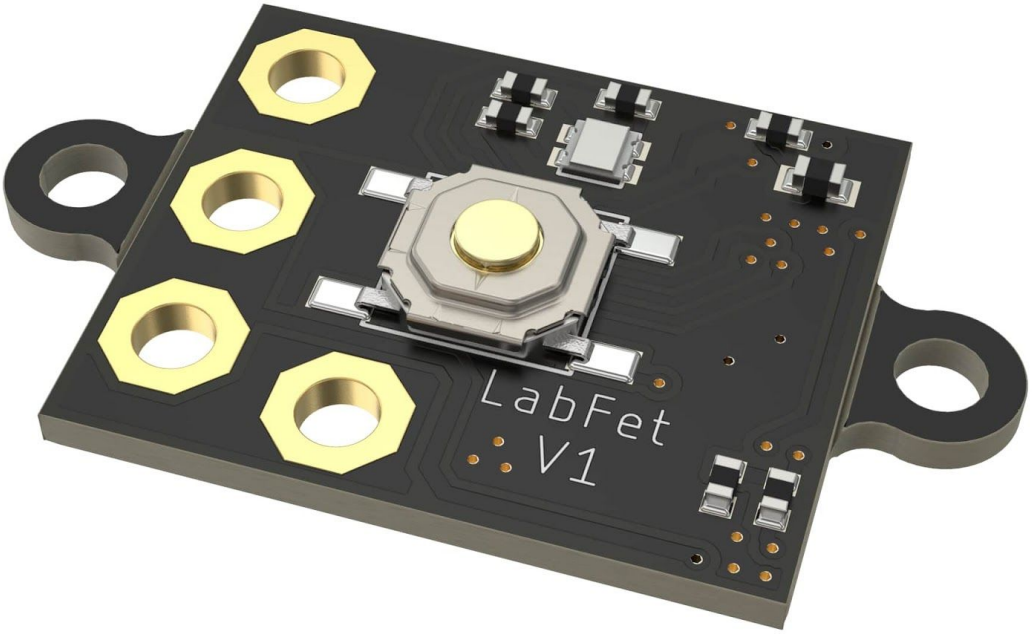


LabFet Manual

The safest mosfet board on the market

Table of contents

Introduction

The LabFet by Steelabs is a mosfet board made with user safety in mind, it has innovative features and many protections to achieve such goal:

- Output short circuit protection.
- Over-temperature protection.
- "Smart battery" protection.
- Reverse polarity auto-adjust.
- Undervoltage protection.
- Puff time limit (with locking protection).
- 5 clicks lock-unlock.
- Automatic sleep mode.
- RGB led for clear user feedback.

It also comes with mounting holes for screws for ease of assembly, which are removable if needed. An optional cradle for flush mounting is available as an accessory for those who don't want to use screws but still want to mount the board securely and level.
It ensures an optimal output power delivery thanks to its very low resistance across the power stage. Being a mosfet board, the output power will be dictated by the resistance of the coil mounted in the atomizer connected to the output, via the Ohm's law formula:

$$I = V / R$$

Where:

I is the current that will be outputted to the coil when the board is activated normally
R is the coil's resistance
V is the actual voltage of the battery

The current needs to be within the battery rating, otherwise the "Smart battery protection" will prevent the board from activation. Always use good batteries with the appropriate rating, even if this board has protection against that.
Consequently, the output wattage can be calculated with the following formula:

$$P = V * I$$

Where:

P is the wattage output
V is the actual voltage of the battery
I is the current calculated with the previous formula

Specifications

	Minimum	Typical	Maximum
Amperage rating		100 Ampere[1]	
Input voltage[2]	3.0 Volt	3.7 Volt	4.2 Volt
Suggested lowest coil resistance[3]	0.05 Ω		
Over temperature protection			80 °C
Sleep activation delay		1 hour	
Puff time			6 seconds
Power stage internal resistance		<0.001 Ω	
Switch operating life		1 million presses	
Switch travel		0.25 mm	
Soldering holes diameter		2 mm	
Size (without screw tabs)		17.5 x 14.5 mm ± 0.1	
Size (with screw tabs)		25.5 x 14.5 mm ± 0.1	
Thickness			4 mm ± 0.1
Thickness (without button)			3 mm ± 0.1

[1] Max amperage rating for continuous use of the mosfets on the board, with appropriate cooling. Pulsed max amperage is much higher.

