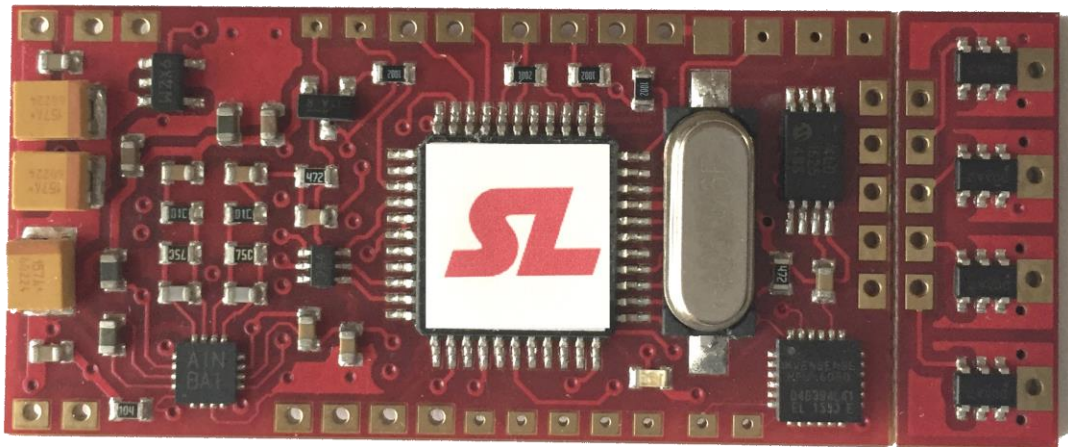


# **SPARK™** **LITE**



## SPARK LITE SETUP GUIDE



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## 2. INTRODUCTION

Introducing Spark Lite™, the beginner board with top-tier sound. Created for dueling in mind, this board requires no configuration, all with the 16 bit audio and Motion Sense V2 amazing motion detection. Best of all, in the event that the SD card becomes ajar during high-impact dueling, the board will continue to work (without sound). In fact, it is possible to just remove the card and all the effects and blade colors work perfectly, just without sound. This is a great way to have a saber with sound around the house, but then can go silent when dueling.

### 2.1. NEW IN SPARK LITE™

Spark Lite™ has the same great hardware setup as the legendary Igniter 3™:

#### HARDWARE

- 16bit off-CPU DAC for crystal-clear audio from all 8ohm speakers.
- Motion Sense V2 ported from Igniter 3™, most accurate motion detection in a production board.

#### FIRWMARE

- Configuration is 100% pre-loaded; no SD configuration needed.
- SD card houses only the single font1, with predetermined number for each type
  - 1 hum
  - 1 extension
  - 1 retraction
  - 8 swings
  - 4 clashes
  - 4 blasts
  - 1 lockup
- Effects work with SD card removed without sound.
- Supports main blade color with aux flash-clash color.

## 3. GETTING STARTED

### 3.1. IMPORTANT NOTES

PLEASE READ THIS SUBSECTION CAREFULLY AS FAILURE TO DO SO COULD CAUSE DAMAGE TO THE SPARK™ BOARD.

#### 3.1.1. 3.7v Power Supply

Spark Lite™ is designed around a 3.7v power supply input. In general, the best way to run a Spark Lite™ is to hook up a single 3.7v battery to the VBATT+ and VBATT-/GND pads.

**NEVER HOOK A 7.4V BATTERY DIRECTLY TO A SPARK LITE™ UNDER ANY CIRCUMSTANCES, OR YOU WILL DESTROY THE BOARD.**

**NEVER REVERSE THE POLARITY OF VBATT+ AND VBATT-/GND. IF USING A CONNECTOR FOR THE BATTERY, MAKE SURE TO USE ONE THAT ONLY CLIPS IN ONE WAY TO PREVENT DAMAGING THE BOARD BY HOOKING THE POWER IN REVERSE.**

---

### 3.1.2. BATTERY PROTECTION

Only use li-ion batteries that have a built-in protection circuit. **NEVER USE UNPROTECTED CELLS AS THIS CAN CAUSE DAMAGE TO THE BATTERY AND/OR SPARK LITE™.** IMR batteries are okay but since they are not protected they can allow large amounts of power to the board and do not act like a fuse when there is a wiring issue, so for beginners it is recommended to use the standard Li-ion with the protection circuit.

