对于任何细节和问题，请告诉我们
For any details and enquiry, please contact VDL；Tel:0755-29961201,Fax:0755-29961203

VDL SPECIFICATIONAPPROVAL SHEET

VDL 产品承认书

Customer Name 客户代码: 0844

Customer Product Model 客户产品型号: YLLP293036C405WVDL

Product Model 产品型号: 293036PN3

Product Capacity 产品容量: 405mAh/3.8V

Product Code产品编码: 100100293036

Assembly Plant Code 组装厂编码:

Terminal Code 终端编码:

ME by 结构工程师	CEE by 电子工程师	Cell by 电芯工程师	ME Checked by 审核	EE Checked by 审核	Approved by 批准
刁鹏	胡继东	刘志豪	陈海异	华优见	刘圣军

Approved by customer 客户承认 (Stamp) (盖章)	Tested by 测试	Checked by 审核	Approved by 批准

重 庆 市 紫 建 电 子 股 份 有 限 公 司
Chongqing VDL Electronics Co., LTD.
地址：重庆市开州区赵家街道浦里工业新区 1-4 号楼　邮编:405401
Add：Building 1-4, Puli Industrial New Area, Zhaojia Street, Kaizhou District, Chongqing, China
电话(Tel):023-5297 7888　传真(Fax):023-5297 5969
深 圳 市 维 都 利 电 子 有 限 公 司
Shenzhen VDL Electronics Co., LTD.
销售中心地址：深圳市宝安区卓越时代广场 C2903 邮编:518100
Add：C2903, Times Square Excellence, Bao'an District, Shenzhen，China. Post: 518100
销售中心电话(Tel):0755-2996 1201（10 线）　传真(Fax):0755-2996 1203
网址(Web)：www.gdvdl.com 邮箱(E-mail)：vdl@gdvdl.comQQ：2355313400

VDL® 业界领先的聚合物锂电池制造商

Revision History
版本履历表

Revision 版本	Description 内容描述	Modify 修改人	Approval 审批人	Date 日期
A/0	First Issue 新版发行	罗波	刘圣军	2023-05-10
A/1	1、删除 7.1 表格 45～50 温度段的内容 2、取消接线端子，长度不变还是 16mm 头部浸锡 3、按照 3C 标准，增加喷码 4、增加电子标签，移印内容 5、型号变更为 ： YLLP293036C405WVDL	罗波	刘圣军	2023-08-22
A/2	客户要求改为双保护方案，IC 规格书	罗波	刘圣军	2023-09-15
A/3	内阻由 305mΩ改为 260mΩ	罗波	刘圣军	2023-10-12
A/4	1.标签尺寸由 0.1*28*30mm 变更为 0.085*25*27mm 2.标签内容中 “红线/Red Wire”变更为实际标签的“红线//Red Wire”	刁鹏	刘圣军	2024-07-29
A/5	头部尺寸管控由 3.2mm 变更为 3.25mm	刁鹏	刘圣军	2024-08-23
	增加侧边胶； 厚度尺寸由 Max2.98mm 变更为 Max3.10mm； 宽度尺寸由 Max30.1mm 变更为 Max30.22mm； 长度尺寸由 Max38mm 变更为 Max38.2mm	刁鹏	刘圣军	2024-09-03

Contents 目录

1. Scope 概述……4

2. Product basic information 产品基本信息：……4

3．Battery protection characteristics 电池保护特性 ……5

4．Condition adapting characteristics 环境适应性（n=1）……6

5．Safety performance 安全性能（n=1）……7

6. Testing requirements 测试要求……9

7．Operation temperature and humidity range 运行温湿度范围……9

8．Storage temperature and humidity range 存储温湿度范围……9

9．Electrical Characteristics 电气特性……10

10．Battery structure diagram 电池架构图……13

11．PCB Layout PCB 布线图……13

12．Schematic circuit diagram 电路原理图……13

13．Cell 电芯……14

14．Battery Outline Drawing 电池组外形尺寸……15

15．connector 连接器 ……15

16．BOM 1(Bill of materials)电池物料清单……17

17．Battery Precautions and Safety Instructions 电池组使用注意事项及安全说明……18

18．Customer Inquiry 客户要求……19

1. Scope 概述

The specification shall be applied to Lithium-ion rechargeable battery pack manufactured by **VDL Electronics Co., LTD**. It is the basis for product design, production and inspection. Its purpose is to let the customer know the quality standard and the instruction.

本产品承认书描述重庆市紫建电子股份有限公司设计制造的可充电锂电池，它是产品设计、生产和检验的依据。其作用是让客户了解产品的质量标准及正确使用方法。

Reference standard 参考标准:

GB/T 31241-2022 中华人民共和国国家标准《蜂窝电话用锂离子电池总规范》

IEC/EN61960 欧盟锂电池标准

UL1642 美国锂电池安全标准

2.Product basic information 产品基本信息:

No.	Items 项 目	Parameter 参 数	
1	Battery model电池型号	YLLP293036C405WVDL	
2	Design scheme保护电路设计方案	一级保护	XBGL6156JS
		二级保护	XBGL6332JTSZR
3	Minimal capacity最小容量	405mAh（0.2C Standard discharge 0.2C标准放电）	
4	Typical capacity典型容量	420mAh（0.2C Standard discharge 0.2C标准放电）	
5	Nominal voltage标称电压	3.8V	
6	Shipment voltage出货电压	3.80~3.95V	
7	Charge ending voltage充电限制电压	4.35V	
8	Discharge ending voltage放电终止电压	3.0V	
9	Over current protection过电流保护	0.92-2.15A	
10	Short circuit protection短路保护功能	有 Yes	
11	AC Impedance内阻	≤260mΩ (详见9.4项 / Detail in 9.4)	
12	Battery Weight电池组重量	About约：7.1g	
13	Max discharge current最大放电电流	1C（连续放电模式For continuous discharge mode）	
14	Max charge current最大充电电流	1C（连续充电模式For continuous charge mode）	

3．Battery protection characteristics 电池保护特性(Ta=25℃)

XBGL6156JS(靠近 P+/P-)

No.	Items 项 目	Parameter 参 数	condition 条件
1	Overcharge protection detection voltage过充保护检测电压	(4.425±0.025)V	Battery voltage is greater than the protection voltage, and the delay time to reach, then the state of the battery into overcharge protection. 电池电压大于过充保护电压，且延时时间达到，则电池进入过充电保护状态。
2	Overcharge release voltage过充保护恢复电压	(4.25±0.05)V	
3	Overcharge protection delay time过充保护延迟时间	70-250 ms	
4	Overdischarge protection detection voltage过放保护检测电压	(2.8±0.1)V	Battery voltage is less than the protection voltage, and the delaytime to reach, then the state of the battery into overdischarge protection. 电池电压小于过放保护电压，且延时时间达到，则电池进入过放电保护状态。
5	Overdischarge release voltage过放保护恢复电压	3.0±0.1V	
6	Over discharge protection delaytime过放保护延迟时间	15-65ms	
7	Overcurrent discharge protection current放电过流保护电流	0.92-2.15A	Battery discharge current is greater than the protection current, and the delay time to reach, then the state of the battery into overcurrent protection 电池放电电流大于过流保护，且延时时间达到，则电池进入放电过流保护状态。
8	Overcurrent protection delay time放电过流保护延时时间	5-20 ms	
9	Current consumption (Operation) of PCM 保护板两段总静态电流	≤2μA	VDD= 3.9V
10	Load resistance of PCM 保护板两段总内阻	≤120mΩ	VDD= 3.9V
11	0V charge function 0V充电功能	Available允许	
12	Charge overcurrent protection current 充电过流保护电流	0.92-2.15A	If shall stop charging for an excessive charge current at Over Current Protection current lasts for delay time 电池充电电流大于充电过流保护电流，且延时时间达到，则电池进入充电过流保护状态。
13	Charge overcurrent delay time 充电过流延迟时间	5-20 ms	
14	Load Short-Circuiting Detection Delay Time短路延时	50-550uS	

XBGL6332JTSZR(靠近 B+/B-)

No.	Items 项 目	Parameter 参 数	condition 条件
1	Overcharge protection detection voltage过充保护检测电压	(4.475±0.025)V	Battery voltage is greater than the protection voltage, and the delay time to reach, then the state of the battery into overcharge protection. 电池电压大于过充保护电压，且延时时间达到，则电池进入过充电保护状态。
2	Overcharge release voltage过充保护恢复电压	(4.15±0.05)V	
3	Overcharge protection delay time过充保护延迟时间	768-1792 ms	
4	Overdischarge protection detection voltage过放保护检测电压	(2.6±0.1)V	Battery voltage is less than the protection voltage, and the delaytime to reach, then the state of the battery into overdischarge protection. 电池电压小于过放保护电压，且延时时间达到，则电池进入过放电保护状态。
5	Overdischarge release voltage过放保护恢复电压	3.0±0.1V	
6	Over discharge protection delaytime过放保护延迟时间	96-224 ms	
7	Overcurrent discharge protection current放电过流保护电流	2.17-5.07 A	Battery discharge current is greater than the protection current, and the delay time to reach, then the state of the battery into overcurrent protection 电池放电电流大于过流保护，且延时时间达到，则电池进入放电过流保护状态。
8	Overcurrent protection delay time放电过流保护延时时间	24-56 ms	
9	Current consumption (Operation) of PCM 保护板两段总静态电流	≤2μA	VDD= 3.9V
10	Load resistance of PCM 保护板两段总内阻	≤120mΩ	VDD= 3.9V
11	0V charge function 0V充电功能	Unavailable禁止	The 1.5V device is rechargeable ≥1.5V可充电
12	Charge overcurrent protection current 充电过流保护电流	2.38-5.46 A	If shall stop charging for an excessive charge current at Over Current Protection current lasts for delay time 电池充电电流大于充电过流保护电流，且延时时间达到，则电池进入充电过流保护状态。
13	Charge overcurrent delay time 充电过流延迟时间	24-56 ms	
14	Load Short-Circuiting Detection Delay Time短路延时	200-800uS	

4. Condition adapting characteristics 环境适应性（n=1）

No.	Items 项目	Test Method 测试方法	Criteria 标准
1	**High/low Temperature 高/低温性能**	After the cell fully charged at 23℃±2℃, measure the discharging capacity with discharging current 0.2C till 3.0 (V) cut off voltage at different temperature. (as compared with initial capacity) 在 23℃±2℃条件下满充电后，测量电池在不同温度下用 0.2 C_5A 电流放电至 3.0 (V)所放出的容量（与初始容量作为比较）。	在-10℃时 ≥70% At -10℃: ≥70% 在 55℃时 ≥95% At 55℃:≥95%
2	**Invariableness humid and hot 恒定湿热**	After putting the cell in the invariableness humid and hot box of 40℃±2℃ and relative humidity of 90～95% for 48 hours. Discharge the cell to 3.0*n(V) cut-off voltage at 0.2C current. 将电池放入 40℃±2℃及相对湿度为 90～95%的恒温恒湿箱中 48 小时后，再以 0.2C 电流放电至 3.0*n(V)。	No leakage, no fire, no explosion. The discharging time ≥3h. 无泄漏，无起火，无爆炸。放电时间≥3h。
3	**Vibration 振动**	The fully charged cell is vibrated from 90 to 100 minutes at three mutually perpendicular planes with excursion of 0.8mm, and change the frequency from 10 to 55 HZ with 1Hz/min speed. 满充电后的电池在三个相互垂直的方向按振幅 0.8mm 的谐振形式进行振动，频率在10-55HZ以1Hz/min的速率变化，往复振动 90 至 100min.	No leakage, no fire, no explosion. 电池无漏液,无冒烟，无起火，无爆炸
4	**Free fall 自由跌落**	The cell free falls from a height of 1m into the cement floor from X,Y,Z front and opposite direction of each direction. Then discharge the cell to 3.0*n(V) cut-off voltage with 1.0C current. 电池将从 1 米高处自由跌落到水泥地板上， 从 X、Y、Z 正反方向每个方向自由跌落一次,再以 1.0C 放电至 3.0 (V)	No leakage, no fire, no explosion. 电池无漏液,无冒烟，无起火，无爆炸

5．Safety performance 安全性能（n=1）

No.	Items 项目	Test Method 测试方法	Criteria 标准
1	Forced discharge 强制放电	Discharge the cell to the cut-off voltage with 0.2C current and then reverse charge the cell for more than 90 mins with 1C current.电池先以 0.2C 放电至终止电压，再以 1C 电流，对电池进行反向充电，90min 以上	No fire, no explosion 无起火，无爆炸
2	Overcharge 过充电	After discharged with 0.2C to the cut-off voltage, charge the cell with 3.0C/4.6V for 7.0hrs. 0.2C 放电至截止电压后，电池用 3C /4.6V 恒流恒压充电 7.0h	No explosion, no fire 无起火、无爆炸
3	Low pressure 低气压	Put the fully charged cell in a vacuum chamber at ambient temperature 20~25℃ for 6 hrs. The vacuum environment pressure is set to be less than 11.6kPa, simulating an altitude of 15240m. 电池放在一个模拟真空的空间放置 6 小时，环境温度为 20~25℃，真空环境压力≤11.6kpa，模拟 15240m 高空低压环境	No leakage, no fire, no explosion 无泄漏，不起火，不爆炸
4	Short test 短路测试	Short circuit the fully charged cell by connecting the positive and negative terminals with resistance load 80±20 mΩ at room temperature 20~25℃. The cell remains on test for 24 hrs or until the surface temperature declines by 20 % of the maximum temperature rise, whichever is the sooner. 在室温 20~25℃下，把充满电电池的正负极用 80±20 mΩ 的负载连接起来，使电池外部短路。结束条件：测试时间 24 小时或者表面温度下降到最高温度的 20%。	No fire, no explosion. The temperature of the cell surface not exceeds 150℃. 无起火，无爆炸 电池表面温度不超过 150℃。

