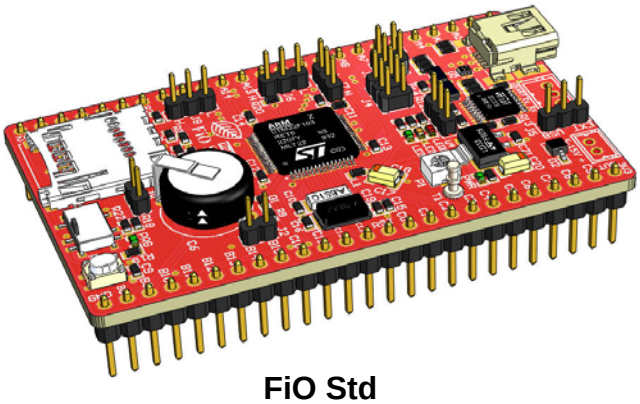
FEATURES

- Built-in RapidSTM32 native-support bootloader.
- ARM 32-bits Cortex™ – M3 Processor (STM32F103RET6)
  - 90MIPS maximum speed
  - 64 KBytes SRAM
  - 51 GPIO
  - 16 channels 12-bit, 1µs ADC
  - 5 USART, 3 SPI, 2 I^2C, 1 CAN
  - On-chip temperature sensor
  - 4 General purpose 16-bits timers with 4 IC/OC/PWM per timer
  - 2 16-bits Advanced control timers
  - 2 Watchdog timer
  - 2 channels 12-bit DAC
  - USB 2.0 full speed interface
- Two onboard crystals
  - 32 kHz (for real-time clock)
  - 8 MHz (for MCU clock)
- Power supply management
  - Reverse supply voltage protection
  - USB or External (up to 15VDC) supply input selection via jumper settings
  - 3.3V (up to 800mA) LDO regulator for internal and external circuitries
- Flash programming
  - 496Kbytes available flash memory
  - In-Application Programming via either USB HID or serial (RS232) interfaces directly from Matlab™ or MS Windows™.
  - Automatic compile and download directly from Matlab™.
- Other onboard peripherals
  - 3 user LED (red, yellow, green)
  - 2 user logic (H/L) input jumpers
  - 10K potentiometer
  - High capacitance (0.33F) capacitor as RTC backup battery
  - RS232 (3232-series) level converter
  - Micro SD card socket
- Four built-in operating modes selectable via jumper settings
  - USB Mass Storage Device (micro SD card reader)
  - In-application programming via USB HID interface
  - In-application programming via serial (RS232/USART) interface
  - Stand-alone custom user application
- RoSH compliant

SAMPLE APPLICATIONS

- Affordable Rapid Prototyping training tools (especially for Automatic Control and Digital Signal Processing studies) when used together with RapidSTM32 blockset, example features include:
  - Support C code generation of a custom user program for STM32 from a Simulink™ model (see minimum requirements).
  - Support various Hardware-in-the-Loop (HIL) simulation configurations, e.g. data acquisition in to, signal generation from Matlab™/Simulink™, and closed-loop control HIL simulation design and analysis.
- Create a data logger to micro SD card (FAT32) program directly from a Simulink model.
- Use in a laboratory as embedded system training kits or in-the-field for any student projects.
- Generic microcontroller evaluation board.



FiO Std

INTRODUCTION

FiO Std is an evaluation board (EVB) from FiO family of evaluation boards that are based on STMicroelectronics STM32™ ARM 32-bits Cortex™ – M3 processors.

FiO EVBs have been primarily designed as affordable embedded system training boards for used by instructors and students to supplement such courses and curriculums as design and analysis of automatic or embedded control systems and digital signal processing (DSP) systems. It is hoped that the introduction of FiO and RapidSTM32 Blockset will help lower the barrier and open up opportunities for more users to play around with Rapid Prototyping technology.

FiO family of evaluation boards have been specifically designed to be applicable both as LAB kits for uses in laboratories as well as a stand-alone system for used in-the-field in any student's science and engineering projects.

