"Y / Descriptions

BRCL3230DZN / BRCL3230DZN
MOSFET
BRCL3230DZN DFN1×1-4L
BRCL3230DZN

The BRCL3230DZN series product is a high integration solution for lithium-lion/polymer battery protection.BRCL3230DZN contains advanced power MOSFET, high-accuracy voltage detection circuits and delay circuits.
BRCL3230DZN is put into an ultra-small DFN1×1-4L package and only one external component makes it an ideal solution in limited space of battery pack. BRCL3230DZN has all the protection functions required in the battery application including overcharging, overdischarging, overcurrent and load short circuiting protection etc. The accurate overcharging detection voltage ensures safe and full utilization charging.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.

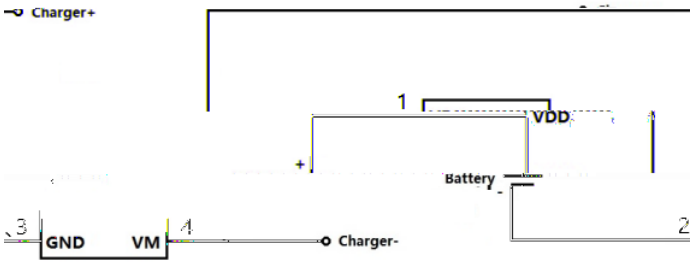
◕È / Features

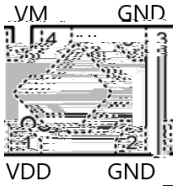
- ◆ 60mΩ MOSFET
- ◆ RC
- ◆ DFN1×1-4L
- ◆
- ◆ 0V
- ◆ 2.5uA <0.1uA;
- ◆
- ◆
- ◆ Integrate advanced power MOSFET with Equivalent of 60mΩ $R_{DS(ON)}$;
- ◆ Internal integration RC without any peripheral devices;
- ◆ Ultra-small DFN1 1-4L package;
- ◆ Over-temperature Protection; Overcharge Current Protection; Overdischarge Current Protection; Load Short Circuiting Protection;
- ◆ Charger detection function; 0V battery charging function; delay times are generated inside;High-accuracy voltage detection.
- ◆ Low Current Consumption; Operation Mode: 2.5μA typ; Power-down Mode: <0.1uA typ ;
- ◆ The Overdischarge is not self recovery and needs to be activated;
- ◆ HF Product.

¥ / Applications

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

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Pin Number	Pin Name	Pin Description
1	VDD	Power Supply
2 3	GND	Ground, connect the negative terminal of the battery to this pin.
4	VM	The negative terminal of the charger. The internal FET switch connects this terminal to GND.

ł ʜ ƃ / Marking

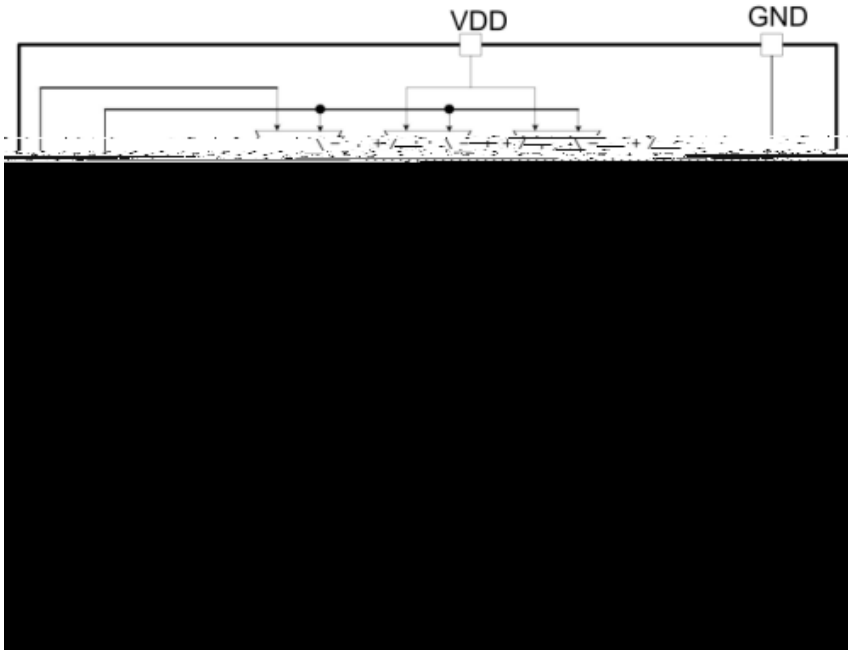
See Marking Instructions.