---

### 3.1.3. BATTERY BRANDS

Because only one battery is being used, it is very important that a quality battery is selected to get the best experience from Spark Lite™. From internal testing, it is determined that the best batteries are ones with a 10amp protection circuit or higher. Specifically, the following batteries meet this criteria:

- KeepPower 18650 3120mAh 15amp PCB
- KeepPower 18650 3400mAh 10amp PCB
- Solo's Hold 18650 15 amp PCB
- Solo's Hold 18650 10 amp PCB

When using a pixel string blade, or a cross-guard setup a 10amp PCB battery **MUST** be used. Failure to do this will lead to the board shutting down unexpectedly during effects.

---

### 3.1.4. BATTERY SIZE

The best battery to use is an 18650, space allowing. If that cannot be used, then an 18500, 17650, 16650, or 17500 should be used, in that order. 14xxx batteries and 18350 batteries are not recommended due to their shorter life, and because those batteries may not be able to output enough power to run 4 die of a High Brightness LED (HBLED).

---

### 3.1.5. LED CHOICES

Because Spark Lite™ uses a 3.7v power source the LEDEngin LEDs will not work well. This is because LEDEngin's green and blue dies require a forward voltage of 4.0v for maximum brightness. This it is highly recommended to use the NECree RGrB, TriCree LEDs, or the Qual Rebel LEDs.

---

## 3.2. SPARK LITE LAYOUT

Before getting started, it is important to familiarize yourself with the layout of Spark Lite™, TruDrive™ and all of the pads on the board. This will help in wiring up the board for use in a saber.

The following two diagrams show the important components of Spark Lite™, with an accompanying table describing what each component does.

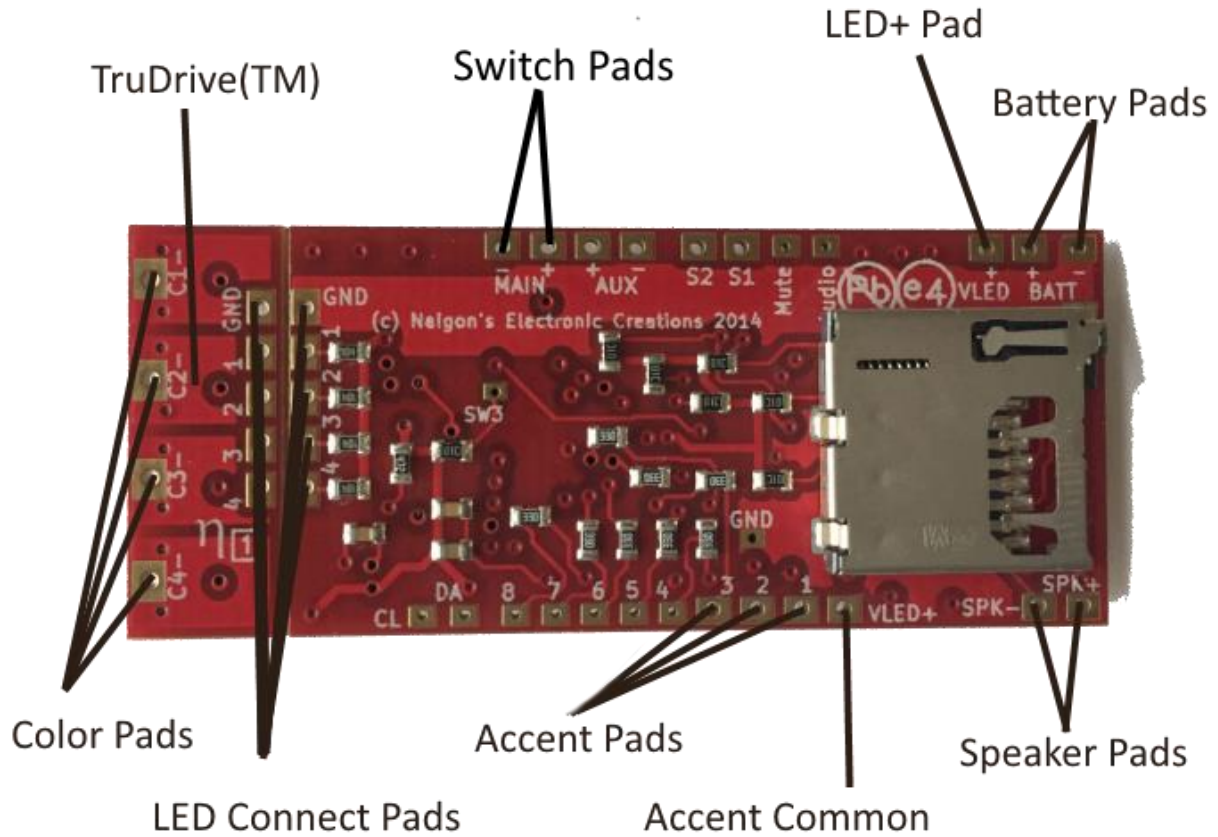


Figure 1 – Important components on the back of Spark Lite™.