[2] This board is designed for 1 cell systems, therefore it does only support single or parallel battery configurations. Please do not use series battery configurations to avoid damage to the circuit.

[3] There is no minimum value, a lower resistance can be used. However without proper cooling on the mosfets such load may shorten the lifespan of the components.

Safety features

Reverse polarity auto-adjust

This is a unique feature of the LabFet. It can work with the battery connected both ways, meaning that the user can insert the battery either way without autofiring or any of the problems all the other mosfet boards have.
The LabFet will work normally even when the polarity is inverted without any loss in performance.

> **⚠ WARNING**
>
> **Always use batteries with a wrapping in good condition. If the wrapping is damaged please change it before using them, especially when using metal battery tubes as their container.**

Short circuit protection

The board will not output when there is a resistance too low or a short in the atomizer.
There is no protection on the input side so never short the batteries connected to the board.
When a short circuit on the output happens it will be signaled by the led flashing in a ORANGE color.

Smart battery protection

The circuit can recognise the load (the resistance of the coil in the atomizer) and checks if the battery connected to it can provide enough current, **if the current requested by the load is too high it won't fire.**
If the battery is changed with one of the appropriate current rating the LabFet will fire normally.
When the coil resistance is too low for the connected battery it will be signaled by the led flashing in a ORANGE color.

Undervoltage protection

When the battery voltage reaches 3.0 Volts the LabFet won't fire anymore until a charged battery is connected to it.
When the battery has a voltage too low it will be signaled by the led flashing in a CYAN color.

Over temperature protection

When the board temperature exceeds 80°C the LabFet won't fire anymore until it cools down. **This is to guarantee a longer life to the components on the board and as a safety in case of malfunction.**
When the board temperature reaches the max temperature limit it will be signaled by the led flashing in a RED color.

Puff time protection

The maximum puff time is set at 6 seconds, after that the LabFet will stop firing and enter lock mode automatically.
This is to prevent auto-fire accidents: in case of an autofire (in a pocket, in a purse etc) it will only fire 1 time for 6 seconds and then be locked; preventing fire hazards or other accidents.
When the max time is exceeded it will be signaled by the led flashing in a PURPLE color.

No coil / open circuit

When no coil is connected to the output or it is connected wrongly and it doesn't make contact between the atomizer posts the board will not enable the output.
This is to prevent the 510 connector to be live when nothing is connected, and to signal to the user if the coil hasn't been mounted properly or has become disconnected.
When there is no coil or the output is an open circuit it will be signaled by the led flashing in a BLUE color.