When used together with RapidSTM32 Blockset, FiO Std offers several capabilities, for examples:

- Real-Time Hardware in the Loop Simulations via USB HID.

Real-Time Hardware in the Loop (HIL) Simulation via USB HID interface		Maximum Update Rate[1] (Hz)
Open-Loop	Target → Host (Data Acquisition)	450
	Host→Target (Signal Generation)	200
Closed-Loop	Target↔Host (Control System)	200

- Higher HIL update rate available via other specially designed interfaces.
- Create working stand-alone embedded systems from Simulink™ models with just one click.
  - Generated source code compatible with Realview MDK™ for ARM with options for automatic compile and download option.
  - Data logger to micro SD card (FAT32).
  - Support simulation and code generation for typical peripherals such as push/toggle button or character LCD.
  - Supported on-chip peripherals include Digital IO, ADC, DAC, RTC, PWM, USART, USB (Virtual COM) and more.
  - Support integration with Finite State Machine simulation and code generation via Stateflow™ and Stateflow Coder™.

MINIMUM REQUIREMENTS

Minimum requirements for FiO Std to fully function with RapidSTM32 Blockset.

- Matlab™ 2009a (v7.8)
- Simulink™ (v7.3)
- Real-Time Workshop™ (v7.3)
- Real-Time Workshop Embedded Coder™ (v7.3)
- Realview MDK™ for ARM (v4.0)
- Microsoft .NET Framework (v3.5)

CAUTIONS!!

All FiO EVBs are pre-installed with proprietary bootloader. FiO EVBs are solely intended to be programmed using FiO own Flash programmer which can program any FiO EVBs directly from Matlab and MS Windows via USB or RS232 interfaces. DO NOT use STMicroelectronics Flash Loader Program to program FiO EVBs because this will erase the pre-installed bootloader and void your warranty totally. Therefore, jumper J8 should not be tampered with in any circumstances.

FURTHER INFORMATION

For further information and tutorials please visit: http://www.aimagin.com/learningresources

[1] The actual update rate depends on several factors such as the host PC speed and other USB hardware in the communication loop; for example, communication speed is faster when the target is connected directly to host USB controller than via a USB hub.

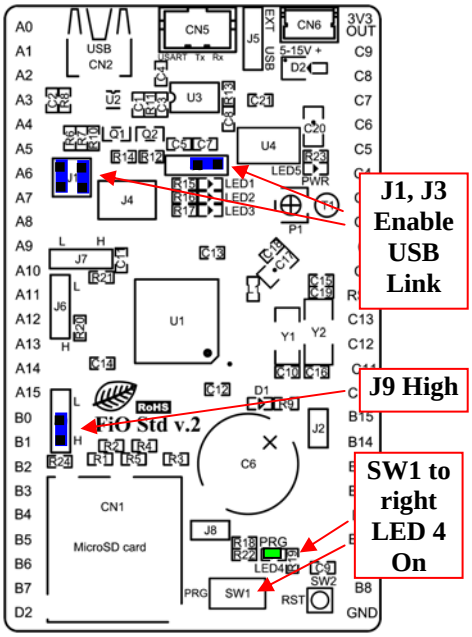
OPERATING MODES

FiO Std supports 4 operating modes

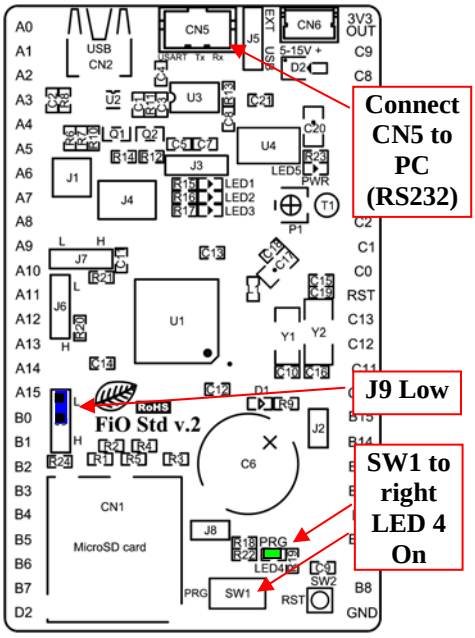
1. In-Aplication Programming via USB HID
2. In-Aplication Programming via RS232
3. Mass Storage Device (microSD card reader)
4. Run Custom User Program

The following figures show required jumper(s) and program switch (SW1) settings for each operating mode. Each operating mode can be activated by pressing the reset switch (SW2).