5	Soak test 浸泡测试	Put the fully charged cell into pure water, soaked for 24 hours. 把满充电的电池放进清水中浸泡 24 小时	No broken, no fire 无破裂，无起火
6	Crush test 挤压测试	A fully charged cell is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cell and the crushing is to be continued until an applied force of 13 ±1kN is reached. Once the maximum force has been obtained it is to be released. 满充电池，放置在两块平面金属板间，持续施压 13±1kN 的压力，直到液压油缸施加的压力达到 13KN（17.2Mpa）时停止。	No fire, no explosion 无起火，无爆炸
7	Shock test 撞击测试	The cell is to be secured to the testing machine by means of a rigid mount which supports all mounting surfaces of the cell. Each cell shall be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of three mutually perpendicular directions unless it has only two axes of symmetry in which case only two directions shall be tested. Each shock is to be applied in a direction normal to the face of the cell. For each shock the cell is to be accelerated in such a manner that during the initial 3ms the minimum average acceleration is 75 g (where g is the local acceleration due to gravity). The peak acceleration shall be between 125 and 175 g. 在环境温度下，将电池分别按三个轴向固定在测试台面上，每个面经受等量的冲击，每一次冲击前 3ms 内平均加速度最少达到 75g (g 为重力加速度)，峰值加速度达 125g 至 175g。	No leakage, no fire, no explosion 无泄漏，不起火，不爆炸

6. Testing requirements 测试要求

6.1 Battery test environment 电池试验环境（无特别注明时，试验环境应符合此项要求）

Temperature 温度：25℃±3℃

Relative humidity 相对湿度： 45～85% RH

Atmospheric pressure 大气压力： 86～106 kPa

6.2 Measuring instrumentation requirements 测量仪表要求

Voltage instrumentation requirements: Measuring the voltage meter accuracy no less than 0.5 magnitude

电压仪表要求：测量电压的仪表的精确度不低于 0.5 级

Current instrumentation requirements: Measuring the current meter accuracy no less than 0.5 magnitude

电流仪表要求：测量电流的仪表精确度不低于 0.5 级

Time instrumentation requirements: Measuring the time meter accuracy no less than 0.1%

时间仪表要求：测量时间的仪表精确度不低于 0.1%

Temperature instrumentation requirements: Measuring the temperature meter accuracy no less than 0.5 ℃

温度仪表要求：测量温度的仪表准确度不低于 0.5℃

Impedance instrumentation requirements: Measuring impedance should by sinusoidal alternating (1 KHZ) test

内阻仪表要求：测量内阻应由正弦交变(1KHZ)进行测试

7．Operation temperature and humidity range 运行温湿度范围

7.1 Charging temperature and the Current requirements 充电环境温度及电流要求:

Temperature 温度	Max charge current 允许最大充电电流	Maximum relative humidity 最大相对湿度
0℃≤T≤15℃	0.5C(截止电压4.35V)	90%
15℃＜T≤45℃	1.0C(截止电压4.35V)	90%

7.2 Discharge temperature 放电环境温度:

-20℃ ～ +60℃，Maximum relative humidity：90%

-20℃ ～ +60℃，最大相对湿度：90%

8．Storage temperature and humidity range(At 50% SOC)存储温湿度范围(在 50% SOC 条件下)

8.1 Environmental conditions 存放条件；；

Unless otherwise specified，Cells shall to be tested within one month after shipment and not be cycled (charge/discharge) over one time before the test. All tests shall be performed at 23±2℃ and humidity of 65±20% RH.

The lithium iron cell impedance would increase in whole storage process, while the capacity would decrease, cell would be charged in 9.1.1 and discharged in 9.1.2

除非另有规定，电池应在装运后一个月内进行测试，且在测试前一段时间内不得循环(充放电)。所有试验均在 23±2℃、65±20% RH 湿度下进行。锂电池在整个存储过程中阻抗会增大，容量会减小，电池在 9.1.1 条件下进行充电，在 9.1.2 条件下进行放电。

Storage Temperature	23℃	23℃	23℃	23℃	60℃	60℃
Storage Duration	1 Year	1 Year	90 Days	90 Days	1 Week	1 Week
Storage Charge State	As received	100%	As received	100%	As received	100%
Recovered Capacity	90%	80%	95%	90%	85%	80%
Recovered Impedance @100% Charge State	150%	150%	120%	150%	150%	160%

9．Electrical Characteristics 电气特性

9.1 Battery standard charge/discharge 电池组标准充/放电

9.1.1 standard charge 标准充电

At 25℃±3℃ conditions, CC 0.5C/CV 4.35V, when charging current drops to 0.02Ccharging is terminated, The charging time limited 4hrs.

在25℃±3℃条件下，以0.5C恒电流，4.35V恒电压充电至电流降到0.02C截止，限时4小时。

9.1.2 Standard Discharge标准放电

Standard discharge current 0.2Cfor continuous discharge, when the voltage drops to discharge cut-off voltage 3.0V discharge is terminated, shall be full discharged.

以标准放电电流 0.2C 进行持续放电，当电压降至放电截止电压 3.0V 时放电被终止，即为放空。

9.2 Maximum charge current 最大充电电流

At 25℃±3℃ conditions, CC 1C/CV 4.35V, when charging current drops to 0.02Ccharging is terminated, The charging time limited 2h.

在25℃±3℃条件下，以1C恒电流，4.35V恒压，充电至电流降到0.02C截止，限时2小时。

9.3Maximum discharge current 最大放电电流

At 23℃±2℃ condition, discharge the cell with 1C.

在23℃±2℃条件下，以1C对电池进行放电。

9.4 Initial impedance 初始内阻

At25℃±3℃ ambient temperature, after standard charged battery pack, AC impedance tester(1KHz) measuring the initial impedance should be≤260mΩ .

在 25℃±3℃环境温度下，经过标准充电的电池，使用交流阻抗测试仪（1KHz）测量初始内阻应≤260mΩ 。

9.5 Initial capacity 初始容量

The initial capacity is for standard charge to full, in 1 hour, the capacity measured at 25℃±3℃ conditions with discharge current of 0.2C till 3.0V cut-off voltage.

The initial capacity≥405mAh.

电池初始容量为电池以标准充电方式满充，1 小时内，在 25℃±3℃条件下以 0.2C 电流放电至 3.0V 截止所放出的容量，初始容量≥405mAh.

9.6 Retention Capability 荷电保持能力

After full charging, storing the battery 28 days with20±5°C condition, and then discharge with discharge current of 0.2C till 3.0V cut-off voltage, discharge time should be≥255min

电池满充电后，在 20±5℃的环境条件下存放 28 天，然后以 0.2C 电流连续放电至 3.0V 终止电压，放电时间≥255min

9.7 Cycle life 循环寿命

Battery cycle life is tested at 25℃±3℃. For each cycle test, battery is charged using 0.5C constant current until battery voltage meet 4.35V. Then, battery is charged by constant voltage until battery charging current drop to 0.02C. After that, battery is discharged by 0.5C constant current until battery voltage drop to 3.0V. Repeat until each 50^{th} cycle.

At each 50 cycle, battery capacity will be tested. The test condition is that the battery is charged using 0.5C constant current until the battery voltage meet 4.35V. Then, battery is charged by constant voltage until the charging current drop to 0.02C. After that, battery is discharged by 0.2C constant current until battery voltage drop to 3.0V.

If the discharge time is more than or equal to 4hours (80% of initial battery capacity), battery need to repeat above 50cycles charge/discharge test. If not, cycle life test is completed.

Cycle life should be 500cycles or above. the thickness after swelling will be less than 108%.

电池在温度 25℃±3℃条件下循环测试，以 0.5C 恒流充电到电压 4.35V，然后恒压充电到截止电流 0.02C。再以 0.5C 恒流放电到 3.0V，为 1 个循环周期。这样重复 50 次。

每 50 次做一次容量检测。以 0.5C 恒流充电到 4.35V，然后恒压充电到截止电流 0.02C。再以 0.2C 恒流放电到 3.0V。如果放电时间大于等于 4 小时（80%初始容量），电池必须再重复 50 次充放电测试。否则，循环寿命测试结束。循环寿命应该大于等于 500 次。膨胀后厚度≤108%。

9.8 Shipments battery capacity 电池出货容量

Shipments battery capacity is 45%～70%.

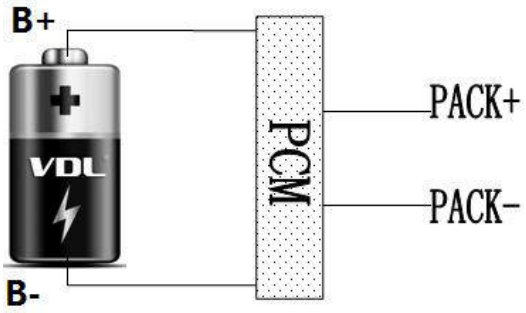
电池的出货容量为45%～70%.

9.9 Agency approvals 承认机构

VDL battery safety performance is designed according to UL1642 standard and CE Directive requirement, the product’ s safety performance is conforming to UL1642 standard and CE Directive requirement.

VDL 电池的安全性能是根据 UL1642 标准和 CE 指令要求制定.产品的安全特性与 UL1642 标准和 CE 指令的要求是一致的.

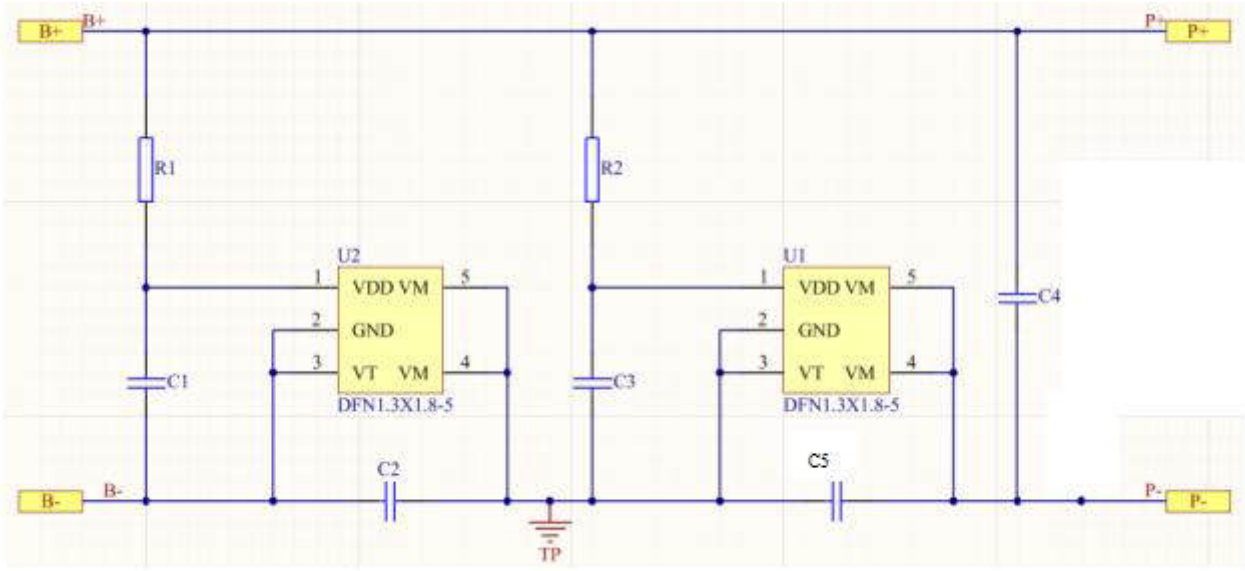
10. Battery structure diagram 电池架构图(Sketch map 示意图)



11. PCB Layout PCB 布线图

TBD

12. Schematic circuit diagram 电路原理图

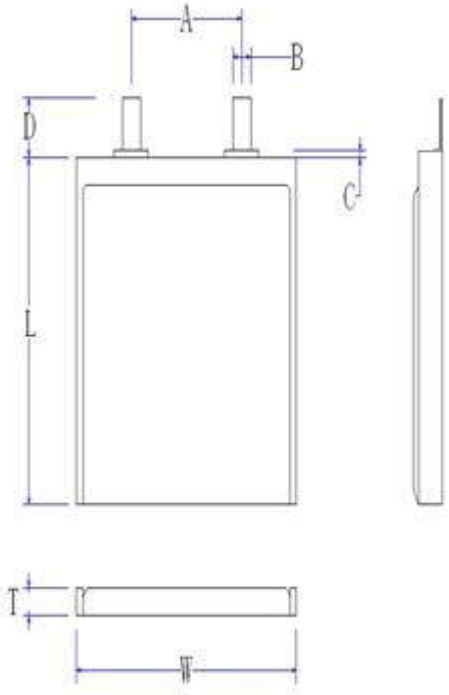


13.Cell 电芯

13.1 Cell Performance parameters 电芯性能参数

编号	项目		规格	备注
1	Initial impedance 初始内阻		≤120mΩ	1kHz AC Impedance 交流阻抗 AC 1kHz
2	Nominal voltage 标称电压		3.8V	/
3	Dimensions 外形尺寸	T	2.86 mm Max	Thickness 厚度(受 300gf 力测量)
		W	29.89 mm Max	Width 宽度(受 300gf 力测量)
		L	36.0 mm Max	Cell length(not include Tab sealant) 电芯长度(不含极耳胶) (受 300gf 力测量)
		A	16±2.0 mm	Tab center distance极耳中心距
		B	3.0±0.1 mm	Tab width 极耳宽度
		C	0.2~2.0 mm	Tab exposed size 极耳胶外露尺寸

13.2 Cell outline drawing 电芯外形尺寸(Not In Scale 未按比例)



13.3 Spray Content 电池喷码:

正面喷码:

