The BRCL3130ZN series product is a high integration solution for lithium-lion/polymer battery protection.BRCL3130ZN contains advanced power MOSFET, high-accuracy voltage detection circuits and delay circuits.

BRCL3130ZN 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. BRCL3130ZN 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.

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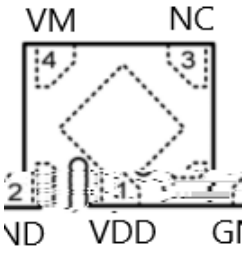

	VDD	Power Supply
	GND	Ground, connect the negative terminal of the battery to this pin.
	NC	No electrical connection
	VM	The negative terminal of the charger. The internal FET switch connects this terminal to GND.

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}	-6 to +10	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

/Test Condition	/Min	/Typ	/Max	/Unit
	4.25	4.30	4.35	V
	4.05	4.10	4.15	V
	2.70	2.80	2.90	V
	2.90	3.00	3.10	V
3.6V		1.2		A
3.6V		1.2		A
3.6V		$3*I_{IOV}$		A
3.6V V_M=0V		2.5	4.0	μA
2V,V_M floating			0.1	μA
3.6V I_{VM}=0.5A		100		mΩ
		140		
		115		
3.6V	5	10	18	ms
3.6V~4.4V	150	200	350	ms
V_{dd}=3.6V~2.0V	30	50	100	ms
V_{dd}=3.6V	7	12	20	ms
V_{dd}=3.6V	200	350	500	us

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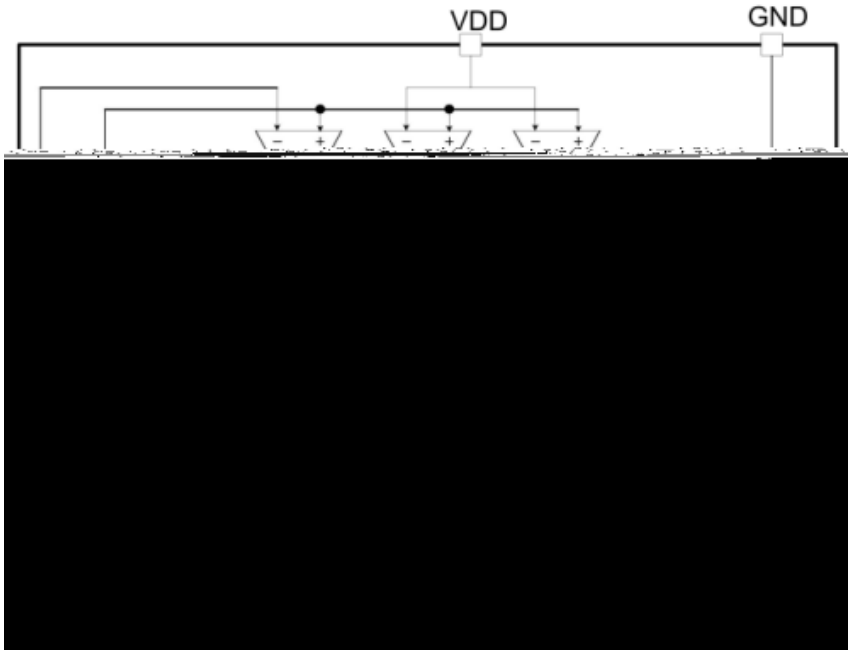
VDD
GND

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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 BRCL3130ZN 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 BRCL3130ZN turns the charging control FET on and returns to the normal condition.

2 When a load is connected and discharging starts, the BRCL3130ZN 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 BRCL3130ZN 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 BRCL3130ZN 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 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 connected, the overcurrent 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 work. Detection of load shortcircuiting works regardless of the battery voltage.

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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 BRCL3130ZN 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 BRCL3130ZN 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.

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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 BRCL3130ZN 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 equals the VDD voltage due to the load.

Because of the connection between the VM and the GND by the RVMS resistor when the load is removed, the VM pin goes back to the GND potential since the VM pin is shorted the GND pin with the RVMS resistor. Detecting that the VM pin potential is lower than the overcurrent detection voltage (VIOV), the IC returns to the normal condition.

