Cell Lithium-Ion Batteries
- Constant-Current/Constant-Voltage
- Charges Single Cell Li-Ion Batteries Directly from USB Port
- Preset 4.2V Charge Voltage with 1.5% Accuracy
- Automatic Recharge
- two Charge Status Output Pins
- C/10 Charge Termination
- 2.9V Trickle Charge Threshold (TP4056)
- Soft-Start Limits Inrush Current
- Available Radiator in 8-Lead SOP Package, the Radiator need connect GND or impending

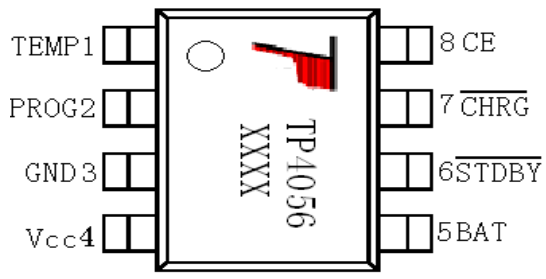
ABSOLUTE MAXIMUM RATINGS

- Input Supply Voltage(V_{CC})：-0.3V～8V
- TEMP：**-0.3V**～10V
- CE：**-0.3V**～10V
- BAT Short-Circuit Duration：Continuous
- BAT Pin Current：1200mA
- PROG Pin Current：1200uA
- Maximum Junction Temperature：145℃
- Operating Ambient Temperature Range：-40℃～85℃
- Lead Temp.(Soldering, 10sec)：260℃

APPLICATIONS

- Cellular Telephones, PDAs, GPS
- Charging Docks and Cradles
- Digital Still Cameras, Portable Devices
- USB Bus-Powered Chargers,Chargers

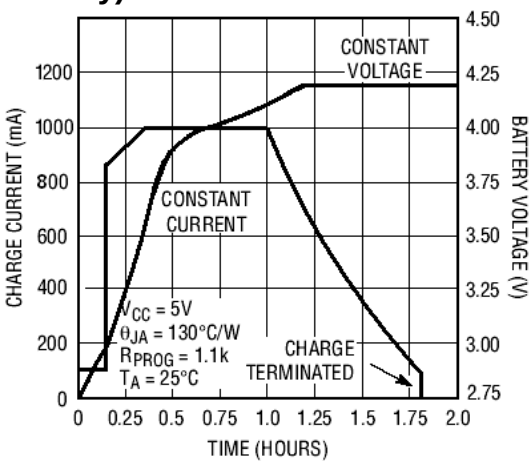
PACKAGE/ORDER INFORMATION



SOP－8

photo	ORDER PART NUMBER
	TP4056-42-SOP8-PP
	PART MARKING TP4056

Complete Charge Cycle (1000mAh Battery)



TEMP(Pin 1) :Temperature Sense Input Connecting TEMP pin to NTC thermistor's output in Lithium ion battery pack. If TEMP pin's voltage is below 45% or above 80% of supply voltage V_{IN} for more than 0.15S, this means that battery's temperature is too high or too low, charging is suspended. The temperature sense function can be disabled by grounding the TEMP pin.

PROG(Pin 2): Constant Charge Current Setting and Charge Current Monitor Pin charge current is set by connecting a resistor R_{ISET} from this pin to GND. When in precharge mode, the ISET pin's voltage is regulated to 0.2V. When in constant charge current mode, the ISET pin's voltage is regulated to 2V.In all modes during charging, the voltage on ISET pin can be used to measure the charge current as follows:

$$I_{BAT} = \frac{V_{PROG}}{R_{PROG}} \times 1200 \quad (V_{PROG}=1V)$$

GND(Pin3): Ground Terminal

Vcc(Pin 4): Positive Input Supply Voltage V_{IN} is the power supply to the internal circuit. When V_{IN} drops to within 30mv of the BAT pin voltage, TP4056 enters low power sleep mode, dropping BAT pin's current to less than 2uA.

BAT(Pin5): Battery Connection Pin. Connect the positive terminal of the battery to BAT pin. BAT pin draws less than 2uA current in chip disable mode or in sleep mode. BAT pin provides charge current to the battery and provides regulation voltage of 4.2V.