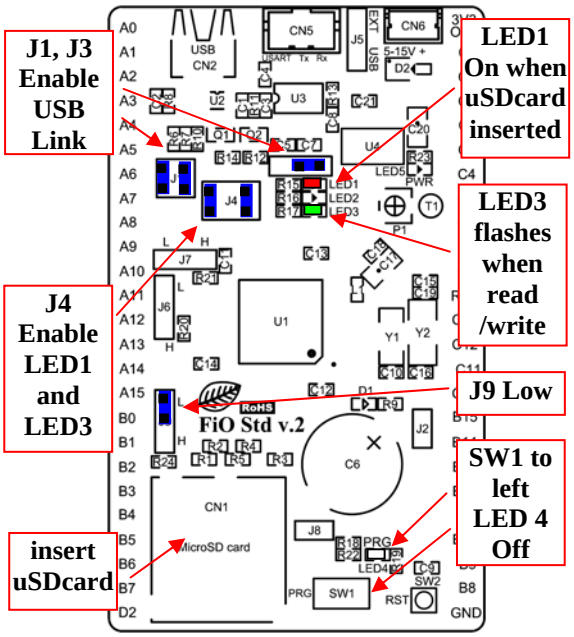
1.1 USB IAP



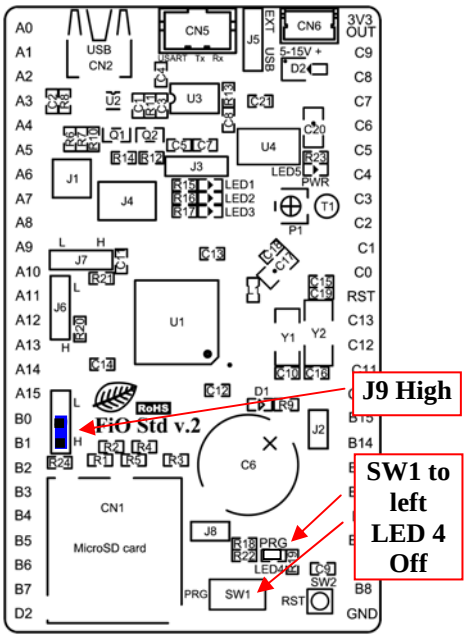
1.2 RS232 IAP



1.3 Mass Storage Device



