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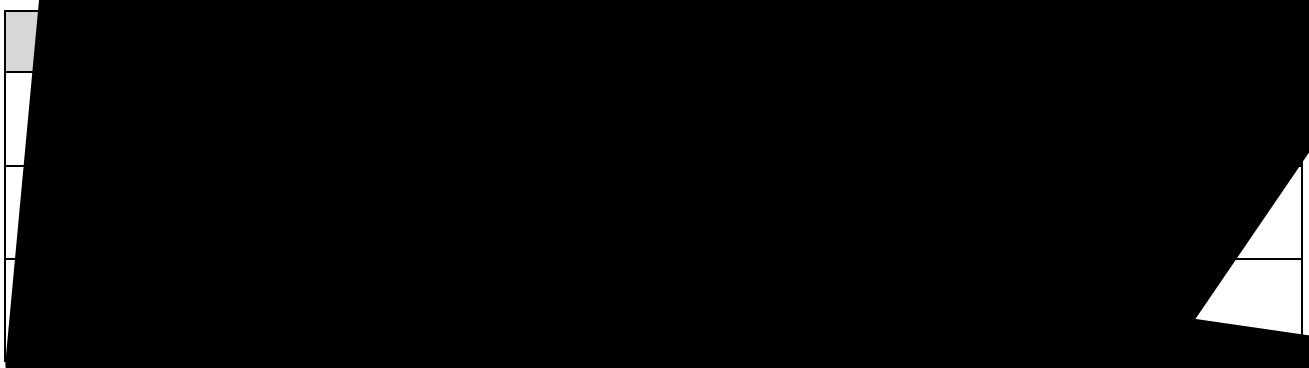
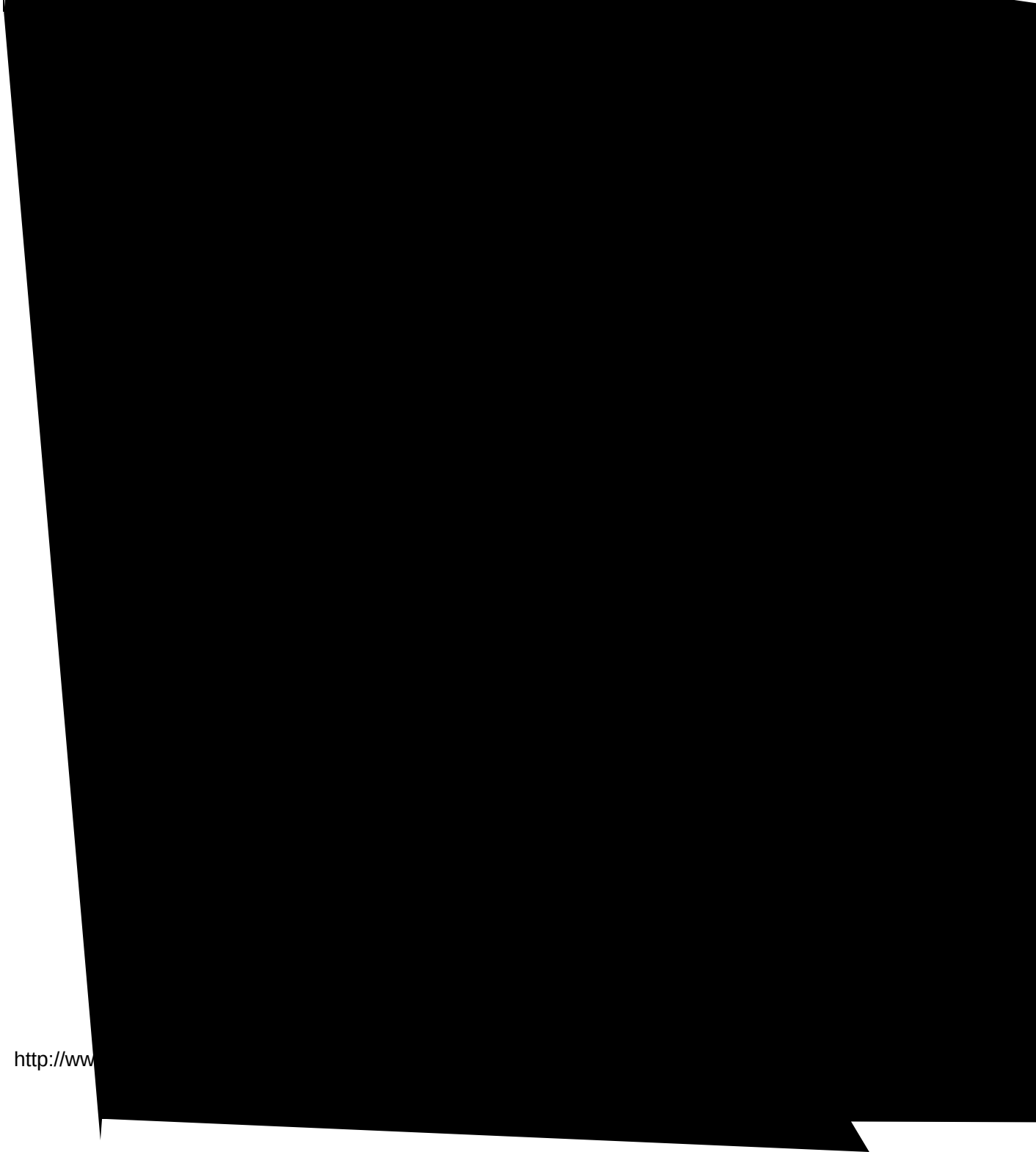




