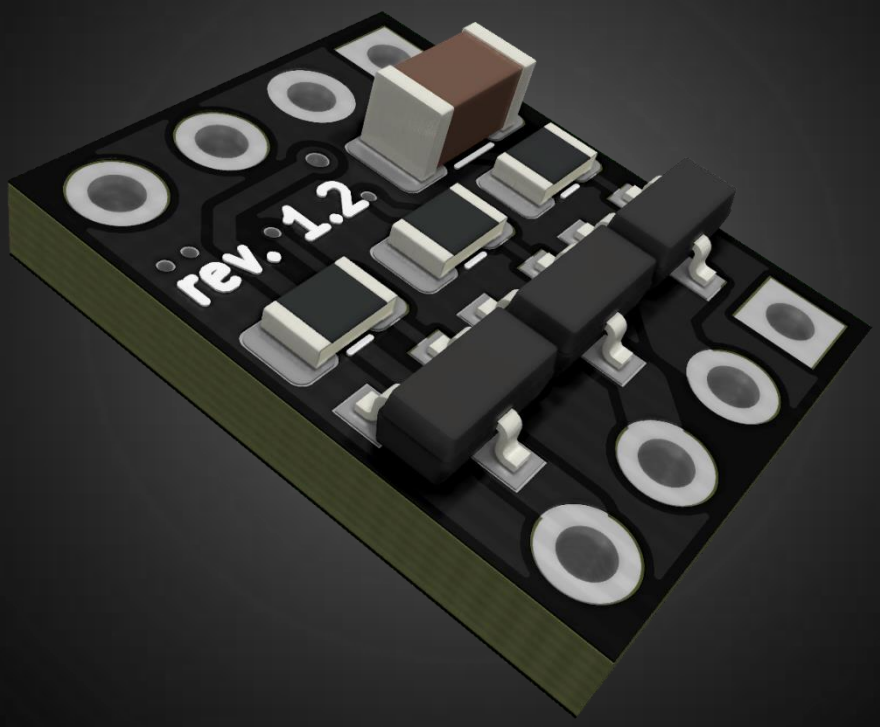

TinyFX RGB controller

User's Guide

Board revision: 1.2
Firmware: v1.0

Scavenger's Den

Safety notice

The board contains parts which are sensitive to electrostatic discharge. Please make sure to always ground yourself properly before working on sensitive electronics and always use a ESD save soldering iron. Furthermore it is strongly recommended to always use PCB protected Lithium-Ion batteries. The creator of this board cannot be held liable for any damage arising from a faulty install or misuse of the board.
Always be very cautious when using High-Power LEDs since they are very bright can damage the eye. If you are photosensitive please note that this device creates heavily flickering and flashing lights.
Please keep this Product away from children due to choking hazard from small parts.

Legal disclaimer

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Table of contents

TinyFX RGB contoller

1. Technical specifications

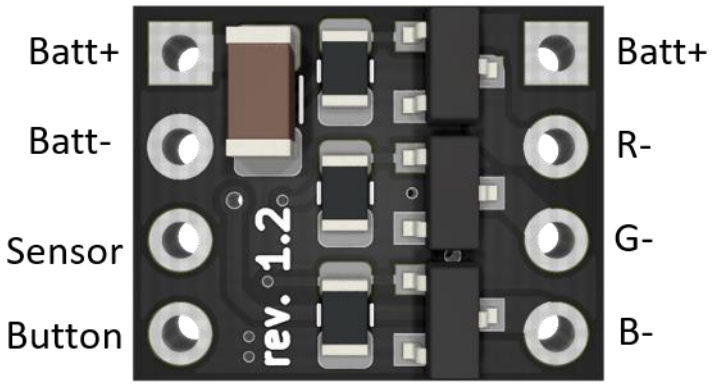
- Super small size (12.7 mm x 10.16 mm / 0.5” x 0,4”)
- Compatible with standard 2.54 mm (0.1”) breadboard spacing
- Three LED channels with up to 2.1A
- Compatible with Tri Cree, Luxeon and most other high power RGB LEDs
- Operating Voltage from 2.7-5.5 V (optimal for single 3.7 V Li-ion battery)
- Intuitive single momentary button control
- Deep sleep mode with low power consumption (< 1 µA)
- Efficient 8 bit processor with 16 pre-set colours and 6 effect profiles
- Interrupt based impact sensing for immediate blade flashing

