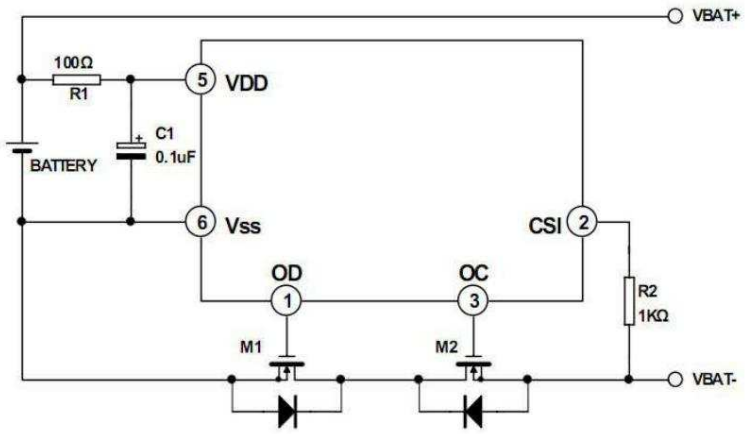
Product Features

- •Low operating current
- •Overcharge detection 4.28V, overcharge release 4.08V
- •Over discharge detection 2.4V, over discharge release 3.0V
- •Overcurrent detection 0.15V, short-circuit current detection 1.3V
- •Charger detection
- •Overcurrent protection reset resistor
- •With self-recovery function
- •0V charging enable
- •Wide operating voltage range
- •Small package: SOT23-6

typical application



Application: Single lithium battery protection circuit. Figure 1 Typical application circuit diagram

describe:

DW01 is a lithium battery protection circuit to prevent the lithium battery from being overcharged, over-discharged, or over-current, which may shorten the battery life or damage the battery.

It is designed for high-precision voltage detection and time delay circuit. With 0V charging function and self-recovery function. Not suitable for wireless and

For products with poor RF signal arrangement and shielding, please verify the finished product before using it.