/ Descriptions

BRCL3230BME /
BRCL3230BME MOSFET
BRCL3230BME SOT23-5
BRCL3230BME

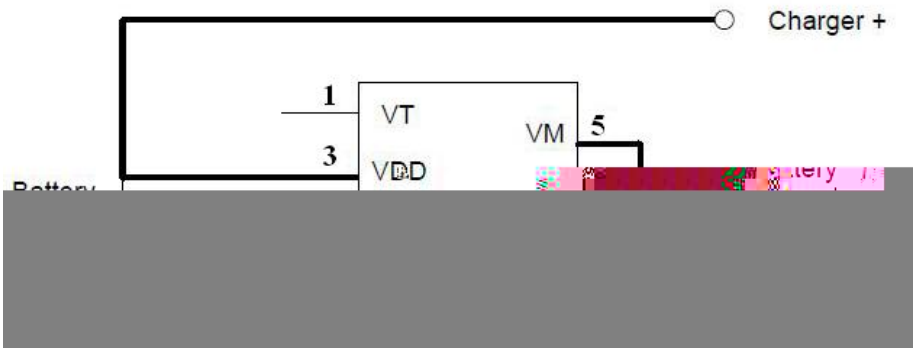
The BRCL3230BME series product is a high integration solution for lithium-lion/polymer battery protection.BRCL3230BME contains advanced power MOSFET, high-accuracy voltage detection circuits and delay circuits.
BRCL3230BME is put into an ultra-small SOT23-5 package makes it an ideal solution in limited space of battery pack. BRCL3230BME 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

- 25mΩ MOSFET
- SOT23-5
- RC
-
-
- 2 1 2
-
- 0V
- 3.0uA, 1.7uA;
-
- Integrate advanced power MOSFET with Equivalent of 25mΩ $R_{DS(ON);}$
- Ultra-small SOT23-5 package;
- Internal integration RC without any peripheral devices;
- 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: 3.0μA typ,Power-down Mode: 1.7μA typ ;
- HF Product;

/ Applications

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



(1)
(2)
(3)

Notes：
(1) The chip power consumption shall not exceed the maximum power consumed by the package.
(2) This product has anti-

/ Absolute Maximum Ratings(Ta=25)

/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

/ Electrical Characteristics(Ta=25)

/Parameter	/Symbol	/Test Condition	/Min	/Typ	/Max	/Unit
Detection voltage						
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}		2.30	2.40	2.50	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
Detection current						
Overcharge Current Detection	I_{IOCC}	V_{dd}=3.6V	4.5	5.5	6.5	A
Overdischarge Current1 Detection	I_{IOV1}	V_{dd}=3.6V	4	5	6	A
Overdischarge Current2 Detection	I_{IOV2}	V_{dd}=3.6V	7	9.5	11	A
Load Short-Circuiting Detection	I_{SHORT}	V_{dd}=3.6V	12	18	25	A
Static current						
Current Consumption in Normal Operation	I_{OPE}	V_{dd}=3.6V，V_M=0V	1.5	3.0	6.0	μA
Current Consumption in power Down	I_{PDN}	V_{dd}=2V,V_M floating	1	1.7	2.5	μA