$\overline{\text{STDBY}}$(Pin6): Open Drain Charge Status Output When the battery Charge Termination, the $\overline{\text{STDBY}}$ pin is pulled low by an internal switch, otherwise $\overline{\text{STDBY}}$ pin is in high impedance state.

$\overline{\text{CHRG}}$ (Pin7): Open Drain Charge Status Output When the battery is being charged, the $\overline{\text{CHRG}}$ pin is pulled low by an internal switch, otherwise $\overline{\text{CHRG}}$ pin is in high impedance state.

CE(Pin8): Chip Enable Input. A high input will put the device in the normal operating mode. Pulling the CE pin to low level will put the YP4056 into disable mode. The CE pin can be driven by TTL or CMOS logic level.

ELECTRICAL CHARACTERISTICS

The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at **T_A=25℃， V_{CC}=5V**， unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{CC}	Input Supply Voltage		●	4.0	5	8.0	V
I_{CC}	Input Supply Current	Charge Mode, R_{PROG} = 1.2k StandbyMode(Charge Terminated) Shutdown Mode (R_{PROG} Not Connected,V_{CC} < V_{BAT}, or V_{CC} < V_{UV})	● ● ●		150 55 55	500 100 100	μA μA μA
V_{FLOAL}	Regulated Output (Float) Voltage	0℃≤T_A≤85℃， I_{BAT}=40mA		4.137	4.2	4.263	V
I_{BAT}	BAT Pin Current Text condition:VBAT=4.0V	R_{PROG} = 2.4k, Current Mode R_{PROG} = 1.2k, Current Mode Standby Mode, V_{BAT} = 4.2V	● ● ●	450 950 0	500 1000 −2.5	550 1050 −6	mA mA μA
I_{TRIKL}	Trickle Charge Current	V_{BAT}<V_{TRIKL}, R_{PROG}=1.2K	●	120	130	140	mA
V_{TRIKL}	Trickle Charge Threshold Voltage	R_{PROG}=1.2K, V_{BAT} Rising		2.8	2.9	3.0	V
V_{TRHYS}	Trickle Charge Hysteresis Voltage	R_{PROG}=1.2K		60	80	100	mV
T_{LIM}	Junction Temperature in Constant Temperature Mode				145		℃

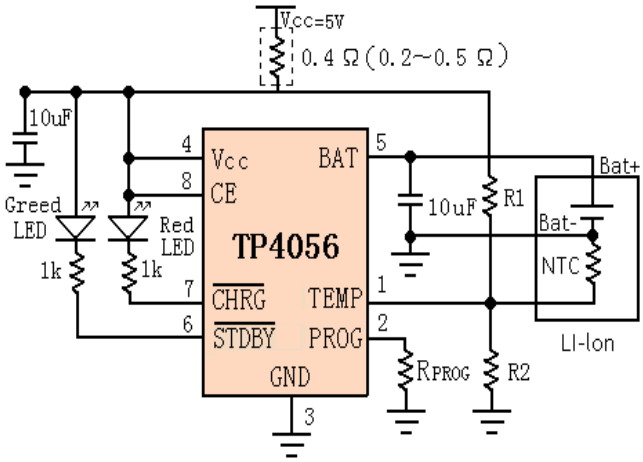
indicator light state

Charge state	Red LED $\overline{CHRG}$	Greed LED $\overline{STDBY}$
charging	bright	extinguish
Charge Termination	extinguish	bright
Vin too low; Temperature of battery too low or too high; no battery	extinguish	extinguish
BAT PIN Connect 10u Capacitance; No battery	Greed LED bright，Red LED Coruscate T=1-4 S	

