

## summary

TP4333 is a synchronous step-up single chip solution designed for mobile power supply. It integrates a linear charge management module, a synchronous discharge management module, a power detection and LED indication module, and a protection module.

The TP4333 has a built-in charge and discharge power MOS. The charge current is fixed at 0.8A. Synchronous boost supports 1A output current.

The TP4333 integrates multiple safety protection functions such as temperature compensation, over-temperature protection, over-charge and over-discharge protection, output over-voltage protection, output overload protection, and output short-circuit protection to ensure the safety of the chip and lithium-ion battery.

The application circuit is simple. Only a few components are needed to achieve charge management and discharge management.

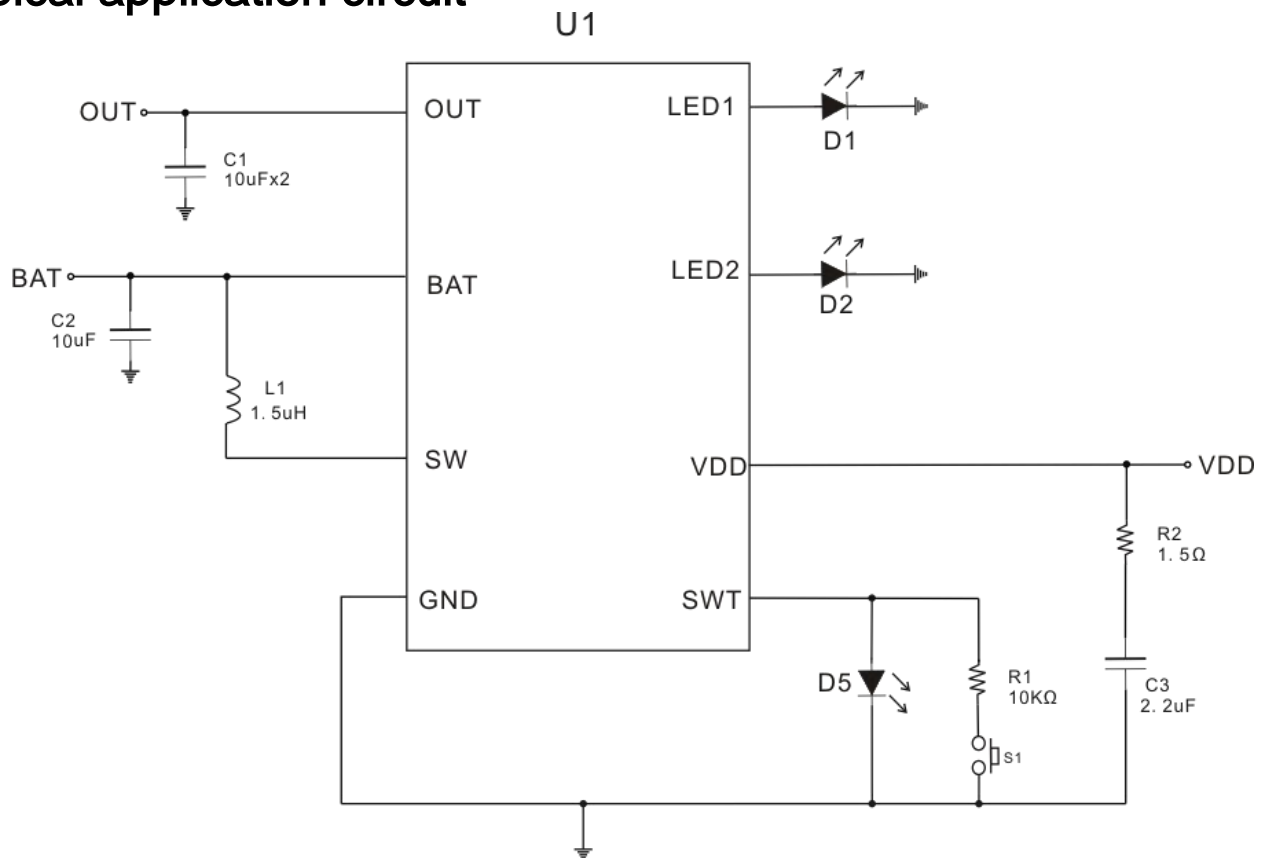
## features

- Discharge output: 5V/1A
- recharging current: 0.8A
- 1A output discharge efficiency up to 93%
- BAT discharge termination voltage: 2.85V
- Optional 4.2V/4.35V charging voltage
- Intelligent temperature control and over-temperature protection
- Integrated output overvoltage protection, short circuit protection, overload protection
  - Integrated over-charge and over-discharge protection
- Supports trickle mode and zero voltage charging
- Support flashlight output
- Package form: SOP8