Equivalent FET on Resistance						
Equivalent FET on Resistance	R_{DS}	V_{dd}=3.6V，I_{VM}=1A	15	25	40	mΩ
Over temperature protection						
Over Temperature Protection	OTP		125	140	155	℃
Over Temperature Recovery Degree	OTPR		100	115	130	℃
Delay time						
Overcharge Current Detection Delay Time	T_{OCC}	V_{dd}=3.6V	5.6	8	10.4	ms
Overcharge Voltage Detection Delay Time	T_{CU}	V_{DD}=3.6V~4.4V	95	135	175	ms
Overdischarge Voltage Detection Delay Time	T_{DL}	V_{DD}=3.6V~2.0V	25	35	45	ms
Overdischarge Current1 Detection Delay Time	T_{IOV1}	V_{DD}=3.6V	5.6	8	10.4	ms

S n g

/ Overcharge Condition

The BRCL3230BME 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 BRCL3230BME 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

/ Overcurrent Condition

VM ,
,BRCL3230BME 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 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 BRCL3230BME 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 (VIOV1), the IC returns to the normal condition.

/ Abnormal Charge Current Detection

VM (VCHA)
(TCU) BRCL3230BME FET
VM GND (VCHA) 0V
0V

If the VM pin voltage drops below the charger detection voltage (VCHA) during charging under the normal condition and it continues for the overcharge detection delay time (TCU) or longer, the BRCL3230BME 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.

/ Load Short-circuiting Condition

VM VSHORT tSHORT
BRCL3230BME VM VSHORT

If voltage of VM pin is higher short circuiting protection voltage (VSHORT) and it continues for the tSHORT or longer, the BRCL3230BME 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 / 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

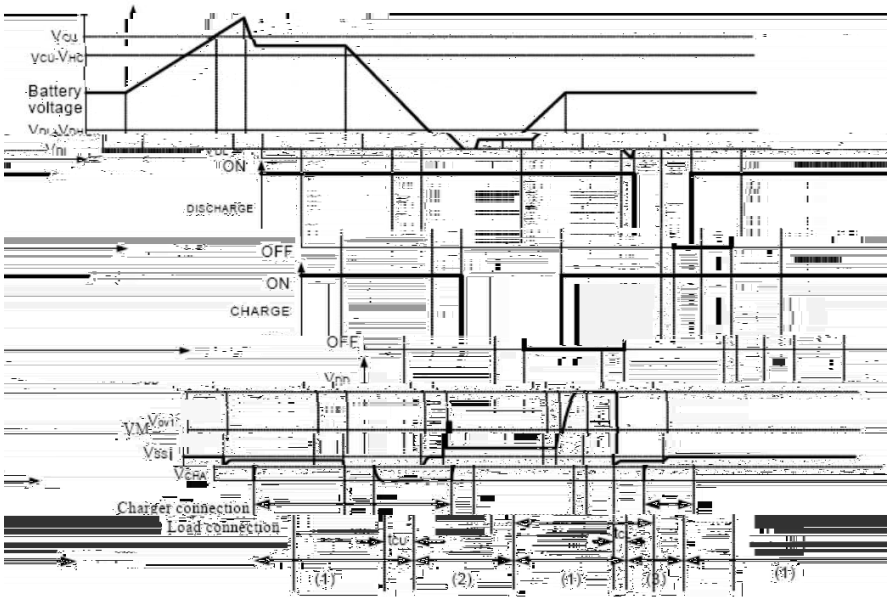
(1) Some battery providers do not recommend charging of completely discharged batteries. Please refer to battery providers before the selection of 0 V battery charging function.

(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.