Name	Label	Description
1. Micro SD card holder	NA	Holds the Spark Lite™ SD card. Ensure the card is fully inserted before applying power to Spark Lite™.
2. TruDrive™ board	LED DRIVER PCB	Driving board that can power two high-power LEDs from Spark Lite™. On Spark Lite™ only the first three Pads are available.
3. Battery +/- pads	BAT+, BAT-	Hook power and ground from a 3.7v Li-ion pack here.
4. Speaker pads	SPKR	Hook a 1.5-2.0w, 8ohm speaker here.
5. Accent Common +	VLED+	Used to power all three of the accent LEDs. Optionally, additional static LEDs can be powered from this pad. The output is 3.3v, and it is rated at 200mA.
6. Accent LED pads	1,2,3	Each pad can hold one 20mA accent LED. These LEDs will be sequenced by the chosen pattern.
7. LED connect pads	1,2,3,4	Pads that hook the TruDrive™ board to the Spark Lite™ main board. Pad #4 is not used.
8. Color Pads	C1-, C2-, C3-, C4-	Hook the main LED and flash LED cathodes to these pads. C1- C3 are for the main blade color; C4- is for the flash color.
9. Switch Pads	MAIN, AUX	Pads for the switches. MAIN can be a momentary or latching, aux must be a momentary. Make sure to select the correct type of switch for MAIN in the Config Editor.

Table 1– Description of each component.

---

### 3.3. TRUDRIVE™ SEPARATION

Spark Lite™ will come by default with the TruDrive™ attached to the main board. If it is desired to have the TruDrive™ separate from the main board for the install, then you can detach the two boards.

To separate them, place a mouse pad at the edge of a table, and place Spark Lite™ on the pad with the seam where TruDrive™ meets Spark right at the edge of the table, so that the entire TruDrive™ is off the table and the entire Spark™ is on the mouse pad. Then with one palm press and hold Spark™ to the pad, and gently use your other hand to press the other board until it starts to snap. Then simply wiggle the TruDrive™ back and forth until it comes free.

*It is important to note that once the board has been removed it cannot go back on; plan accordingly before separating the boards.*

## 4. WIRING DIAGRAMS

The following diagrams are the most common to get your board up and running. Note that with Spark Lite™, C1, C2, and C3 are hard-coded to the blade colors, and C4 is dedicated effects colors. This is true for all wiring diagrams below.

In all the diagrams below the resistor is shown on channel C4 only; however, a resistor is only necessary for a red/amber/red-orange die. If C1 and C2 both have these colors then a red die will be needed for them as well; if none of the LEDs are red, red-orange, or amber then no resistors are needed.

**Note:** It is very important that the correct resistor be used between the negative pad of the LED and C1-, C2-, C3-, and C4- to prevent burning out the LED for warm color LEDs. For Rebel LEDs if a red, red-orange or amber LED is used, then a 1ohm 1watt resistor is needed. For any other Rebel colors a resistor is not needed. The STTH2L06 diode can be used in place of the resistor and it is a slightly smaller part.

---

### 4.1. BASIC WIRING

This is the most basic wiring that is possible to get the board up and running. It is great for testing your Spark Lite™ on the bench, or if you are doing a simple install into a saber that will have a removable battery.

