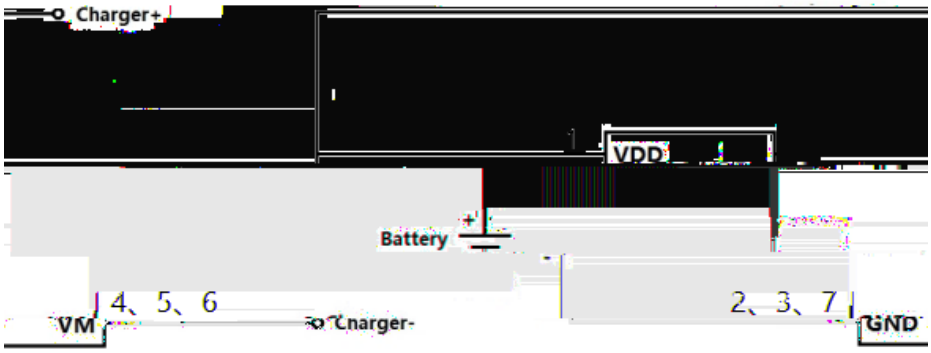
BRCL3230EZF

/ Typical Application



(1)

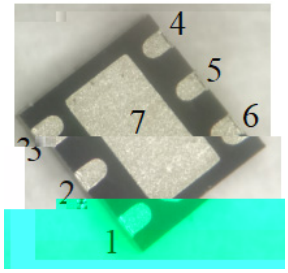
(2)

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





Pin Number	Pin Name	Pin Description
1	VDD	Power Supply
2 3 7	GND	Ground, connect the negative terminal of the battery to this pin.
4 5 6	VM	The negative terminal of the charger. The internal FET switch connects this terminal to GND.

/ Marking

See Marking Instructions.

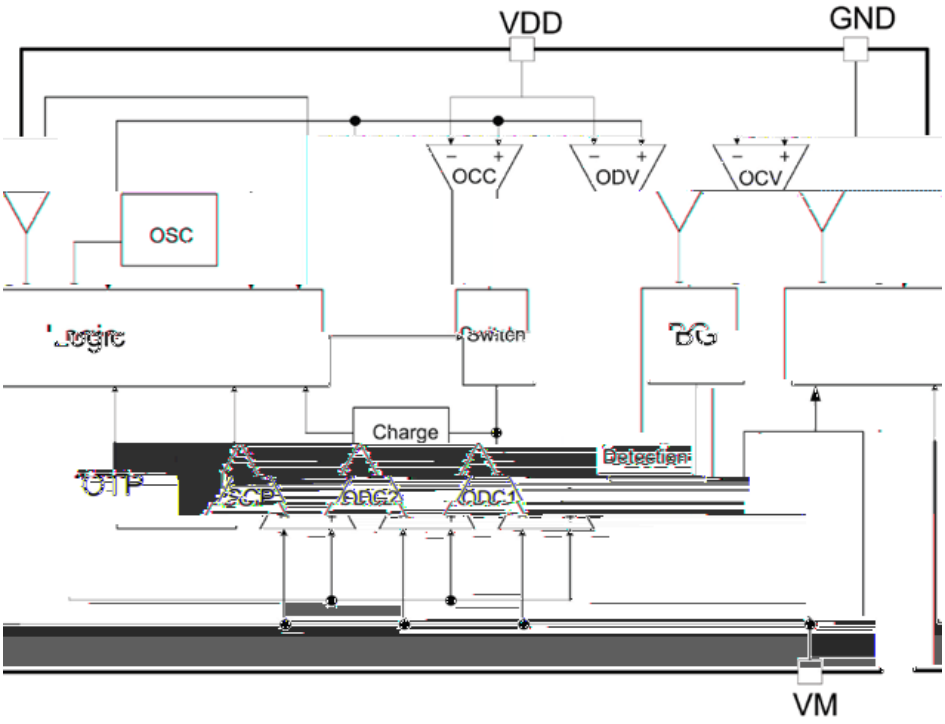
/Parameter	/Symbol	/Value	/Unit
V_{DD} input pin voltage	V_{IN}	-0.3 to +6	V
V_M input pin voltage	V_{VM}	-6 to +10	V
Power Dissipation	P_D	400	mW
Maximum Junction Temperature	T_J	125	
Lead Temperature	T_L	300	
Operating Junction Temperature	T_{opr}	-40 to +85	
Storage Temperature	T_{stg}	-55 to +150	
Package Thermal Resistance	$R_{\theta JA}$	250	/W
	$R_{\theta Jc}$	130	/W
ESD	ESD	2000	V

/Parameter	/Symbol	[redacted]

/ Electrical Characteristics(Ta=25)