Functional Block Diagram

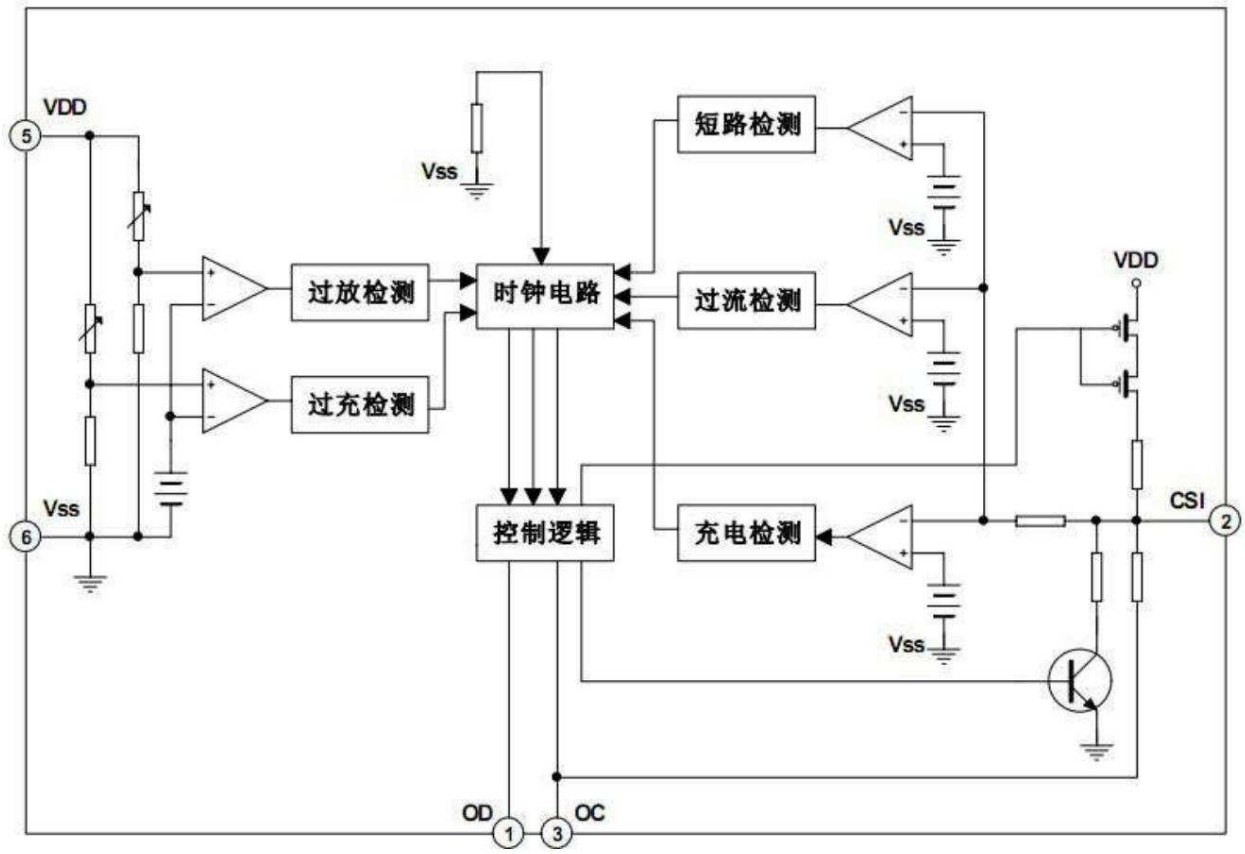


Figure 2 Functional block diagram

model	Material situation	Encapsulation	Operating temperature range	Package
DW01	Note 1 Halogen Free	SOT23-6	-40 °C Up to 85 °C	Tape and reel 3000 pcs/reel

Note 1: Whether lead-free and halogen-free packaging is required is subject to order.

Package and pinout

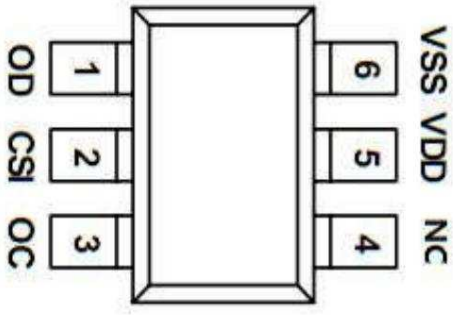


Figure 3 SOT23-6 package and pinout of DW01

Pin Function Description

Pin No.	Pin Name	I/O	Functional Description
	FROM	O	discharge control FET threshold connection pin
1	CSI	I/O	current sensing input pin, charger detection.
2 3	OC	O	Charge control FET threshold connection pin.
4	NC	---	no connection
5	VDD	I	Positive power input pin.
6	VSS	I	Negative power input pin.

Limit parameters Note

2 Parameters	symbol	Parameter range value	unit
voltage	VDD	VSS-0.3~VSS+8	*IN*
OC output pin voltage	VOC	VDD-15~VDD+0.3	*IN*
OD output pin voltage	VOD	VSS-0.3~VDD+0.3	*IN*
CSI Input Pin Voltage Operating	VCSI	VDD-15~VDD+0.3	*IN*
Temperature	Topr	-40~+85	°C
Storage Temperature	Tstg	-40~+125	°C

Note 2: "Limit parameter" means that if the operating point exceeds this parameter, the chip may be permanently damaged; if the operating point is close to the limit parameter for a long time, the chip reliability may be reduced.

Low.

Electrical characteristics parameters (unless otherwise specified, Ta = 25°C

parameter	Symbol Test	Conditions Min Typ Max Unit				
Operating Voltage						
Operating Voltage	VDD	-	1.5	-	8	IN
Current consumption						
Working current	IDD	VDD=3.9V	-	4.0	6.0 uA	
detection voltage						
Overcharge detection voltage	VOCD	-	4.23	4.28	4.33	IN
Overcharge release voltage	VOCR	-	4.03	4.08	4.13	IN
Overdischarge detection	VODL	-	2.30	2.40	2.50	IN
voltage Overdischarge release voltage	V.O.D.R.	-	2.90	3.00	3.10	IN
Overcurrent 1 detection voltage	VOI1	-	0.12	0.15	0.18	IN
Overcurrent 2 (short-circuit current) detection voltage VOI2 Overcurrent		VDD=3.6V	0.80	1.30	1.75	IN
reset resistor	Rshort	VDD=3.6V	50	100	150 Kÿ	
Charger detection voltage	VCH	-	ÿ1.1	ÿ0.7	ÿ0.3	IN
Delay time						
Overcharge detection delay time	TOC VDD=3.6V~4.4V		-	80	200	ms
Overdischarge detection delay	TOD VDD=3.6V~2.0V		-	40	120	ms
time Overcurrent 1 detection delay	TOI1	VDD=3.6V	-	10	15	ms
time Overcurrent 2 (short-circuit current) detection delay time TOI2		VDD=3.6V	-	50	120	us
other						
OC pin outputs high level voltage	Wow1	-	VDD-0.1 VDD-0.02		-	IN
OC pin outputs low level voltage	Vol1	-	-	0.1	0.5	IN
OD pin outputs high level voltage	Voh2	-	VDD-0.1 VDD-0.02		-	IN
OD pin outputs low level voltage	Vol2	-	-	0.1	0.5	

Functional Description

Normal conditions

If VODL<VDD<VOCU, and VCH<VCSI<VOI1, then both M1 and M2 are turned on (see the typical application circuit diagram).