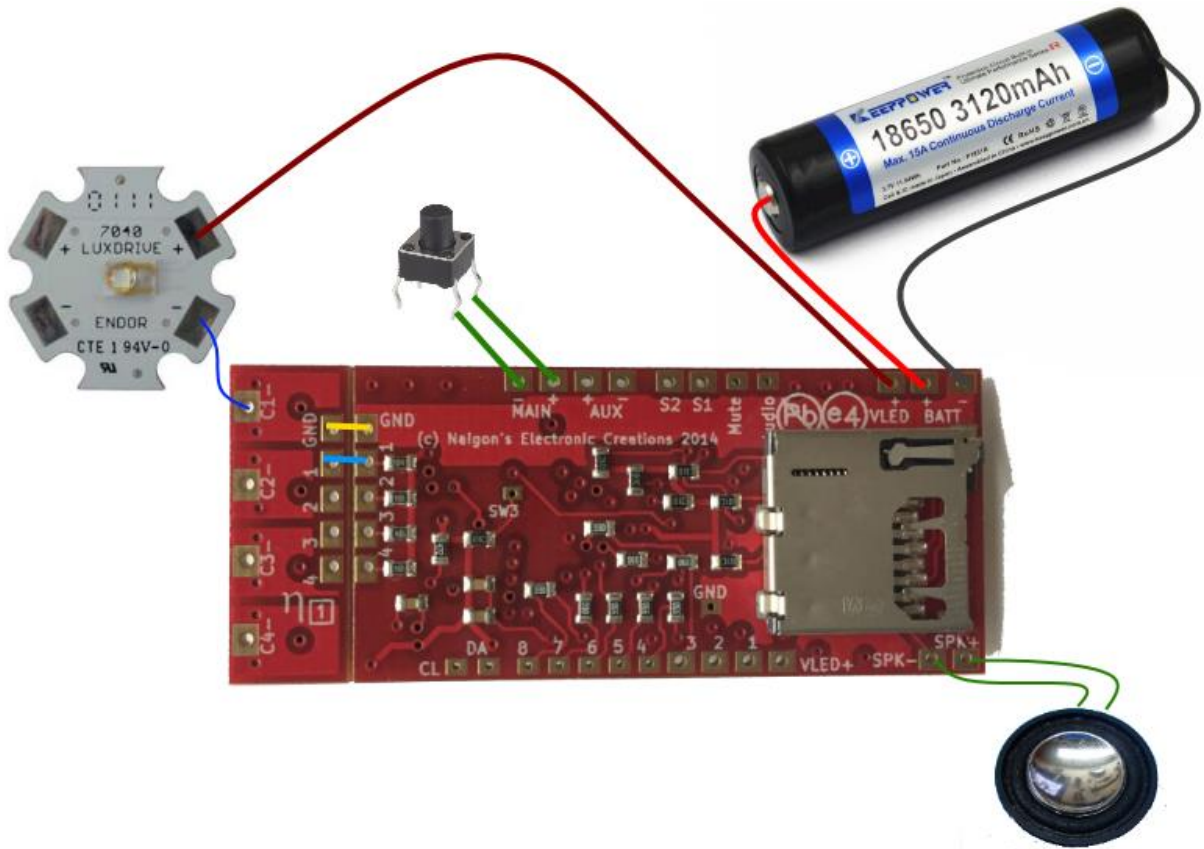


Figure 2 – Basic wiring for Spark Lite™. This will drive a single main LED and would require a removable battery for charging. Note that a resistor between the blue wire and C1- of TruDrive™ would be needed if the LED is red, amber, or red-orange.

#### 4.2. FLASH WIRING

Wiring a basic setup to have a TriCree LED with two die of one color and a third die for a flash color is the most popular choice for Spark Lite™. This setup allows for a bright single-color blade while still allowing for an effect/aux color for blast and clash/lockup effects. The wiring diagram below shows how to utilize that setup.

The preferred LED to use for this setup is the TriCree, as it has an optic made specifically for this configuration, and it has a great balance of brightness with good efficiency, so it doesn't waste too much power. It also produces a very even blade when diffused and sanded. The X2/X4 previously recommended is no longer preferred as it's optic doesn't allow enough of the brightness down the tube evenly.



