Descriptions

Battery Protection IC in a SOT23-6 Plastic Package.

Features

(1) Precision voltage detection circuit

Overcharge detection voltage	4.3 V	Accuracy	±50 mV (1)
Overcharge release voltage	4.1 V	Accuracy	±50 mV
Overdischarge detection voltage	2.4 V	Accuracy	±100 mV
Overdischarge release voltage	3.0 V	Accuracy	±100 mV
Discharge overcurrent detection voltage	0.14 V	Accuracy	±30 mV
Load short-circuiting detection voltage	1.2 V	Accuracy	±300 mV

(2) On-chip detection delay circuit

Overcharge detection delay time	Typ	100ms
Overdischarge detection delay time	Typ	100ms
Discharge overcurrent detection delay time	Typ	10ms
Load short-circuiting detection delay time	Typ	50μs

(3) High voltage tolerance is used for charger connection pins, VM and CO pins are absolute maximum rating = 28V)

(4) 0V battery charge function available，unavailable are selectable.

(5) Operating Temperature Range -40 to +85℃

(6) Low self current consumption

Operation mode

Typ 2.4μA Max 6.0 μA （25℃）

Standby Mode

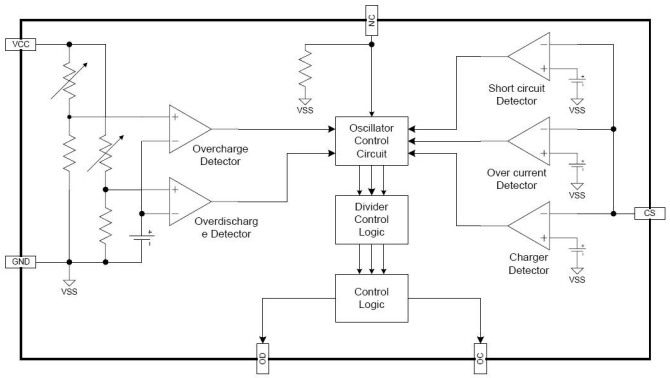
Green-mode Max 0.1μA （25℃）

Self-recovery function Max 3.0μA （25℃）

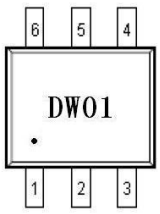
Applications

For lithium ion / lithium polymer rechargeable battery pack.

Equivalent Circuit



Pinning



Pin Name	Pin Number	Pin Function
DO	1	Discharge control output terminal
Vm	2	Charge/discharge current detection input
CO	3	Charge control output terminal
NC	4	Not connected
V_{DD}	5	Power input
V_{SS}	6	Power ground terminal

Marking

See Marking Instructions.

Absolute Maximum Ratings(Ta=25℃)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{DD}	Vss-0.3 to Vss+12	V
VM pin Input voltage	V_M	V_{DD}-28 to V_{DD}+0.3	V
OC output pin voltage	V_{CO}	V_{DD}-28 to V_{DD}+0.3	V
OD output pin voltage	V_{DO}	V_{DD}-0.3 to V_{DD}+0.3	V
Operating Temperature	T_{opr}	-40 to +85	℃
Storage Temperature	T_{stg}	-55 to +125	℃

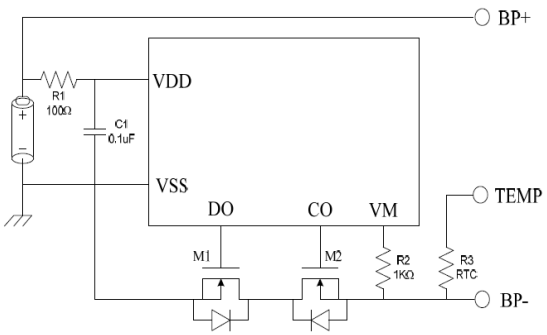
Electrical Characteristics(Ta=25℃)