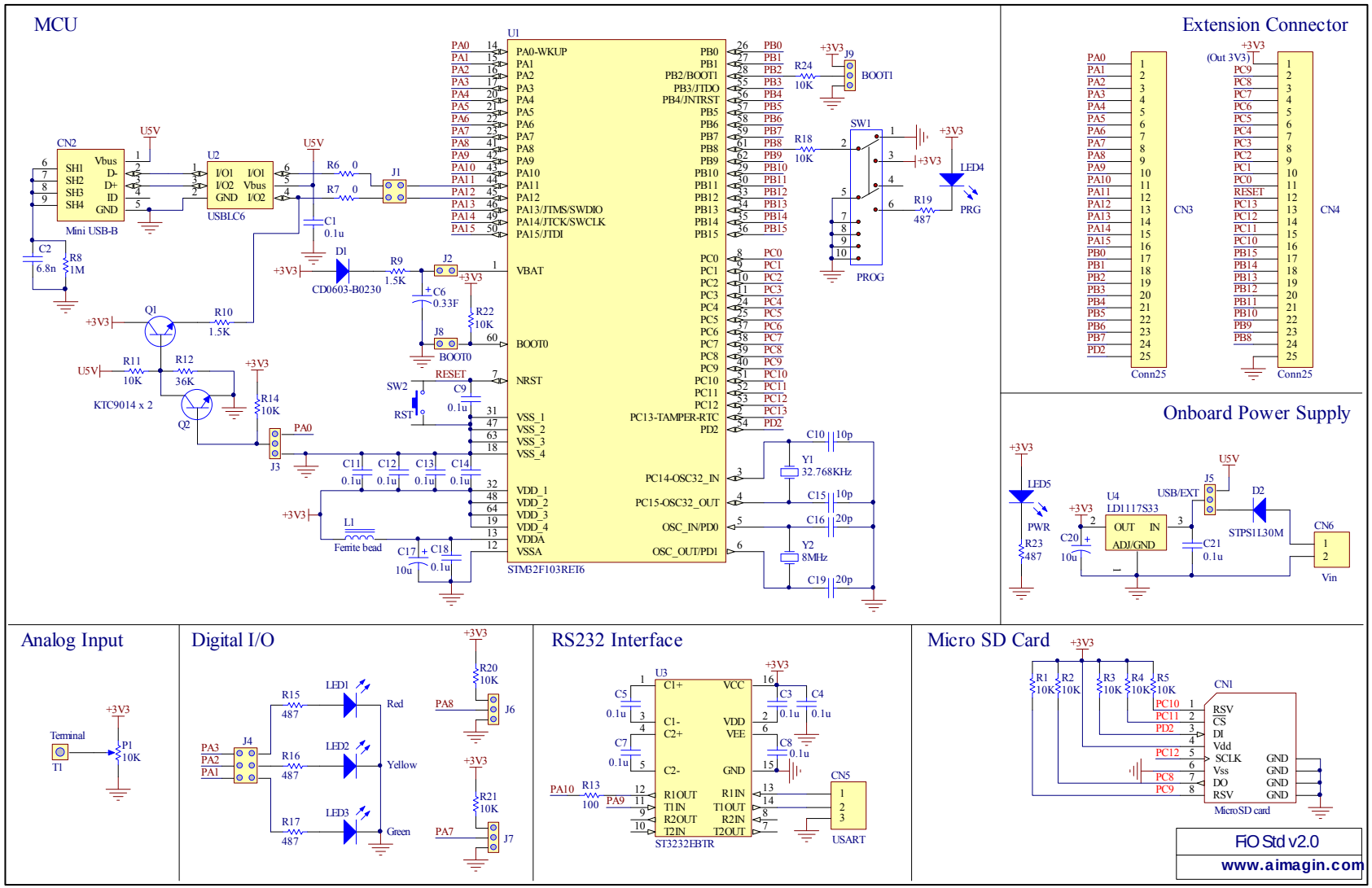
1.4 Run Custom User Program



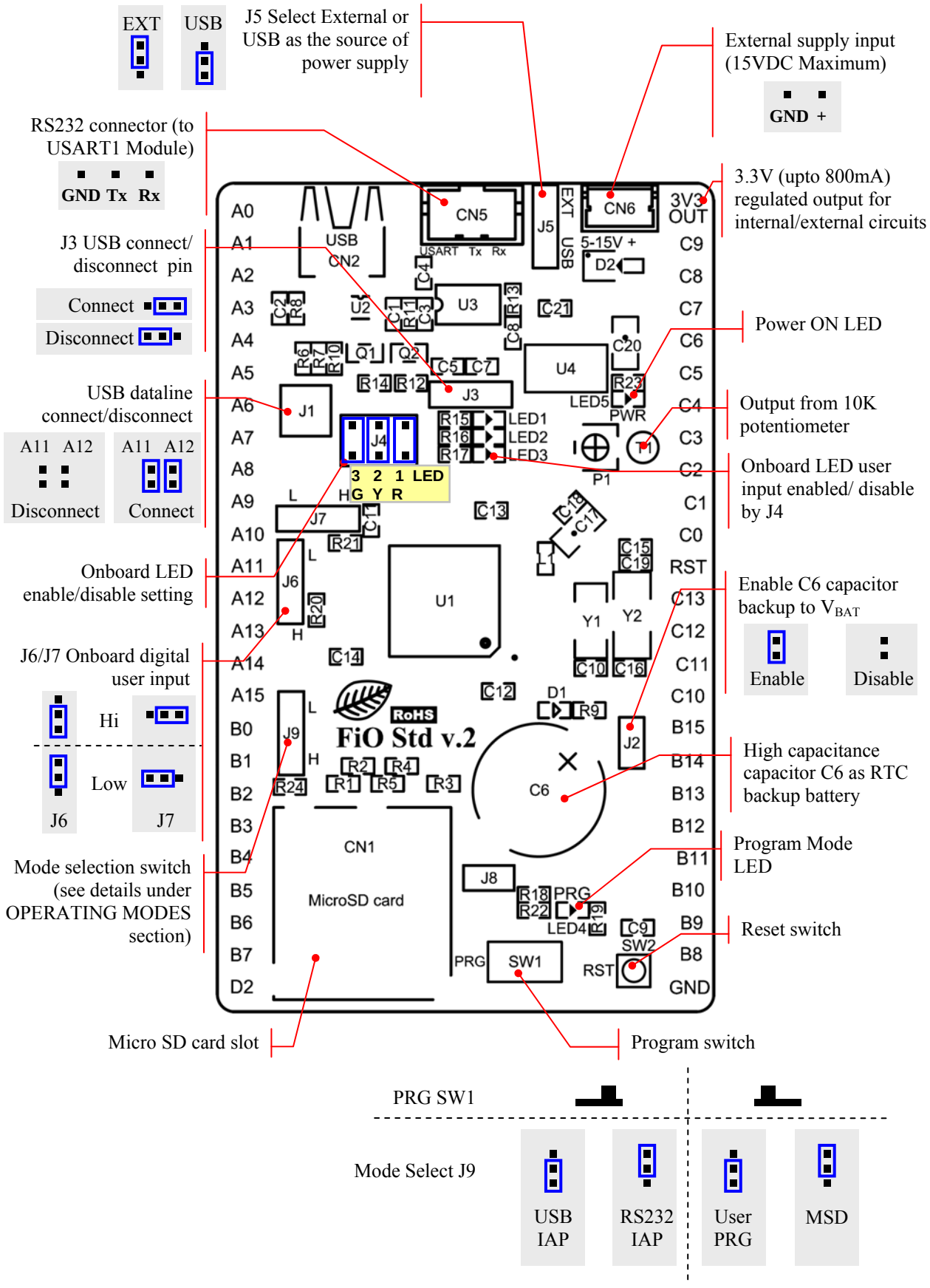
Warning: J8 should not be tampered with at all. Warranty is void if J8 is tampered.

Note: Other jumpers, e.g. J2, J6, J7 not mentioned in the above figures may be set or not, depending upon required functionalities.