2. Overview and Features

The TinyFX is probably the smallest effect board for stunt sabers. It features three LED channels for full 24 bit RGB control, has 16 pre-set colours and 6 different effect profiles/blade styles. Everything can be controlled though one momentary button. When the board is not active for 5 seconds, it goes into deep sleep mode to reduce the power consumption. The board reactivates on a single push of the button, thus integrating the sleep mode into seamless operation.

3. Pinout and wiring Guide

The Connections on the board are as follows:

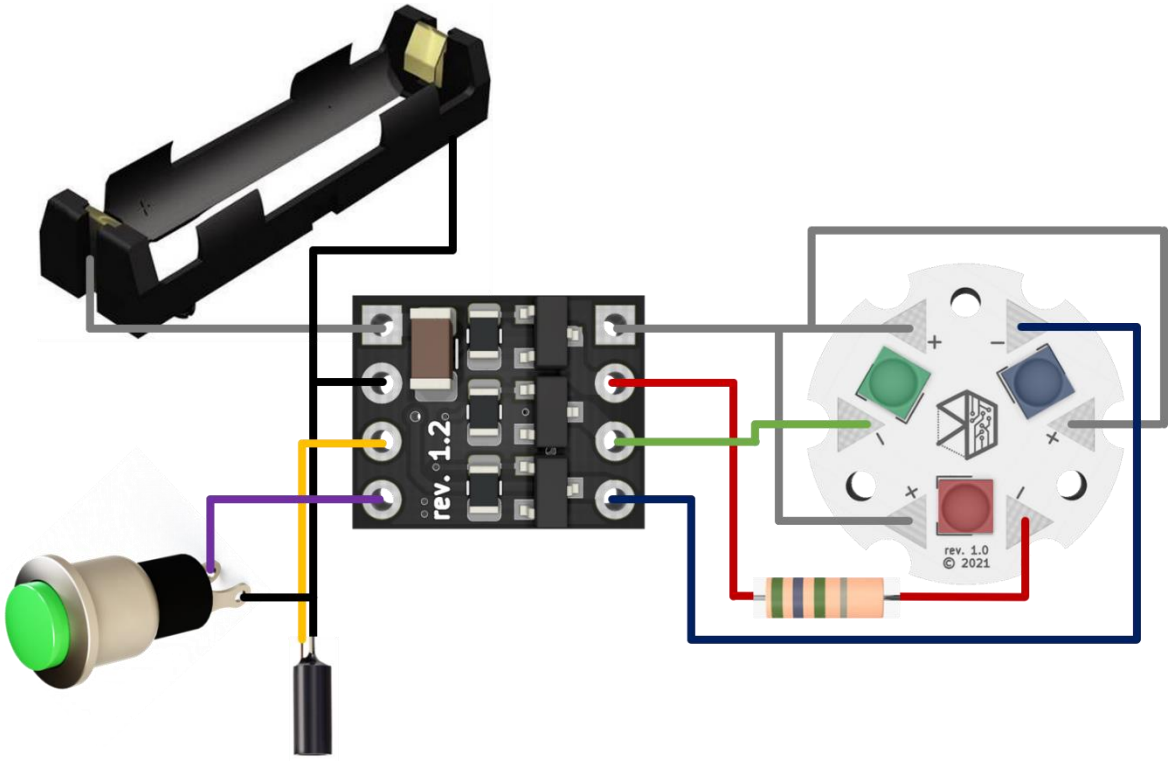


Please use at least 0.25 mm^2 (24 AWG) wires for the load bearing lines to prevent heat losses and damage to the components. It is also recommended to put the Board in 12.7 mm (0.5”) Heat shrink and glue it to the battery mount or to mount it in a 3D printed chassis. **NEVER** run the board free dangling and without insulation in your Saber and **ALWAYS** take care of the polarity, otherwise you will damage your components. For better clash sensitivity, place the sensor at the front or back of the saber (back is slightly better), whilst the wires from the sensor point towards the center of the hilt.