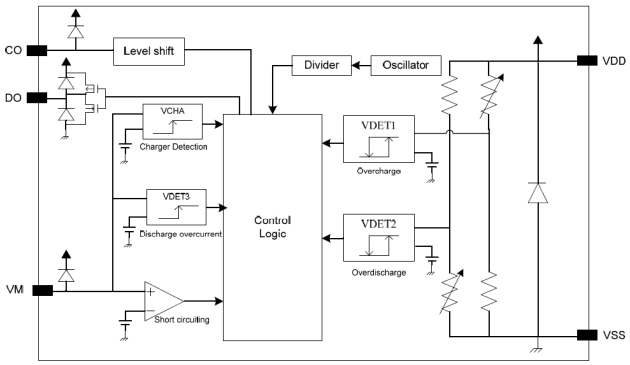
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Operating voltage between VDD&VSS	V_{DD}		1.5		9	V
Operating voltage between CO&VM	C_O		1.5		28	V
Minimum operating voltage for 0V charging	V_{st}	V_{DD}-V_M V_{DD}-V_{SS}=0V			1.2	V
Discharging overcurrent release resistance	R_{short}	V_{DD}=3.6 V_M=1.0V	30	50	100	KΩ
CO pin N_{ch} ON voltage V_{COL}				0.4	0.5	V
CO pin N_{ch} ON voltage V_{COH}			V_{DD}-0.1	V_{DD}-0.02		V
CO pin N_{ch} ON voltage V_{DOL}				0.2	0.5	V
CO pin N_{ch} ON voltage V_{DOH}			V_{DD}-0.1	V_{DD}-0.02		V
Current consumption	I_{DD}	V_{DD}=3.5V V_M=0V	1.2	2.4	6.0	μA
Current consumption at stand-by(Green)	I_{st1}	V_{DD}=2.0V V_M=2.0V			0.1	μA
Overdischarge current consumption(Self-recovery)	I_{DOX}	V_{DD}=2.0V,V_M=2.0V		1.8	3.0	μA
Overcharge detection voltage	V_{det1}		4.25	4.3	4.35	V
Overcharge release voltage	V_{rel1}		4.05	4.1	4.15	V
Overcharge hysteresis voltage	V_{hys1}	V_{hys1}=V_{det1}-V_{rel1}		0.2		V
Overdischarge detection voltage	V_{det2}	V_M=0V	2.3	2.4	2.5	V

Electrical Characteristics(Ta=25 ℃)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Overdischarge release voltage	V_{rel2}		2.9	3.0	3.1	V
Overdischarge release voltage2	$V_{rel2'}$	$V_M=V_{chg}$	2.3	2.4	2.5	V
Discharging over current detection voltage	V_{det3}	V_{DD}=3.6V	0.11	0.14	0.17	V
Short detection voltage	V_{short}	V_{DD}=3.6V	0.9	1.2	1.5	V
Overcharge detection delay time	T_{Vdet1}	V_{DD}=3.8V→4.5V	50	100	200	ms
Overdischarge detection delay time	T_{Vdet2}	V_{DD}=3.2V→2.2V	50	100	200	ms
Discharging over current detection delay time	T_{Vdet3}	V_{DD}=3.0V V_M=0V→0.2V	5	10	20	ms
Short detection delay time	T_{short}	V_{DD}=3.5V V_M=0V→1.0V		50	100	μs
Charger detection voltage	V_{chg}	V_{DD}=3.6V	0.3	0.7	1.1	V

Application Circuits：





Symbol	Components	Function	Min	Type	max	Unit	Notes
R1	Resistor	Current limit Noise filtering		100	1K	Ω	*1
R2	Resistor	Current limit ESD protection	300	1K	2K	Ω	*4
C1	Capacitor	Noise Filtering	0.022	0.1	1.0	μF	*3
M1	N-MOSFET	Discharge switch					*2
M2	N-MOSFET	Charging switch					*2

Notes

*1： R1 is a single-stage RC filter，the higher resistance of R1，the better the filtering effect，If the R1 resistance higher than the recommended value， it will affect the internal detection circuit and the voltage detection accuracy will out of specification. We suggest using the recommended resistance in application.

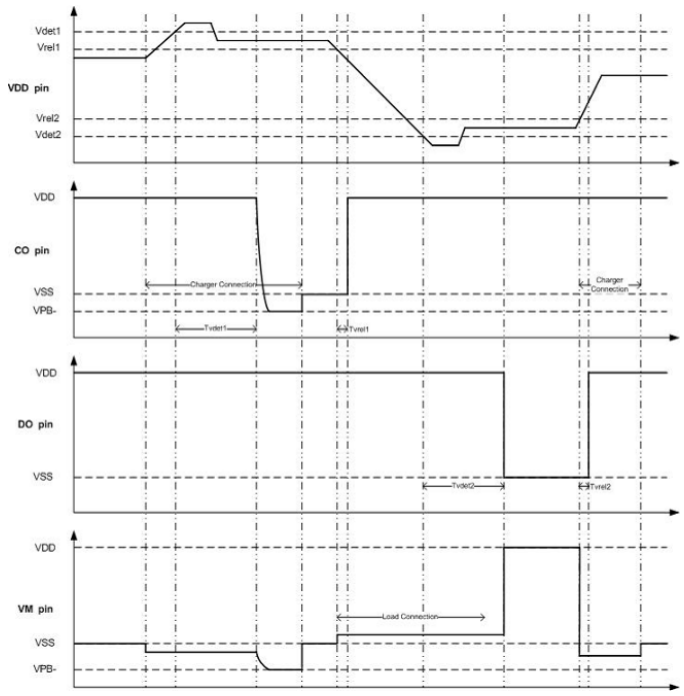
*2：The absolute maximum rating of CO and VM is 28V, customer could choose 20V or 30V dual N-MOSFET switches for different application.