Rprog Current Setting

R_{PROG} (k)	I_{BAT} (mA)
10	130
5	250
4	300
3	400
2	580
1.66	690
1.5	780
1.33	900
1.2	1000

TYPICAL APPLICATIONS



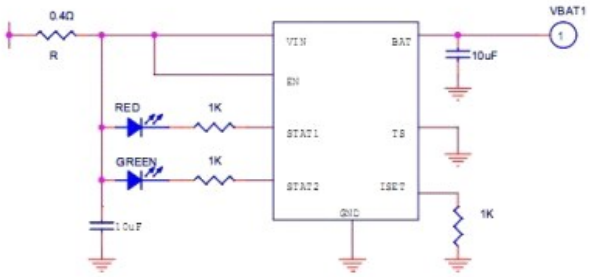
TP4056

1A USB-Compliant Li-Ion/Polymer Charger IC for Portable Applications

General Description

The TP4056 is a complete constant-current/constant- voltage linear charger for single cell lithium-ion batteries. Its SOP8 package and low external component count make the TP4056 ideally suited for portable applications. Furthermore, the TP4056 is specifically designed to work within USB power and wall Adapter.

No external sense resistor is needed, and no blocking diode is required due to the internal MOSFET architecture. 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 TP4056 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 TP4056 automatically enters a low current state, dropping the battery drain current to less than 2μA. The TP4056 can be put into shutdown mode, reducing he supply current to 55μA.Other features include charge current monitor, undervoltage lockout, automatic recharge and a status pin to indicate charge termination and the presence of an input voltage.



Features

- Programmable Charge Current Up to 1000mA
- No MOSFET, Sense Resistor or Blocking Diode Required
- Complete Linear Charger in SOP8
- 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
- Two Charge Status Output Pin
- Automatic Recharge
- Soft-Start Limits Inrush Current
- Available Radiator in 8-Lead SOP8
- Package,the radiator need connect GND or impending
- 2.9V Trickle Charge Threshold
- C/10 Charge Termination
- 2.9V Trickle Charge Threshold

Applications

- Portable Media Players/MP3 players
- Cellular Telephones,GPS,PDAs
- Digital Still Cameras,Portable Devices
- Bluetooth Applications

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Ordering Information

TP4056-□□

F:PB-Free

Package
S:SOP8

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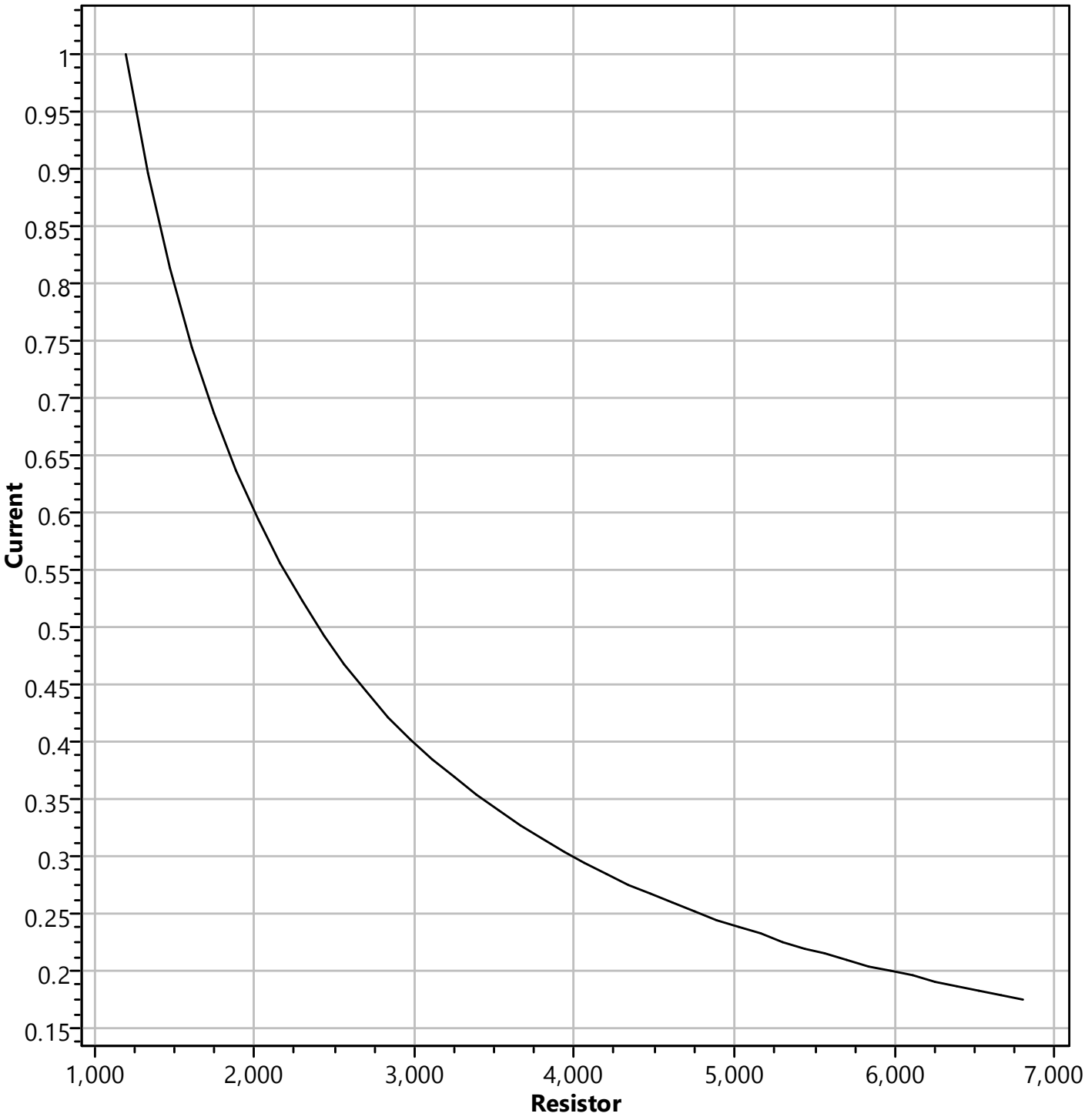
Marking Information

