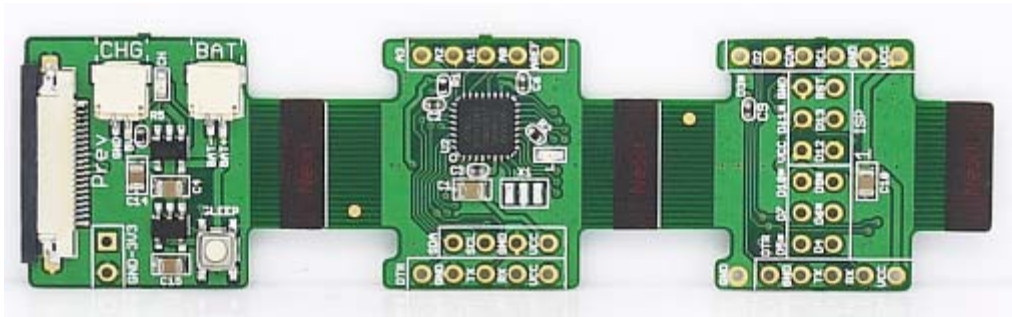


SEEEDUINO FILM v1.0



Seeeduino FILM is an Arduino compatible development platform for space-sensitive projects. It's flexible, super slim, with built-in Li-Po charger, suitable to build wearable applications. FILM and other extension FRAMES could be simply connected via the 20p universal bus like a chain, native 2.54mm pitch pins also enables quick prototyping.

FEATURES

- Arduino compatible
- Flexible
- Ultra small/slim form factor
- Transform by cutting and chaining
- Full functional Atmega168
- 0.1" pitch pad breakout
- 20pin daisy-chain flex bus
- UartSBee programming compatible
- Built-in charger circuit
- Reinforced to increase endurance

LICENSING

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SPECIFICATIONS

Microprocessor	Atmega168
Indicators	LED on digital pin8(Port B 0)
Charge voltage	4.5V~6V
Work voltage	3.3V
IO counts	19(15 IO on chain connector)
IO level	3.3V (5V compatible)
IO Connectivity	20p FPC connector, 0.1" pin header
ADC input	6(2 ADC on chain connector)
Program interface	Serial/ISP
Communication Protocol	Serial/I2C/SPI
Frequency	8MHz
Outline Dimension	77.5mm*20.3mm*1.57(3.2 w/ battery connector)mm

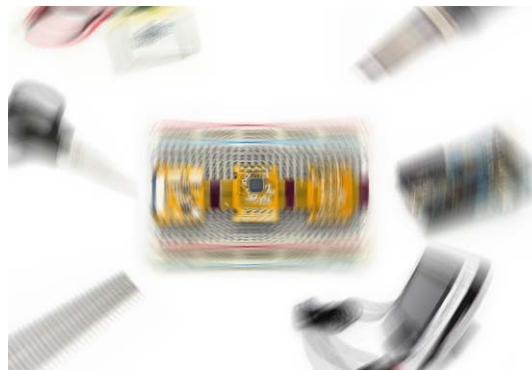
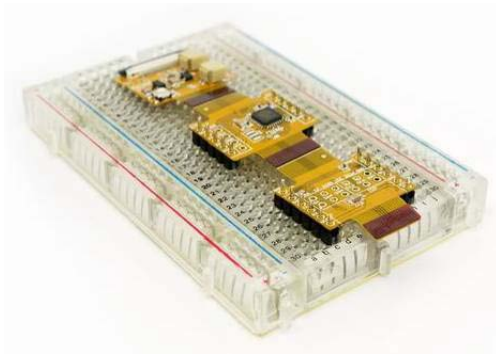
ELECTRICAL CHARACTERISTICS

Specification	Min	Type	Max	Unit
Input voltage	3	3.3	3.6	VDC
Idle Current		5.2		mA
Power-down Current	1	2	5	μA

REFERENCE USAGE

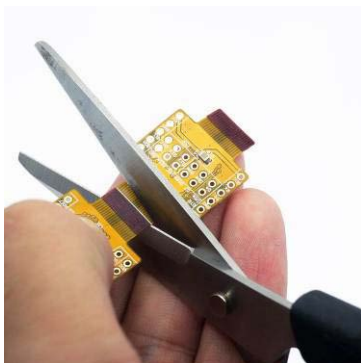
1. *PROTOTYPE*

Lay the FILM on a breadboard; nail it with pin headers to start prototyping.