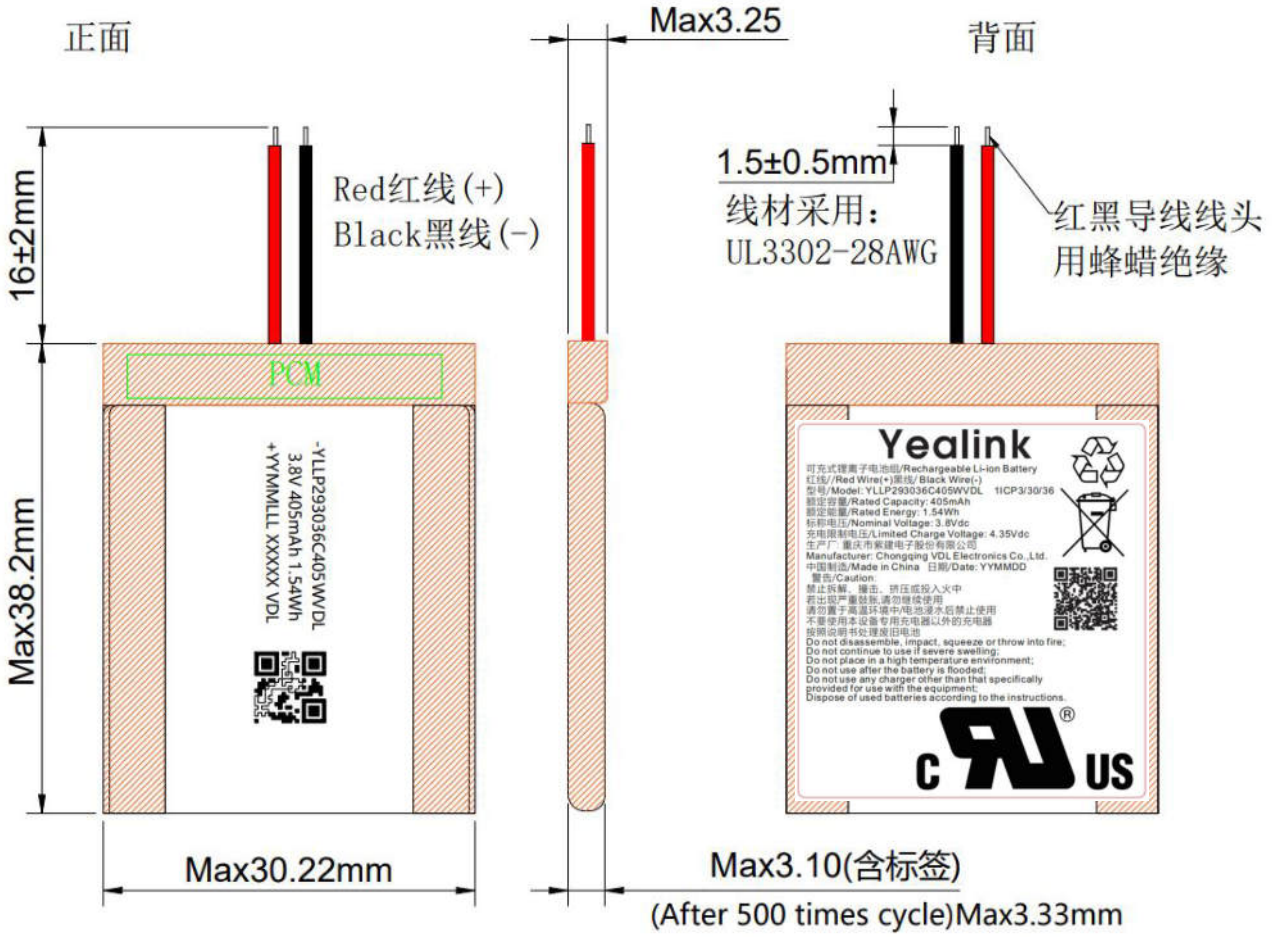
- YLLP293036C405WVDL
3.8V 405mAh 1.54Wh
+ YYMMLLLXXXXX VDL

Remark: YYMM (Date 日期),LLL(批次), XXXXX(流水码)
例: 210900100001 代表 21 年 09 月 001 批次第 1 个电池
喷码二维码内容与 "YYMMLLLXXXXX" 明码内容一致
尺寸: 4.5*4.5mm±0.3mm 位置: 大致居中即可
VDL代表生产厂: 重庆紫建电子股份有限公司

14. Battery Outline Drawing 电池组外形尺寸（Units 单位: mm）

3rd ANGLE

14.1Battery Outline Drawing 电池组外形尺寸(Not In Scale 未按比例)

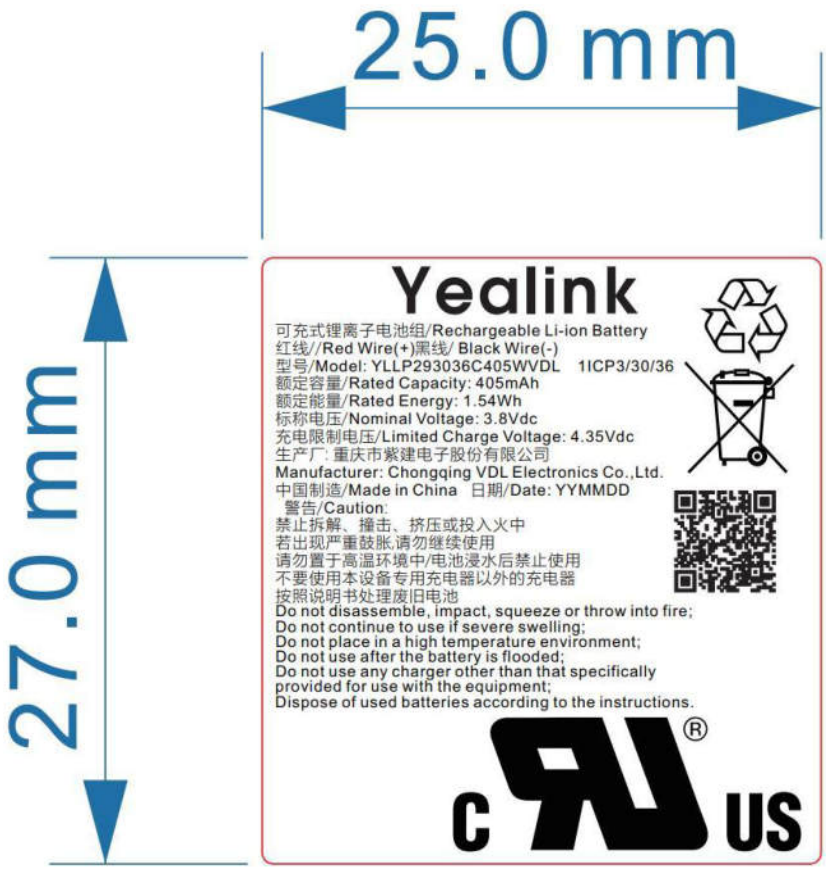


14.2 Battery size parameters 电池组尺寸参数

Wiring method 出线方式	The middle line 中间出线
Remark 备注	1、Protection plate resistance welding，保护板电阻焊； 2、Protect circuit components facing inside，保护电路元器件朝内； 3、The thickness of the finished product is measured by the force of 600gf, and the width and length of the finished product are measured by the force of 300gf. 成品厚度受 600gf 的力测量，宽度、长度尺寸，需受 300gf 的力测量。 4、Tags on the back，背面贴标签

15. **Label 标签**

YYMMDD为生产日期，YY(年)年两位，MM(月)两位,DD(日)两位.
生产日期随订单实时更新,由我司PMC提供/The production date is updated with the order, which is provided by our PMC.
例如/for instance：230721，即为2023年7月21日。
二维码内容：
如"1270A29303623072100001"客户 代码（1270）+字母（A)+产品型号（293036)+年两位（YY)+月两位（MM）+日两位（DD）+五位自然流水码(XXXXX)。二维码不能重码，大小：4.5*4.5mm±0.5



16. BOM 1(Bill of materials)电池物料清单

NO.(项次)	Material Name (零件名称)	Specification(规格型号)	Qty (用量)
1	Cell 电芯	YLLP293036C405WVDL/405mAh	1
2	Protection board 保护板	XBGL6156JS+XBGL6332JTSZR	1
3	Red wire 红色导线	UL3302-28#	1
4	Black wire 黑色导线	UL3302-28#	1
6	Kapton tape 茶色高温胶	T=0.05(保护板绝缘)	若干
7	Kapton tape 茶色高温胶	T=0.05(缠头部)	若干
8	Kapton tape 茶色高温胶	T=0.05(侧面胶)	若干
9	Label 标签	合成纸+哑膜	1
10	Beeswax 蜂蜡	蜂蜡，熔点 62~70℃ (绝缘导线线头)	若干

PCM BOM 2

Material Name (零件名称)	Specification (规格型号)	Position (零件位置)	Qty (用量)
PCBA	TBD	/	1
PCB	0.6*3.8*24	/	1
IC	XBGL6156JS	U1	1
IC	XBGL6332JTS	U2	1
贴片电阻 Chip resistor	100Ω±5%	R1、R2	2
贴片电容 Chip capacitors	0.1μF/-20%~+80%/16V	C1~C5	5
镍片	0.3*3*6	B+, B-	2

Note：The battery of materials should be consistent with the requirements of the RoHS.

注：电池组所使用的材料应符合RoHS的要求.

17．Battery Precautions and Safety Instructions 电池组使用注意事项及安全说明

Please be sure to comply with the specifications and the following precautions to use with batteries. For any accident caused by operation not following the specifications, VDL Electronics Co., Ltd will not take any responsibility

请您务必需遵守本规格书和以下使用注意事项使用电池，对于没有按照规格书进行操作所造成的任何意外事故，重庆市紫建电子股份有限公司将不承担任何责任.

- Warranty period is 12 months after shipment date.
  从出厂代码日起 12 个月内保修.
- When the battery is stored for 3 months, it should be charged with 0.5C current to 50% SOC.
  电池每放置三个月,请预先以 0.5C 充电 1 次,即让电池具备 50%以上的电量.
- Before using the battery, carefully read the instruction manual and battery labels on the surface.
  使用电池前，请仔细阅读使用说明书和电池表面标识.
- Please use the original battery charger. The battery should be placed in a dry and ventilated place.
  电池需使用原装充电器充电，并应放置在干燥通风场所.
- If the battery is not used for a long time, please charge the battery to 50% SOC status. Remove the battery from the device and place it separately, to avoid the short-circuit and damage caused by contacting metal.
  如长期不使用时，请将电池充电至半满电荷状态，把电池从设备中拆除并分开放置，避免金属接触电池，造成短路或损坏现象.
- When using or during storage, if the battery is hot, with leakage, odor, distortion or other anomalies, please stop using it immediately and stay away from the battery.
  在使用或储存期间，如发现电池有出现高温发热、漏液、散发异味、变形及其它异常现象时，请立即停止使用并远离电池.
- Do not short-circuit the battery positive and negative terminals. Do not damp the battery to avoid any danger.
  切勿将电池正负极短路，并注意不可让电池受潮，以免发生危险.
- Please keep the battery away from heat, high voltage place. Please do not beat or hit the battery.
  使用过程中，应远离热源、高压场所，并勿摔打、撞击电池.
- Remove the battery immediately from the device when the battery life ends. Please dispose the waste battery properly. Do not put it into fire or water.
  电池寿命终止应立刻从设备中取出,废弃电池请安全妥善处理，切勿投入火中或水中.
- Keep small cells and batteries which are considered swallowable out of the reach of children.
- 将电池远离孩童不能得到的地方，以避免孩童噬咬或吞咽电池
- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion.In case of ingestion of a cell or battery, seek medical assistance promptly.
  如果吞咽了电池，应迅速送医院处理，吞咽有可能导致烧伤、软组织穿孔和死亡，摄入后 2 小时内可能发生严重烧伤
- In case of ingestion of a cell or battery, seek medical assistance promptly.
  如果摄入电芯或电池，应立即寻求医疗援助。

18. Customer Inquiry

客户要求

Model 型号: **YLLP293036C405WVDL/405mAh**

1.If the customer approves the specification and samples, please sign the specification back to VDL within 1 week. It is invalid when expires.

如果客户认可本承认书和样品，请于 7 天内回签本承认书给重庆市紫建电子股份有限公司，过期视为无效。

2. If the customer requires more explanation or the operating conditions are different from the specification content, please write down your information and contact VDL Electronics Co., Ltd in advance. VDL Electronics Co., Ltd could design and build products according to your special request.

如果客户需要其他方面的说明或工作条件与规格书内容不一致,请客户提前和重庆市紫建电子股份有限公司联系. 重庆市紫建电子股份有限公司将按照贵公司特殊要求设计和开发产品.特殊要求标准:

项目 / 序号	Special Request 特殊要求	Criteria 标准
1		
2		
3		
4		
5		
6		

Company Name : Signature : Date:

公司名称: 签名: 日期:

Appendix 附件:

XBGL6156 IC 规格书

Xysemi

XBGL6156 S Series

One Cell Lithium-ion/Polymer Battery Protection IC

GENERAL DESCRIPTION

The XBGL6156 S Series product is a high integration solution for lithium-ion/polymer battery protection. XBGL6156 S Series contains advanced power MOSFET, high-accuracy voltage detection circuits and delay circuits. XBGL6156 S Series is put into an ultra-small DFN1.3X1.8-5 package and only one external component makes it an ideal solution in limited space of battery pack.

XBGL6156 S Series has all the protection functions required in the battery application including overcharging, over-discharging, 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-lo-n and Li-Poly battery-powered information appliances requiring long-term battery life.