There are three different wiring setups available depending on how you want to recharge your battery. Please also make sure to use the proper resistors for your LEDs. Some resistor values and the formula for resistance and power calculation are provided in the attachment.

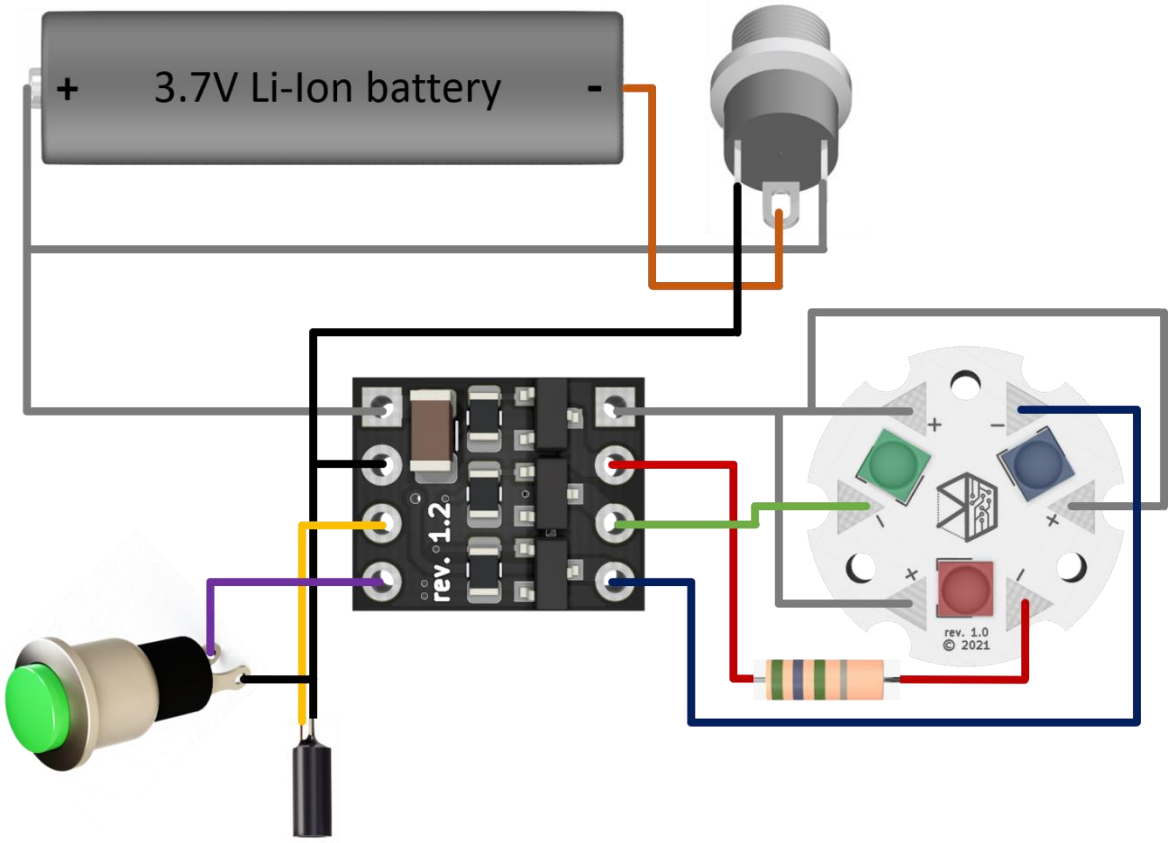
Setup 1: External recharging

This is the simplest of the three setups and is the recommended option for most users since it allows for simple battery swapping and needs the least wiring of all options it also makes proper use of the sleep mode. It is not recommended to use an illuminated switch in this setup because it renders the sleep mode useless.