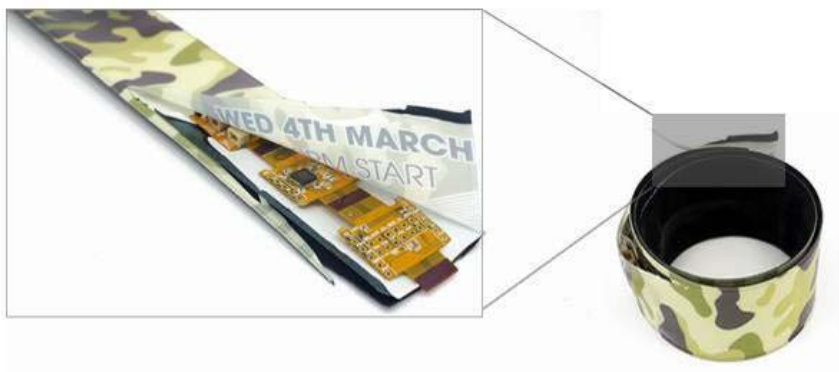
2. *TRANSFORM*

Cut off unnecessary FRAMES and attach-on extension FRAMES, battery, or customized circuits.

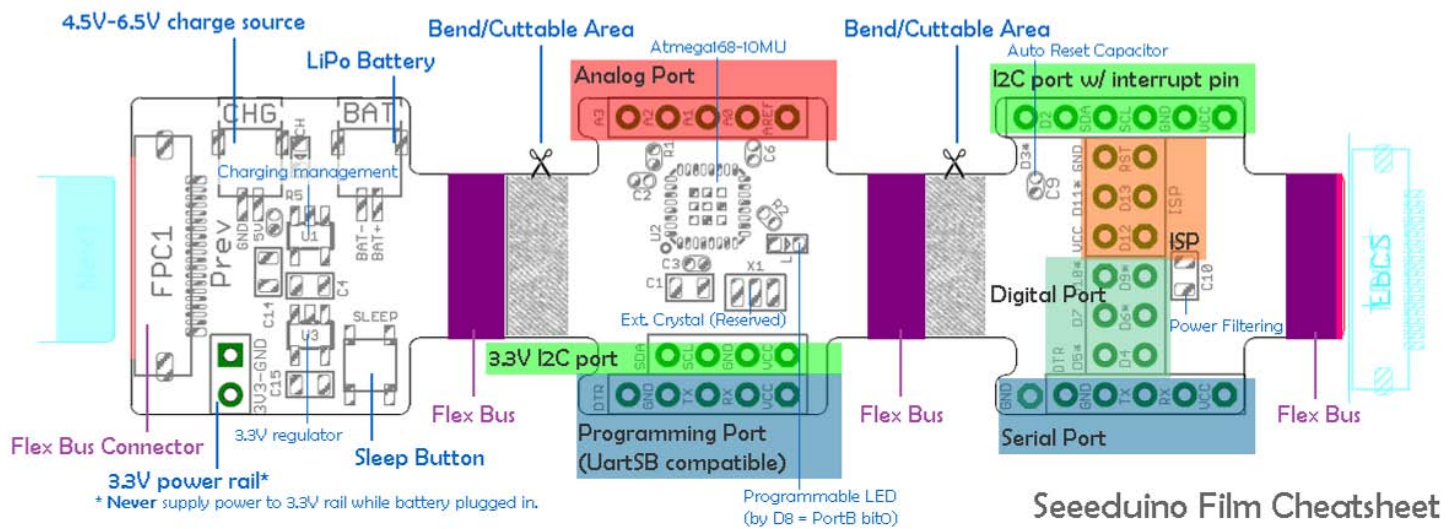


3. *SEAL*

Fold down carefully to the desired dimension and bring it on!



