

/ Revised record

**/ Descriptions**

The BRCL3230SE series product is a high integration solution for lithium-ion/polymer battery protection. BRCL3230SE contains advanced power MOSFET, high-accuracy voltage detection circuits and delay circuits.

BRCL3230SE is put into an ultra-small ESOP-8 package makes it an ideal solution in limited space of battery pack. BRCL3230SE has all the protection functions required in the battery application including overcharging, overdischarging, overcurrent and load short circuiting protection etc. The low standby current drains little current from the cell while in storage. The device is not only targeted for digital cellular phones, but also for any other Li-Ion and Li-Poly battery-powered information appliances requiring long-term battery life.

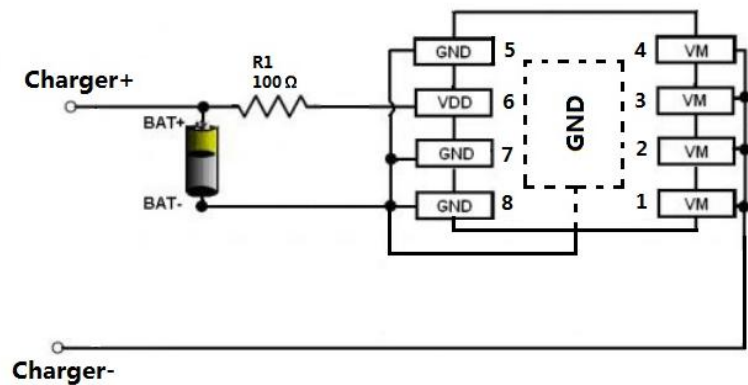
/ Features

- ◆ Integrate advanced power MOSFET with Equivalent of $23\text{m}\Omega$ $R_{DS(ON)}$;
- ◆ Ultra-small ESOP-8 package;
- ◆ No capacitance is required for peripheral circuits;
- ◆ Over-temperature Protection;
- ◆ Overcharge Current Protection;
- ◆ Three-step Overcurrent Detection: Overdischarge Current1, Overdischarge Current2, Load Short Circuiting;
- ◆ Charger detection function;
- ◆ 0V battery charging function, delay times are generated inside, High-accuracy voltage detection.
- ◆ Low Current Consumption, Operation Mode: $6\mu\text{A}$ typ, Power-down Mode: $3\mu\text{A}$ typ ;
- ◆ HF Product.

/ Applications

One-Cell lithium-ion battery pack; Lithium-Polymer battery pack.

/ Typical Application



- Notes:
- (1) The chip power consumption shall not exceed the maximum power consumed by the package.
 - (2) This product has anti-static protection function, but do not exceed the maximum capacity of the product to withstand static electricity.

/ Pinning

	VM	
	GND	
	VDD	
EPAD	EPAD	GND

/ Marking

See Marking Instructions.

/Parameter	/Symbol	/Value	/Unit
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R

R

Equivalent FET on Resistance	R_{DS}	$V_{dd}=3.6V$ $I_{VM}=1A$		23	30	mΩ
Over temperature protection						
Over Temperature Protection	OTP		125	140	155	

Functional Description

BRCL3230SE

MOSFET

23mΩ

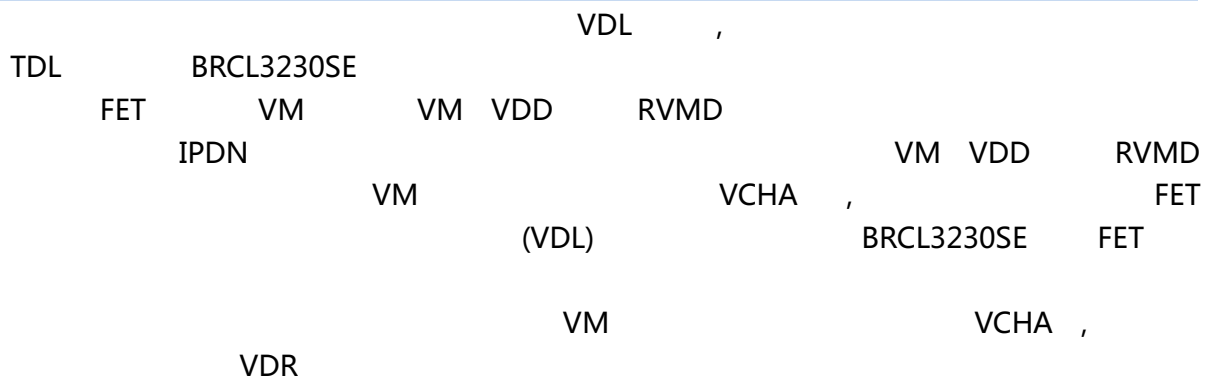
The BRCL3230SE monitors the voltage and current of a battery and protects it from being damaged due to overcharge voltage, overdischarge voltage, overdischarge current, and short circuit conditions by disconnecting the battery from the load or charger. The peripheral circuit is very simple.