Both charging and discharging can proceed normally.

•Overcharge status

When entering the charging state from the normal state, the battery voltage can be detected through VDD. When the battery voltage enters this charging state, the VDD voltage

Greater than VOCU, the delay time exceeds TOC, and M2 is closed.

•Release overcharge status

After entering the over-power state, there are two ways to release the over-power state and enter the normal state. 1)

If the battery self-discharges and VDD < VOCR, M2 turns on and returns to normal state.

2) After removing the charger and connecting the load, if VOCR<VDD<VOCU, VCSI>VOI1, M2 is turned on and returns to normal mode.

•Over discharge detection

When the battery enters the discharge state from the normal state, the battery voltage can be detected through VDD. When the battery voltage enters the over-discharge state, the VDD voltage is less than

VODL, if the delay time exceeds TOD, M1 will be closed.

•Release power-off mode

When the battery is in power-off mode, if a charger is connected and VCH<VCSI<VOI2, VDD<VODR, M1 is still closed, but the release Power-off mode. If VDD>VODR, M1 turns on and returns to normal mode. Or when the load is floating, VDD voltage returns to VDD>VODR, M1 turns on And returns to normal mode (self-recovery function).

•Charging detection

If a charger is connected to the battery in power-down mode, the voltage will become VCSI < VCH and VDD > VODL. M1 turns on and returns to normal mode.

•Overcurrent/short-circuit current detection

In normal mode, when the discharge current is too large, the voltage detected by the CSI pin is greater than VOIX (VIO1 or VIO2) and the delay is greater than TOIX. (TIO1 or TIO2), it indicates an overcurrent (short circuit) state. M1 is closed and CSI is pulled to VSS through the internal resistor RCSIS.

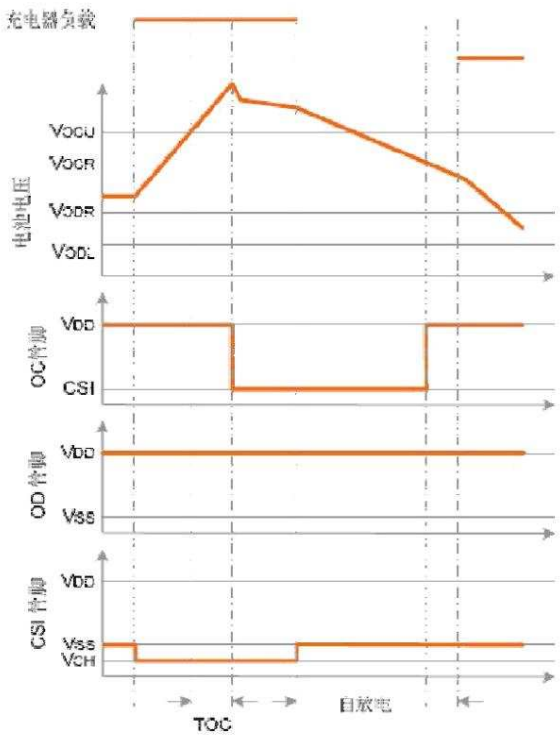
•Release overcurrent/short-circuit current status

When the protection circuit remains in the overcurrent/short-circuit current state, remove the load or the impedance between VBAT+ and VBAT- is greater than 500KŸ, and VCSI<VOI1, then M1 turns on and returns to normal conditions.