FEATURES

- Protection of Charger Reverse Connection
- Protection of Battery Cell Reverse Connection without external load
- Integrate Advanced Power MOSFET with Equivalent of 42mΩ $R_{SS(ON)}$
- Ultra-small DFN1.3X1.8-5 Package
- Low Overcharge Release Voltage
- Over-temperature Protection
- Overcharge Current Protection
- Two-step Overcurrent Detection:
  -Over-discharge Current
  -Load Short Circuiting
- Charger Detection Function
- 0 V Battery Charging Function
- Delay Times are generated inside
- High-accuracy Voltage Detection
- Low Current Consumption
  -Operation Mode:0.8μA typ.
  -Power-down Mode: 10nA max.
- RoHS Compliant and Lead (Pb) Free
- ESD HBM:8KV. ESD CDM 2KV. ESD MM :400V

APPLICATIONS

One-Cell Lithium-ion Battery Pack
Lithium-Polymer Battery Pack
Wearable Device
Bluetooth Earphone

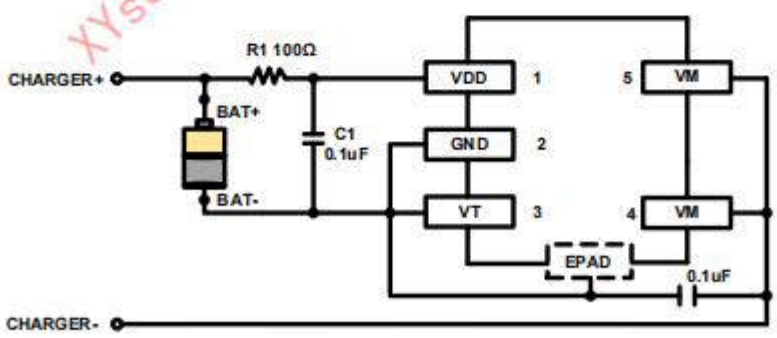


Figure 1. Typical Application Circuit

XBGL6156 S Series

ORDERING INFORMATION

Conventional basic voltage temperature parameters: Ta=25℃

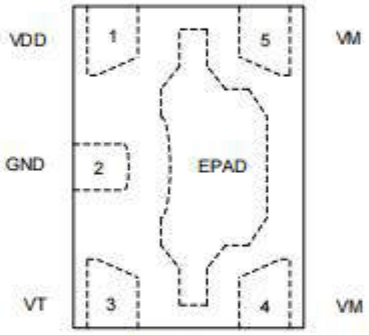
PART NUMBER	OCV [VCU] (V)	OCRV [VCL] (V)	ODV [VDL] (V)	ODRV [VDR] (V)	TOP MARK
XBGL6156QS	4.275±25mV	4.075±50mV	2.8±100mV	3.0±100mV	YWxx(note)
XBGL6156JS	4.425±25mV	4.25±50mV	2.8±100mV	3.0±100mV	
XBGL6156MS	4.475±25mV	4.30±50mV	2.8±100mV	3.0±100mV	
XBGL6156UAS	4.525±25mV	4.35±50mV	2.8±100mV	3.0±100mV	
XBGL6156RS	4.55±25mV	4.375±50mV	2.8±100mV	3.0±100mV	
XBGL6156VS	4.575±25mV	4.40±50mV	2.8±100mV	3.0±100mV	

Conventional basic voltage temperature parameters: Ta=-20℃~60℃*

PART NUMBER	OCV [VCU] (V)	OCRV [VCL] (V)	ODV [VDL] (V)	ODRV [VDR] (V)	TOP MARK
XBGL6156QS	4.275-50mV ~4.275+50mV	4.075-75mV ~4.275+75mV	2.800-125mV ~2.800+125mV	3.000-125mV ~3.000+125mV	YWxx(note)
XBGL6156JS	4.425-50mV ~4.425+50mV	4.250-75mV ~4.275+75mV	2.800-125mV ~2.800+125mV	3.000-125mV ~3.000+125mV	
XBGL6156MS	4.475-50mV ~4.475+50mV	4.300-75mV ~4.300+75mV	2.800-125mV ~2.800+125mV	3.000-125mV ~3.000+125mV	
XBGL6156UAS	4.525-50mV ~4.475+50mV	4.350-75mV ~4.300+75mV	2.800-125mV ~2.800+125mV	3.000-125mV ~3.000+125mV	
XBGL6156RS	4.550-50mV ~4.550+50mV	4.375-75mV ~4.375+75mV	2.800-125mV ~2.800+125mV	3.000-125mV ~3.000+125mV	
XBGL6156VS	4.575-50mV ~4.575+50mV	4.400-75mV ~4.400+75mV	2.800-125mV ~2.800+125mV	3.000-125mV ~3.000+125mV	

Note:1)."YW" is manufacture date code, "Y" means the year, "W" means the week.
2)."xx" is internal product code of XySemi.
*: Since products are not screened at high and low temperatures, the specification for this temperature range is guaranteed by design, not tested in production.

PIN CONFIGURATION



TOP VIEW

Figure 2. PIN Configuration

PIN DESCRIPTION

XBGL6156 S SERIES PIN NUMBER	PIN NAME	PIN DESCRIPTION
1	VDD	Power Supply.
2, EPAD	GND	Ground, connect the negative terminal of the battery to these pins.
3	VT	For test mode debugging (Can be connected to ground).
4,5	VM	The negative terminal of the battery pack. The internal FET switch connects this terminal to GND.

ABSOLUTE MAXIMUM RATINGS

(NOTE: DO NOT EXCEED THESE LIMITS TO PREVENT DAMAGE TO THE DEVICE. EXPOSURE TO ABSOLUTE MAXIMUM RATING CONDITIONS FOR LONG PERIODS MAY AFFECT DEVICE RELIABILITY.)

PARAMETER	VALUE	UNIT
VDD input pin voltage	-0.3 to 12	V
VM input pin voltage	VDD-15 to 12	V
Charger input voltage	-7.4 to 15	V
Operating Ambient Temperature	-40 to 85	°C
Maximum Junction Temperature	150	°C
Storage Temperature	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)	300	°C
Power Dissipation at T=25°C	0.4	W
Package Thermal Resistance (Junction to Ambient) θJA	250	°C/W
Package Thermal Resistance (Junction to Case) θJC	130	°C/W
ESD HBM	8000	V
ESD MM	400	V
ESD CDM	2000	V

Xysemi

XBGL6156 S Series

ELECTRICAL CHARACTERISTICS

Typical and limits appearing in normal type apply for TA = 25°C, unless otherwise specified.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detection Current						
Over-discharge Current Detection	*I_{OV1}	V_{DD}=3.0V	0.92	1.32	1.72	A
Over-discharge Current Detection	*I_{OV1}	V_{DD}=3.6V	1.00	1.50	2.00	A
Over-discharge Current Detection	*I_{OV1}	V_{DD}=4.2V	1.15	1.65	2.15	A
Overcharge Current Detection	*I_{CHOC}	V_{DD}=3.0V	0.92	1.32	1.72	A
Overcharge Current Detection	*I_{CHOC}	V_{DD}=3.6V	1.00	1.50	2.00	A
Overcharge Current Detection	*I_{CHOC}	V_{DD}=4.2V	1.15	1.65	2.15	A
Load Short-Circuiting Detection	*I_{SHORT}	V_{DD}=3.6V	2.00	2.80	3.60	A
Current Consumption						
Current Consumption in Normal Operation	I_{OPE}	VDD=3.6V VM =0V		0.8	1.0	μA
Current Consumption in Power Down	I_{PD}	VDD=2.0V VM pin floating		1	10	nA
VM Internal Resistance						
Internal Resistance between VM and V_{DD}	R_{VMD}	VDD =2.0V VM pin floating	150	250	350	kΩ
Internal Resistance between VM and GND	R_{VMS}	VDD=3.6V VM=1.0V	70	100	130	kΩ
FET on Resistance						
Equivalent FET on Resistance	*$R_{SS(ON)}$	V_{DD}=3.0V I_{VM}=0.2A		46	53	mΩ
		V_{DD}=3.6V I_{VM}=0.2A		42	48	
		V_{DD}=4.2V I_{VM}=0.2A		39	45	
Over Temperature Protection						
Over Temperature Protection	*T_{SHD+}			150		°C
Over Temperature Recovery Degree	*T_{SHD-}			110		°C
Detection Delay Time						
Overcharge Voltage Detection Delay Time	t_{CU}		70	160	250	mS
Over-discharge Voltage Detection Delay Time	t_{DL}		15	40	65	mS
Over-discharge Current1 Detection Delay Time	t_{OV1}	V_{DD}=3.6V	5	10	20	mS
Overcharge Current Detection Delay Time	t_{CHOC}	V_{DD}=3.6V	5	10	20	mS
Load Short-Circuiting Detection Delay Time	*t_{SHORT}	V_{DD}=3.6V	50	200	550	μS

Note1: *---The parameter is guaranteed by design.

Xysemi

XBGL6156 S Series

ELECTRICAL CHARACTERISTICS

Typical and limits appearing in normal type apply for TA = -20°C~60°C, unless otherwise specified.*

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detection Current						
Over-discharge Current Detection	*I_{IOV1}	V_{DD}=3.0V	0.66	1.32	1.98	A
Over-discharge Current Detection	*I_{IOV1}	V_{DD}=3.6V	0.75	1.50	2.25	A
Over-discharge Current Detection	*I_{IOV1}	V_{DD}=4.2V	0.82	1.65	2.48	A
Overcharge Current Detection	*I_{CHOC}	V_{DD}=3.0V	0.79	1.32	1.85	A
Overcharge Current Detection	*I_{CHOC}	V_{DD}=3.6V	0.90	1.50	2.10	A
Overcharge Current Detection	*I_{CHOC}	V_{DD}=4.2V	1.00	1.65	2.30	A
Load Short-Circuiting Detection	*I_{SHORT}	V_{DD}=3.6V	1.40	2.80	4.20	A
Current Consumption						
Current Consumption in Normal Operation	I_{OPE}	VDD=3.6V VM =0V		0.8	1.3	μA
Current Consumption in Power Down	I_{PD}	VDD=2.0V VM pin floating			0.2	μA
VM Internal Resistance						
Internal Resistance between VM and V_{DD}	R_{VMD}	VDD =2.0V VM pin floating	120	250	420	kΩ
Internal Resistance between VM and GND	R_{VMS}	VDD=3.6V VM=1.0V	56	100	156	kΩ
FET on Resistance						
Equivalent FET on Resistance	*$R_{SS(ON)}$	V_{DD}=3.6V I_{VM}=0.2A		46	70	mΩ
				42	65	
				39	60	
Over Temperature Protection						
Over Temperature Protection	*T_{SHD+}			150		°C
Over Temperature Recovery Degree	*T_{SHD-}			110		°C
Detection Delay Time						
Overcharge Voltage Detection Delay Time	t_{CU}		49	160	350	mS
Over-discharge Voltage Detection Delay Time	t_{DL}		10.5	40	91	mS
Over-discharge Current1 Detection Delay Time	t_{IOV1}	V_{DD}=3.6V	3.5	10	28	mS
Overcharge Current Detection Delay Time	t_{CHOC}	V_{DD}=3.6V	3.5	10	28	mS
Load Short-Circuiting Detection Delay Time	*t_{SHORT}	V_{DD}=3.6V	35	200	770	μS

Note1: *---The parameter is guaranteed by design.

FUNCTIONAL BLOCK DIAGRAM

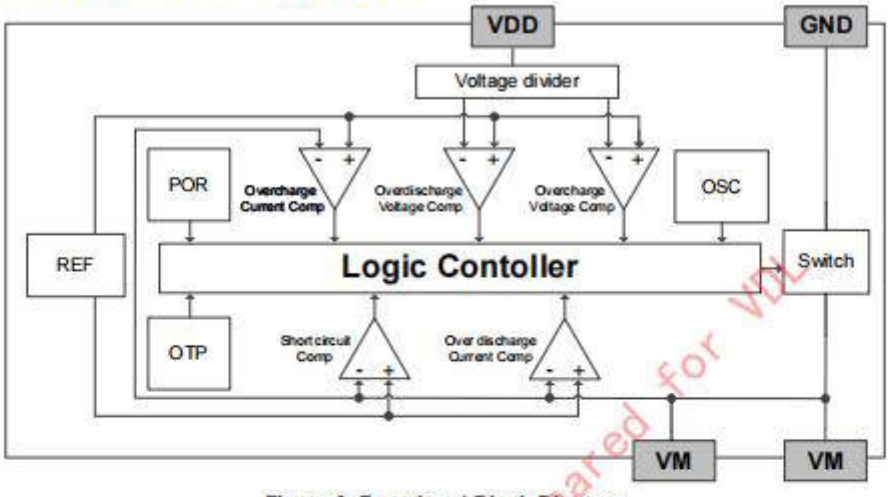


Figure 3. Functional Block Diagram

FUNCTIONAL DESCRIPTION

The XBGL6156 S Series monitors the voltage and current of a battery and protects it from being damaged due to overcharge voltage, over-discharge voltage, over-discharge current, and short circuit conditions by disconnecting the battery from the load or charger. These functions are required in order to operate the battery cell within specified limits.

The device requires only one external capacitor. The MOSFET is integrated and its $R_{SS(ON)}$ is as low as 42mΩ typical.

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.

Overcharge Condition

When the battery voltage becomes higher than the overcharge detection voltage (V_{CU}) during charging under normal condition and the state continues for the overcharge detection delay time (t_{CU}) or longer, the XBGL6156 S Series 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 (V_{CL}), the XBGL6156 S Series turns the charging control FET on and returns to the normal condition.

