

## Descriptions

The CTCL4056BSE is a complete CC/CV linear charger for single cell lithium-ion batteries, It has the function of positive and negative electrode protection for battery. Its ESOP-8 package and low external component count make the CTCL4056BSE ideally suited for portable applications. Furthermore, the CTCL4056BSE is specifically designed to work within USB power specifications.

No external sense resistor is needed and no blocking diode is required due to the internal P-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 CTCL4056BSE 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 CTCL4056BSE automatically enters a low current state dropping the battery drain current to less than 3  $\mu$  A. Other features include charge current monitor, under-voltage lockout, automatic recharge and two status pins to indicate charge and charge termination.

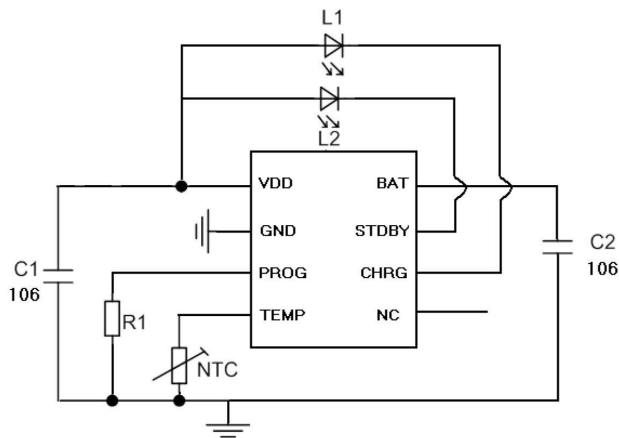
## Features

- Preset 4.20V charge voltage with  $\pm 1\%$  accuracy
- Maximum allowable input voltage is 8V
- With BAT-VIN anti-backflow function
- Linear charge mode, built-in 1A MOSFET, Trickle /Constant current/Constant voltage three stage charging, externally adjustable charging current
- Supports 0V battery charging
- Short circuit protection, battery polarity reverse polarity protection
- Charges single cell Li-ion batteries Directly from USB port
- Intelligent temperature control technology, charging current will decrease with increasing temperature, 130 $^{\circ}$ C began to decline, the lowest can be reduced to 0
- Soft-Start limits inrush current
- Automatic recharge
- 4KV ESD (HBM mode)
- Halogen-free Product

## Applications

- Suitable for USB power and adapter power,Bluetooth applications and other portable devices.

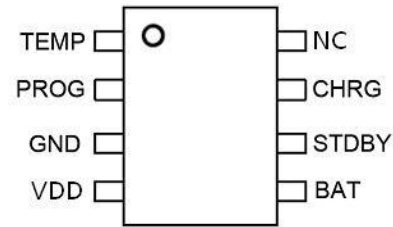
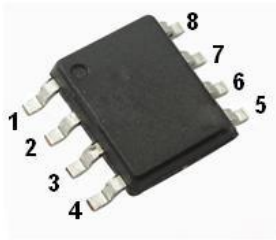
## Typical Application



## Indicator light working state

charging state	L1 (CHRG)	L2 (STDBY)
Charging	Light	Lights off
Battery full	Lights off	Light
Undervoltage, battery temperature is too high, too low or other fault conditions, or no battery access (use TEMP)	Lights off	Lights off
BAT terminated with 10uF capacitor, no battery	Flashing light T=1-4s	Light

## Pinning



pin	name	description
1	TEMP	External temperature sensing pin
2	PROG	Charge current regulator
3	GND	Chip ground
4	VDD	External input DC 5V
5	BAT	Battery input
6	STDBY	Battery charge completion indicator
7	CHRG	Charging indicator
8	NC	Vacant

## Marking

See Marking Instructions.

## Absolute Maximum Ratings(Ta=25°C)

Parameter	Symbol	Rating	Unit
VDD to GND	$V_{DD}$	-0.3~8	V
BAT to GND	$V_{BAT}$	-0.3~7	V
CHRG/STDBY to GND	$V_{chrg}/V_{stdby}$	-0.3~8	V
PROG to GND	$V_{prog}$	-0.3~8	V
TEMP to GND	$V_{temp}$	-0.3~8	V
Storage Temperature	$T_{STG}$	-50~+125	°C
Operating Temperature Range	$T_{opr}$	-40~+85	°C
Lead Temperature (Soldering, 10s)	$T_{solder}$	260	°C