*3： Add a C1 capacitor between VDD and VSS could filter conduction and radiation noise.

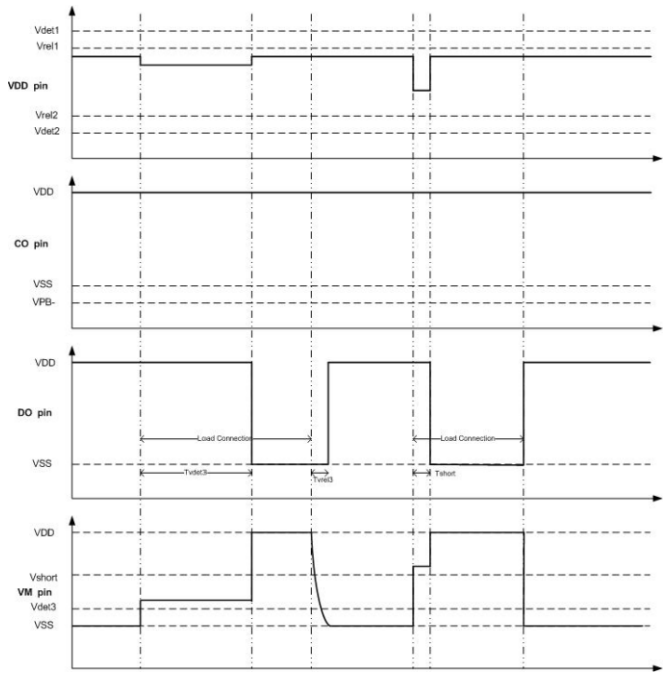
*4：R2 resistor could have a current limit function and limit charger current surge.

Timing Chart

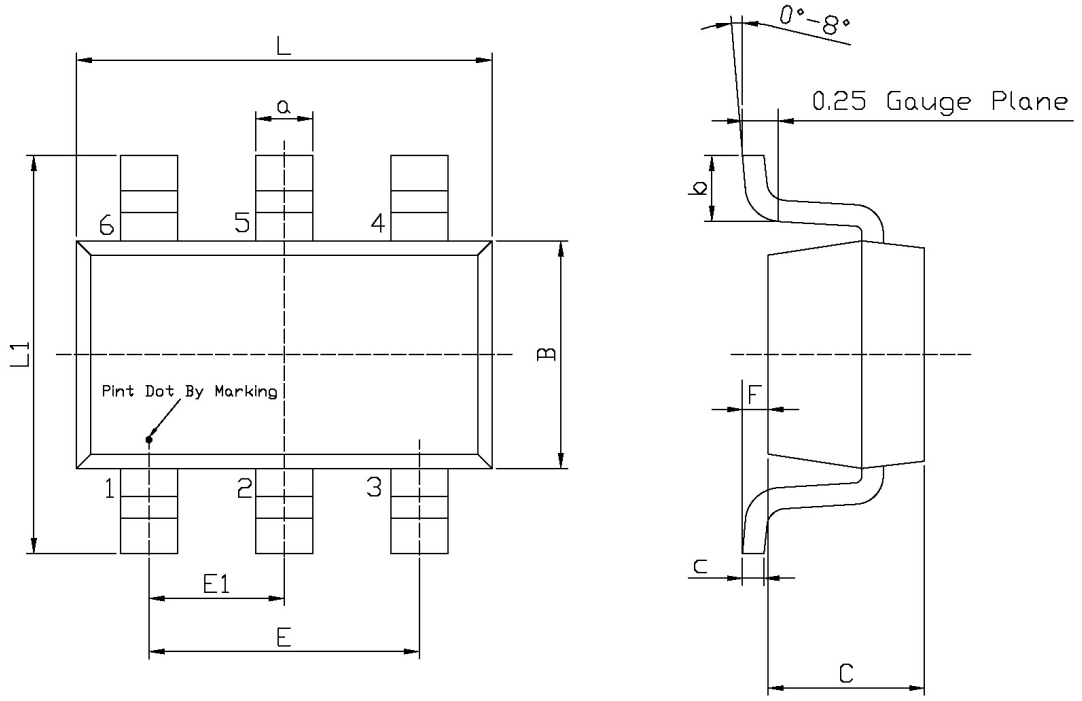
(1) Overcharge protection / overcharge recovery & Over-discharge protection / over-discharge recovery：