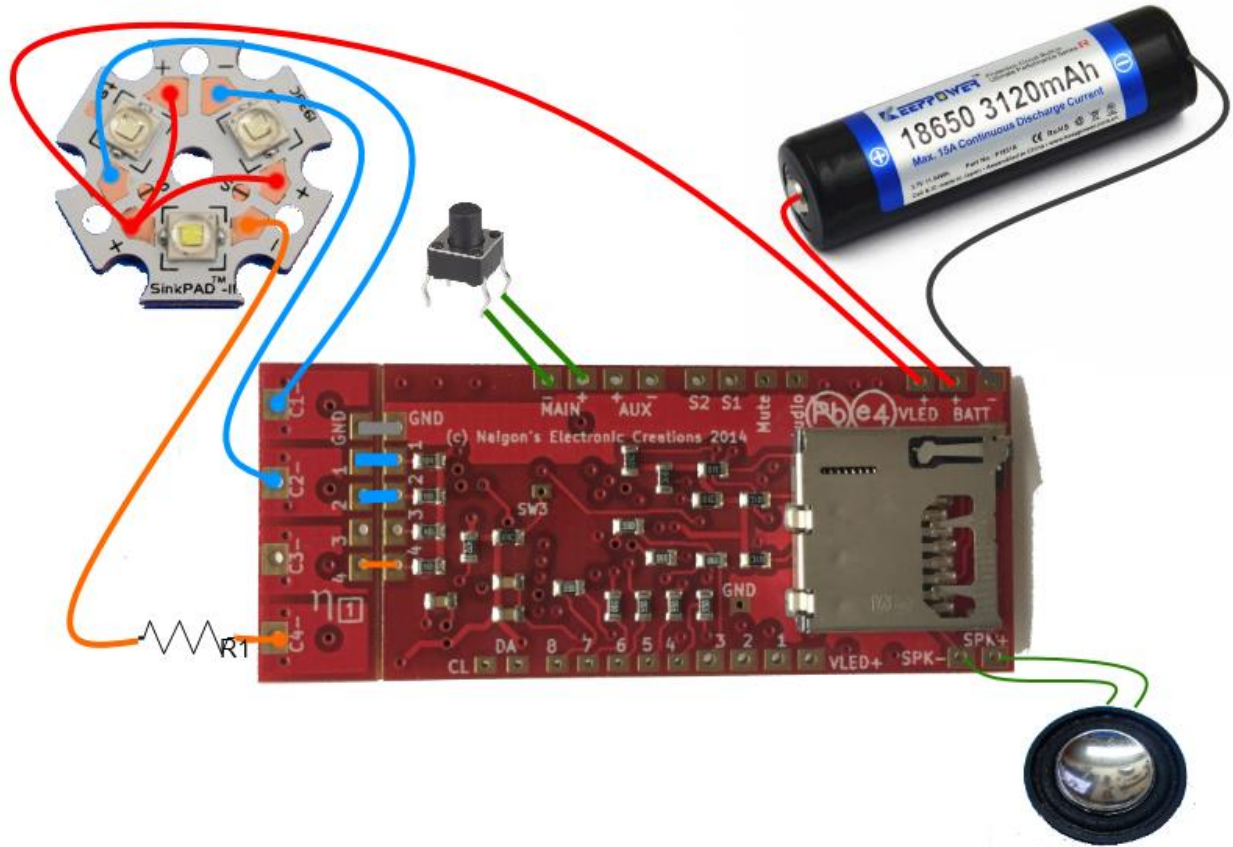


Figure 3 – Wiring a Spark Lite™ for a main blade and a flash color. R1 is needed if the die is red, red-orange, or amber; resistors would be needed for C1 and C2 if they were red, red-orange, or amber.

#### 4.3. SINGLE AV SWITCH WIRING

Spark Lite™ always uses a single momentary switch, and thus works well with an AV switch.