Sleep mode

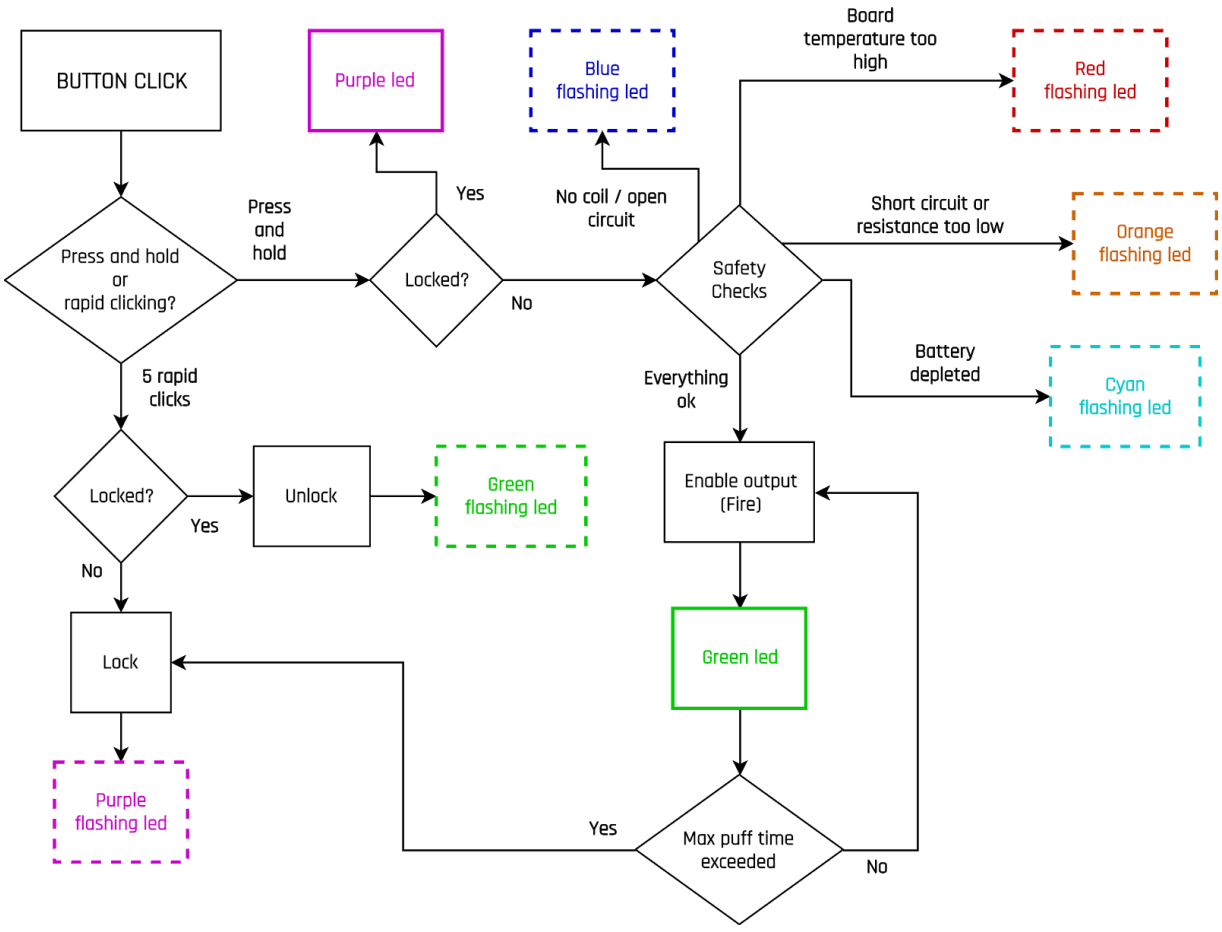
The LabFet will lock itself and go into sleep mode if it's left inactive for 1 hour.
This is to improve idle battery life and to prevent any accidental autofire from the mod being left with the battery inserted (liquid slowly shorting the button etc.).
To exit sleep mode just unlock the circuit as usual.