## Electrical Characteristics(Ta=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input voltage range	V <sub>DD</sub>		4	5	6	V
V <sub>DD</sub> from low to high	V <sub>DD</sub> Power failure monitoring	V <sub>DD</sub> >BAT		100		mV
V <sub>DD</sub> from high to low		V <sub>DD</sub> >BAT		30		mV
Floating charge threshold voltage	V <sub>BAT</sub>	V <sub>DD</sub> =5V	4.158	4.20	4.242	V
BAT reverse current	I <sub>BAT</sub>	V <sub>CC</sub> =3.5V V <sub>bat</sub> =4.2V		±0.5	±5	μA
A slow flow is constant	V <sub>TRKL</sub>	V <sub>BAT</sub> from low to high		2.8		V
Trickle charging hysteresis voltage	V <sub>TRHYS</sub>			100		mV
V <sub>DD</sub> Undervoltage blocking threshold	V <sub>UV</sub>	V <sub>DD</sub> from low to high		3.7		V
V <sub>DD</sub> Undervoltage blocking threshold	V <sub>UVHYS</sub>			200		mV
Manual stop threshold voltage	V <sub>msd</sub>			1.2		V
Manual stop hysteresis voltage	V <sub>msdHYS</sub>			50		mV
PROG voltage at trickle	V <sub>prog1</sub>			0.1		V
PROG voltage at high current	V <sub>prog2</sub>			1.0		V
Overtemperature recovery	OTR	V <sub>DD</sub> =5V		130		°C

## Electrical Characteristic Curve

The CTCL4056BSE is a complete CC/CV linear charger for single cell lithium-ion batteries. CC/CV to charger batter by internal MOSFET. It can deliver up to 1.2A of charge current .No blocking diode or external current sense resistors required. CTCL4056BSE include two Open-Drain charge status Pins: Charge status indicator CHRГ and battery charge completion status output STDBY.

The internal thermal regulation circuit reduces the programmed charge current if the die temperature attempts to rise above a preset value of approximately 130°C. This feature protects the CTCL4056BSE from excessive temperature, and allows the user to push the limits of the power handling capability of a given circuit the external components. Another benefit of adopting thermal regulation is that charge current can be set according to typical, not worst-case, ambient temperatures for a given application with the assurance that the charger will automatically reduce the current in worst-case conditions.

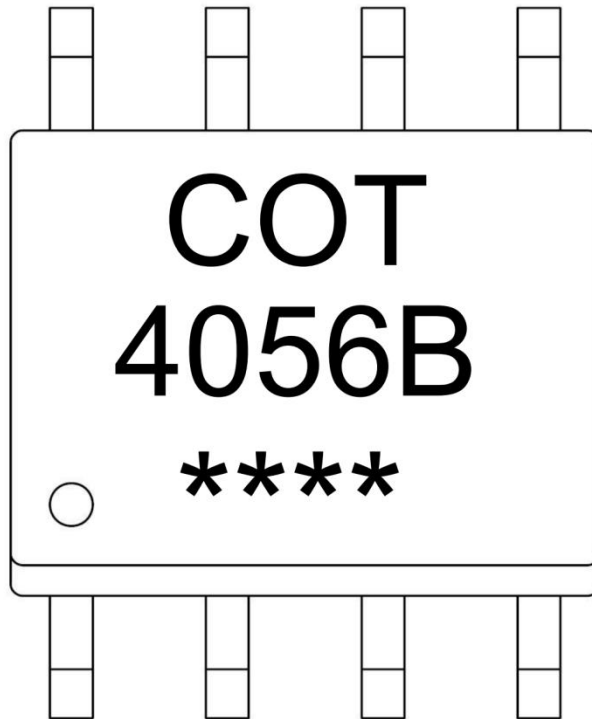
The charge cycle begins when the voltage at the VCC pin rises above the UVLO level, a current set resistor is connected from the PROG pin to ground. The CHRГ pin outputs a logic low to indicate that the charge cycle is on going. At the beginning of the charge cycle, if the battery voltage is below 2.8V, the charge is in pre charge mode to bring the cell voltage up to a safe level for charging. The charger goes into the fast charge CC mode once the voltage on the BAT pin rises above 2.8V. In CC mode, the charge current is set by RPROG. When the battery approaches the regulation voltage 4.2V, the charge current begins to decreases the CTCL4056BSE enters the CV mode. When the current drops to charge termination threshold, the charge cycle is terminated, and CHRГ pin assumes a high impedance state to indicate that the charge cycle is terminated and STDBY pin is pulled low. The charge termination threshold is 10% of the current in CC mode.

To restart the charge cycle, remove the input voltage and reapply it. The charge cycle can also be automatically restarted if the BAT pin voltage falls below the recharge threshold. The on-chip reference voltage, error amplifier and the resistor divider provide regulation voltage with 1% accuracy which can meet the requirement of lithium-ion and lithium polymer batteries. When the input voltage is not present, or input voltage is below VBAT, the charger goes into a sleep mode, dropping battery drain current to less than 3 $\mu$ A. This greatly reduces the current drain on the battery and increases the standby time.

## Description of the Principle

The charge current is programmed using a single resistor from the PROG pin to ground. The program resistor and the charge current are calculated using the following equations.

**Marking Instructions**



Note:

COT: Company Code

4056B: Product Type.

\*\*\*\*: Lot No. Code, code change with Lot No.

**Packaging SPEC.**

REEL

Package Type	Units					Dimension (unit: mm <sup>3</sup> )		
	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Reel	Inner Box	Outer Box
ESOP-8	4,000	2	8,000	6	48,000	13" ×12	360×360×50	380×335×366

Packaging SPEC.

ESOP-8

Unit:mm