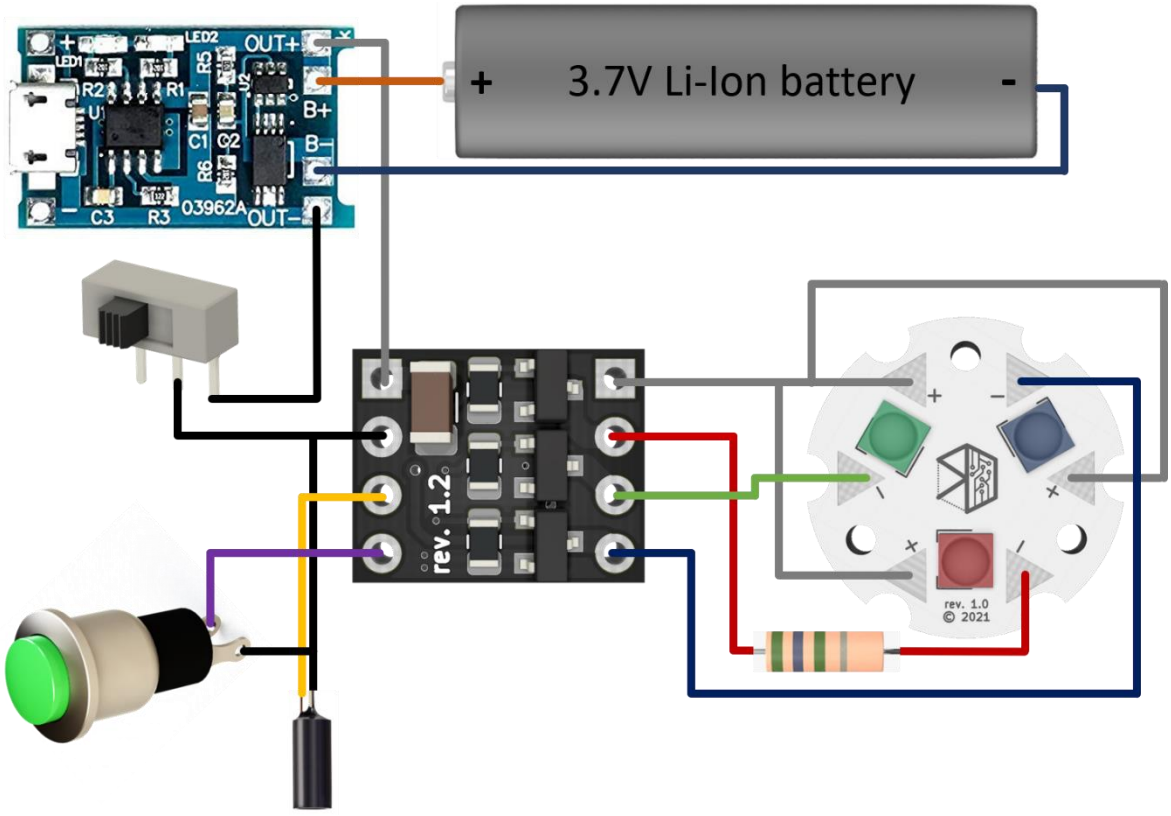
Setup 2: Internal recharging with power jack and kill key

This slightly more complex setup allows for battery recharging within the saber and thus giving the opportunity for using larger non swappable batteries (like 26650s). For recharging any **4.2V 1S** LiPo recharger with a **5.5 mm** plug can be used. Make sure to use the right charger or you can destroy your battery ant the control board. Also it is highly recommended to use PCB protected batteries. Since the circuit is physically interruptable this setup is usable with illuminated switches. Of course you can combine the first two wiring setups to have quickly swappable battery and the possibility of in hilt recharging, for the best from both worlds 😉.