Overcharge Condition

The BRCL3230SE detects this voltage and releases the overcharge condition. Consequently, in the case that the battery voltage is equal to or lower than the overcharge detection voltage (VCU), the BRCL3230SE returns to the normal condition immediately, but in the case the battery voltage is higher than the overcharge detection voltage (VCU), the chip does not return to the normal condition until the battery voltage drops below the overcharge detection voltage (VCU) even if the load is connected. In addition, if the VM pin voltage is equal to or lower than the overcurrent 1 detection voltage when a load is connected and discharging starts, the chip does not return to the normal condition.

Note: If the battery is charged to a voltage higher than the overcharge detection voltage (VCU) and the battery voltage does not drop below the overcharge detection voltage (VCU) even when a heavy load, which causes an overcurrent, is connected, the overcurrent 1 and overcurrent 2 do not work until the battery voltage drops below the overcharge detection voltage (VCU). Since an actual battery has, however, an internal impedance of several dozens of mΩ, and the battery voltage drops immediately after a heavy load which causes an overcurrent is connected, the overcurrent 1 and overcurrent 2 work. Detection of load shortcircuiting works regardless of the battery voltage.

Overdischarge Condition



When the battery voltage drops below the overdischarge detection voltage (VDL) during discharging under normal condition and it continues for the overdischarge detection delay time (tDL) or longer, the BRCL3230SE turns the discharging control FET off and stops discharging. This condition is called overdischarge condition. After the discharging control FET is turned off, the VM pin is pulled up by the RVMD resistor between VM and VDD in BRCL3230SE the current of the chip is reduced to the power-down current (IPDN). This condition is called power-down condition. The VM and VDD pins are shorted by the RVMD resistor. The power-down condition is released when a charger is connected and the potential difference between VM and VDD becomes typical or higher, at this time, the FET is still off. When the battery voltage becomes the overdischarge detection voltage (VDL) or higher (see note), the BRCL3230SE turns the FET on and changes to the normal condition from the overdischarge condition. Note: If the VM pin voltage is no less than the charger detection voltage (VCHA), when the battery under overdischarge condition is connected to a charger, the overdischarge condition is released (the discharging control FET is turned on) as usual, provided that the battery voltage reaches the overdischarge release voltage (VDR) or higher.

Overcurrent Condition



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When the discharging current becomes equal to or higher than a specified value (the VM pin voltage is equal to or higher than the overcurrent detection voltage) during discharging under normal condition and the state continues for the overcurrent detection delay time or longer, the BRCL3230SE turns off the discharging control FET to stop discharging. This condition is called overcurrent condition. (The overcurrent includes overcurrent, or load shortcircuiting.) The VM and GND pins are shorted internally by the RVMS resistor under the overcurrent condition. When a load is connected, the VM pin voltage

0V Battery Charging Function

(1) 0V VDL IC

(2) " 0V " " 0V " 0V "

(3) VM GND VM GND

Notes

- (1) Some battery providers do not recommend charging of completely discharged batteries. Please refer to battery providers before the selection of 0 V battery charging function.
- (2) The 0V battery charging function has higher priority than the abnormal charge current detection function. Consequently, a product with the 0 V battery charging function charges a battery and abnormal charge current cannot be detected during the battery voltage is low.
- (3) When a battery is connected to the IC for the first time, the IC may not enter the normal condition in which discharging is possible. In this case, set the VM pin voltage equal to the GND voltage (short the VM and GND pins or connect a charger) to enter the normal condition.