2. When a load is connected and discharging starts, the XBGL6156 S Series 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 XBGL6156 S Series 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 volt-age (V_{CU}), the XBGL6156 S Series returns to the normal condition immediately, but in th

e case the battery voltage is higher than th e overcharge detection voltage (V_{CU}),the ch ip does not return to the normal condition u ntil the battery voltage drops below the ove rcharge detection voltage (V_{CU}) even if the load is connected. In addition, if the VM pin voltage is equal to or lower than the overcu rrent 1 detection voltage when a load is co nnected and discharging starts, the chip do es not return to the normal condition.

Remark :

If the battery is charged to a voltage higher th- an the overcharge detection voltage (V_{CU}) and the battery voltage does not drops below the over charge detection voltage (V_{CU}) even when a heav y load, which causes an overcurrent, is connecte d, the overcurrent 1 and overcurrent 2 do not wor k until the battery voltage drops below the overch arge detection voltage (V_{CU}). Since an actual ba ttery has, however, an internal impedance of se veral dozens of mΩ, and the battery voltage drop s immediately after a heavy load which causes a n overcurrent is connected, the overcurrent 1 a nd overcurrent 2 work. Detection of load short cir cuiting works regardless of the battery voltage.

Over-discharge Condition

When the battery voltage drops below the over-discharge detection voltage (V_{DL}) during discharging under normal condition and it continues for the over-discharge det ection delay time (t_{DL}) or longer, the XBGL6 156 S Series turns the discharging control FET off and stops discharging. This conditi on is called over-discharge condition. After the discharging control FET is turned off, th e VM pin is pulled up by the R_{VMD} resistor b etween VM and VDD in XBGL6156 S Serie s. Meanwhile when VM is bigger than 1.5V (typ.) (the load short-circuiting detection vol tage), the current of the chip is reduced to t he power-down current (I_{PDN}). This conditio n is called power-down condition. The VM and VDD pins are shorted by the R_{VMD} resis tor in the IC under the over-discharge and power-down conditions.

The power-down condition is released when a charger is connected and the poten tial difference between VM and VDD beco mes 1.3 V (typ.) or higher (load short-circui ting detection voltage). At this time, the FET is still off. When the battery voltage be comes the over-discharge detection voltag e (V_{DL}) or higher (see note), the XBGL6156 S Series turns the FET on and changes to t he normal condition from the over-discharg e condition.

Remark:

If the VM pin voltage is no less than the charg er detection voltage (V_{CHA}), when the battery und er over-discharge condition is connected to a cha rger, the over-discharge condition is released (th e discharging control FET is turned on) as usual, provided that the battery voltage reaches the ove r-discharge release voltage (V_{DU}) or higher.

Overcurrent Condition

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) duri ng discharging under normal condition and the state continues for the overcurrent dete ction delay time or longer, the XBGL6156 S Series turns off the discharging control F ET to stop discharging. This condition is c alled overcurrent condition. (The overcurre nt includes overcurrent, or load short-circuit ing.)

The VM and GND pins are shorted intern ally by the R_{VMS} resistor under the overcurr ent condition. When a load is connected, th e VM pin voltage equals the VDD voltage d ue to the load.

The overcurrent condition returns to the normal condition when the load is released and the impedance between the B+ and B- pins becomes higher than the automatic recoverable impedance. When the load is removed, the VM pin goes back to the GN- D potential since the VM pin is shorted the GND pin with the R_{VMS} resistor. Detecting that the VM pin potential is lower than the overcurrent detection voltage (V_{IOV1}), the IC returns to the normal condition.

Abnormal Charge Current Detection

If the VM pin voltage drops below the ch arger detection voltage (V_{CHA}) during chargi

ng under the normal condition and it contin ues for the overcharge detection delay time (t_{CU}) or longer, the XBGL6156 S Series t-ur ns the charging control FET off and stop-s charging. This action is called abnormal ch arge current detection.

Abnormal charge current detection work- s when the discharging control FET is on and the VM pin voltage drops below the ch arger detection voltage (V_{CHA}). When an a bnormal charge current flows into a battery in the over-discharge condition, the XBGL6 156 S Series consequently turns the chargi ng control FET off and stops charging after the battery voltage becomes the over-disch arge detection voltage and the overcharge detection delay time (t_{CU}) elapses.

Abnormal charge current detection is rel eased when the voltage difference betwee n VM pin and GND pin becomes lower tha n the charger detection voltage (V_{CHA}) by separating the charger. Since the 0 V batte ry charging function has higher priority than the abnormal charge current detection func tion, abnormal charge current may not be detected by the product with the 0 V batter y charging function while the battery voltag e is low.

Load Short-circuiting condition

If voltage of VM pin is equal or below short circuiting protection voltage (V_{SHORT}), the XBGL6156 S Series will stop dischargi ng and battery is disconnected from load. T -he maximum delay time to switch current off is t_{SHORT}. This status is released when vo ltage of VM pin is higher than short protect ion voltage (V_{SHORT}), such as when discon necting the load.

Delay Circuits

The detection delay time for over-dischar ge current 2 and load short-circuiting starts when over-discharge current 1 is detected. As soon as over-discharge current 2 or loa d short-circuiting is detected over detection delay time for over-discharge current 2 or l oad short-circuiting, the XBGL6156 S Seri es stops discharging. When battery voltage falls below over-discharge detection voltag e due to over-discharge current, the XBGL 6156 S Series stop discharging by over-dis charge current detection. In this case the re covery of battery voltage is so slow that if b attery voltage after over-discharge voltage detection delay time is still lower than over -discharge detection voltage, the XBGL615 6 S Series shifts to power-down.

0V Battery Charging Function [1] [2] [3]

This function enables the charging of a connected battery whose voltage is 0 V by self-discharge. When a charger having 0 V battery start charging charger voltage (V_{0CHA}) or higher is connected between B+ and B- pins, the charging control FET gate is fix ed to VDD potential. When the voltage bet ween the gate and the source of the chargi ng control FET becomes equal to or higher than the turn-on voltage by the charger vol tage, the charging control FET is turned on to start charging. At this time, the dischargi ng control FET is off and the charging cur rent flows through the internal parasitic dio de in the discharging control FET. If the bat tery voltage becomes equal to or higher th an the over-discharge release voltage (V_{DU}), the normal condition returns.

Note:

(1) Some battery providers do not recommend char ging of completely discharged batteries. Please refe r to battery providers before the selection of 0 V bat tery charging function.

(2) The 0V battery charging function has higher prio rity than the abnormal charge current detection func tion. Consequently, a product with the 0 V battery c harging function charges a battery and abnormal c harge current cannot be detected during the batter- y voltage is low (at most 1.8 V or lower).

(3) When a battery is connected to the IC for the fir- st 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 th e normal condition.

TIMING CHART

1. Overcharge and Over-discharge voltage detection

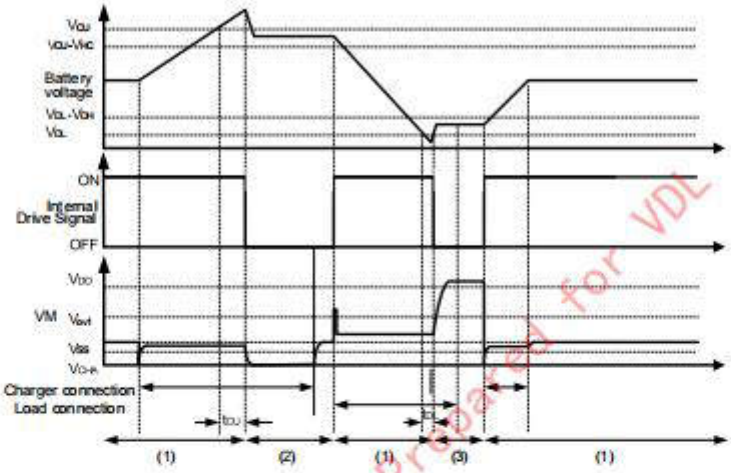


Figure4-1 Overcharge and Over-discharge Voltage Detection

Remark: (1) Normal condition (2) Overcharge voltage condition (3) Over-discharge voltage condition

2. Over-discharge Current and Load Short detection

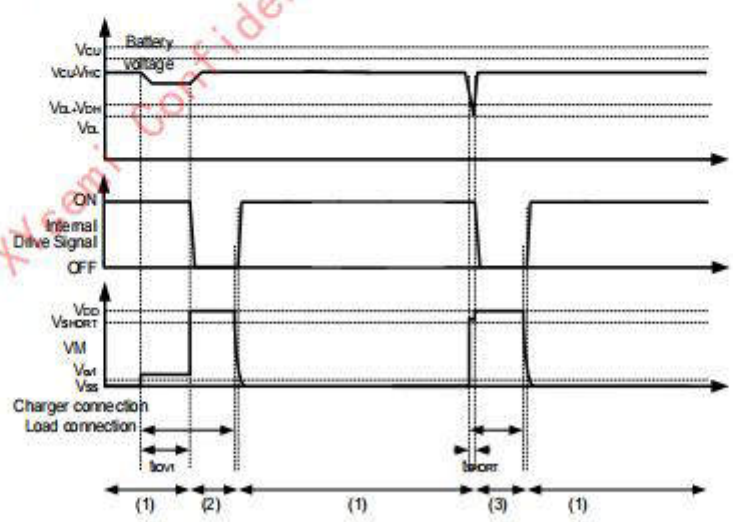


Figure4-2 Over-discharge Current and Short Detection

Remark: (1) Normal condition (2) Overcharge voltage condition (3) Over-discharge voltage condition

3. Abnormal Charger Detection

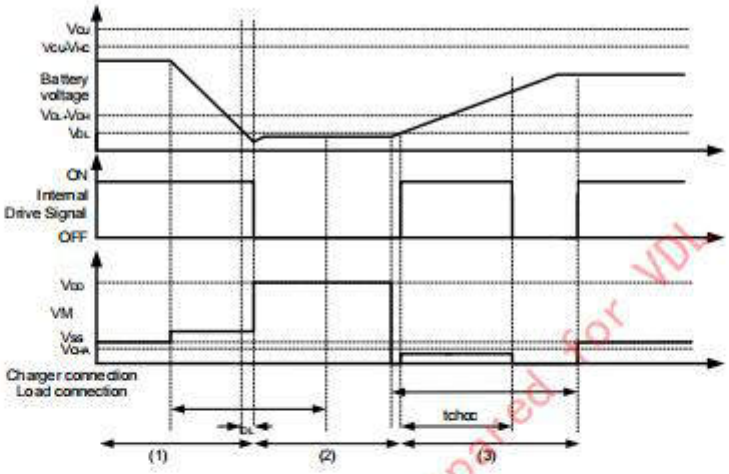


Figure4-3 Abnormal Charger Detection

Remark: (1) Normal condition (2) Over-discharge voltage condition (3) Overcharge voltage condition

TYPICAL APPLICATION

As shown in Figure 5, the current path which must be kept as short as possible. For thermal management, ensure that these trace widths are adequate. C1 is a decoupling capacitor which should be placed as close as possible to XBGL6156 S Series.

If add one 0.1uF capacitor between VM pin and GND pin closely, the system ESD level and anti-interference capability of circuit will improve greatly.

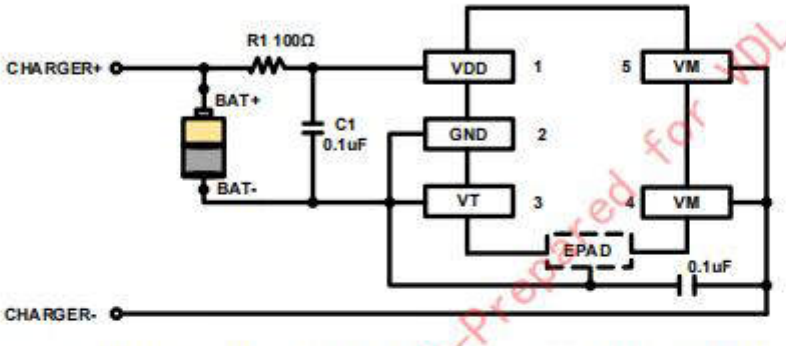


Figure 5 XBGL6156 S SERIES in a Typical Battery Protection Circuit

Symbol	Typ	Value range	Unit
R1	100	100~1000	Ω
C1	0.1	0.1~2.2	μF

Remark:
1.The above parameters may be changed without notice;
2.The schematic diagram and parameters of the IC are not used as the basis to ensure the operation of the circuit. Please conduct full measurement on the actual application circuit before setting the parameters.
3.If the resistance value is large , the overcharging voltage will be correspondingly larger by several mV.

Precautions

• Pay attention to the operating conditions for input/output voltage and load current so that the power loss in XBGL6156 S Series does not exceed the power dissipation of the package.
• Do not apply an electrostatic discharge to this XBGL6156 S Series that exceeds the performance ratings of the built-in electrostatic protection circuit.

APPLIED MEASUREMENT METHOD

(1).Overcharge characteristic test method:

a. According to the figure6-1, connect the power supply DC1 to the B + and GND pins of the system board and set the voltage to about 3.6V. Connect the power supply from GND to VM to DC2 power supply and set 100mV current limiting 10mA. Observe the waveform.

b. Adjust the power supply voltage V1 and increase it by 0.001V until the output level of VM pin changes from 0 to negative (-100mV). Record the overcharge protection voltage and measure the protection delay.

c. Adjust the power supply voltage V1 to decrease by 0.001V until the output voltage of VM pin is recovered from negative (-100mV) to 0 level, and record the overcharge recovery voltage.

(2).Over discharge characteristic test method:

a. According to the figure6-2, connect the power supply DC1 to the B + and GND pins of the system board and set the voltage to about 3.6V. Connect the DC2 power supply from VM to GND, set the 100mV current limiting 10mA, and observe the waveform.

b. Adjust the power supply voltage V1 and decrease it by 0.001V until the output level of VM pin changes from 0 to positive (100mV). Record the overdischarge protection voltage and measure the protection delay.

c. Adjust the power supply voltage V1 to increase by 0.001 V until the output voltage of VM pin is restored from positive (100 mV) to 0 level, and record the overdischarge recovery voltage.