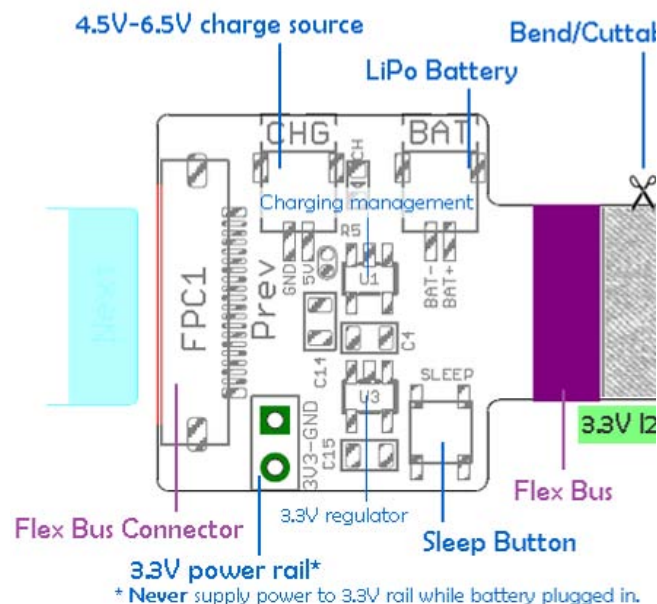
STRUCTURE AND PIN MAP



Seeeduino FILM has three FRAMES: *power*, *mainboard*, and *breakout*. They are connected by flex 20pin FPC bus, which can be bended to fit into various spaces, or cut and reformed easily.

