GLF73927

Ultra-Efficient, Optimized I_QSmart™ Battery Protection IC

DESCRIPTION

The GLF73927 family is an I_QSmart™ ultra-efficient IC, with accurate over charge/discharge voltage protection, over charge current protection and short circuit protection.

The over charge and discharge voltage protections are capable of keeping a rechargeable battery working within the desired safe operating condition. When the battery is charged above the overcharge voltage detection level (V_{OC}), the GLF73927 charging switches off after a preset delay time. As the battery voltage decreases lower than the over discharge detection voltage (V_{OD}), the GLF73927 discharging switch is turned off immediately. In the off state, GLF73927 consumes an ultra-low leakage current (I_{SD}) to save the battery power. In addition, when the load current is higher than the short circuit protection current level (I_{SC}), the GLF73927 is turned off and will maintain the off state to avoid any serious damage to system. The short circuit delay time can avoid any false trigger which might turn off the switch.

The GLF73927 provides a shipping mode to prevent smart devices which has a non-removable battery from discharging during the shipping period. When a charged battery cell is connected to the GLF73927, and GLF73927 remains in the off state, the smart devices consume an ultra-low leakage current (I_{SD}). Note that the only way to active the GLF73927 is applying a charger output V_{ON} voltage to VOUT pin.

The GLF73927 has 0 V battery minimum voltage charging function, when discharged to around 0 V, the battery can still be charged up.

FEATURES

- Over Charge Detection Voltage, V_{OC}
  - GLF73927A/C, V_{OC}: 4.30 V
  - GLF73927B, V_{OC}: 4.45 V
  - V_{OC} accuracy: ± 1.2 %
  - Detects VBAT to release V_{OC}
- Over Discharge Detection Voltage, V_{OD}
  - GLF73927A/B, V_{OD}: 2.80 V
  - GLF73927C, V_{OD}: 2.50 V
  - Detects VBAT to release V_{OD}
- Overcharge Current Detection, I_{OC}
  - GLF73927A, I_{OC}: 1.90 A
  - GLF73927B, I_{OC}: 2.15 A
  - GLF73927C, I_{OC}: 1.20 A
- Short Circuit Protection, I_{SC}: 3.0 A
- Activated by Applying V_{ON} to the VOUT Pin from Charger
- Shipping Mode Implementation
- Low R_{ON}: 32 mΩ Typ. at 3.6 V_{BAT}
- Low Quiescent Current, I_Q : 1.6 µA Typ.at 3.6 V_{BAT}
- Shutdown Current:
  - I_{SD} = 6 nA Typ. @ $V_{BAT} < V_{OD}$
  - I_{SD} = 8 nA Typ. @ V_{BAT} = 3.7 V, Shipping Mode
  - I_{SD} = 10 nA Typ. @ V_{BAT} = 4.2 V, Shipping Mode
- Latch-off at Over Charge Current, Over Discharge Voltage Detection and Short Circuit Protection.
- 0 V Battery Charging.

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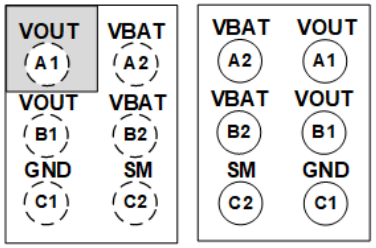
PRODUCT TABLE

Eval Board Ordering Info	Part Number	R_{ON} (Typ.) at V_{BAT} = 3.6 V	Over charge Detection V_{OC} (Typ.)	Over discharge Detection V_{OD} (Typ.)	Over charge Current I_{OC} (Typ.)	Short Circuit Current I_{SC} (Typ.)
EV051-GLF73927A	GLF73927A-S37	32 mΩ	4.30 V	2.80 V	1.90 A	3 A
EV051-GLF73927B	GLF73927B-S37		4.45 V	2.80 V	2.15 A	
EV051-GLF73927C	GLF73927C-S37		4.30 V	2.50 V	1.20 A	