Setup 3: Internal USB recharge with kill switch

The third (and fanciest) wiring setup moves the charging circuitry inside the Hilt. For that the TP4056 USB Charging module is preferably used. This module is very widely available and allows for charging currents up to 1A. If you want to use an illuminated button it is necessary to add a kill switch to turn off the entire electronics. Of course you can combine the different wiring setups to add a removable battery. If you want to use a cheaper unprotected battery make sure to use a TP4056 module with integrated battery protection (recognizable by the two wide and narrow chips next to the output pads).

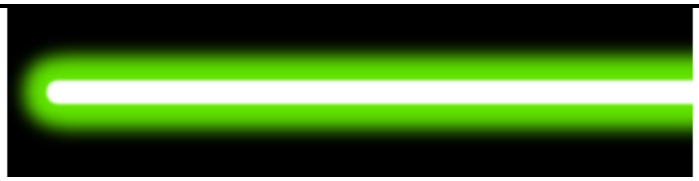
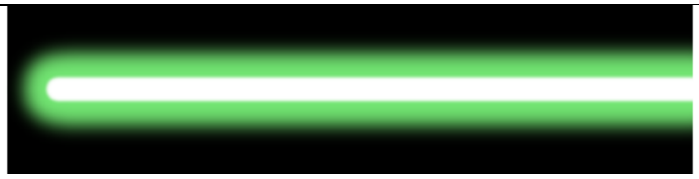
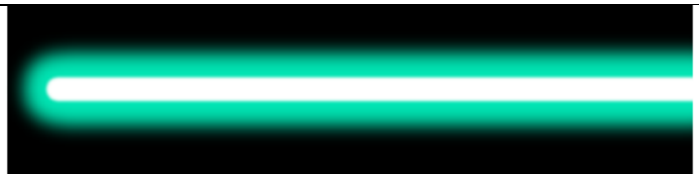
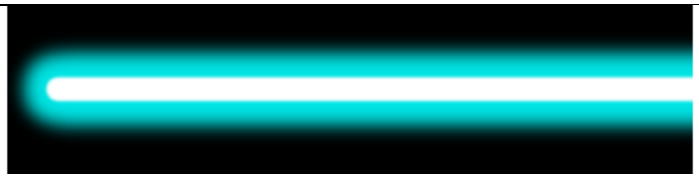


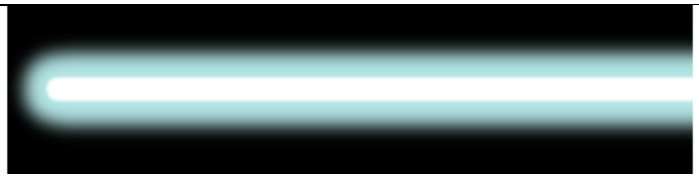
4. Settings and control

To enter the colour and effect control menu press the Button for at least one second while the blade is turned off. When entering the menu the LEDs will Blink three times in the currently set colour to indicate the entering in the colour menu. After that the blade will stay continuously on and a single push of the button will go to the next colour. To save the chosen colour, hold the button down until the blade starts to blink again. After that the Saber will switch into the blade style menu, where the flickering and clash styles of the blade are chosen the same way as the colour is chosen.

The 16 predetermined colours are shown below (please Note that the depiction of the colour is heavily dependent on the LEDs used and will change slightly with the charge state of the battery in your saber):

Name	PWM Values	approximate colour
Red	255, 0, 0	
Orange	255, 31 , 0	
Amber	255, 63, 0	
Yellow	255, 127, 0	

Lime	108, 255, 0	
Green	0, 255, 0	
Turquoise	0, 255, 31	
Viridian	48, 255, 48	
Mint	0, 255, 63	
Cyan	0, 255, 255	
Iceblue	0, 127, 255	
Royalblue	0, 0, 255	
Indigo	31, 0, 255	