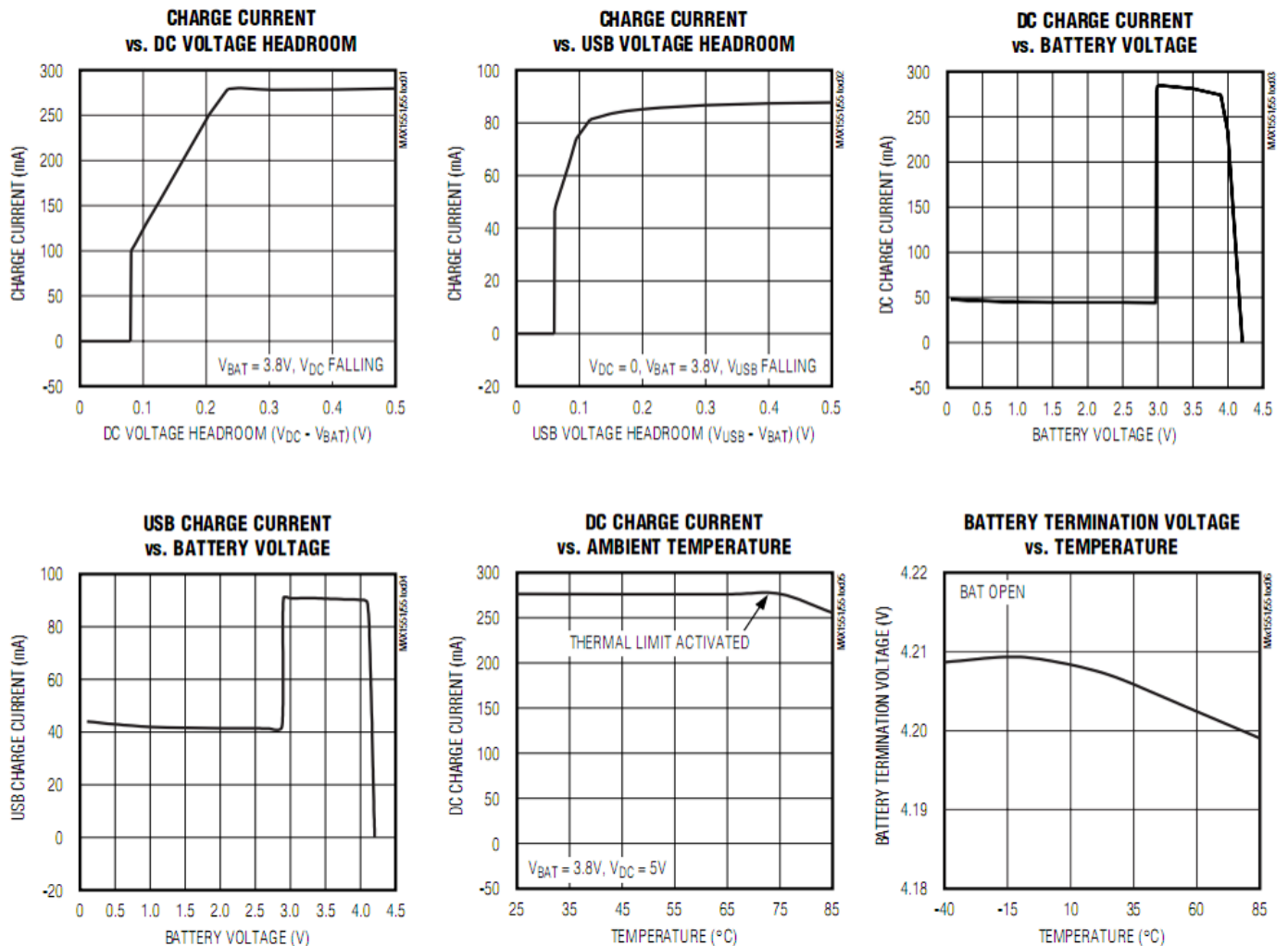
POWER FRAME

Power FRAME contains a handy power management circuit for Li-Po battery charging and regulation.



CHARGING:

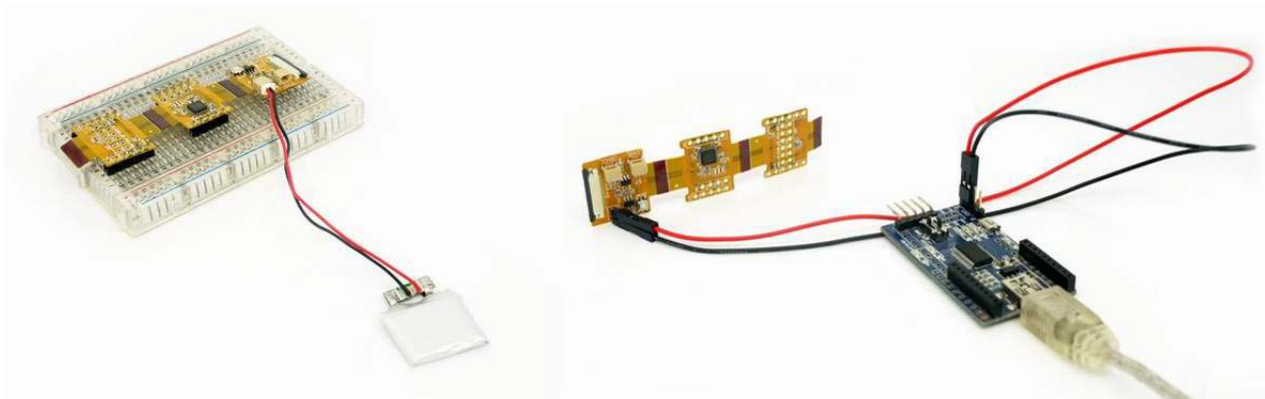
The management IC will handle the charging progress with max 280mA current, and keep 3.7v battery working properly. It drains power via CHG jack, most 4.5 ~ 6Vdc source like solar panel, wireless charger, power adapter and etc could be used.