DEVICE PACKAGE AND PINOUT



TOP VIEW BOTTOM VIEW

0.97mm x 1.47mm x 0.55mm WLCSP

Pin #	Name	Description
A1, B1	VOUT	VOUT pin is connected to the charger output and system load. If the switch is in the off state, applying the appropriate voltage (V_{ON}) to VOUT turn the switch on.
A2, B2	VBAT	VBAT pin is connected to the positive terminal of a battery pack to monitor the battery voltage.
C1	GND	Ground
C2	SM	Shipping Mode Control. Active high.

TEST SETUP

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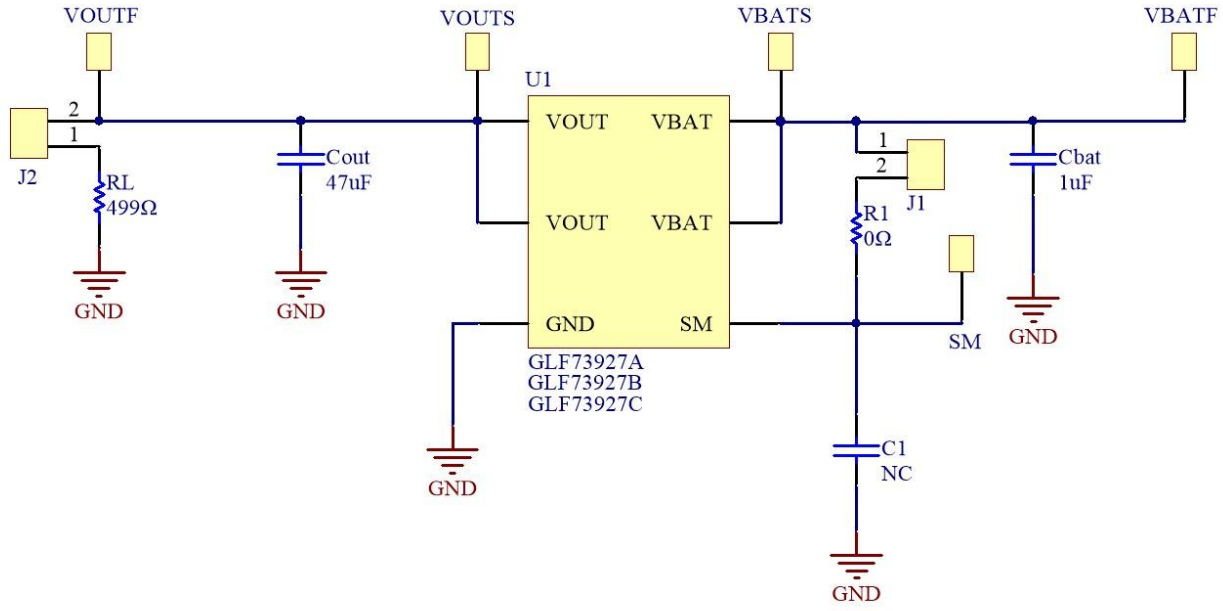
QUICK START GUIDE

The evaluation board EV051-GLF73927 is easy to set up to evaluate the performance of GLF73927.