Operation

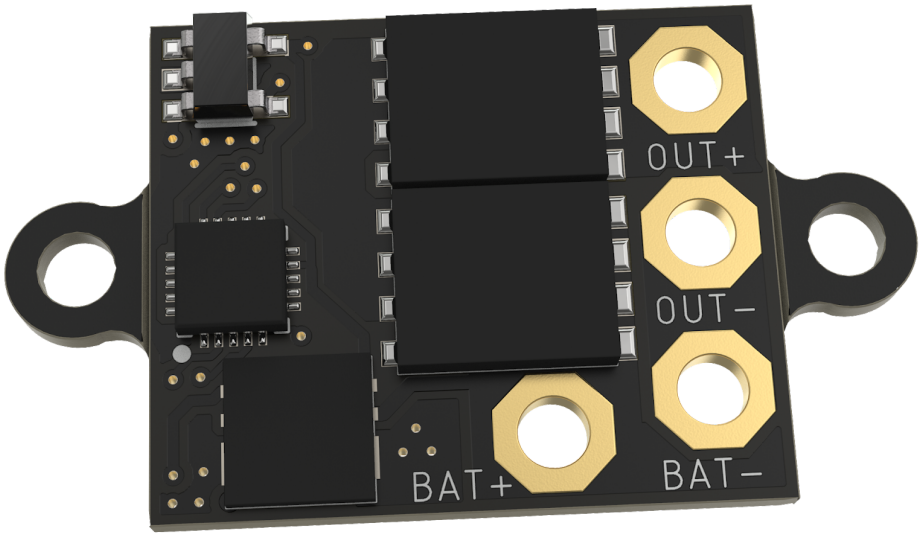
To operate the LabFet press and hold the button, if the checks discussed in the previous section are passed it will fire normally until it reaches the max puff time. The on-board led will be GREEN during the whole length of a correct firing routine.
If the circuit isn't used for 1 hour it will enter sleep mode and self-lock to save battery power.

To Lock/Unlock the board rapidly press the button 5 times, when unlocking the led will flash GREEN, when locking it will flash PURPLE.
When the board is locked it will not fire and it will signal that it is in the locked state with the led being PURPLE while the button is pressed.

Here is a flow diagram to better illustrate all of the board functions and feedback:



Assembly



For assembly some soldering is required, solder wires on the exposed pads as follows:

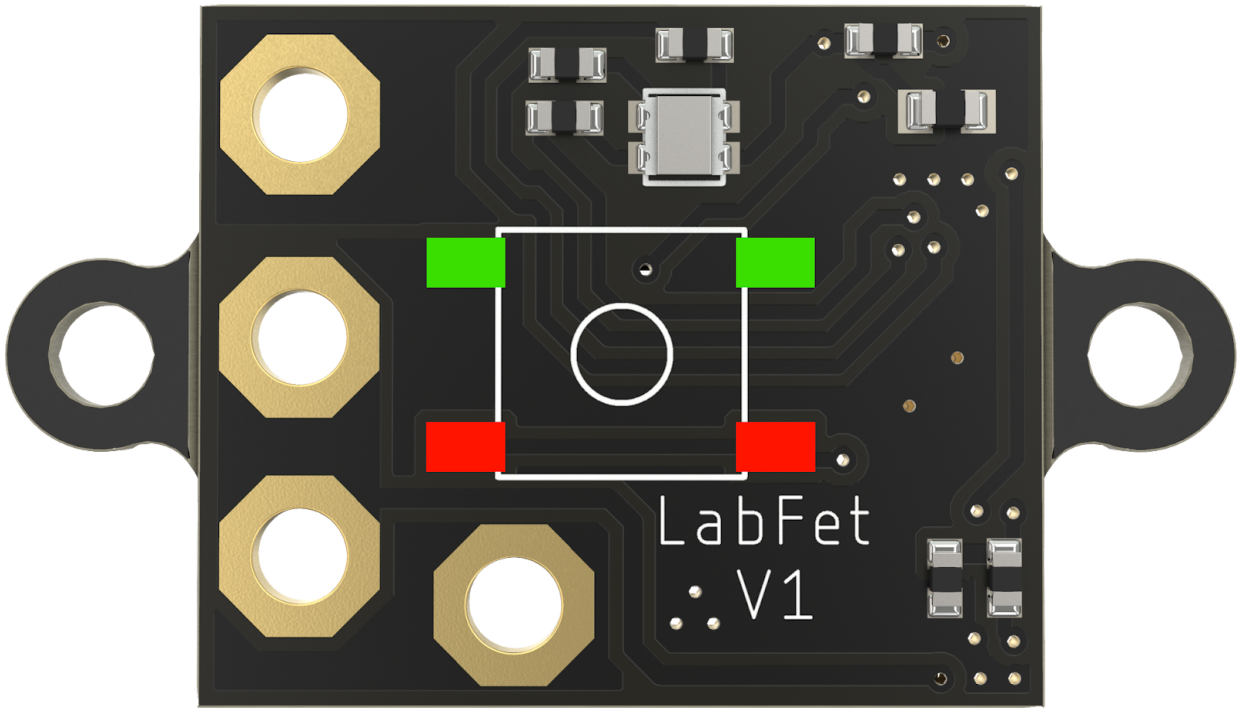
OUT+ positive output of the 510 connector.
OUT- negative output of the 510 connector.
BAT+ positive input from the battery.
BAT- negative input from the battery.