POWER RAILS:

Battery output is regulated to 3.3Vdc (max 150mA) for power rail and flex bus. Battery is a must even plugged power supply to CHG connector.

In simpler usage, applying 3.3Vdc directly to power rail could skip the power management circuit and power up the system too. Please remove battery to avoid damage when used this way.

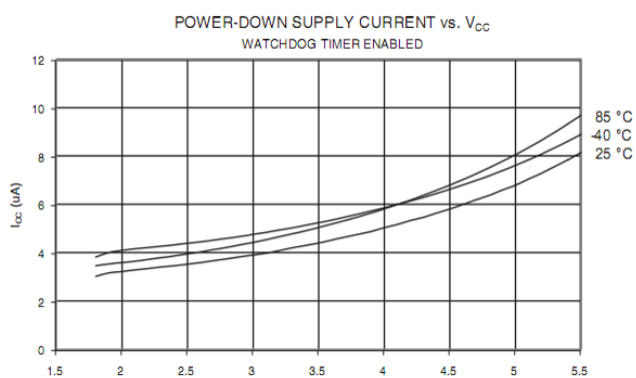
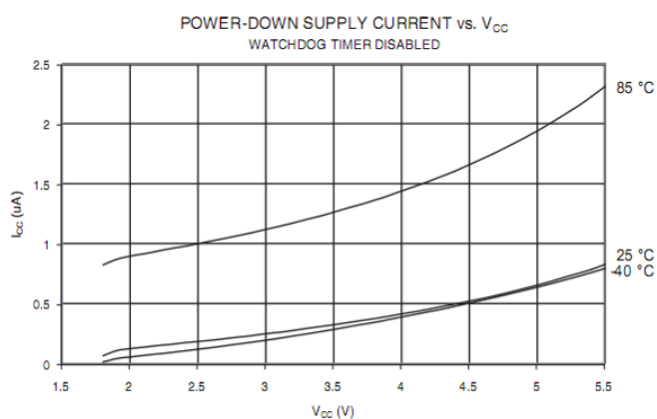
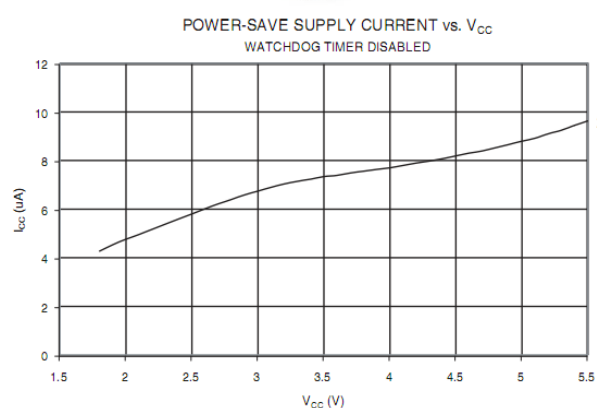
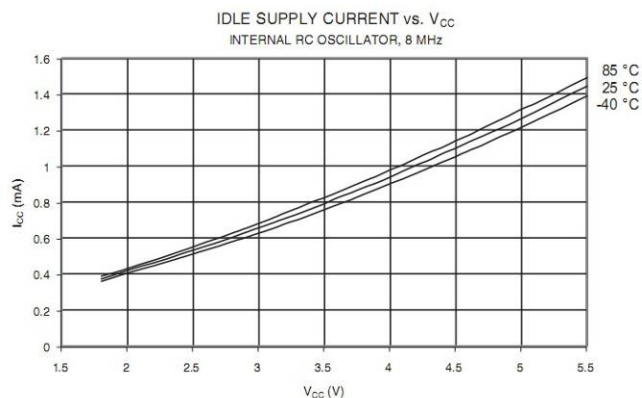
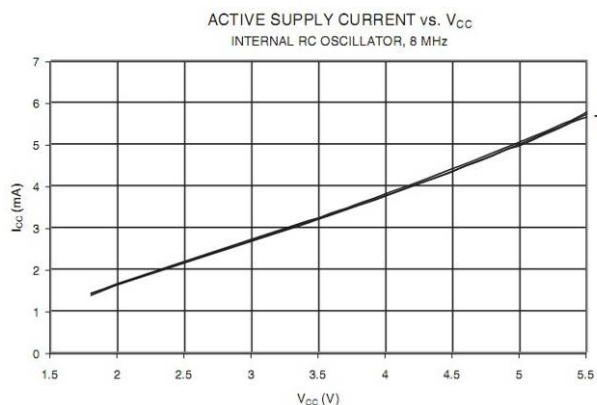