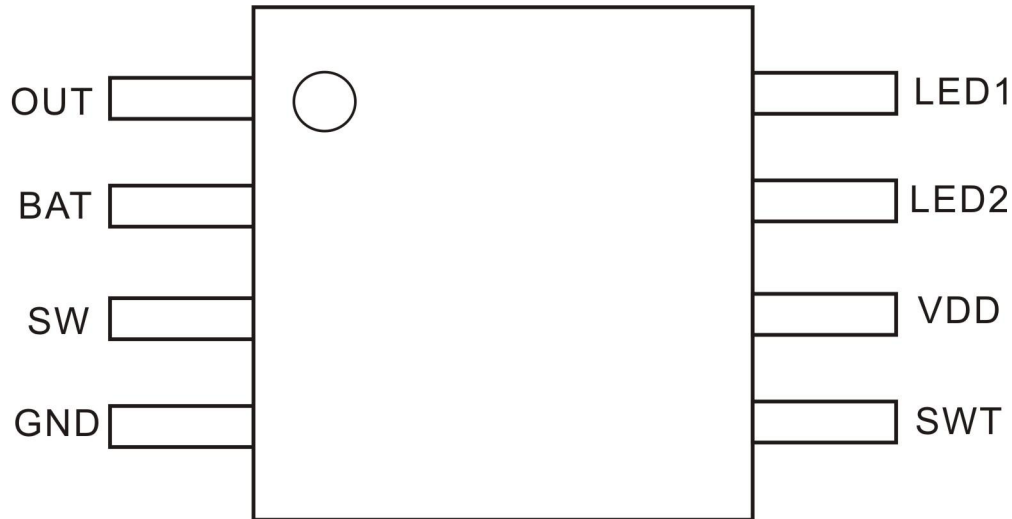
## application

- mobile power

## Typical application circuit



## PIN



## Pin description

Pin number	Pin name	description
1	OUT	Boost output positive terminal and output voltage sample terminal
2	BAT	Lithium ion battery anode
3	SW	Boost Power NMOS Drain
4	GND	Chip ground
5	SWT	Connect the button and flashlight LED light, short press the button to display the power, long press the button 2S flashlight to open or close
6	VDD	Power input
7	LED2	Discharge indicator LED driver
8	LED1	Charge indicator LED driver

## Limit parameters (Note 1)

parameter	Rated value	unit
All pins to GND	-0.3~+7	V
Storage environment temperature	-50~+150	°C
Operating junction temperature range	-40~150	°C
HBM	3000	V
MM	300	V

## Recommended working area

symbol	parameter	Range of parameters	unit
VDD	Charging input voltage	4.5~5.5	V
T <sub>OP</sub>	Working temperature	-20~85	°C

Note 1: The maximum limit is that the chip may be damaged beyond this working range. The recommended working range means that the chip works normally in this range, but it does not guarantee to meet individual performance indicators. The electrical parameters define the DC and AC electrical parameter specifications of the device within the operating range and under test conditions that guarantee specific performance specifications. For unspecified upper and lower limit parameters, the specification does not guarantee its accuracy, but its typical value reasonably reflects the device performance.