Timing Chart

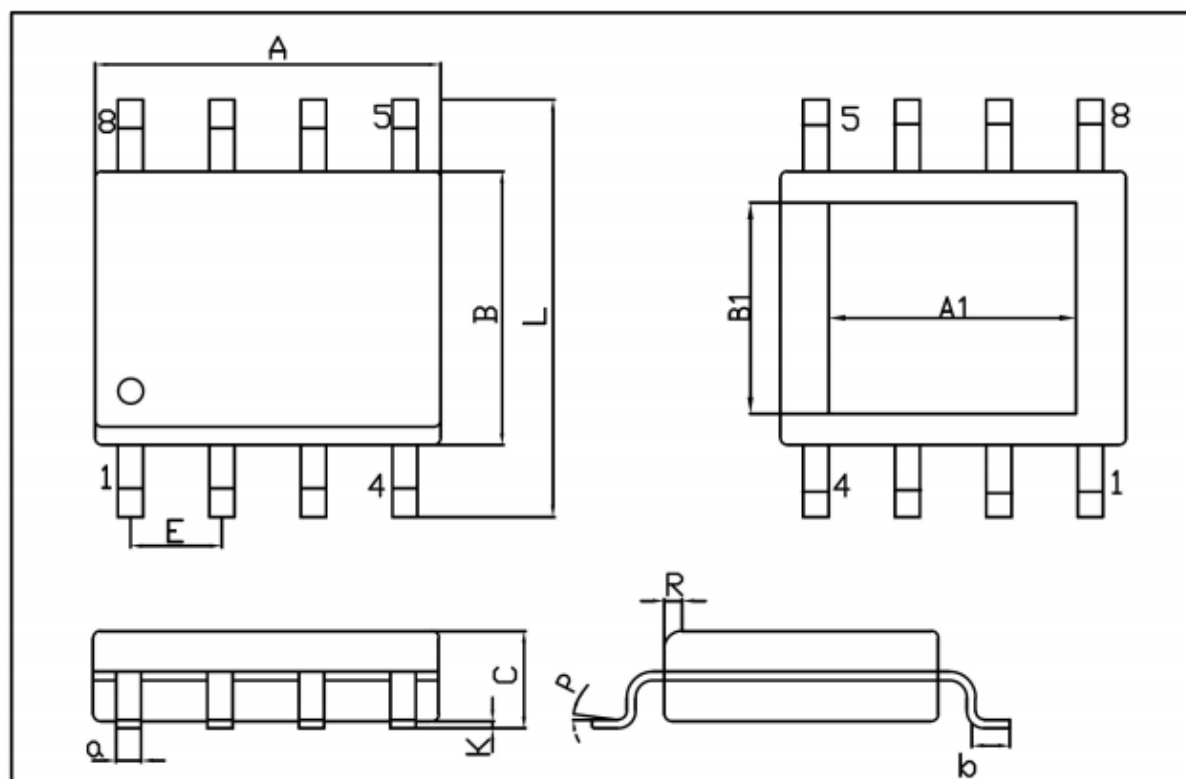
Overcharge And Overdischarge Detection

[illegible]

/ Package Dimensions

ESOP-8

Unit:mm



Symbol	Min	Max
C	1.35	1.75
a	0.35	0.49
R	0.30	0.60
P	0°	7°
b	0.40	1.25
B1	2.2	2.6

Symbol	Min	Max
A	4.70	5.10
B	3.70	4.10
L	6.00	6.40
E	1.27BSC	
K	0.02	0.10
A1	3.1	3.5

/ Marking Instructions



说明：

BR: 为公司代码

3230： 为产品型号

****： 为生产批号代码，随生产批号变化。

Note:

BR: Company Code

3230: Product Type.

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

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Note:

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|---|-------------|-----------|--|
| 1 | 150 180 | 60 90sec; | 1.Preheating:150~180°C, Time:60~90sec. |
| 2 | 245±5 | 5±0.5sec; | 2.Peak Temp.:245±5°C, Duration:5±0.5sec. |
| 3 | 2 10°C/sec. | | 3. Cooling Speed: 2~10°C/sec. |

/ Resistance to Soldering Heat Test Conditions

260±5°C	10±1 sec.	Temp.:260±5°C	Time:10±1 sec
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/ Packaging SPEC.

/ REEL

Package Type 封装形式	Units 包装数量					Dimension 包装尺寸 (unit: mm ³)		
	Units/Reel 只/卷盘	Reels/Inner Box 卷盘/盒	Units/Inner Box 只/盒	Inner Boxes/Outer Box 盒/箱	Units/Outer Box 只/箱	Reel	Inner Box 盒	Outer Box 箱