SLEEPING BEAUTY:

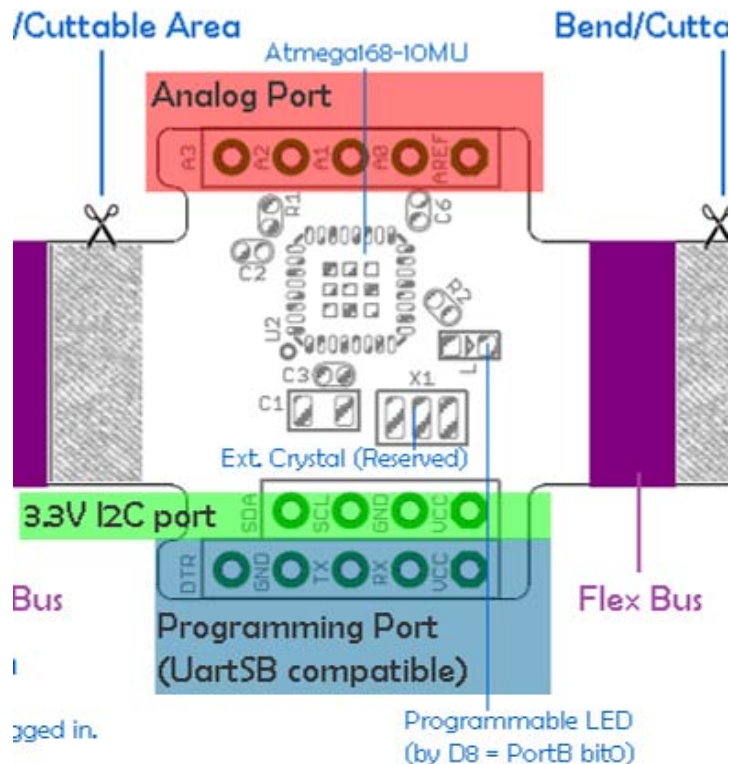
A sleep button is included instead of power switch. The button is connected to external interrupt (PD2), by including corresponding code in firmware, the system could go to either power down mode (<5uA) or idle mode(<0.8mA). To wake up it: 1) press sleep button again or 2) trigger any external interrupt OR 3) timer (idle mode). Sleep button could be reused for other purpose by changing software.

POWER CONSUMPTION:

When working at 3.3v 8Mhz by default, the minimal system power consumption is about 3mA. When working in power down mode, consumption could be minimal 1.2uA (!).



MAINBOARD FRAME



Mainboard FRAME carries an Arduino compatible AVR MCU Atmega168-10MU. It runs either at default 8Mhz with internal crystal or higher with external crystal (reserved). It includes 2.54 grid pad for prototyping and easier extension. You may even nail them into breadboard by a pin header for early development.