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If the VM pin voltage drops below the Overcharge Current Detection during charging under the normal condition and it continues for the overcharge detection delay time or longer, the BRCL3130ZN turns the charging control FET off and stops charging. This action is called abnormal charge current detection.
Abnormal charge current detection is released when the voltage difference between VM pin and GND pin becomes higher than the charger detection voltage (VCHA) by separating the charger. Since the 0 V battery charging function has higher priority than the abnormal charge current detection function, abnormal charge current may not be detected by the product with the 0 V battery charging function while the battery voltage is low.

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If voltage of VM pin is higher short circuiting protection voltage (VSHORT) and it continues for the tSHORT or longer, the BRCL3130ZN will stop discharging and battery is disconnected from load. This status is released when voltage of VM pin is higher than short protection voltage (VSHORT), such as when disconnecting the load.

0V /

This function enables the charging of a connected battery whose voltage is 0V by self-discharge. When connectes to a charger , the discharging control FET is off and the charging current flows through the internal parasitic diode in the discharging control FET. If the battery voltage becomes equal to or higher than the overdischarge release voltage (VDL), the normal condition returns.
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 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 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

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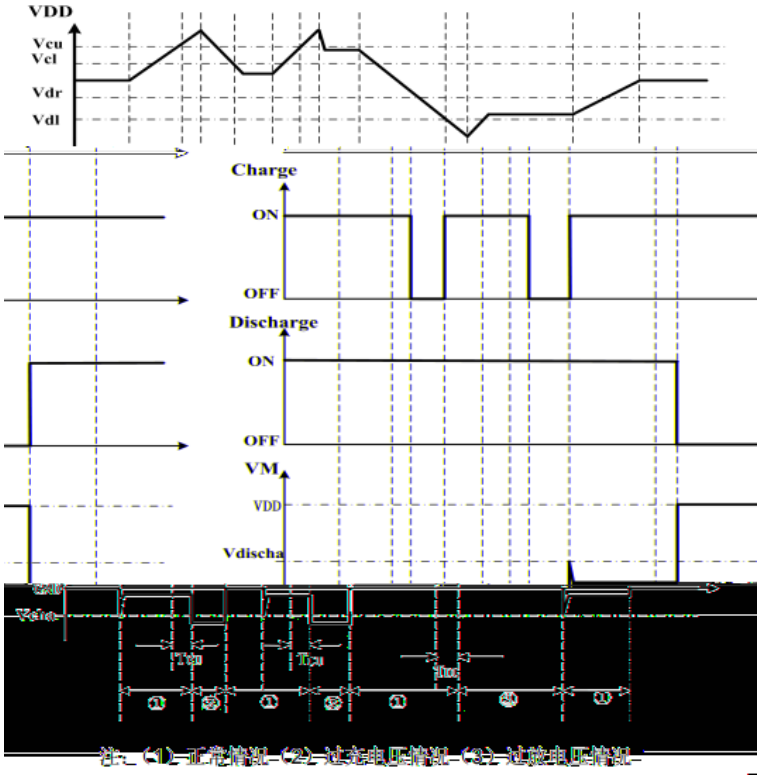