/Parameter	/Symbol	/Value	/Unit
V_{DD} input pin voltage	V_{IN}	-0.3 to +6	V
V_M input pin voltage	V_{VM}	-9 to +9	V
Maximum Junction Temperature	T_J	125	
Operating Junction Temperature	T_{opr}	-40 to +85	
Storage Temperature	T_{stg}	-55 to +150	
Package Thermal Resistance	$R_{\theta JA}$	250	/W
ESD HBM	ESD	2000	V

/Parameter	/Symbol	/Test Condition	/Min	/Typ	/Max	/Unit
Overcharge Detection Voltage	V_{CU}		4.25	4.30	4.35	V
Overcharge Release Voltage	V_{CL}		4.05	4.10	4.15	V
Overdischarge Detection Voltage	V_{DL}		2.70	2.80	2.90	V
Overdischarge Release Voltage	V_{DR}		2.90	3.00	3.10	V
Charger Detection Voltage	V_{CHA}		-0.3	-0.4	-0.5	V
Overcharge Current Detection	I_{IOCC}	V_{dd}=3.6V	0.4	0.7	1.0	A
Overdischarge Current1 Detection	I_{IOV1}	V_{dd}=3.6V	0.4	0.7	1.0	A
Load Short-Circuiting Detection	I_{SHORT}	V_{dd}=3.6V	6	12	18	A
Current Consumption in Normal Operation	I_{OPE}	V_{dd}=3.6V V_M=0V		2.5	3.5	μA
Current Consumption in power Down	I_{PDN}	V_{dd}=2V,V_M floating			0.1	μA
Equivalent FET on Resistance	R_{DS}	V_{dd}=3.6V I_{VM}=0.3A		60		mΩ
Over Temperature Protection	T_{SHD+}			140		
Over Temperature Recovery Degree	T_{SHD-}			115		
Overcharge Current Detection Delay Time	T_{OCC}	V_{dd}=3.6V	7	9	11	ms
Overcharge Voltage Detection Delay Time	T_{CU}	V_{dd}=3.6V~4.4V	100	150	200	ms
Overdischarge Voltage Detection Delay Time	T_{DL}	V_{dd}=3.6V~2.0V	30	40	50	ms
Overdischarge Current1 Detection Delay Time	T_{IOV1}	V_{dd}=3.6V	7	9	11	ms
Load Short-Circuiting Detection Delay Time	T_{SHORT}	V_{dd}=3.6V		100	300	us

dd

ก ﾉ ‘ ƒ 2 Functionl Block Diagram



ก ﾉ ˜Yت 2 Functional Description

BRCL3230DZN Ű ά

60mΩ

The BRCL3230DZN 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. The MOSFET is integrated and its R

is as low as 60mΩ typical.

₇ ẁ ṣ l ⁴ ẩ 2 Normal Operating mode

If no exception condition is detected, charging and discharging can be carried out freely. This condition is called the normal operating mode.

٩ ƒ ≠ ˜ 2 Overcharge Condition

VCU ,
TCU BRCL3230DZN FET

1 VCL BRCL3230DZN
2 BRCL3230DZN
VM 0.7V
BRCL3230DZN VCU
VCU BRCL3230DZN VCU
VCU
VM 1
VCU VCU
1 VCU
1

When the battery voltage becomes higher than the overcharge detection voltage (VCU) during charging under normal condition and the state continues for the overcharge detection delay time (TCU) or longer, the BRCL3230DZN turns the charging control FET off to stop charging. This condition is called the overcharge condition.

The overcharge condition is released in the following two cases:

1 When the battery voltage drops below the overcharge release voltage (VCL), the BRCL3230DZN turns the charging control FET on and returns to the normal condition.