(3).Discharge over current test method:

a. According to the figure6-3, connect the DC1 power supply to the B + and GND pins of the system board and set the voltage to about 3.0V/3.6V/4.2V. Connect the electronic load from B + to VM and observe the waveform.

b. Adjust the electronic load increase it by 0.1A step, detect that the current from B + to VM is turned off and meet the delay standard (about 10ms), and record the discharge delay time.

(4).Charging over current test method:

a. According to the figure6-4, connect the DC1 power supply to the B + and GND pins of the system board and set the voltage to about 3.0V/3.6V/4.2V, and load DC2 power supply from GND to VM.

b. Adjust the current limiting value of DC2 power supply to increase by 0.1A step, detect that the current from GND to VM is turned off and meet the delay standard(about 10ms), and record the charging over-current delay time.

(5).Iq test method:

a. As shown in the figure6-5, connect the positive pole of DC1 to B +, and the negative pole to GND, and set the voltage to 3.6V;

b. VM grounding, record the current passing through DC1 (Iq).

(6).Isd test method:

a. As shown in the figure6-6, connect the positive pole of DC1 to B + and the negative pole to GND, and set the voltage to 2V;

b. VM is suspended and the current passing through DC1 is recorded as Isd.

SCHEMATIC DIAGRAM OF TEST METHOD

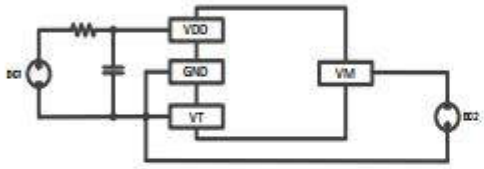


Figure6-1

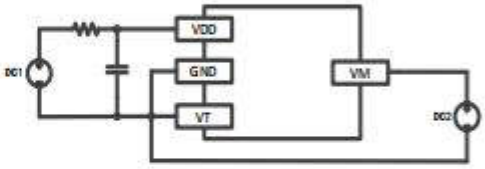


Figure6-2

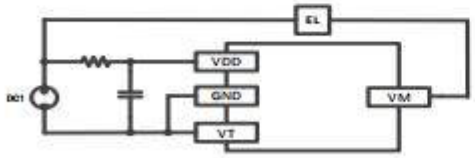


Figure6-3

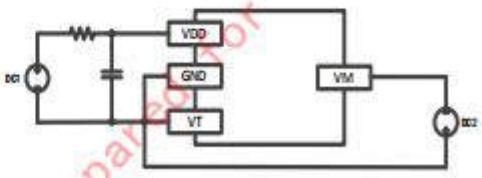


Figure6-4

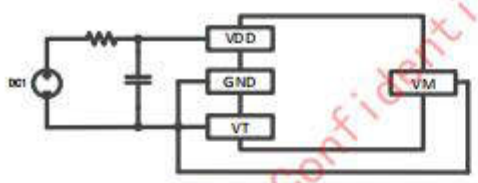


Figure6-5

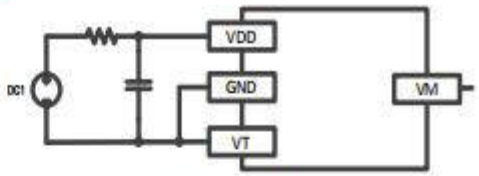
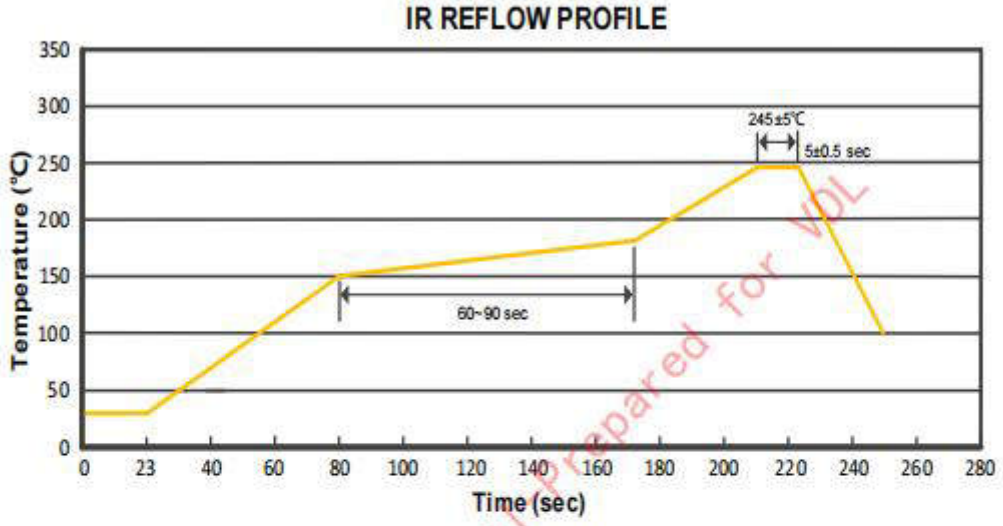


Figure6-6

Solderability Curve of Lead-Free Reflow Soldering (applicable to SMT tube)



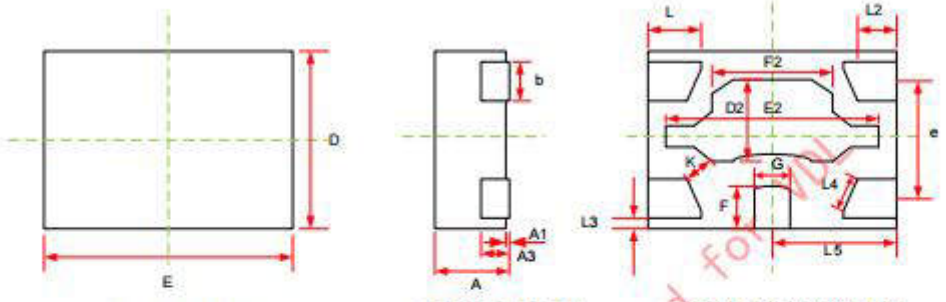
Explain:
1.Preheating temperature 25~150℃, duration 60~90sec;
2.Peak temperature 245 ± 5 ℃, duration 5 ± 0.5sec;
3.Cooling rate of welding process is 2~10℃/sec.

Resistance to welding heat conditions

Temperature: 270±5℃; Time:10±1sec

XBGL6156 S Series

PACKAGE OUTLINE(DFN1.3x1.8-5)



TOP VIEW SIDE VIEW BOTTOM VIEW

SYMBOL	MIN	NOM	MAX
A	0.60	0.65	0.70
A1	0.000	0.02	0.050
A3		0.20 REF	
b	0.22	0.27	0.32
D	1.224	1.3	1.376
E	1.724	1.8	1.876
e		0.880 TYP	
L	0.244	0.32	0.396
K	0.20	-	-
F	0.184	0.26	0.336
G	0.20	0.25	0.30
E2	1.43	1.53	1.63
D2	0.47	0.57	0.67
F2	0.87	0.97	1.07
L2		0.19REF	
L3		0.074REF	
L4		0.25REF	
L5		0.9REF	

XBGL6156 S Series

DISCLAIMER

The information described herein is subject to change without notice.

Suzhou XySemi Electronic Technology Co., Limited is not responsible for any problems caused by circuits or diagrams described herein whose related industrial properties, patents, or other rights belong to third parties. The application circuit examples explain typical applications of the products, and do not guarantee the success of any specific mass-production design.

When the products described herein are regulated products subject to the Wassenaar Arrangement or other arrangements, they may not be exported without authorization from the appropriate governmental authority.

Use of the information described herein for other purposes and/or reproduction or copying without express permission of Suzhou XySemi Electronic Technology Co., Limited is strictly prohibited.

The products described herein cannot be used as part of any device or equipment affecting the human body, such as exercise equipment ,medical equipment, security systems, gas equipment, or any apparatus installed in airplanes and other vehicles, without prior written permission of Suzhou XySemi Electronic Technology Co., Limited.

Although Suzhou XySemi Electronic Technology Co., Limited. exerts the greatest possible effort to ensure high quality and reliability, the failure or malfunction of semiconductor may occur. The use of these products should therefore give thorough

consideration to safety design, including redundancy, fire-prevention measure and malfunction prevention, to prevent any accidents, fires, or community damage that may ensue.

XBGL6332 IC 规格书

XBGL6332 TSZR Series

One Cell Lithium-ion/Polymer Battery Protection IC

GENERAL DESCRIPTION

The XBGL6332 TSZR Series product is a high integration solution for lithium-ion/polymer battery protection. XBGL6332 TSZR Series contains advanced power MOSFET, high-accuracy voltage detection circuits and del-ay circuits. XBGL6332 TSZR Series put into an ultra-small DFN1.3X1.8-5 package with simple components makes it an ideal solution in limited space of battery pack.

XBGL6332 TSZR Series has all the protection functions required in the battery application including overcharging, over-discharging, over-current 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.

FEATURES

- Protection of Battery Cell Charger Reverse Connection with external load
- Protection of Charger Reverse Connection
- Integrate Advanced Power MOSFET with Equivalent of 42mΩ $R_{SS(ON)}$
- Ultra-small DFN1.3X1.8-5 Package
- Low Overcharge Release Voltage
- Over-temperature Protection
- Overcharge Current Protection
- Two-step Overcurrent Detection:
  - -Over-discharge Current
  - -Load Short Circuiting
- Charger Detection Function
- 0V Battery Charging Function
- <1.20V(typ.) Battery Charging Forbidden
- Delay Times are generated inside
- High-accuracy Voltage Detection
- Over-Discharge Self-locking
- Low Current Consumption
  - -Operation Mode:0. 80μA typ.
  - -Power-down Mode: 30nA max.
- RoHS Compliant and Lead (Pb) Free
- ESD HBM:6KV.

APPLICATIONS

One-Cell Lithium-ion Battery Pack
Lithium-Polymer Battery Pack
Wearable Device
Bluetooth Earphone

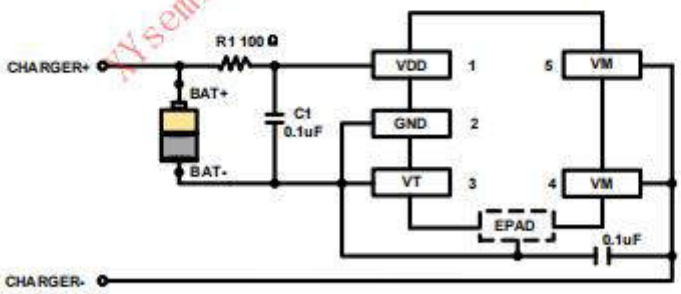


Figure 1. Typical Application Circuit

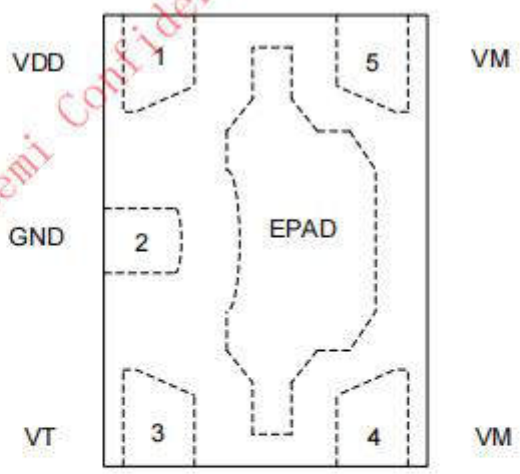
XBGL6332 TSZR Series

ORDERING INFORMATION

PART NUMBER	OCV [VCU] (V)	OCRV [VCL] (V)	ODV [VDL] (V)	ODRV [VDR] (V)	TOP MARK
XBGL6332ITSZR	4.325±25mV	3.975±50mV	2.6±100mV	3.0±100mV	YWxx
XBGL6332JTSZR	4.475±25mV	4.150±50mV	2.6±100mV	3.0±100mV	YWxx
XBGL6332MTSZR	4.525±25mV	4.200±50mV	2.6±100mV	3.0±100mV	YWxx
XBGL6332UATSZR	4.575±25mV	4.250±50mV	2.6±100mV	3.0±100mV	YWxx
XBGL6332RTSZR	4.600±25mV	4.275±50mV	2.6±100mV	3.0±100mV	YWxx
XBGL6332VTSZR	4.625±25mV	4.300±50mV	2.6±100mV	3.0±100mV	YWxx

Note: 1)."YW" is manufacture date code, "Y" means the year, "W" means the week.
2)."xx" is internal product code of XySemi.

PIN CONFIGURATION



TOP VIEW

Figure 2. PIN Configuration

XBGL6332 TSZR Series

PIN DESCRIPTION

XBGL6034 S SERIES PIN NUMBER	PIN NAME	PIN DESCRIPTION
1	VDD	Power Supply.
2, EPAD	GND	Ground, connect the negative terminal of the battery to these pins.
3	VT	For test mode debugging (Can be connected to ground).
4,5	VM	The negative terminal of the battery pack. The internal FET switch connects this terminal to GND.

ABSOLUTE MAXIMUM RATINGS

(NOTE: DO NOT EXCEED THESE LIMITS TO PREVENT DAMAGE TO THE DEVICE. EXPOSURE TO ABSOLUTE MAXIMUM RATING CONDITIONS FOR LONG PERIODS MAY AFFECT DEVICE RELIABILITY.)