Please see website.

Toxic - TP4056



y = (1 / x) * 1,200

n	X-Value	Y-Value
1	1,200	1
2	1,336.58536585365854	0.89781021897810219
3	1,473.17073170731707	0.81456953642384106
4	1,609.75609756097561	0.74545454545454545
5	1,746.34146341463415	0.68715083798882682
6	1,882.92682926829268	0.63730569948186529
7	2,019.51219512195122	0.59420289855072464
8	2,156.09756097560976	0.55656108597285068
9	2,292.68292682926829	0.52340425531914894
10	2,429.26829268292683	0.49397590361445783
11	2,565.85365853658537	0.46768060836501901
12	2,702.4390243902439	0.44404332129963899
13	2,839.02439024390244	0.42268041237113402
14	2,975.60975609756098	0.40327868852459016
15	3,112.19512195121951	0.38557993730407524
16	3,248.78048780487805	0.36936936936936937
17	3,385.36585365853659	0.35446685878962536
18	3,521.95121951219512	0.3407202216066482
19	3,658.53658536585366	0.328
20	3,795.1219512195122	0.31619537275064267
21	3,931.70731707317073	0.30521091811414392
22	4,068.29268292682927	0.29496402877697842
23	4,204.8780487804878	0.28538283062645012
24	4,341.46341463414634	0.27640449438202247
25	4,478.04878048780488	0.26797385620915033
26	4,614.63414634146342	0.26004228329809725
27	4,751.21951219512195	0.25256673511293635
28	4,887.80487804878049	0.24550898203592814
29	5,024.39024390243903	0.23883495145631068
30	5,160.97560975609756	0.23251417769376182
31	5,297.5609756097561	0.22651933701657459
32	5,434.14634146341463	0.22082585278276481
33	5,570.73170731707317	0.21541155866900175
34	5,707.31707317073171	0.21025641025641026
35	5,843.90243902439024	0.20534223706176962
36	5,980.48780487804878	0.20065252854812398
37	6,117.07317073170732	0.19617224880382775
38	6,253.65853658536585	0.19188767550702028
39	6,390.24390243902439	0.18778625954198473
40	6,526.82926829268293	0.18385650224215247
41	6,663.41463414634146	0.18008784773060029
42	6,800	0.17647058823529412