2 When a load is connected and discharging starts, the BRCL3230DZN turns the charging control FET on and returns to the normal condition. The release mechanism is as follows: the discharging current flows through an internal parasitic diode of the charging FET immediately after a load is connected and discharging starts, and the VM pin voltage increases about 0.7 V (forward voltage of the diode) from the GND pin voltage momentarily. The BRCL3230DZN 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 BRCL3230DZN 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 drops below the overcharge detection voltage (VCU) even when a heavy load, which causes an overcurrent, is co n v 1

٩ ٰ ≠ P ˜ 2 Overdischarge Condition

VDL ,
TDL BRCL3230DZN
FET VM VM VDD RVMD
IPDN VM VDD
RVMD
VM VCHA ,
VDR

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 BRCL3230DZN 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 BRCL3230DZN 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.

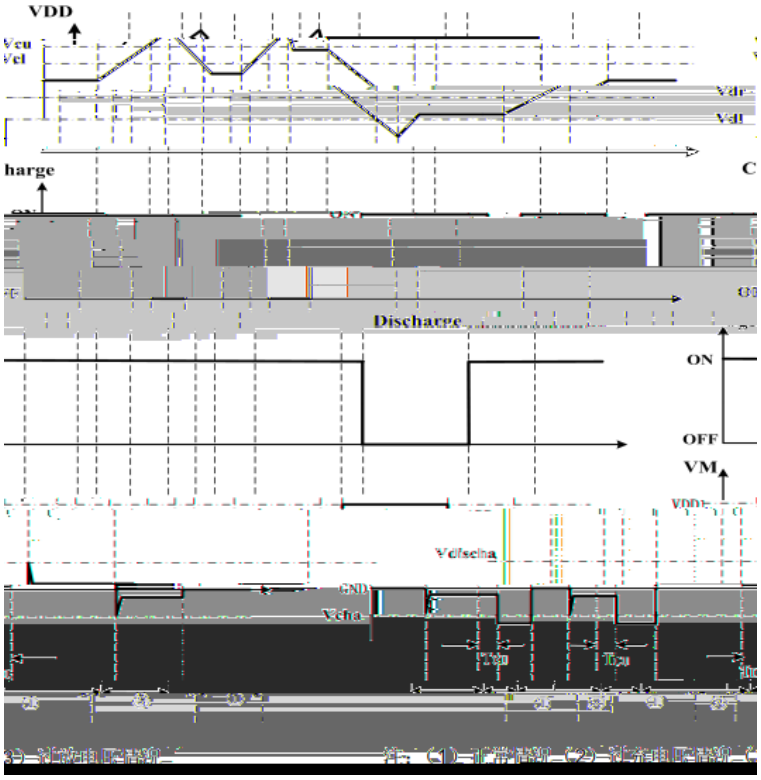
Note: If the VM pin voltage is no less than the charger detection voltage (VCHA), when the battery under overdischarge condition is connected to a charger, the overdischarge condition is released (the discharging control FET is turned on) as usual, provided that the battery voltage reaches the overdischarge release voltage (VDR) or higher.