SCHEMATIC DIAGRAM



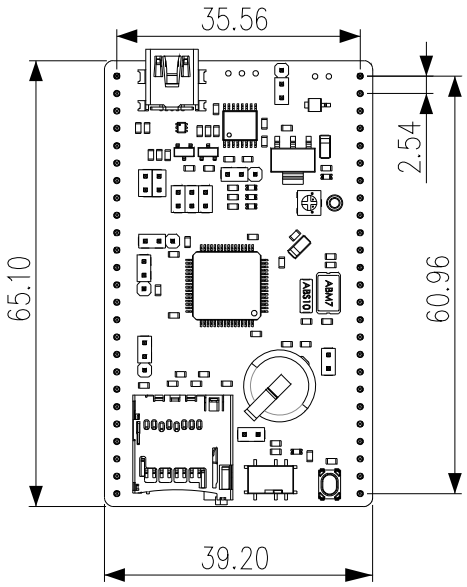
FiO Std PCB LAYOUT

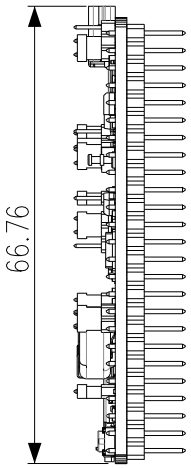


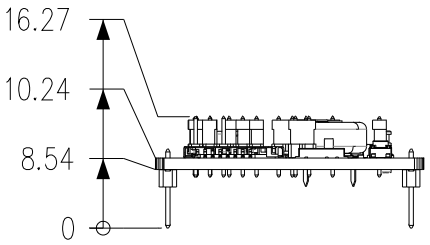
BILL OF MATERIALS

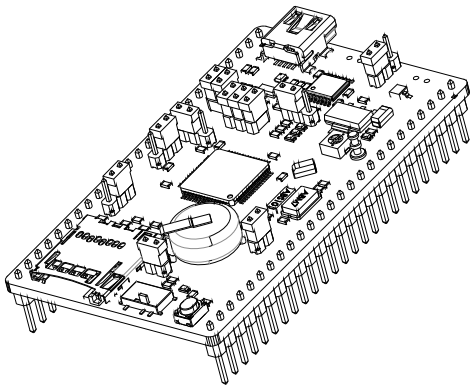
[Manufacture Part No.] Name	Designator	Source
[0603B682K500CT] 6.8nF	C2	www.es.co.th
[0603ZC104KAT2A] 0.1uF	C1, C3, C4, C5, C7, C8, C9, C11, C12, C13, C14, C18, C21	www.mouser.com
[C1608C0G1H100C] 10pF	C10, C15	www.mouser.com
[C1608C0G1H200J] 20pF	C16, C19	www.mouser.com
[293D106X0010A2TE3] 10uF	C17, C20	www.mouser.com
[EECS0HD334H] 0.33F	C6	www.mouser.com
[2908-05WB-MG] MicroSD socket	CN1	www.mouser.com
[67503-1020] USB Mini-B female	CN2	www.mouser.com
[CD0603-B0230] CD0603-B0230	D1	www.mouser.com
[STPS1L30M] STPS1L30M	D2	www.mouser.com
[MMZ1608S601A] Ferrite Beads	L1	www.mouser.com
[APT1608EC] LED Red	LED1	www.mouser.com
[APT1608YC] LED Yellow	LED2	www.mouser.com
[APT1608SGC] LED Green	LED3, LED4, LED5	www.mouser.com
[PVG3A103C01R00] 10K	P1	www.mouser.com
[KTC9014S-C-RTK/P] KTC9014	Q1,Q2	www.es.co.th
[0603WAJ0103T5E] 10K	R1, R2, R3, R4, R5, R11, R14, R18, R20, R21, R22, R24	www.es.co.th
[RC0603FR-0736KL] 36k	R12	www.mouser.com
[0603WAJ0101T5E] 100	R13	www.mouser.com
[CR0603-FX-4870ELF] 487	R15, R16, R17, R19, R23	www.mouser.com
[WR06X000PTL] 0	R6, R7	www.es.co.th
[RC0603JR-071ML] 1M	R8	www.mouser.com
[CRCW06031K50JNEB] 1.5k	R9, R10	www.mouser.com
[SSSS820201] Switch	SW1	www.mouser.com
[SKRPACE010] Switch	SW2	www.mouser.com
[534-1593-2] Terminal	T1	www.mouser.com
[STM32F103RET6TR] STM32F103RET6	U1	www.mouser.com
[USBLC6-2P6] USBLC6	U2	www.mouser.com
[ST3232EBTR] ST3232EBTR	U3	www.mouser.com
[LD1117S33TR] LD1117S33	U4	www.mouser.com
[ABS10-32.768KHZ-9-T] Xtal 32.768kHz	Y1	www.mouser.com
[ABM7-8.000MHZ-D2Y-T] Xtal 8MHz	Y2	www.mouser.com

ENGINEERING DRAWINGS (Units: mm)









Patent Pending
PCT/TH2010/000010, PCT/TH2010/000020, and PCT/TH2010/000037

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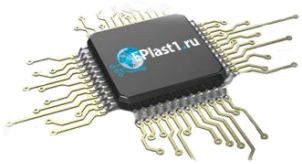

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