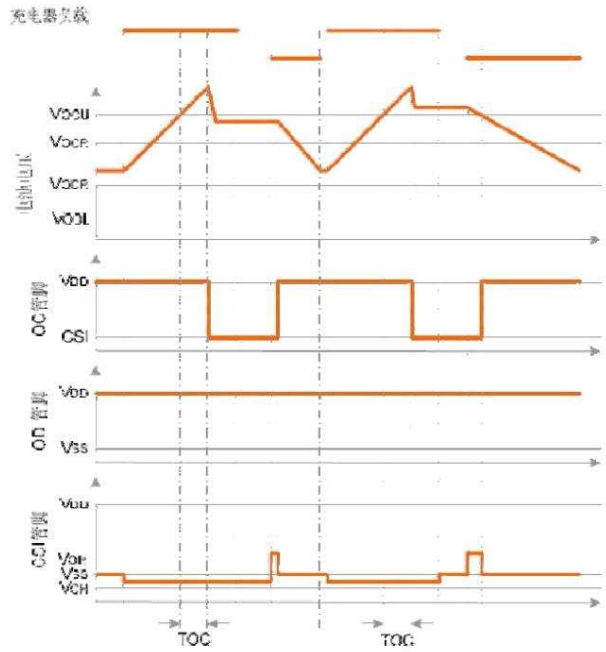
Note: When the battery is first connected to the protection circuit, the circuit may not enter normal mode and cannot discharge. When the CSI pin voltage is equal to the VSS voltage (short-circuit CSI and VSS or connect a charger), the device can enter normal mode.

Timing diagram

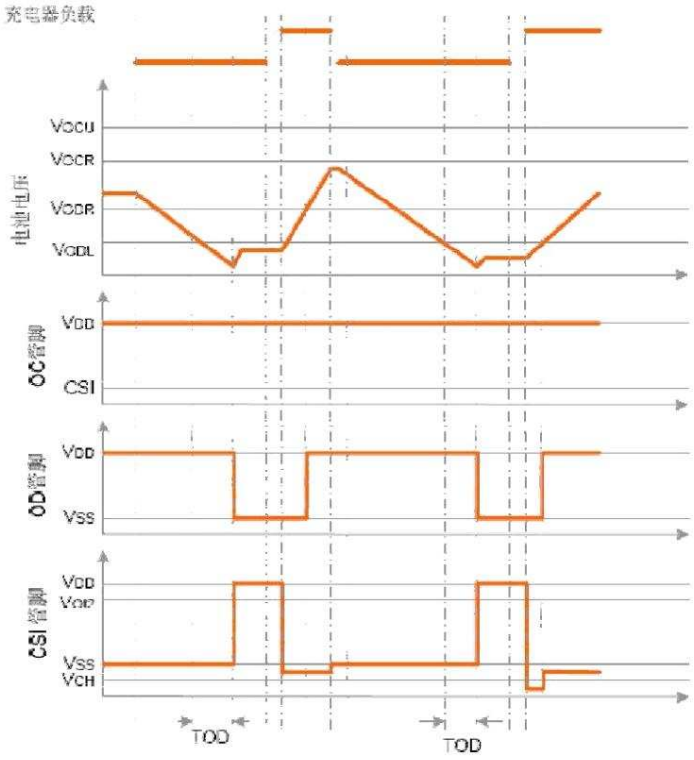
•Overcharge state- Self-discharge state - Normal state



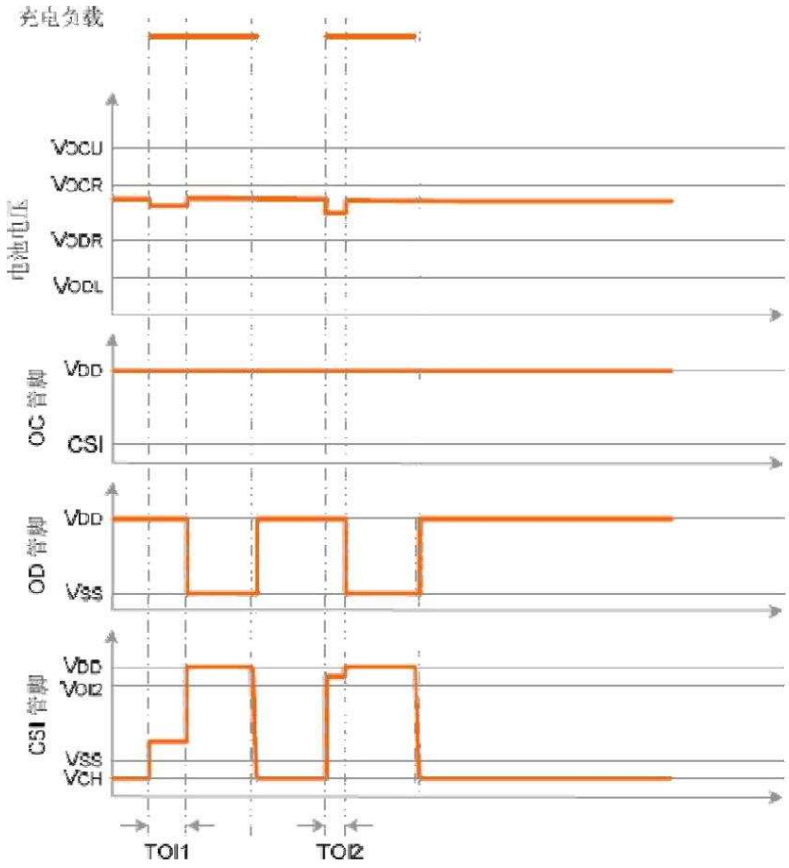
•Overcharge state - Load discharge - Normal state