PARAMETER	VALUE	UNIT
VDD input pin voltage	-0.3 to 12	V
VM input pin voltage	VDD-15 to 12	V
Charger input voltage	-7.4 to 15	V
Operating Ambient Temperature	-40 to 85	℃
Maximum Junction Temperature	150	℃
Storage Temperature	-55 to 150	℃
Lead Temperature (Soldering, 10 sec)	300	℃
Power Dissipation at T=25℃	0.4	W
Package Thermal Resistance (Junction to Ambient) θJA	250	℃/W
Package Thermal Resistance (Junction to Case) θJC	130	℃/W
ESD HBM	6000	V

XBGL6332 TSZR Series

ELECTRICAL CHARACTERISTICS

Typical and limits appearing in normal type apply for TA=25°C, unless otherwise specified.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detection Voltage						
0V Battery forbidden charge Battery voltage	*V_{0INH}	0V Battery forbidden charge	0.9	1.2	1.5	V
Discharge over-current release Voltage	V_{RIOV1}		VDD-1.0	VDD-0.7	VDD-0.4	V
Detection Current						
Over-discharge Current Detection	I_{IOV1}	V_{DD}=3.0V	2.17	3.10	4.03	A
Over-discharge Current Detection	I_{IOV1}	V_{DD}=3.6V	2.40	3.60	4.75	A
Over-discharge Current Detection	I_{IOV1}	V_{DD}=4.2V	2.73	3.90	5.07	A
Overcharge Current Detection	I_{CHOC}	V_{DD}=3.0V	2.38	3.40	4.42	A
Overcharge Current Detection	I_{CHOC}	V_{DD}=3.6V	2.40	3.60	4.75	A
Overcharge Current Detection	I_{CHOC}	V_{DD}=4.2V	2.94	4.20	5.46	A
Load Short-Circuiting Detection	*I_{SHORT}	V_{DD}=3.6V	4.50	7.20	9.60	A
Current Consumption						
Current Consumption in Normal Operation	I_{OPE}	VDD=3.6V VM=0V		0.8	1.0	μA
Current Consumption in Power Down	I_{PD}	VDD=2.0V VM pin floating			30	nA
VM Internal Resistance						
Internal Resistance between VM and V_{DD}	*R_{VMD}	VDD=2.0V VM pin floating	150	250	350	kΩ
Internal Resistance between VM and GND	*R_{VMS}	VDD=3.6V VM=1.0V	50	100	150	kΩ
FET on Resistance						
Equivalent FET on Resistance	*$R_{SS(ON)}$	V_{DD}=3.6V I_{VM} =1.0A		42	50	mΩ
Over Temperature Protection						
Over Temperature Protection	*T_{SHD+}			150		°C
Over Temperature Recovery Degree	*T_{SHD-}			100		°C

Note1: *---The parameter is guaranteed by design.

XBGL6332 TSZR Series

ELECTRICAL CHARACTERISTICS

Typical and limits appearing in normal type apply for TA=25°C, unless otherwise specified.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Detection Delay Time						
Overcharge Voltage Detection Delay Time	t_{CU}		768	1280	1792	mS
Overdischarge Voltage Detection Delay Time	t_{DL}		96	160	224	mS
Overdischarge Current1 Detection Delay Time	t_{IOV1}	V_{DD}=3.6V	24	40	56	mS
Overcharge Current Detection Delay Time	t_{CHOC}	V_{DD}=3.6V	24	40	56	mS
Load Short-Circuiting Detection Delay Time	*t_{SHORT}	V_{DD}=3.6V	200	560	800	μS

Note1: *—The parameter is guaranteed by design.

FUNCTIONAL BLOCK DIAGRAM

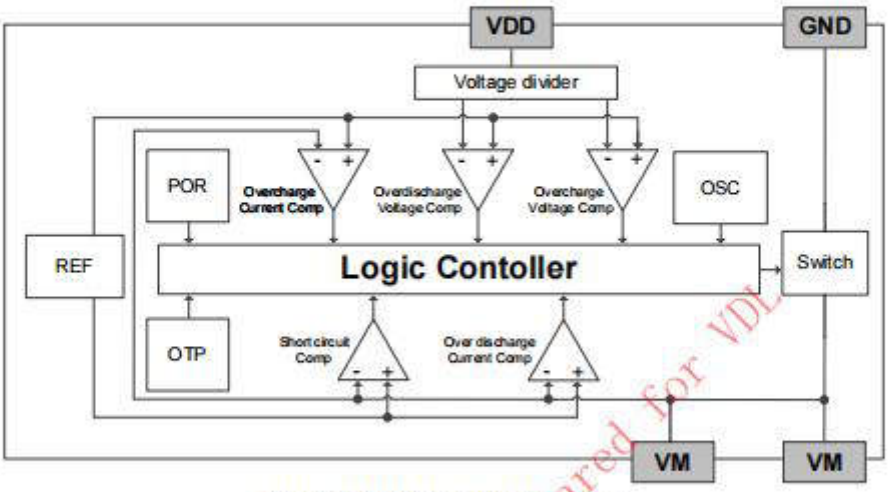


Figure 3. Functional Block Diagram

FUNCTIONAL DESCRIPTION

The XBGL6332 TSZR Series monitors the voltage and current of a battery and protect-s it from being damaged due to overcharge voltage, over-discharge voltage, over-discharge current, and short circuit conditions by disconnecting the battery from the load or charger. These functions are required in order to operate the battery cell within specified limits.

The device requires only one external capacitor. The MOSFET is integrated and its $R_{SS(ON)}$ is as low as 42mΩ typical.

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.

Overcharge Condition

When the battery voltage becomes higher than the overcharge detection voltage (V_{CU}) during charging under normal condition and the state continues for the overcharge detection delay time (t_{CU}) or longer, the XBGL6332 TSZR Series 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 (V_{CL}), the XBGL6332 TSZR Series turns the charging control FET on and returns to the normal condition.

2. When a load is connected and discharging starts, the XBGL6332 TSZR Series turns t-he 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 0.7V (forward voltage of the diode) from the GND pin voltage momentarily. The XBGL6332 TSZR Series 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 (V_{CU}), the XBGL6332 TSZR Series returns to the normal condition immediately, but in the case the battery voltage is higher than t-he overcharge detection voltag

e (V_{CU}), the chip does not return to the normal condition until the battery voltage drops below the overcharge detection voltage (V_{CU}) 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.

Remark :

If the battery is charged to a voltage higher than the overcharge detection voltage (V_{CU}) and the battery voltage does not drops below the overcharge detection voltage (V_{CU}) 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 (V_{CU}). 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 short-circuiting works regardless of the battery voltage.

Over-discharge Condition

When the battery voltage drops below the over-discharge detection voltage (V_{DL}) during discharging under normal condition and it continues for the over-discharge detection delay time (t_{DL}) or longer, the XBGL6332 TSZR Series turns the discharging control FET off and stops discharging. This condition is called over-discharge condition. After the discharging control FET is turned off, the VM pin is pulled up by the R_{VMD} resistor between VM and VDD in XBGL6034 S Series. Meanwhile when VM is bigger than 1.5 V(typ.) (the load short-circuiting detection voltage), the current of the chip is reduced to the power-down current (I_{PDN}). This condition is called power-down condition. The VM and VDD pins are shorted by the R_{VMD} resistor in the IC under the over-discharge and power-down conditions.

The power-down condition is released when a charger is connected and the potential difference between VM and VDD becomes 1.3V (typ.) or higher (load short-circuiting detection voltage). At this time, the FET is still off. When the battery voltage becomes the over-discharge detection voltage (V_{DL}) or higher (see note), the XBGL6332 TSZR Series turns the FET on and changes to the normal condition from the over-discharge condition.

Remark :

If the VM pin voltage is no less than the charger detection voltage (V_{CHA}), when the battery under over-discharge condition is connected to a charger, the over-discharge condition is released (the discharging control FET is turned on) as usual, provided that the battery voltage reaches the over-discharge voltage (V_{DL}) or higher.

Overcurrent Condition

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 XBGL6332 TSZR Series turns off the discharging control FET to stop discharging. This condition is called overcurrent condition. (The overcurrent includes overcurrent, or load short-circuiting.)

The VM and GND pins are shorted internally by the R_{VMS} resistor under the overcurrent condition. When a load is connected, the VM pin voltage equals the VDD voltage due to the load.

The overcurrent condition returns to the normal condition when the load is released and the impedance between the B+ and B- pins becomes higher than the automatic recoverable impedance. 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 R_{VMS} resistor. Detecting that the VM pin potential is lower than the overcurrent detection voltage (V_{IOV1}), the IC returns to the normal condition.

Abnormal Charge Current Detection

If the VM pin voltage drops below the charger detection voltage (V_{CHA}) during charging under the normal condition and it continues for the overcharge detection delay time (t_{CU}) or longer, the XBGL6332 TSZR Series

t-urns the charging control FET off and sto ps charging. This action is called abnormal charge current detection.

Abnormal charge current detection work s when the discharging control FET is on and the VM pin voltage drops below the ch arger detection voltage (V_{CHA}). When an ab normal charge current flows into a battery i n the over-discharge condition, the XBGL6 332 TSZR Series consequently turns the c harging control FET off and stops charging after the battery voltage becomes the over- discharge detection voltage and the over-c harge detection delay time (t_{CU}) elapses.

Abnormal charge current detection is rel eased when the voltage difference betwee n VM pin and GND pin becomes lower tha n the charger detection voltage (V_{CHA}) by separating the charger. Since the 0V batter y charging function has higher priority than the abnormal charge current detection func tion, abnormal charge current may not be detected by the product with the 0V battery charging function while the battery voltage i s low.

Load Short-circuiting condition

If voltage of VM pin is equal or below sho rt circuiting protection voltage (V_{SHORT}), the XBGL6332 TSZR Series will stop dischargi ng and battery is disconnected from loa d. T-he maximum delay time to switch curr ent off is t_{SHORT}. This status is released whe n voltage of VM pin is higher than short pr otection voltage (V_{SHORT}), such as when di sconnecting the load.

Delay Circuits

The detection delay time for over-dischar ge current 2 and load short-circuiting starts when over-discharge current 1 is detected. As soon as over-discharge current 2 or loa d short-circuiting is detected over detection delay time for over-discharge current 2 or l oad short-circuiting, the XBGL6332 TSZR Series stops discharging. When battery vol tage falls below over-discharge detection v oltage due to over-discharge current, the X BGL6332 TSZR Series stop discharging by over-discharge current detection. In this ca se the recovery of battery voltage is so slo w that if battery voltage after over-discharg e voltage detection delay time is still lower than over-discharge detection voltage, the XBGL6332 TSZR Series shifts to power-do wn.

0V Battery Charging Function [1] [2] [3]

This function enables the charging of a connected battery whose voltage is 0V by self-discharge. When a charger having 0V battery start charging charger voltage (V_{0CHA}) or higher is connected between B+ and B- pins, the charging control FET gate is fix ed to VDD potential. When the voltage bet- ween the gate and the source of the chargi ng control FET becomes equal to or higher than the turn on voltage by the charger vol tage, the charging control FET is turned on to start charging. At this time, the dischargi ng control FET is off and the charging curr ent flows through the internal parasitic diod e in the discharging control FET. If the batt ery voltage becomes equal to or higher tha n the over-discharge release voltage (V_{DR}), the normal condition returns.

Remark :

(1) Some battery providers do not recommend ch arging of completely discharged batteries. Please r efer to battery providers before the selection of 0V b attery 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 batte ry charging function charges a battery and abnorma l charge current cannot be detected during the batte ry voltage is low (at most 1.8 V or lower).

(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 th e VM pin voltage equal to the GND voltage (short t he VM and GND pins or connect a charger) to enter the normal condition.

Discharge Over-current /Short Self-recovery

The recovery condition of short circuit/ discharge overcurrent is that the VM voltag e is less than V_{RIOV1}.

TIMING CHART

1. Overcharge and Over-discharge voltage detection

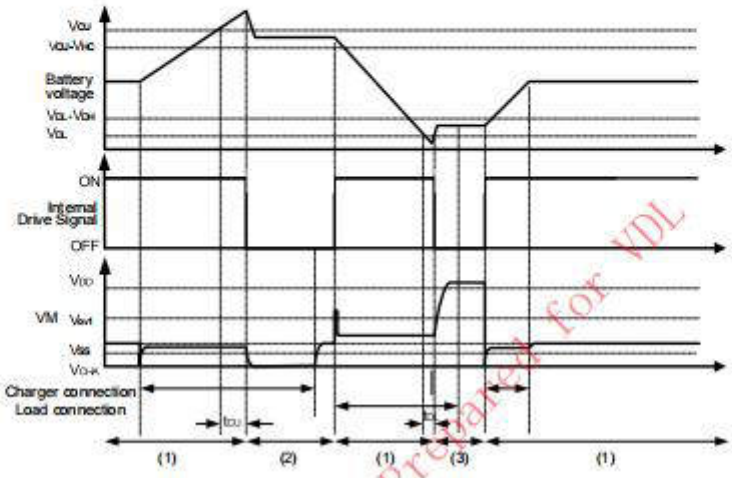


Figure4-1 Overcharge and Over-discharge Voltage Detection

Remark: (1) Normal condition (2) Overcharge voltage condition (3) Over-discharge voltage condition

2. Over-discharge Current and Load Short detection

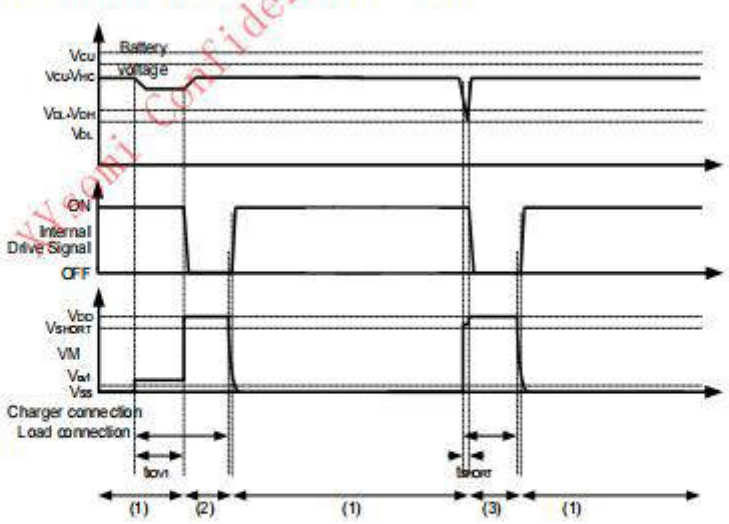


Figure4-2 Over-discharge Current and Short Detection

Remark: (1) Normal condition (2) Overcharge voltage condition (3) Over-discharge voltage condition