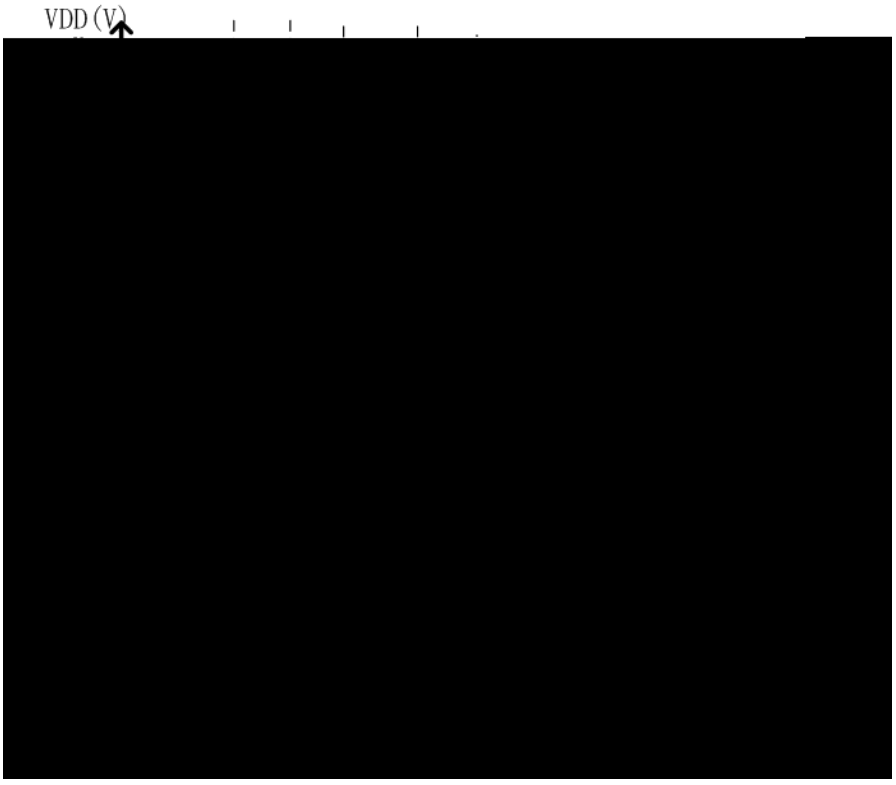
/ Timing Chart

/Overcharge And Overdischarge Detection



注：（1）正常情况（2）过充电压情况（3）过放电压情况

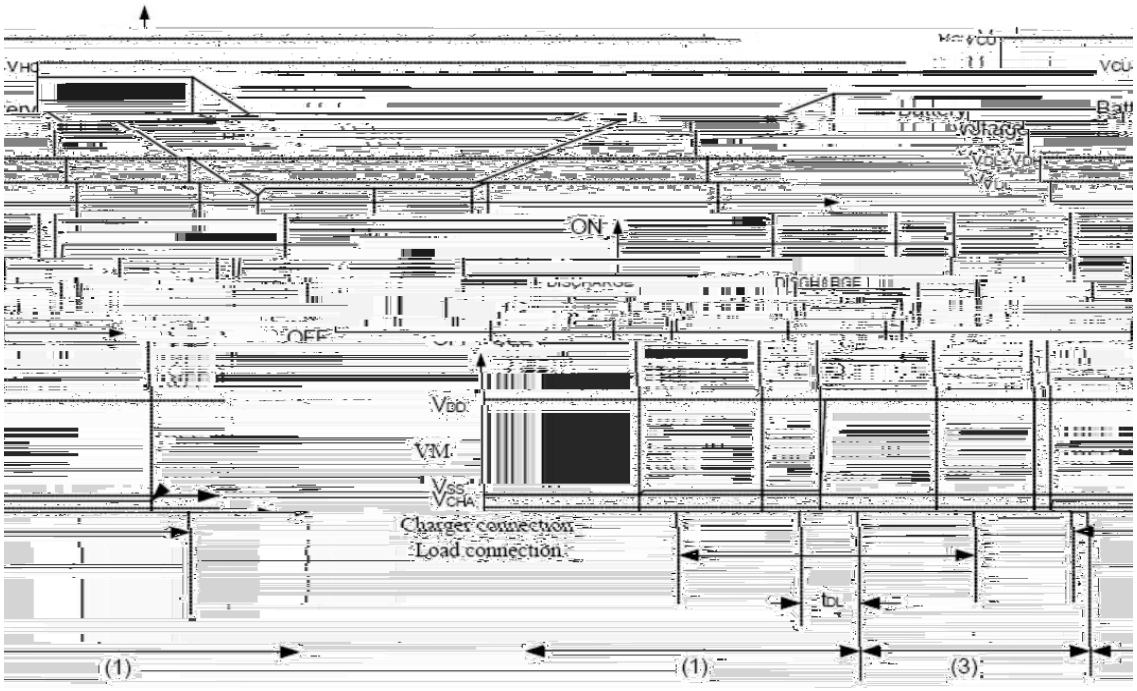
/Overcharge Overdischarge Current Detection