Equivalent FET on Resistance						
Equivalent FET on Resistance	R_{DS}	V_{dd}=3.6V I_{VM}=1A	15	22	40	mΩ
Over temperature protection						
Over Temperature Protection	OTP			140		
Over Temperature Recovery Degree	OTPR			115		
Delay time						
Overcharge Current Detection Delay Time	T_{OCC}	V_{dd}=3.6V	3.5	5	6.5	ms
Overcharge Voltage Detection Delay Time	T_{CU}	V_{DD}=3.6V~4.4V	55	85	115	ms
Overdischarge Voltage Detection Delay Time	T_{DL}	V_{DD}=3.6V~2.0V	25	40	55	ms
Overdischarge Current1 Detection Delay Time	T_{IOV1}	V_{DD}=3.6V	3.5	5	6.5	ms
Overdischarge Current2 Detection Delay Time	T_{IOV2}	V_{DD}=3.6V	0.4	0.6	0.8	ms
Load Short-Circuiting Detection Delay Time	T_{SHORT}	V_{DD}=3.6V		100	300	us

/ Functionl Block Diagram



/ Overcharge Condition

The BRCL3230EZF 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 BRCL3230EZF 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 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

VDL ,
TDL BRCL3230EZF
FET VM VM VDD RVMD
IPDN VM VDD
RVMD VM VCHA ,
FET (VDL) BRCL3230EZF
FET
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 BRCL3230EZF 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 BRCL3230EZF 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 BRCL3230EZF 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

VM ,

,BRCL3230EZF FET

1 2 ,VM GND RVMS

VM VDD

VM GND RVMS VM VM

1

When the discharging current becomes equal to or higher than a specified val

0V / 0V Battery Charging Function

0V

VDL IC

(1)

“ 0V ” “ 0V ”

(2) “ 0V ” “ ” , “ 0V ”

IC VDL

(3)

VM GND VM GND

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 battery and abnormal charge current cannot be detected during the battery voltage is low.

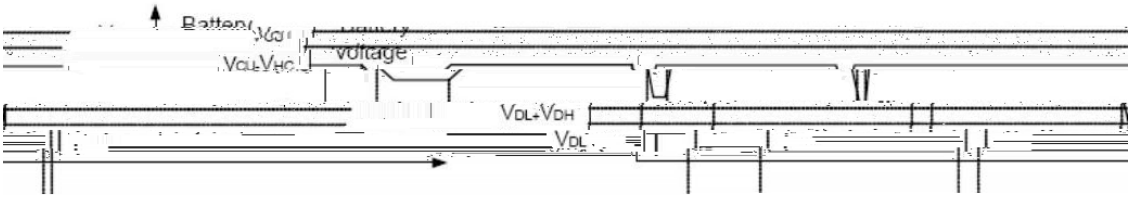
(3) When a battery is connected to the IC for the first time, the IC may not enter the normal condition in which discharging is possible. In this case, set the VM pin voltage equal to the GND voltage (short the VM and GND pins or connect a charger) to enter the normal condition.