3. Abnormal Charger Detection

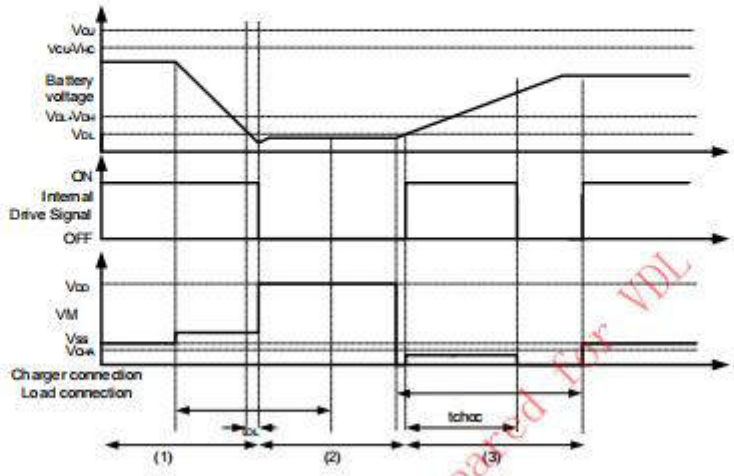


Figure4-3 Abnormal Charger Detection

Remark: (1) Normal condition (2) Over-discharge voltage condition (3) Overcharge voltage condition

TYPICAL APPLICATION

As shown in Figure 5, the current path which must be kept as short as possible. For thermal management, ensure that these trace widths are adequate. C is a decoupling capacitor which should be placed as close as possible to XBGL6350 TSZR Series.

If add one 0.1uF capacitor between VM pin and GND pin closely, the system ESD level and anti-interference capability of circuit will improve greatly.

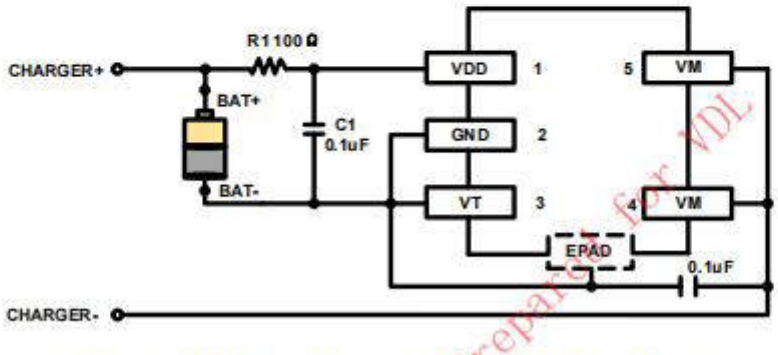


Figure 5 XBGL6034 S SERIES in a Typical Battery Protection Circuit

Symbol	Typ	Value range	Unit
R1	100	100~1000	Ω
C1	0.1	0.1~2.2	μF

Remark:
1.The above parameters may be changed without notice;
2.The schematic diagram and parameters of the IC are not used as the basis to ensure the operation of the circuit. Please conduct full measurement on the actual application circuit before setting the parameters.
3.If the resistance value is large , the overcharging voltage will be correspondingly larger by several mV.

Precautions

- Pay attention to the operating conditions for input/output voltage and load current so that the power loss in XBGL6332 TSZR Series does not exceed the power dissipation of the package.
- Do not apply an electrostatic discharge to this XBGL6332 TSZR Series that exceeds the performance ratings of the built-in electrostatic protection circuit.

APPLIED MEASUREMENT METHOD

(1).Overcharge characteristic test method:

a. According to the figure6-1, connect the power supply DC1 to the B + and GND pins of the system board and set the voltage to about 3.6V. Connect the power supply from GND to VM to DC2 power supply and set 100mV current limiting 10mA. Observe the waveform.

b. Adjust the power supply voltage V1 and increase it by 0.001V until the output level of VM pin changes from 0 to negative (-100mV). Record the overcharge protection voltage and measure the protection delay.

c. Adjust the power supply voltage V1 to decrease by 0.001V until the output voltage of VM pin is recovered from negative (-100mV) to 0 level, and record the overcharge recovery voltage.

(2).Overdischarge characteristic test method:

a. According to the figure6-2, connect the power supply DC1 to the B + and GND pins of the system board and set the voltage to about 3.6V. Connect the DC2 power supply from VM to GND, set the 100mV current limiting 10mA, and observe the waveform.

b. Adjust the power supply voltage V1 and decrease it by 0.001V until the output level of VM pin changes from 0 to positive (100mV). Record the over-discharge protection voltage and measure the protection delay.

c. Adjust the power supply voltage V1 to increase by 0.001 V until the output voltage of VM pin is restored from positive (100 mV) to 0 level, and record the over-discharge recovery voltage.

(3).Discharge over current test method:

a. According to the figure6-3, connect the DC1 power supply to the B + and GND pins of the system board and set the voltage to about 3.0V/3.6V/4.2V. Connect the electronic load from B + to VM and observe the waveform.

b. Adjust the electronic load increase it by 0.1A step, detect that the current from B + to VM is turned off and meet the delay standard (about 10ms), and record the discharge delay time.

(4).Charging over current test method:

a. According to the figure6-4, connect the DC1 power supply to the B + and GND pins of the system board and set the voltage to about 3.0V/3.6V/4.2V, and load DC2 power supply from GND to VM.

b. Adjust the current limiting value of DC2 power supply to increase by 0.1A step, detect that the current from GND to VM is turned off and meet the delay standard (about10ms), and record the charging over-current delay time.

(5).Iq test method:

a. As shown in the figure6-5, connect the positive pole of DC1 to B +, and the negative pole to GND, and set the voltage to 3.6V;

b. VM grounding, record the current passing through DC1 (Iq).

(6).Isd test method:

a. As shown in the figure6-6, connect the positive pole of DC1 to B + and the negative pole to GND, and set the voltage to 2V;

b. VM is suspended and the current passing through DC1 is recorded as Isd.

SCHEMATIC DIAGRAM OF TEST METHOD

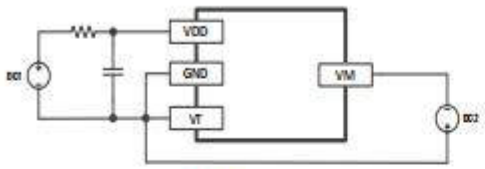


Figure6-1

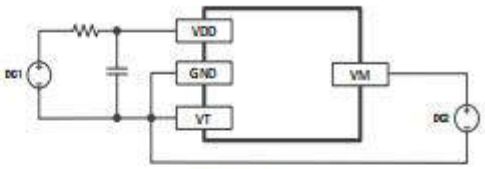


Figure6-2

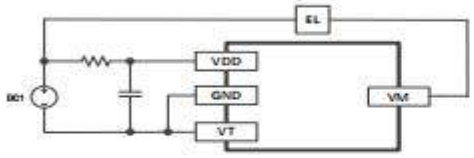


Figure6-3

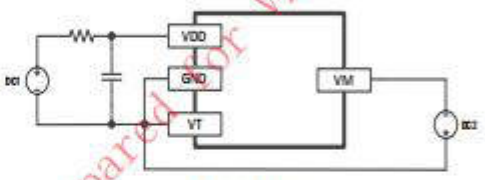


Figure6-4

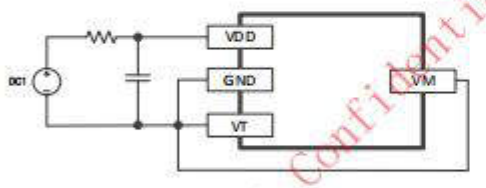


Figure6-5

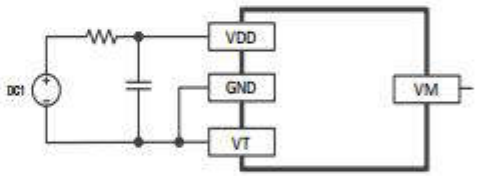
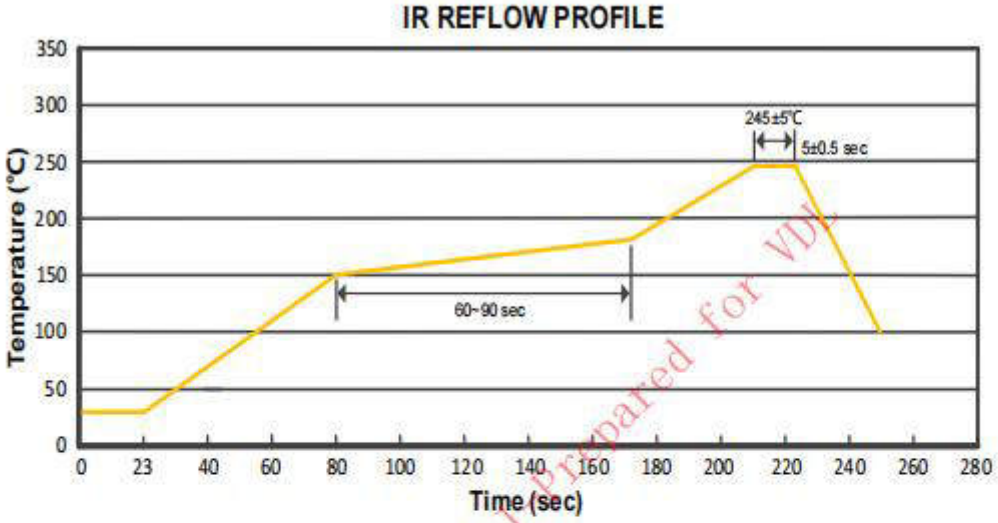


Figure6-6

Solderability Curve of Lead-Free Reflow Soldering (applicable to SMT tube)



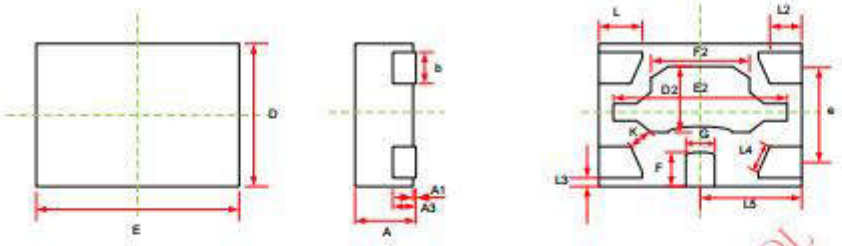
Explain:
1.Preheating temperature 25~150℃, duration 60~90sec;
2.Peak temperature 245 ± 5 ℃, duration 5 ± 0.5sec;
3.Cooling rate of welding process is 2~10℃/sec.

Resistance to welding heat conditions

Temperature: 270±5℃; Time:10±1sec

XBGL6332 TSZR Series

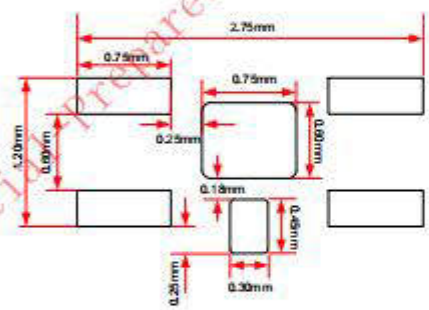
PACKAGE OUTLINE(DFN1.3x1.8-5)



TOP VIEW SIDE VIEW BOTTOM VIEW

SYMBOL	MIN	NOM	MAX
A	0.60	0.65	0.70
A1	0.000	0.02	0.050
A3		0.20 REF	
b	0.22	0.27	0.32
D	1.224	1.3	1.376
E	1.724	1.8	1.876
e		0.880 TYP	
L	0.244	0.32	0.396
K	0.20	-	-
F	0.184	0.26	0.336
G	0.20	0.25	0.30
E2	1.43	1.53	1.63
D2	0.47	0.57	0.67
F2	0.87	0.97	1.07
L2		0.19REF	
L3		0.074REF	
L4		0.25REF	
L5		0.9REF	

RECOMMENDED LAND PATTERN uint (mm)



XBGL6332 TSZR Series

DISCLAIMER

The information described herein is subject to change without notice.

Suzhou XySemi Electronic Technology Co., Limited is not responsible for any problems caused by circuits or diagrams described herein whose related industrial properties, patents, or other rights belong to third parties. The application circuit examples explain typical applications of the products, and do not guarantee the success of any specific mass-production design.

When the products described herein are regulated products subject to the Wassenaar Arrangement or other arrangements, they may not be exported without authorization from the appropriate governmental authority.

Use of the information described herein for other purposes and/or reproduction or copying without express permission of Suzhou XySemi Electronic Technology Co., Limited is strictly prohibited.

The products described herein cannot be used as part of any device or equipment affecting the human body, such as exercise equipment ,medical equipment, security systems, gas equipment, or any apparatus installed in airplanes and other vehicles, without prior written permission of Suzhou XySemi Electronic Technology Co., Limited.

Although Suzhou XySemi Electronic Technology Co., Limited. exerts the greatest possible effort to ensure high quality and reliability, the failure or malfunction of semiconductor may occur. The use of these products should therefore give thorough consideration to safety design, including redundancy, fire-prevention measure and malfunction prevention, to prevent any accidents, fires, or community damage that may ensue.