## Electrical parameters

Unless otherwise specified, VDD=5V, Ta=25°C

symbol	parameter	Test Conditions	Min	Typical value	Max	unit
VDD	Charging input voltage		4.3	5	5.5	V
VBAT	Preset charging voltage	For 4.2V specifications	4.15	4.2	4.25	V
		For 4.35V specifications	4.30	4.35	4.4	V
IBAT	BAT Constant current charging current	Constant current charging mode		0.8		A
ITRK	BAT Trickle charge current	Trickle charge mode		100		mA
VTRK	Trickle Charge Threshold Voltage	VBAT raise		2.9		V
VTRK_HYS	Trickle charge hysteresis voltage			100		mV
TST	Charging temperature compensation threshold			120		°C
TZERO	Charge zero current temperature			135		°C
VUV_BAT	BAT Under Voltage Lockout Threshold Voltage	VBAT raise		3.2		V
VWN_BAT	BAT Low voltage alarm voltage	VBAT drop		3.0		V
VBAT_END	BAT discharge termination voltage			2.85		V
ISD_BAT	BAT standby current	VBAT=3.7V		50	80	uA
VSD	VDD-VBAT lock threshold	VDD raise		180		mV
		VDD drop		80		mV
VOUT	Boost output voltage	ILOAD=1A,VBAT=3.7V	4.8	5V	5.2	V
ILEDx	LEDx drive current	BAT=4V		2		mA
FLED1_C	LED1 charging flash frequency			1		Hz
FLED2_WN	LED2 low alarm frequency			1		Hz
RON_CHRG	Charge PMOS On Resistance			300		mΩ
RON_NMOS	Discharge NMOS On-resistance			65		mΩ
RON_PMOS	Discharge PMOS On-resistance			65		mΩ
FOSC	Boost circuit operating frequency		0.7	1	1.3	MHz

## Application note

### Constant temperature mode

The TP4333 integrates a temperature feedback loop. When the internal temperature of the chip rises to 120°C (approximately 80°C on the surface), the charge or discharge current decreases as the temperature of the chip increases. This reduces system power consumption. , Reduce the temperature rise, due to the temperature feedback control, the IC will enter the constant temperature mode without fear of damaging the IC or forcing the IC off when the temperature is too high.

### Charging mode

If the lithium ion battery voltage is less than 2.9V before charging, in order to protect the battery, the TP4333 operates in trickle charge mode, and the charging current is 100mA. After the battery voltage reaches 2.9V, the TP4333 enters the constant current charging mode, and the charging current is 0.8. A: When the battery voltage reaches 4.2V, the TP4333 operates in the constant voltage charging mode. At this time, the BAT voltage is constant and the charging current is gradually reduced. When the charging current is reduced to 100mA, the charging process ends and the charging current is reduced to zero.

### Load detection and low-power smart standby

When the load is inserted, the TP4333 can automatically detect the load and turn on the boost circuit. When the load is removed, the boost circuit closes after an 18S delay, and the IC enters a low-current standby mode.

### Charge and discharge instructions

LED1 externally instructs the LED lamp. When charging, LED1 flashes at 1Hz frequency. LED1 is always on after the battery is fully charged.

LED2 externally instructs the LED light. During the discharge process, LED2 is always on. When the battery voltage is lower than 3.0V, LED2 will flash at a frequency of 1HZ for low alarm.

### Flashlight output

The SWT can drive the LED light for flashlight illumination. The maximum drive current is 50mA. The series resistance of the LED can be used to reduce the current of the indicator flashlight. SWT is also the key switch foot. If you press the S1 key for 2 seconds, the flashlight will turn on again. Press S1 key 2S flashlight output off.

### Low battery protection

During start-up, when the BAT voltage is greater than 3.2V, the boost circuit starts to work. If the battery voltage is lower than 3.0V during operation, LED2 will flash at a frequency of 1HZ to remind that the power is low, and when the battery voltage is lower than 2.85V, the discharge The output turns off and the TP4333 enters low-current standby mode.

### Protective function

The TP4333 integrates multiple protection mechanisms such as overcharge protection, overdischarge protection, charge temperature compensation, over-temperature protection, output over-voltage protection, output overload protection, output short-circuit protection, etc. It is also possible to additionally add a DW01 to double protect the system.

