PANIC GRIP, INC.

HARDWARE TEST PLATFORM

PHASE 1 DEVELOPMENT

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JMJ Engineering Consulting

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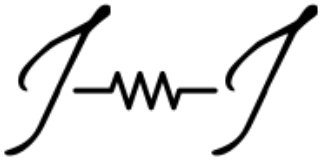

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Overview

PANIC GRIP, INC. is developing a system which will enable mobile phone users to quickly enable a series of personal defense actions using a combination of hardware and mobile software application products. The initial hardware product is a mobile phone case that contains two external user buttons. When button(s) are pressed, an internal Bluetooth Low Energy (BLE) microcontroller (MCU) will wake up, advertise, and connect to the mobile phone software application.

For this proposal we are focusing on enabling the initial proof-of-concept hardware design. To shorten the development timeline, the electrical hardware for the system will be developed outside of collaboration with external manufacturing or mechanical engineering firms, and thus can be thought of as an evaluation platform. Future development will integrate the design work from this project into the final product form factor.

Approach

This design will have the following characteristics:

- BLE microcontroller
  - Nordic Semiconductor's nRF52 series (exact part number TBD)
- CR2032 coin cell battery power
  - For added convenient, a screw terminal will be included to power the PCB from a bench supply for development purposes.
- 2x momentary push buttons
  - Emulation of the side buttons of the future hardware product
- Programming header
  - The intended programming & debugging tools will be TagConnect TC2050-IDC-NL & Segger J-Link
- Expansion headers
  - Additional 100mil pin headers will be populated on the board to allow external connection to unused pins on the BLE MCU for evaluation purposes
- Debug LED
  - At least one green LED will be included on the board for purpose of debug indication
  - The power consumption of the LED will be excluded from any battery life measurement & calculations, as final product will not likely have LED
- Mechanical constraints
  - Board size approximately 1.50" x 1.50" (may be slightly larger to accommodate expansion headers)
  - M3 mounting holes in 4 corners of board
  - Maximum component height of 0.5"
- Firmware Development
  - Any BLE MCU will need firmware to run properly and interact with a mobile phone
  - JMJ Engineering Consulting is primarily a hardware design provider, but does have experience with MCU firmware development
  - A firmware program can be provided with the following behaviors:
    1. MCU will be in lowest power sleep mode always until…

2. Either/both of the buttons are pressed, MCU will wake up and begin advertising as a BLE peripheral
3. When mobile phone makes connection with BLE MCU, two characteristics will be present that will show the status of the two buttons

JMJ Engineering Consulting will provide schematics, layout, and build packages for the PCB Assembly. If MCU firmware development is desired, JMJ Engineering Consulting will provide full source code for the program as delivered.

Given the need for flexibility in today's chip market, it is likely that circuit components will need to be selected for availability and as this availability is very fluid, it is likely that from design to manufacturing, we may need to make substitutions. Therefore, it is most efficient for JMJ Engineering Consulting to manage the interactions with the contract manufacturer through the production of the initial PCBAs. It is also desirable for PANIC GRIP, INC. to specify early in project schedule the quantity of boards to be built, and pre-purchase as many of the IC components as possible prior to design work to mitigate sourcing risks.

JMJ Engineering Consulting will receive the assembled boards and manage the initial bring up process. We will deliver debugged boards to PANIC GRIP, INC. and will provide support and guidance through the initial tests. JMJ Engineering Consulting will retain one board for further support use.

Costs

The design, schematic entry, board layout, and initial board bring up will be charged as a fixed fee. Firmware development, if desired, will also be charged as a fixed fee. Follow on support once the board bring up is complete will be provided on an hourly basis. This minimizes PANIC GRIP, INC.'s risk and ensures that JMJ Engineering Consulting is available for support going forward.

All component sourcing and contract manufacturing costs will be transparently passed through to PANIC GRIP, INC. JMJ Engineering Consulting uses MacroFab as its CM. JMJ Engineering Consulting will defer to PANIC GRIP, INC. for turn times and initial quantities at time of manufacture.

Item	**Cost**	**Notes**
Board Design through manufacturing and board bring up	$6,000.00	NRE Fixed fee
Firmware Design	$4,000.00	NRE Fixed fee
Experimentation Support to PANIC GRIP, INC.	$150/Hr.	Hourly fee invoiced monthly for any experimentation work beyond the scope of work according to acceptance criteria
Estimated Manufacturing Costs	$2000	Rough estimate for 5 PCBAs. Will vary based on desired quantity and manufacturing turn times. Exact costs will be determined after hardware design is complete.

Schedule Estimate

Activity	Approximate Dates	Notes
Kickoff payment received	Project Start (PS)	
Design Complete	PS +3w	
Design Review	PS +3w	Video conference meeting to review schematics and layout
Manufacturing Complete	PS + 7w	Variable based on turn times. Turn times can raise or lower prices significantly
Board Bring up	PS + 8w	
Firmware Development	PS + 10w	
Support	Ongoing as needed	

Hardware Acceptance Criteria

- BLE Microcontroller is able to be erased and programed via specified programming/debugging tools
- BLE microcontroller is able to detect button presses

Firmware Acceptance Criteria

- BLE microcontroller is able to operate primarily in sleep/low-power mode to extend battery life as much as possible
- BLE microcontroller is able to wake upon detecting a button press
- BLE microcontroller is able to make connection with nRF Connect for Desktop development software from Nordic Semiconductor and have 2 BLE characteristics showing status of two buttons

Terms

50% of NRE due upon Project Start (Net 0). Remainder due when prototype boards are debugged, delivered, and acceptance criteria met (Net30). Support costs invoiced monthly.