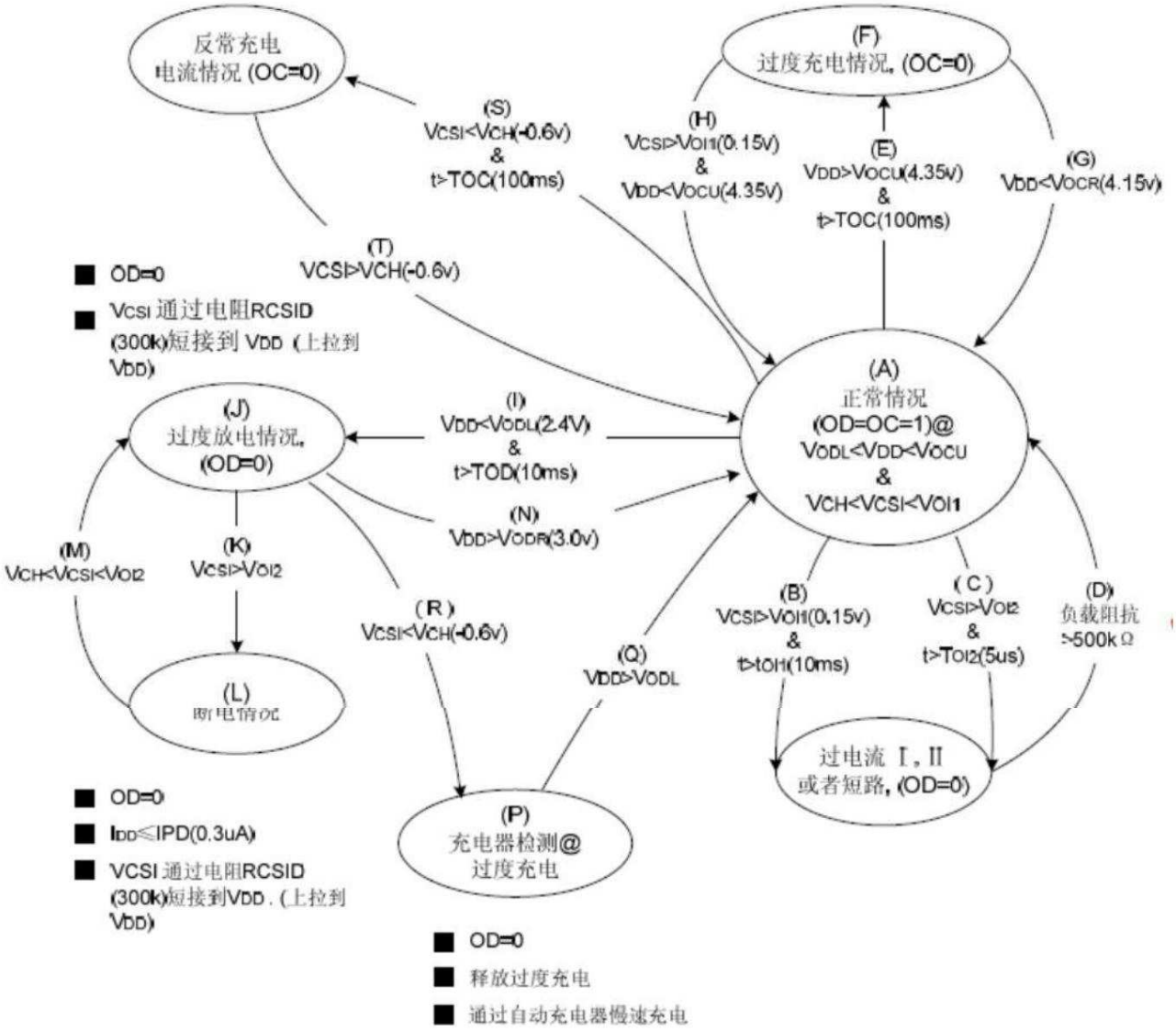
•Overcharge state - Charger charging - Normal state



•Overcharge state - Normal state



Operational state diagram



Package size and outline (unit: mm)

SOT-23-6