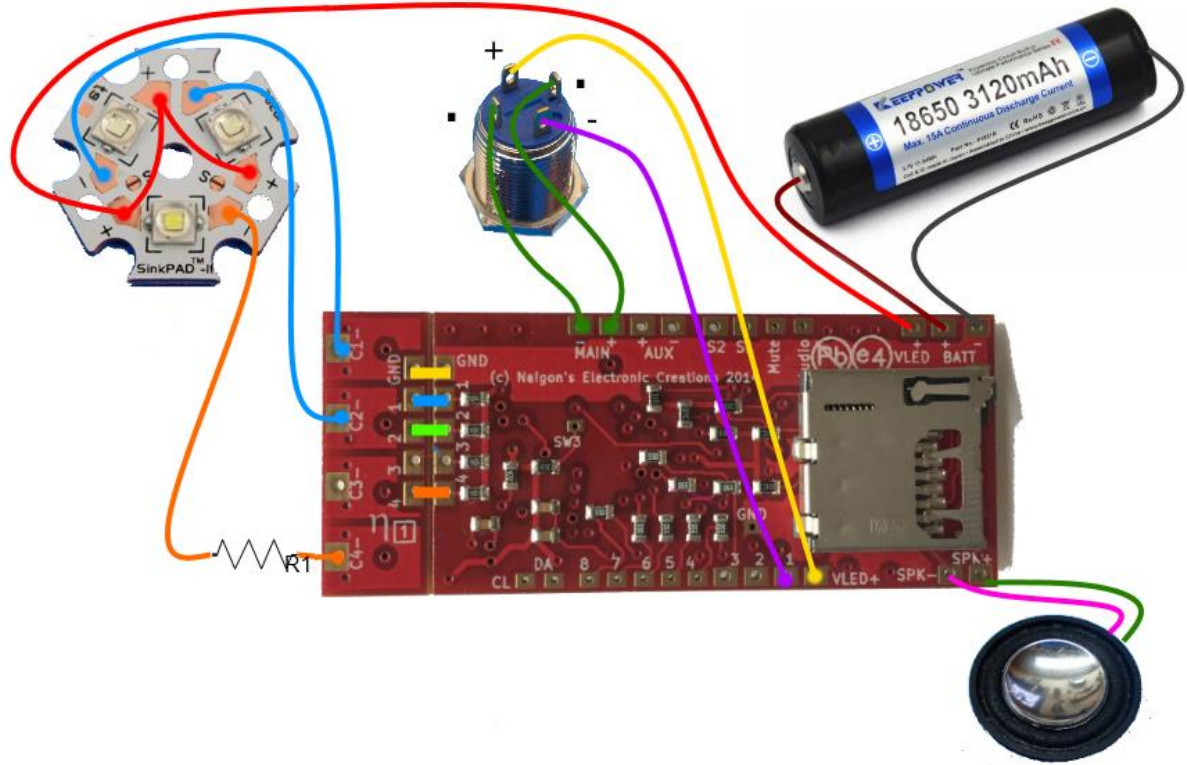


Figure 4 – Single AV switch wiring with a tri Cree LED. It is difficult to see in the picture, but the yellow wire to the switch is hooked to the pad labeled “+”, purple to “-”, and the two green don’t matter. The resistor is shown only on C4 and is only needed if the die is red, red-orange or amber. A resistor is needed for C1 and C2 if those die are also red, red-orange, or amber.

#### 4.4. FULL WIRING

This diagram shows how to wire a recharge port along with accent LEDs and the NECree RGB v2 LED, allowing all the features of Spark Lite™ to be utilized. The recharge port also acts as a kill key, where pushing a kill plug into the port will stop power from getting to the board. Accent leds are very basic for Spark Lite™, where the first accent comes on when the kill key is pulled, the second comes on after a successful boot, and the third comes on only when the saber is running.

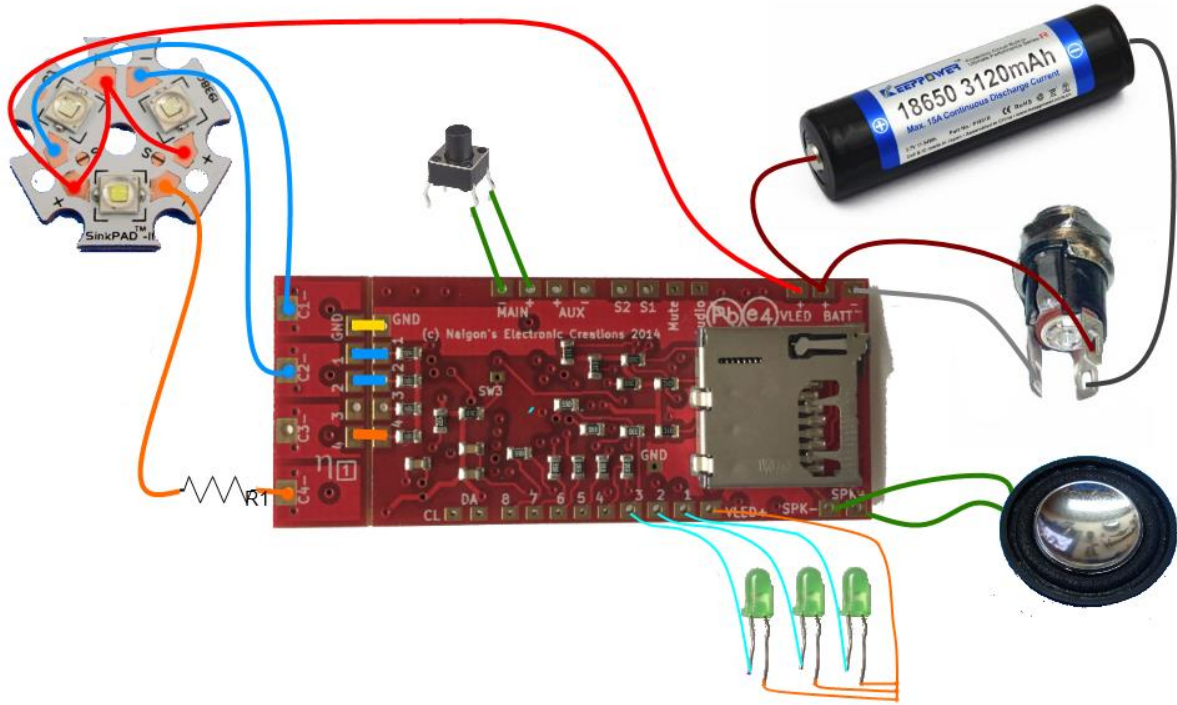


Figure 5 – Full wiring using all accent LEDs and a recharge port/kill key combo. This wiring will allow all features of Spark Lite™ to be experienced. Resistors are only needed if the die are red, red-orange, or amber. C4 in this picture is red.