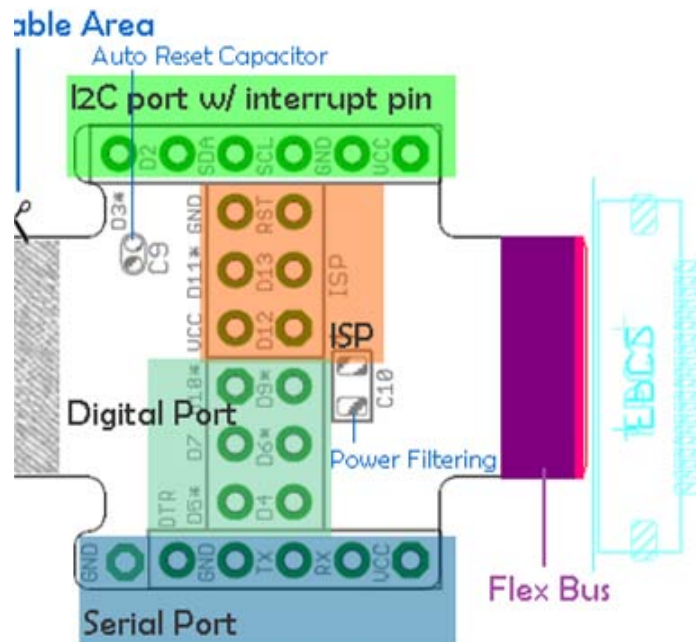
INTERFACE: Mainboard includes 4 Analog/Digital port with 1 Aref and I2C, Programming port to provide core functions for extremely compact application. Further pins are still extensible via Flex Bus.

4 Analog port (A0-A3) with Aref (Analog reference) pads are placed as close to MCU as possible to avoid interference. They can be used to control or input as digital port too. The second row of 4 pads are for 3.3v and 5v I2C buses, please note other I2C devices should be able to read 3.3v as high. The easiest way to program FILM is to use UartSB which is direct plug. Other USB to serial convertor will do the job well, just be ware on the pad sequence.

INDICATOR LED: Mainboard has a programmable LED wired to Digital 8 pin. Maybe wire the battery pin to the AD port? The LED could then tell the battery level. The last usage might be shut down to save some mA.

EXTERNAL CRYSTAL: Reserved for Asynchronous Timer/Counter2. If the Internal Calibrated RC Oscillator is used as FILM clock source, PB7..6 is used as TOSC2..1 input for the Asynchronous Timer/Counter2. Set AS2 bit in ASSR to enable this.