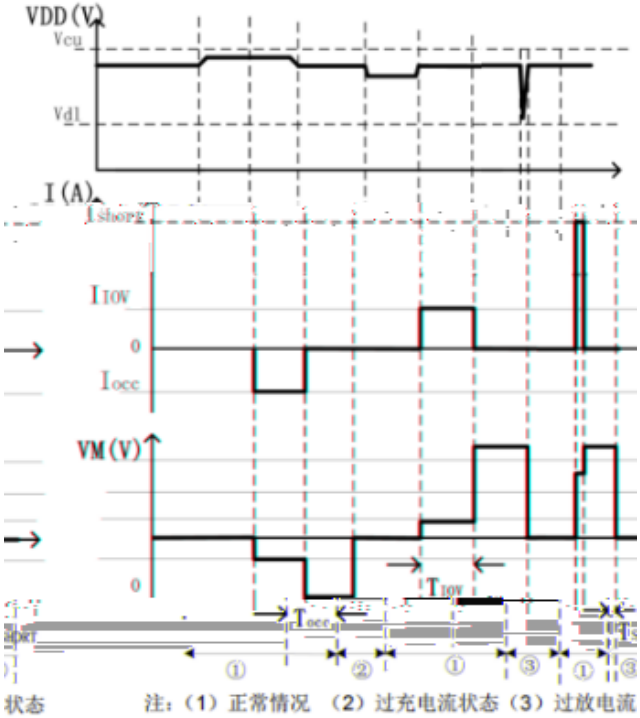

状态　　注：（1）正常情况　（2）过充电流状态（3）过放电流

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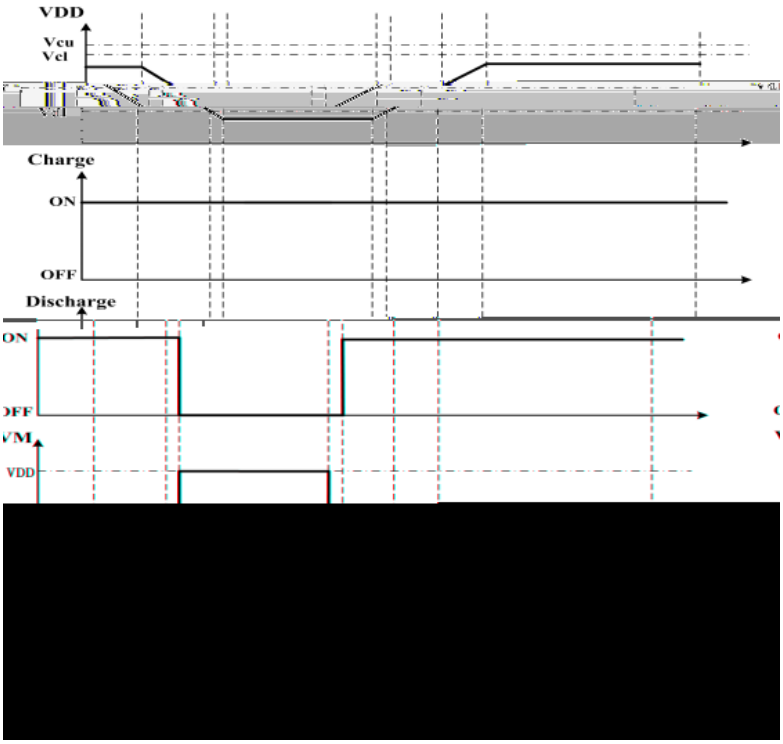
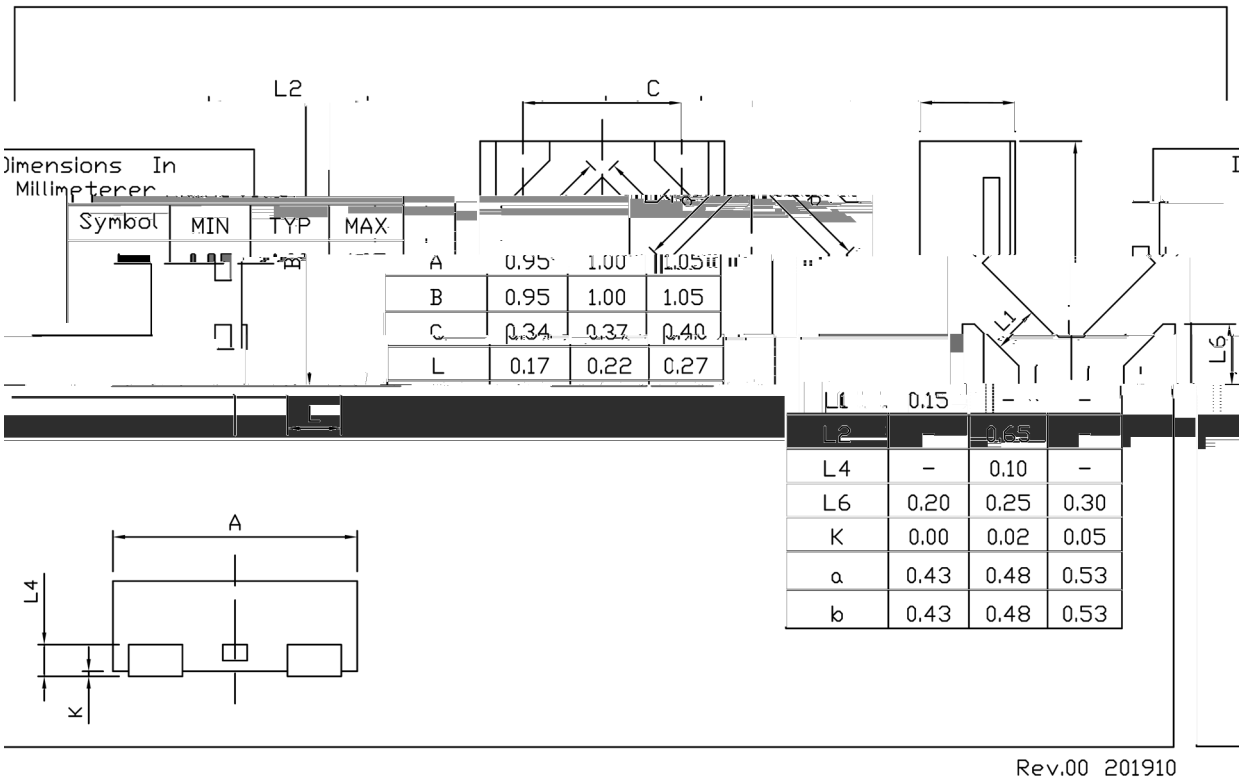
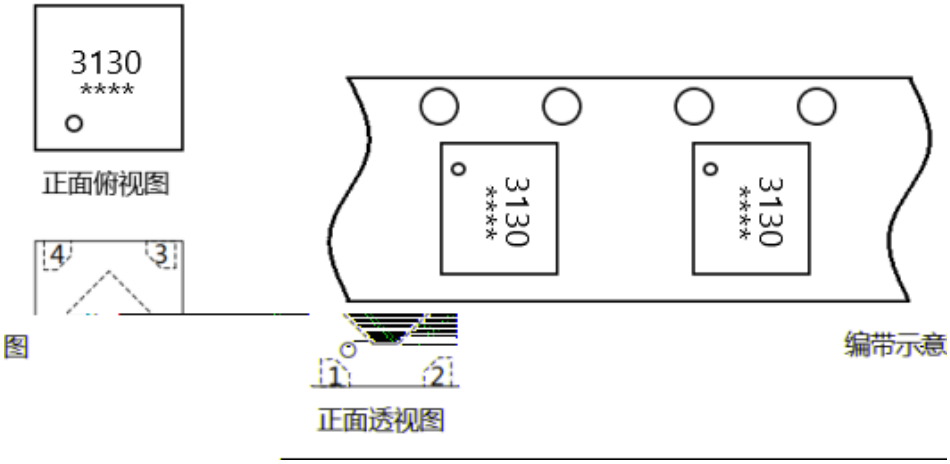