## 5. CONFIGURATION EDITING

No configuration is needed for Spark Lite™, as it has been set with the most common default settings and is setup for simple two-color operation. The only thing that is needed is to copy the correct wav files to the SD card.

Spark Lite™ uses the following files:

File Group	File Paths
Blast	/font1/blst/blst01.wav /font1/blst/blst02.wav /font1/blst/blst03.wav /font1/blst/blst04.wav
Clash	/font1/clsh/clsh01.wav /font1/clsh/clsh02.wav /font1/clsh/clsh03.wav /font1/clsh/clsh04.wav
Hum	/font1/hum/hum01.wav
Retraction	/font1/in/in01.wav
Lockup	/font1/lock/lock01.wav
Extension	/font1/out/out01.wav
Swing	/font1/swng/swng01.wav /font1/swng/swng02.wav /font1/swng/swng03.wav /font1/swng/swng04.wav /font1/swng/swng05.wav

	/font1/swng/swng06.wav /font1/swng/swng07.wav /font1/swng/swng08.wav
Font description	/font1/font.wav
Boot sound	boot.wav

The following sections will go over formatting the SD card and copying the font to the card.

### 5.1. FORMAT MICRO SD

I no longer recommend using Windows built-in format tool to format the SD cards, as it doesn't do a true UNIX style format. Instead, it is much better to use a good 3<sup>rd</sup> party tool, such as SDFormatter.

[https://www.sdcard.org/downloads/formatter\\_4/](https://www.sdcard.org/downloads/formatter_4/)

This tool will properly format the SD card for use with all my boards.

Upon launching the tool the window below will be shown

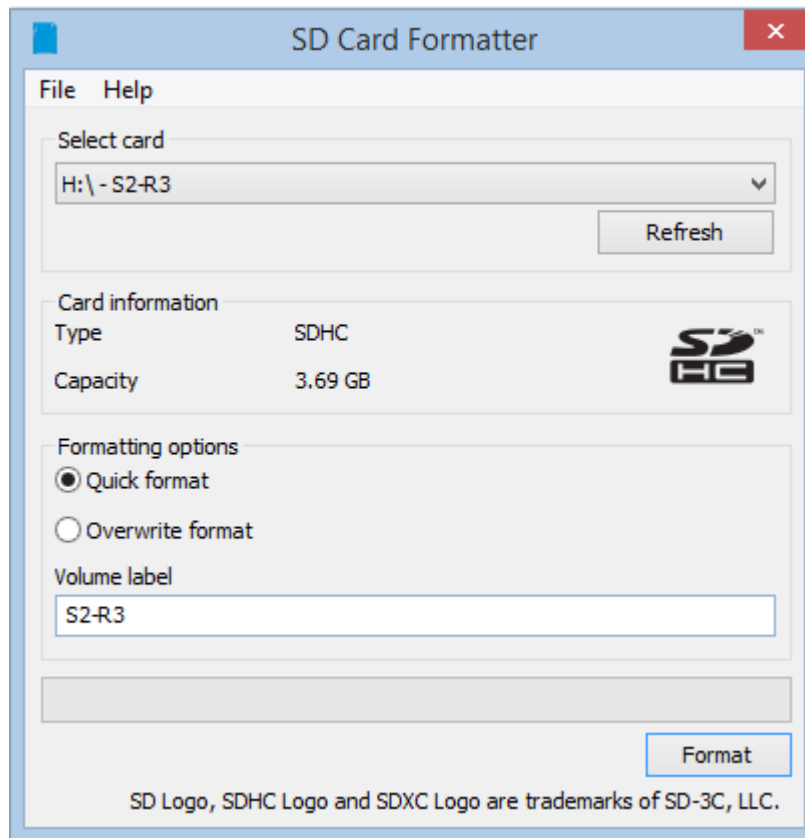


Figure 6 – Using SD Formatter to format the micro SD card for use with any of my products, including Spark™, Spark Color™, Igniter™, and Sound Hornet™.

To format an SD card, simply select the drive of the micro SD card from the Select card dropdown, type a name into the Volume label field, ensure Quick Format is chosen, and hit format, clicking yes on the prompt that appears. This will format the card and erase the existing contents, ensuring it is ready for use with your board.

Note that I do this for every card that gets sent with the board, but this is necessary for those that are changing fonts and/or have a new SD card.