BAT- and OUT- are connected directly, it is possible to use only one wire for both of these connections (connected to either BAT- or OUT-) if there is such a need.
This will allow a 3 wire installation, with the caveat that this wire needs to have a higher amperage rating than the others because it will carry both the input and the output current in this configuration.
A connection between the battery negative input and the negative output of the 510 connector is still required.
We still advise to use 4 separate wires for the best performance.

⚠ WARNING

**All the wires need to be of the appropriate gauge based on the expected power output.
Undersized wires are not to be used for the aforementioned connections.
If the wires must be as small as possible we suggest using our rigid tinned copper wires, which have a very good current rating and take the least amount of space out of all the cables we tried in our assemblies; it is a good practice to add some heat-shrink tubing around said wires for insulation and improved safety.**

Remote Switch



It is possible to use a **remote switch**, it is sufficient to solder one wire coming from the remote switch on **one of the green pads** and the other wire on **one of the red pads**.

If this is the case, the existing switch can be removed, via carefully desoldering it, to obtain a thinner board footprint; or it can be left on the board if there is no such need.

> **⚠ ATTENTION**
>
> **Button removal is a delicate process and might damage the board if done incorrectly.**
> **For this reason, warranty will be voided if the button is removed by customers.**

We can provide boards with the switch already removed, however this option will be available on quantities multiples of 25 only (25/50/75 etc), ordering through e-mail (support@steelabs.it).

Mounting holes

There are two holes on the side of the board for screw mounting, they are meant for standard M2 screws. The mounting tabs are removable just by carefully snapping them off the board to make the board even smaller.

They are connected to the main pcb via a V cut so when using this mounting method **we highly suggest to mount the board with some support underneath it**, to prevent the user from breaking the tabs away with the repeated pressure exerted on the button.

Support features can be added directly in the cavity where the board will reside, they must not interfere with any of the components on the board or with soldered wires.

An optional 3D printed cradle that supports the whole board is available here: LINK
It can be used as is with screws (like in the image above). Also, when the mounting supports are removed from the board, to keep the board perfectly level (the components on the backside are not all the same height); in this second case the screw supports on the 3D printed support can be trimmed to fit exactly under the pcb without screw tabs.

Conformal Coating

The board will come with conformal coating applied. This treatment is applied to insulate the components from humidity and dust/debris.
The board cannot be covered completely from the factory to preserve the ability to solder the needed wires to it, we advise that the board should be coated again after assembly to cover all the solder joints and provide better protection, **the switch body must not be covered to maintain its functionality.**
An easy to apply conformal coating compound is available for that purpose, here: LINK

> **⚠ WARNING**
>
> **Conformal coating DOES NOT make the boards and components waterproof, to fully waterproof the PCB and components it must be epoxy coated (or similar) after assembly/soldering.**

3D files

Board with screw tabs: LINK
Board without screw tabs: LINK
3D printed cradle: LINK

Custom Boards

We are open for requests of custom boards with this circuit design (or others), provided the following conditions are met:

1. We must meet an MOQ for custom production.
2. The client needs to pay for the R&D of the new design.
3. The redesign will be scheduled within a timeframe, it can not be immediate.

All of the above will be varying based on the kind of redesign of the board layout.

Warranty Policy

This product WILL NOT be covered by our warranty policy if it's already been soldered to.
To provide a means of testing it without doing so, a purpose-made pcb is available here:
LINK