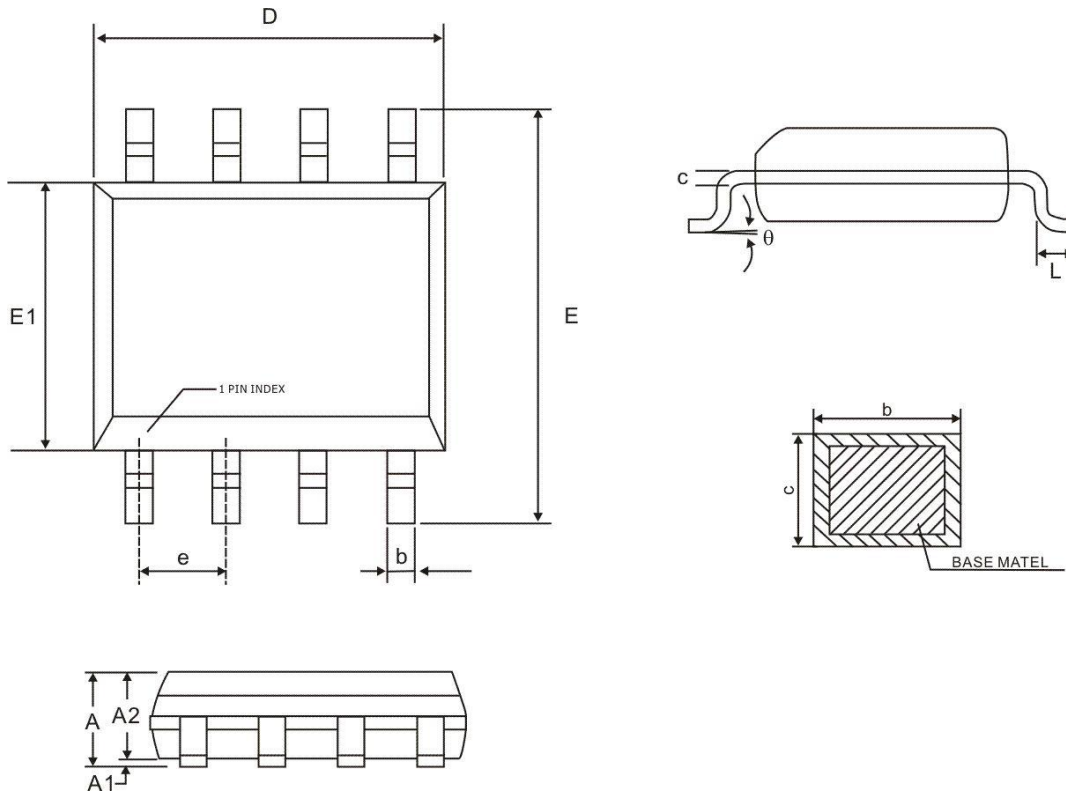
### Component selection

- 1、 The output capacitor C1 selects the low ESR chip capacitor with good quality, otherwise it will affect the output ripple;
- 2、 The saturation current of the inductor L1 needs to be greater than 3A, otherwise the saturation of the inductor may cause the chip to work abnormally.
- 3、 **Flashlights need to have a leakage current less than 1uA when the voltage is less than 1.5V, otherwise BAT must be added to the SWT pull-up resistor 100K.**

### PCB design reference

- 1、 The grounding area should be as large as possible, and other unimportant lines can be bypassed to meet the needs of the ground.
- 2、 It is recommended that 10uF be placed next to the inductor and 1uF should be placed close to the BAT pin of the chip. If only one BAT capacitor is placed, it must be ensured that the capacitor is located close to the chip and close to the inductor. The ground line of the capacitor should be connected to a large area ground line as much as possible. Small ground wire to chip and large area;
- 3、 The output capacitor C1 should be as close as possible to the chip, and its ground line should be connected to a large area ground line as much as possible. Do not go through the small ground line to the chip and a large area.;
- 4、 The inductor needs to be close to the BAT capacitor. The inductor and the BAT capacitor C2 and the chip should be in the same layer as far as possible without passing through the hole. The trace from the inductor to the SW should be as short and thick as possible.

## Package size SOP8L



符号	毫米		
	最小值	标准值	最大值
A	1.35	1.60	1.77
A1	0.08	0.15	0.28
A2	1.20	1.40	1.65
b	0.33	-	0.51
c	0.17	-	0.26
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC.		
L	0.38	0.60	1.27
$\theta$	0°	-	8°

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