---

## 5.2. COPY FILES TO THE MICRO SD

To copy a different or new sound font to Spark Lite™, simply move all the files from your harddrive to the sd card. It is important that the folder is named **FONT1**, and that each appropriate folder like **swng**, **clsh**, ect is in this folder, with the corresponding sounds. All fonts for my board should support this format, so copying them should be relatively simple. Just make sure to look out for some fonts that do not have 4 blast, 4 clash, or 8 swings as you would need to supplement those to ensure the board works correctly. It is fine to copy a font that has more than the required amount; those will just be ignored.

## 6. SABER OPERATION

To use your saber, with the micro SD card inserted and the wiring correctly completed, insert the battery or pull the kill key. You should hear the boot sound or first font sound play (depending on the config setting), and you should also see the first accent LED blinking rapidly. After this your saber will load into idle mode for the first font.

There are three main modes of operation for the saber: Idle mode, Running mode and Tracks mode. These two modes will be discussed in detail in the next sections.

---

### 7.1. IDLE MODE

Idle mode is when the saber is loaded for a font but not running. This is where the accent LEDs are running the idle pattern, and the saber is ready for use. In this mode there are two ways to interact with the saber. The first is hitting the aux button to advance to the next font. When you are on font three, hitting aux goes back to font1. Spark™ always assumes that there are 3 fonts present on the config card, so make sure they are always present on the micro SD card.

The other way to interact with the saber is by hitting the main button. This puts the saber in running mode. For more details on that see the next section.

---

#### 6.1.1. IDLE MODE INTERACTION TABLE

The following table lists all the interactivity that is possible with the saber while in idle mode.

Entry	Label	Action	Description
<b>Main button</b>	MAIN+/-	Press	Pressing the main button puts the saber into running mode.

**Table 2 – Possible interactions in idle mode, when the kill key is pulled but the saber is not in the hum effect.**

---

### 7.2. RUNNING MODE

When the saber is running, there are many actions that are possible. Swings, Blaster Blocks, Clashes, Lockups and retraction all become available. Further, this is when the main LED runs and accent LEDs follow the patterns for the actions performed. A detailed description on how to interact with the saber is given in the following subsection.

To stop the saber from running, simply hold down the main button (unlatch if it is a latching switch) until the retraction sound and effect happen. The saber will then return to Idle mode. From here you can re-insert the kill key or remove the battery. Do not remove power when the saber is running, as this can cause the micro SD card to get an incorrect formatting, and then it would need to be reformatted. Granted this is very rare but it is better to put the saber into Idle before disconnecting the power.

### 6.2.1. RUNNING MODE INTERACTION TABLE

The following table lists all the interactivity that is possible with the saber while in running mode. If the One Button is enabled in the config, please see the interaction guide for one button: **0 TABLE 3 – INTERACTIONS POSSIBLE** when the saber is running, and two buttons are installed.

Entry	Label	Action	Description
<b>Main Button</b>	AUX +/-	Press	Pressing the aux button engages Blaster Block mode. Once in this mode, swinging the saber will perform EzBlaster™, where another Blaster Block will be performed. Keeping the saber still will cause the mode to exit.
<b>Main Button</b>	AUX +/-	Press (in Clash)	Pressing the AUX button will perform EzClash™; immediately after the press the Lockup sound will play when in Clash mode.
<b>Swing saber</b>	NA	NA	Swinging the saber causes a single swing sound to be played. If the swing is performed rapidly then a Slash sound will be performed.
<b>Hit saber/Blade</b>	CS	NA	Hitting the saber against something or hitting your hand on the hilt will cause the Clash sound to play. To return to running simply wait for the clash to finish.
<b>Main Button</b>	MAIN+/-	Hold	Holding or unlatching the main button will cause the retraction sound to play and then the saber will return to Idle mode.

**Table 3 – Interactions possible when the saber is running, and two buttons are installed.**

## 7. SPECIAL THANKS

Shout out to Kyle Miller for being a great tester and helping ensure the quality is up to par. Without his attention to detail the sound fonts and feel of all the gen 3 boards would not have been what it was.

Big thanks to Jimmy Hutson for setting up the NEC Editor, which made editing on Mac not only a reality, but a first class citizen, being developed hand-in-hand with Windows as opposed to being a port.

Thanks to Shaye and Pat for offering support and being good user advocates, advising on what is best for the customers.

And finally, huge thanks to everyone that has supported my products, especially repeat customers and those that continually support my brand.

Revision History

Date	Revision
<b>01 September 2018</b>	Initial version of Spark Lite™