How to use the VPack_PCB board.

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Bodhilabs
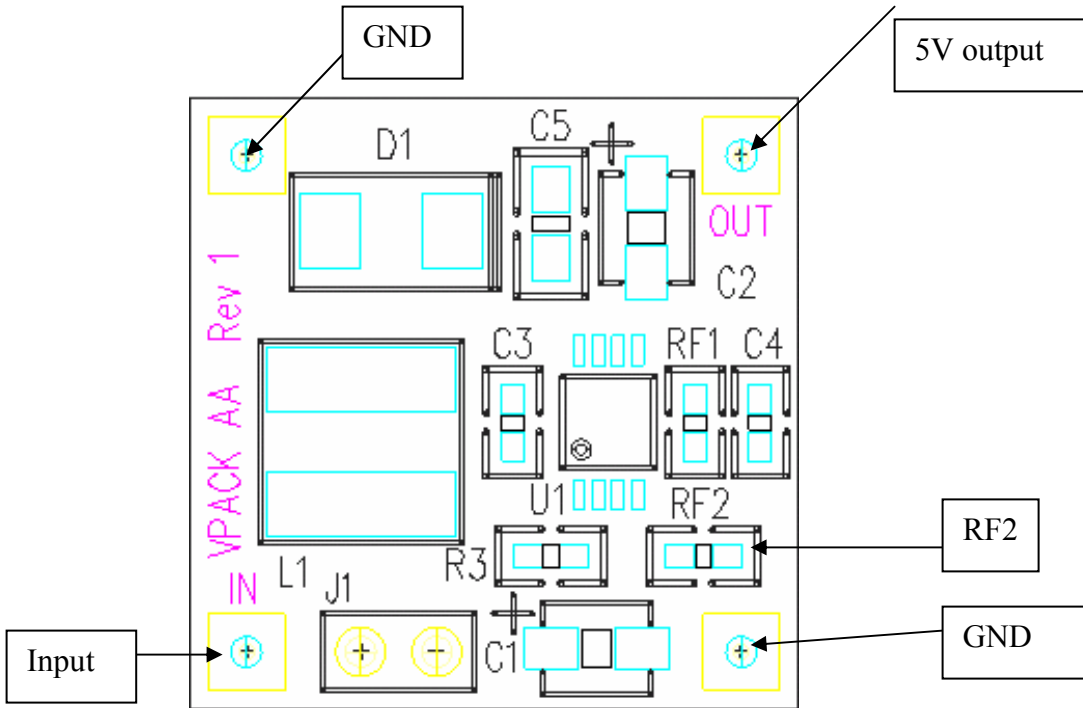

Figure 1. VPack_AA_PCB outline

U1: LM2623, **1.2A** typical.
L1: 4.1uH, 2A
RF1: 301K, 1%, 0603
RF2: 100K, 1%, 0603
C1, C4: 47uF, 6.5V, SMB
J1: Input Jumper – Open to disconnect the battery from the circuit. (Factory default)

Specifications:

- Minimum start up voltage: 1.1V
- Dimensions: 0.8" x 0.8"
- Weight: 2 grams
- Input voltage range: 1.1 – 4.5V
- Output Voltage range: 3 – 6.5V (factory set to 5V, with RF2 = 100K)
- Output voltage ripple: 100 – 150mV (depending on the step up voltage)

Description:
The Vpack_PCB is a voltage booster (output voltage is **greater** than the input voltage): it takes the input current for the boost in the output voltage, as described in this simple equation:
$P_{out} = P_{in}$ x Efficiency
Or
$I_{out} = V_{in}$ x I_{in} x 0.8 / V_{out} (1)
$I_{in} = V_{out}$ x I_{out} /(0.8 x V_{in}) (2)

Equation (1) is very important to remember because it allows you to set the maximum allowable current output, given the voltage level of the battery. Of course there are many more factors which will affect the current output and the battery life: one of those is the internal resistance of the battery cell. Also the efficiency varies with different step up voltage. This document does not intend to give a tutorial of how the battery works, but instead a "idealized" design in which the internal resistance is perfectly 0 (which is not true) to come up with a rough estimate of what you would expect for the output current, and how long your battery would last.
For example, you have a cell of 1.5V, given an output of 5V. What is the maximum load can the circuit drive?
I_{out} = 1.5 x **1.2** x 0.8 / 5 = 288mA
If your battery is rated at 2000mAH, it would "ideally" last 2000/1200=1.6Hr.
If your load is 50mA, how long your 2000mAH would last?
(2) I_{in} = 5 x .050/(0.8 x 1.5) = 208mA, Battery lasts 2000/208= 9.6Hr

How to change the output voltage:
The output voltage is set by the following equation:
1.25 = V_{out} x RF2/ (300K + RF2)   (3)
Note that this equation is independent of the voltage input.
So for:
1. V_{out} = 5V, RF2 = 100K, 1%, SMT0603
2. V_{out} = 3.3V, RF2 = 182K, 1%, SMT0603
Remember the output capacitor is only rated at 6.5V, so if you want to boost more than 6.5V, you need to change the output capacitor C2 to a higher voltage grade (typical x1.5V_{out}).

Voltage ripple:
To keep the module small and compact, C2 is selected to be 47uF, SMB package. The ripple is measured to be around 100mA pk-pk (150mA for 1.5V input). If smaller ripple is required, add a big tantalum cap of 100uF at the output.
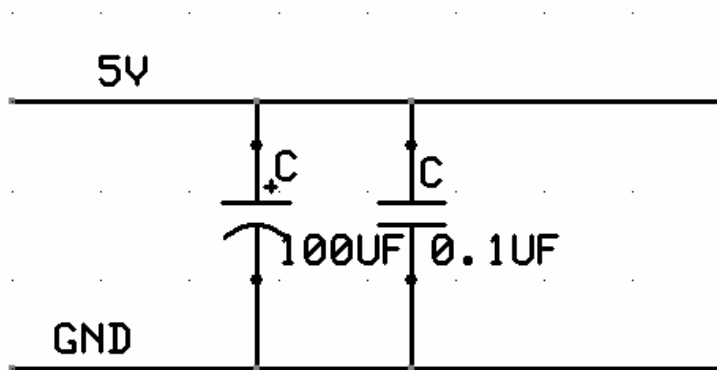
100UF Tantalum cap in parallel with a ceramic 0.1UF