VDD
Vcu
Vcl
Charge
ON
OFF
Discharge
ON
VDD

DFN1X1-4L-A Unit:mm

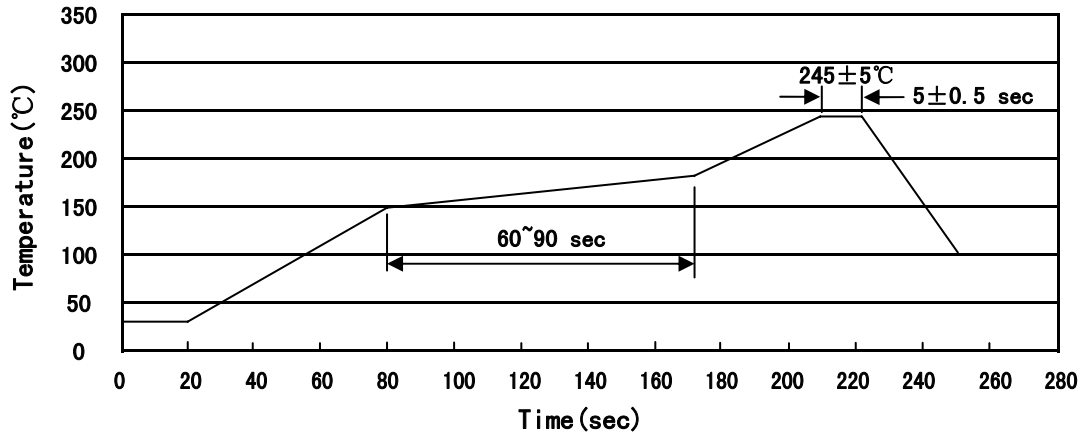




Note:

3130:	Product Type
****:	Lot No. Code, code change with Lot No

Temperature Profile for IR Reflow Soldering(Pb-Free)



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

260 5	10 1 sec.	Temp.:260 5 Time:10 1 sec

/ REEL