/ Timing Chart

/Overcharge And Overdischarge Detection

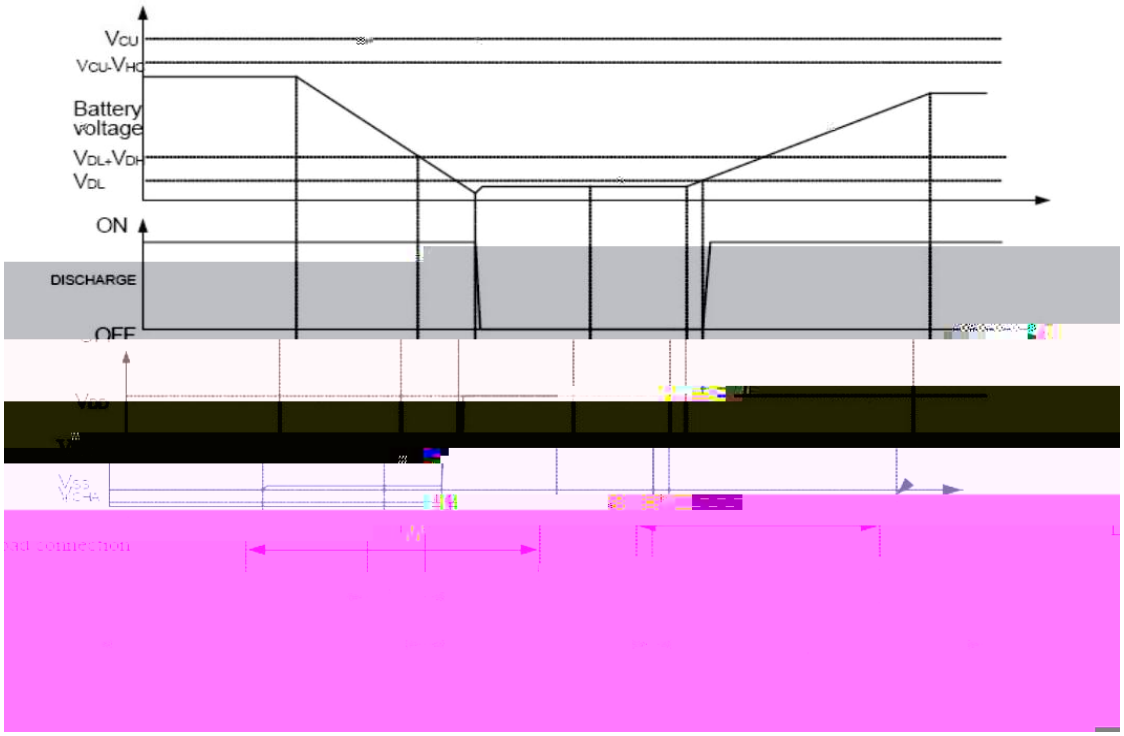


/Overdischarge Current Detection

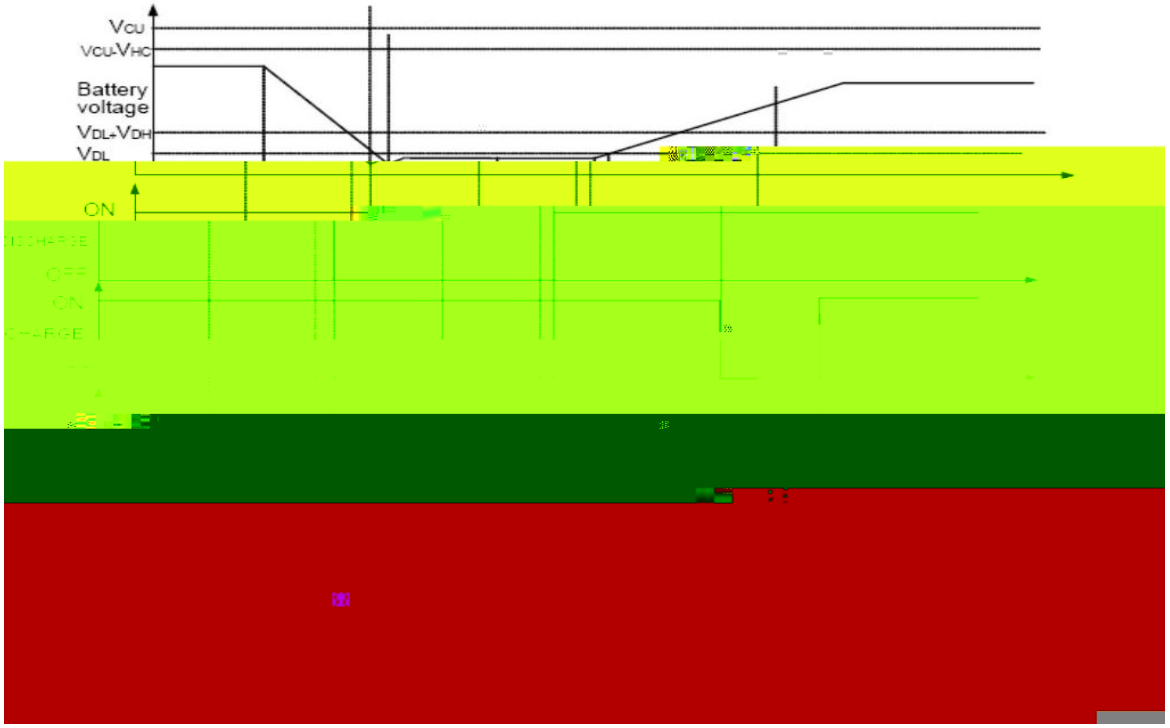


/ Timing Chart

/Charger Detection



/Abnormal Charge Detection

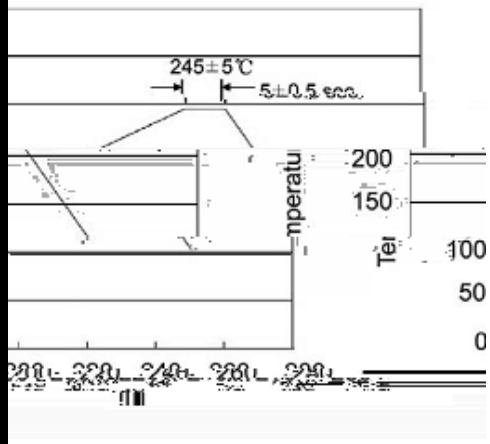


Notes: (1) Normal condition (2) Overcharge voltage condition (3) Overdischarge voltage condition (4) Overcurrent condition

/ Package Dimensions



IR Reflow Soldering(Pb-Free)



Note:

.Preheating:150~180 , Time:60~90sec.

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

. Cooling Speed: 2~10 /sec.

Test Conditions

Temp.:260±5 Time:10±1 sec

/ Packaging SPEC.

/ REEL