Purple	92, 0, 255	
Magenta	255, 0, 255	
Silver	168, 255, 255	

The six predetermined bladestyles are:

Name	Description
Static	no flickering, slow and steady extending/retracting, consistent short flashing on impact
Jedi 1	gentle and consistent flickering, slow and steady extending/retracting, short, slightly randomized flashing
Jedi 2	gentle and slightly randomized flickering, faster extending/retracting, shorter randomized flashing
Sith	Strong randomized flickering, fast extending/retracting, short strongly randomized flashing
Unstable	Fast heavily randomized flickering, immediate extension/retraction, extremely heavy randomized flashing on impact
Rainbow	no flickering or clashing, but all colours are cycled through, for a very colourful blade 😉

If the button is pressed once while the blade is ignited the saber will enter Lockup mode where the clash effect is played repeatedly until the button is pushed again.

5. Attachment

5.1 Resistor Values for LEDs

This List shows the recommended resistor values for different suitable LEDs with a supply voltage of 3.7 V.

Note: Resistors with a value of 0.33Ω or lower can be left out if the Heatsink is sufficient.

Brand	Model	Colour	λ / nm	U_f / V	I_f / mA	R / Ω	P_R / W
Cree	XP-E2	Red	620	2.65	1000	1	1
	XP-E2	Deep Red	650	2.50	1000	1	1
	XP-E2	Photo Red	660	2.90	1000	0.75	0.75
	XP-E2	Green	520	3.70	1000	-	-
	XP-E2	Blue	470	3.40	1000	0.33	0.33
	XP-E2	Royal Blue	440	3.40	1000	0.33	0.33
	XP-G3	Royal Blue	440	2,80	2000	0.5	2
	XP-G3	Photo Red	670	1.99	1500	1	2.25
Luxeon	Rebel Color	Red	630	2.10	700	2.1	1
	Rebel Color	Deep Red	660	2.10	700	2.1	1
	Rebel Color	Green	530	3.20	1000	0.5	0.5
	Rebel Color	Royal Blue	450	2.95	1000	0.75	0.75
	Rebel Color	Blue	470	2.95	1000	0.75	0.75
Winger	WEPRGB9-S1	Red	625	2.4	700	1.5	0.75
	WEPRGB9-S1	Green	525	3.4	700	0.33	0.2
	WEPRGB9-S1	Blue	465	3.4	700	0.33	0.2
Nichia	NCSR219B-V1	Red	620	2.7	1000	1	1
	NCSG219B-V1	Green	520	3.6	1200	0.1	0.22
	NCSB219B-V1	Blue	470	3.2	1500	0.33	0.33

If your LED is not present in this list use this formulas to calculate the necessary resistor and its wattage:

$$R_{th}[\Omega] = \frac{U_{supply}[V] - U_f[V]}{I_f[A]}$$

$$P_{Rth}[W] = \left(U_{supply}[V] - U_f[V]\right) * I_f[A]$$

– or –

$$P_R[W] = R[\Omega] * I_f[A]^2$$

U_{supply} = Supply voltage in Volts (typical 3.3-4.2 V)

U_f= Forward voltage of the LED in Volts

I_f = Forward current of the LED in Amperes

R_{th}= theoretical necessary resistance in Ohms

P_{Rth} = minimal heat dissipation capability of the theoretical resistor in Watts

P_R = minimal heat dissipation capability of the chosen resistor in Watts

5.2 Quick control guide

a) Turn blade on/off

- short button push ignites the blade
- long button press turns of the blade

b) Lockup mode

- short button push with ignited blade toggles the Lockup mode

c) Colour/effect changing:

- turn off blade
- hold the button until the blade blinks and turns on
- choose the colour with short button pushes
- confirm the chosen colour by holding the button until the blade blinks
- wait for the blade to turn on again (with flickering)
- choose the bade style with short button pushes
- confirm the chosen style by holding the button until the blade blinks
- turn on the Saber with the new settings