٩ ٰ ≠ ∫ ˜ 2 Overcurrent Condition

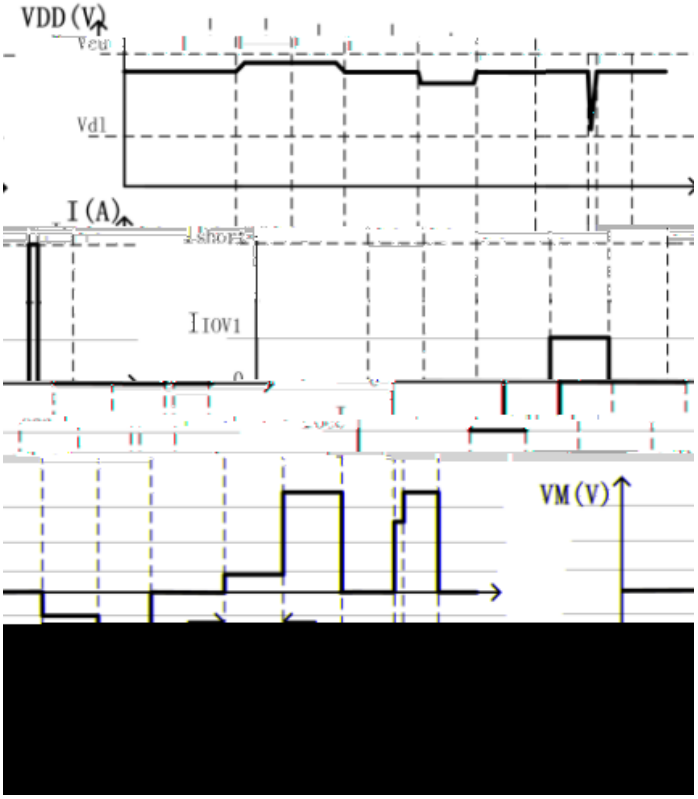
VM ,
,BRCL3230DZN FET
1 ,VM GND RVMS
VM VDD
VM GND RVMS VM VM

Ώ Ẑ ƒ 2 Timing Chart

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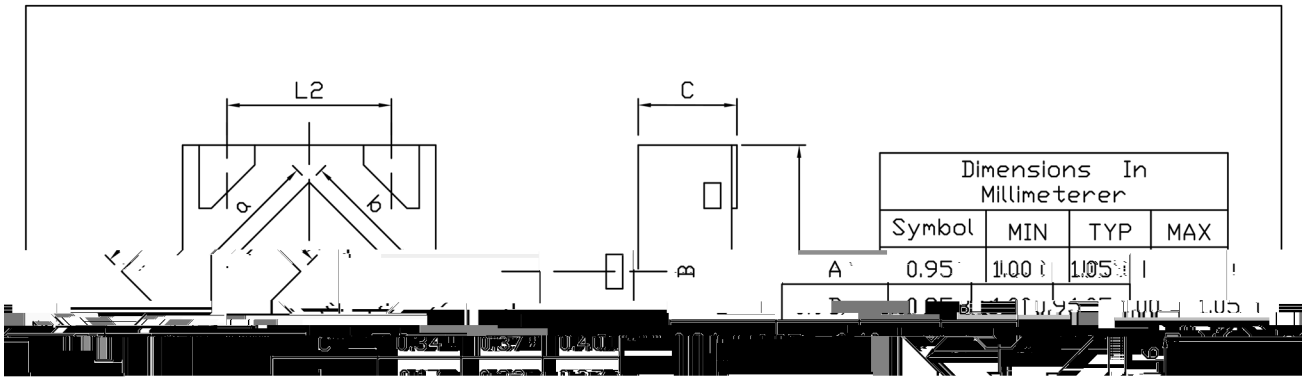
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ᵘ Ė Ồ Ļ ƒ / Package Dimensions

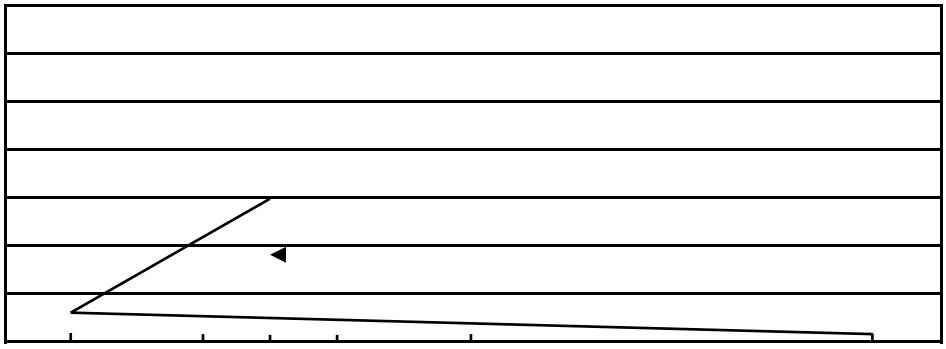
DFN1X1-4L-A

Unit:mm



Ł. Ļ Ω / Marking Instructions

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Note:

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