1. Connect the positive and negative terminals of the Input Power Supply or a Li-battery pack higher than 3.1 V (GLF73927C is 2.7 V) to VBAT and GND respectively. The VBATS and VOUTS can be used for measurement points. Make sure there is no high peak voltage generated when a VBAT input source is hot-plugged in.
2. Use a jumper wire to connect SM to GND to prevent false activation of shipping mode.
3. Use an enabled charger or a DC power supply that has finished setting the current limit and the output voltage exceeds V_{ON} is connected to VOUT, GLF73927 internal switch will be turned on.
4. The load resistor RL=499 Ω, has been populated on the PCB board. Short the J2 to use the RL. To increase the output current, connect an electronic load to VOUT and GND.
5. When the VBAT voltage decreases to the V_{OD} or the VOUT pin is shorted to GND, the GLF73927 is latched-off. In order to wake up GLF73927 again, the VBAT voltage needs to be above 3.1 V (GLF73927C is 2.7 V) and applying a voltage higher than V_{ON} to the VOUT pin can reactivate the output.
6. When the VBAT voltage reaches the V_{OC}, the GLF73927 switch is turned off to stop charging and get back to the on state as the VBAT voltage decreases by 105 mV (V_{OC_HYS}) below V_{OC}.
7. When the GLF73927 switch is turned on, apply a voltage of more than 1.2 V to SM for at least t_{SM} = 15 ms. The GLF73927 will turn off after a delay of td_{SM} = 460 ms. This can save battery energy during transportation and storage.

SCHEMATIC



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BILL OF MATERIALS

Qty	Reference	Value	Part Description	Note
1	U1	GLF73927	Single lithium battery protection IC	GLF Integrated Power
1	Cbat	1 μF	Cap., X7R, 25 V, 10 % 0805	YAGEO CC0805KKX7R8BB105
1	Cout	47 μF	Cap., X5R, 10V, 20% 0805	YAGEO CC0805MKX5R6BB476
1	RL	499 Ω	Resistor, 1 % 0805	YAGEO RC0805FR-07499RL
1	R1	0 Ω	Resistor	
1	C1	NC		Not placed
2	J1, J2	Jumper	Jumper	

PRINTED CIRCUIT BOARD LAYOUT

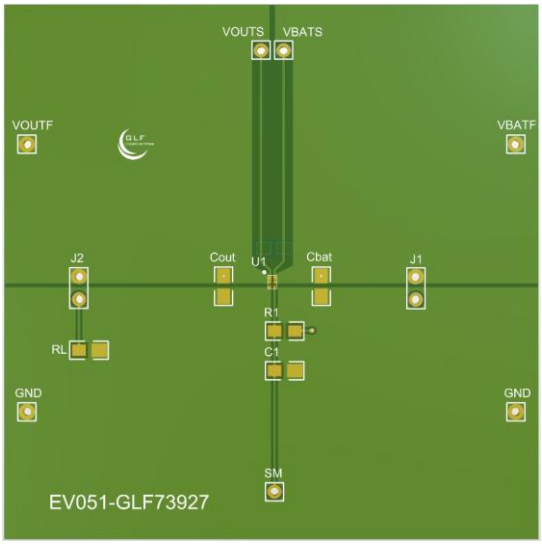

Fig 1. Top Layer

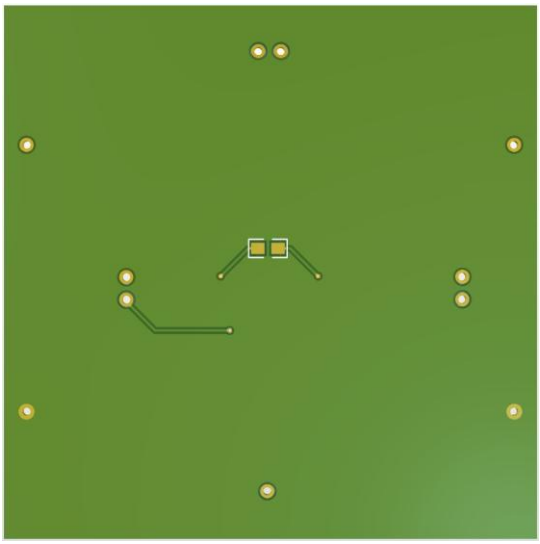

Fig 2. Bottom Layer

NOTICE: The evaluation board provided by GLF Integrated Power is intended for use for ENGINEERING DEVELOPMENT, OR EVALUATION PURPOSES ONLY and is not for any commercial use. The user assumes all responsibility and liability for proper and safe handling of the goods.

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