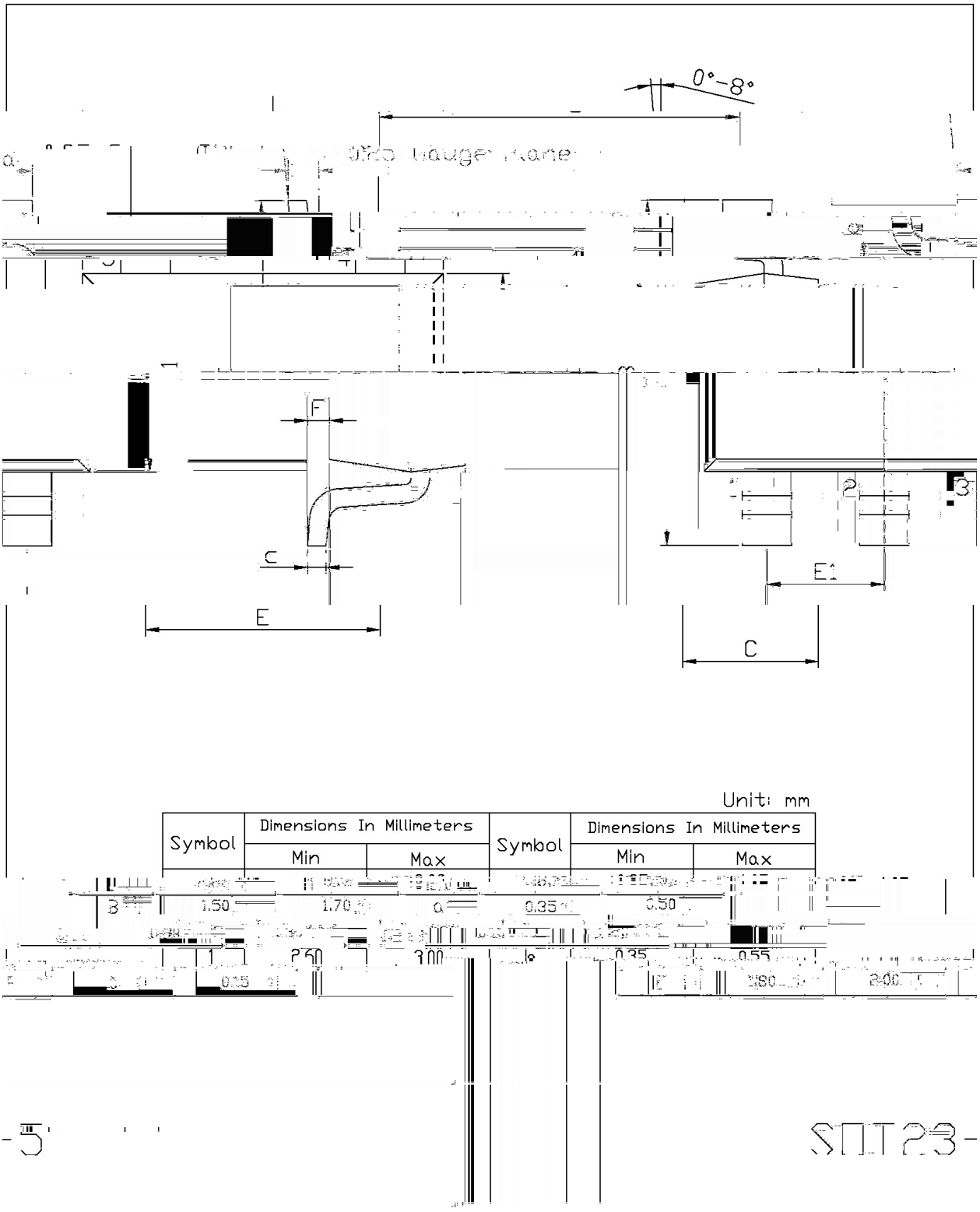
注：（1）正常情况 （2）过充电流状态（3）过放电流状态

/ Timing Chart

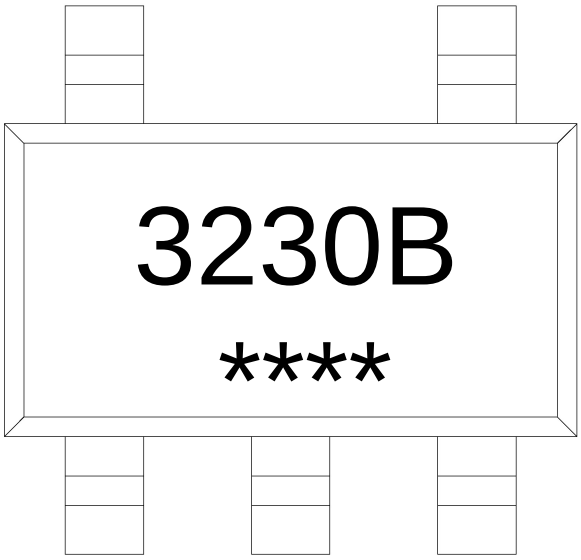
/Charger Detection



/ Package Dimensions



/ Marking Instructions



3230B

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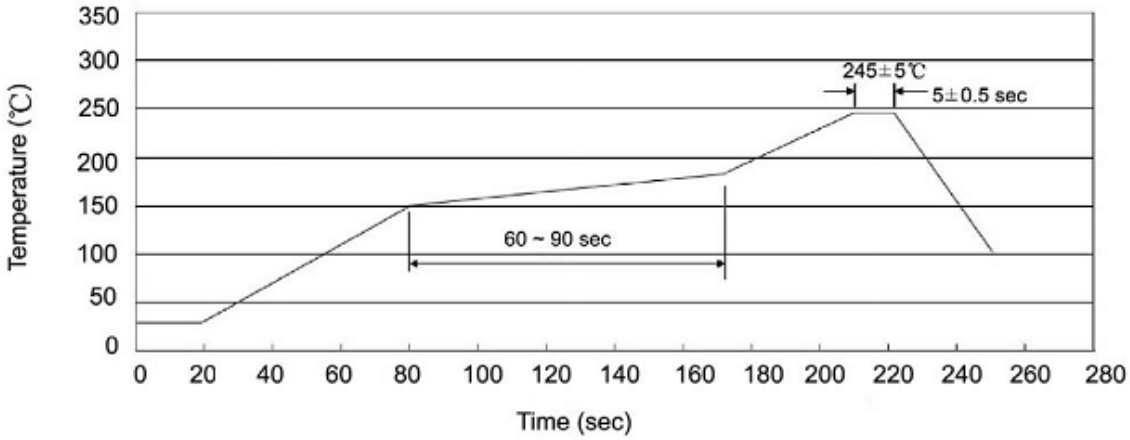
Note:

3230B: Product Type.

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

( ) / Temperature Profile for IR Reflow Soldering(Pb-Free)



		Note:	
1	150 180 60 90sec;	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.	

/ Resistance to Soldering Heat Test Conditions

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

/ Packaging SPEC.

/ REEL

Package Type 封装形式	Units 包装数量					Dimension 包装尺寸 (unit : mm³)		
	Units/Reel 只/卷盘	Reels/Inner Box 卷盘/盒	Units/Inner Box 只/盒	nner Boxes/Outer Bo 盒/箱	Units/Outer Box 只/箱	Reel	Inner Box 盒	Outer Box 箱
SOT23-5/6	3,000	10	30,000	4	120,000	7″ ×8	210×205×205	435×225×420

/ Notices