(2) Overcurrent detection &Load short-circuit protection detection



Package Dimensions

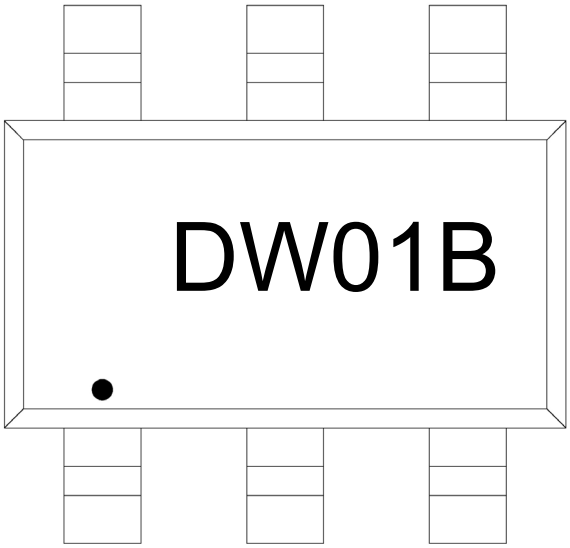


: mm

Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
L	2.82	3.02	E1	0.85	1.05
B	1.50	1.70	a	0.35	0.50
C	0.90	1.30	c	0.10	0.20
L1	2.60	3.00	b	0.35	0.55
E	1.80	2.00	F	-0.15	0

SOT23-6

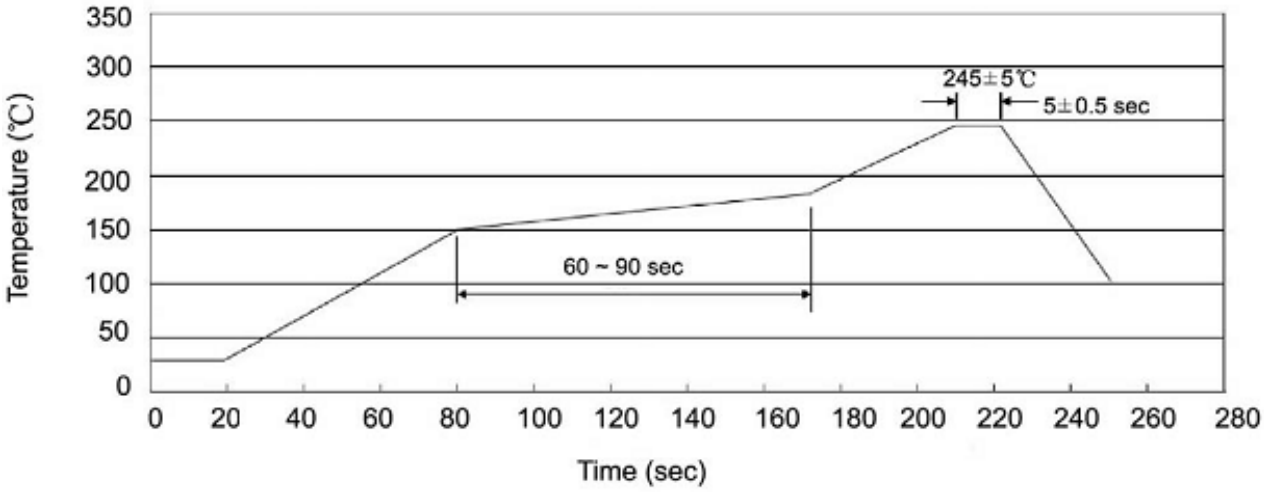
Marking Instructions



Note:

DW01B: Product Type.

Temperature Profile for IR Reflow Soldering(Pb-Free)



Note:

1.Preheating:150~180℃, Time:60~90sec.

2.Peak Temp.:245±5℃, Duration:5±0.5sec.

3. Cooling Speed: 2~10℃/sec.

Resistance to Soldering Heat Test Conditions

Temp.:260 ±5℃ Time:10±1 sec

Packaging SPEC.

REEL

Package Type	Units					Dimension (unit: mm^3)		
	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Reel	Inner Box	Outer Box
SOT23-5/6	3,000	10	30,000	4	120,000	7″ ×8	210×205×205	445×230×435

Notices