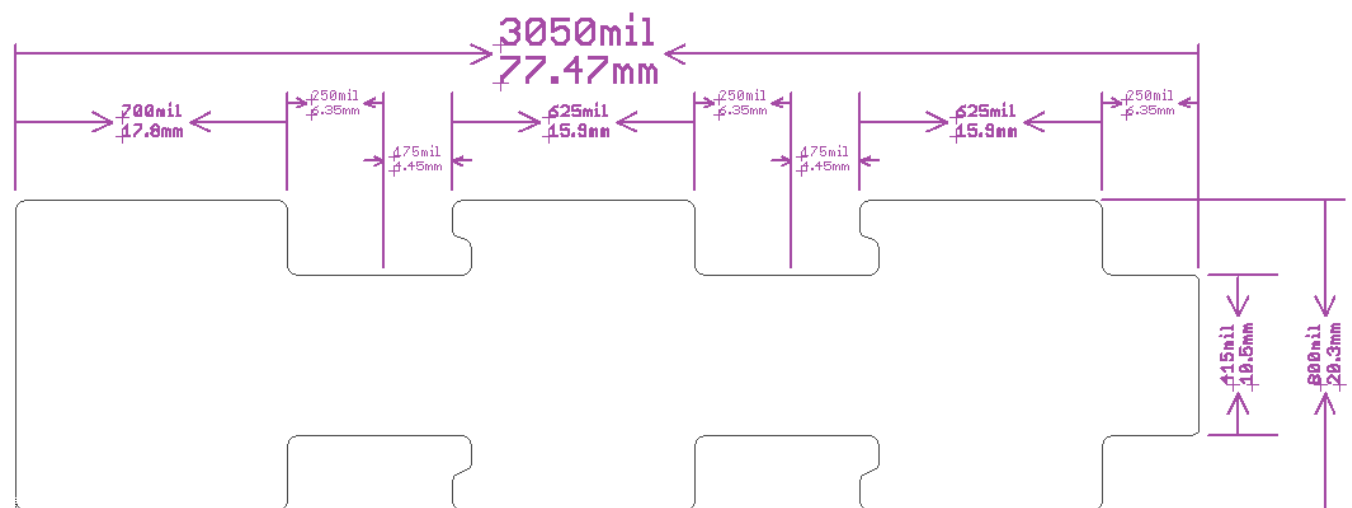
BREAKOUT FRAME



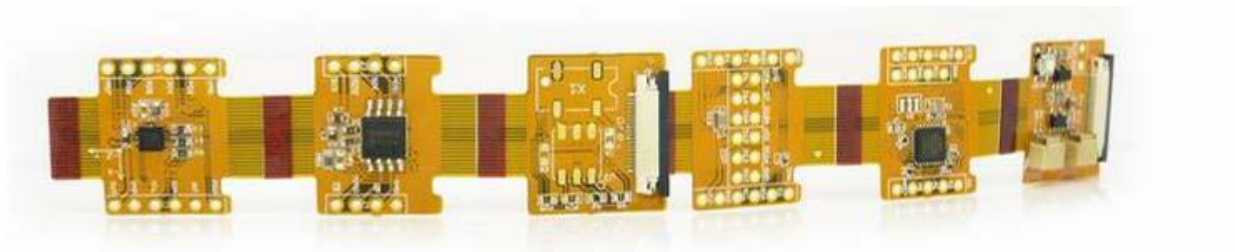
Breakout FRAME enables expansion and prototyping of FILM. It completely breakout 20pin flex bus to 2.54mm pin header pads. The pads are grouped by 1) I2C port w/interrupt pin, 2) ISP port 3) Digital Port 4) Serial port and an extra GND for random usage. The end of breakout FRAME is a ready for expansion; just insert it into Flex Bus Connectors on other FRAMEs to extend.

SHAPES AND 20PIN FPC BUS

Seeeduino FILMs and FRAMEs are sharing the same shape, consisted of 3 FRAMEs on a whole FPC. Same shape makes manufacturing and usage easier. They are designed to be cut or re-grouped, you are the tailor.



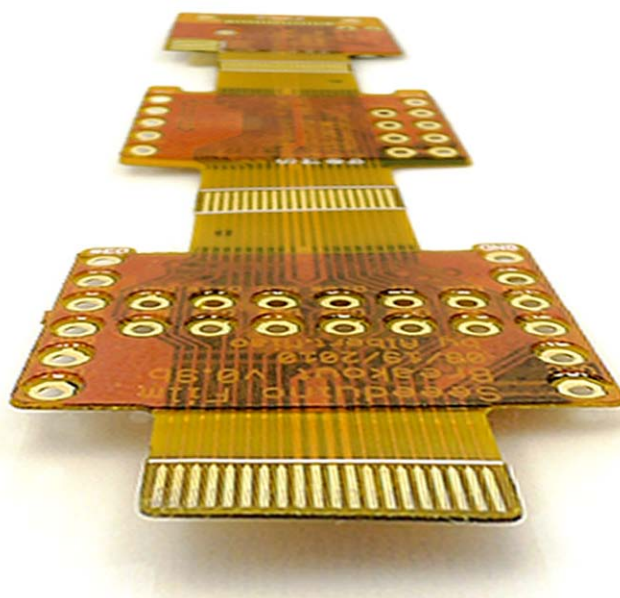
Seeeduino FILM and its extension FRAMEs use unified 20pin FPC bus linked in daisy-chain. You may easily cascade multiple FRAMEs per requirement. The connection could be bent easily to fit into various spaces. Any 0.5mm pitch FPC 0.3mm thick connection ribbon could be used to extend the connection further.



FLEX BUS PIN DEFINITION:

FPC_0.5_20PO_ONBOARD

1	1 PD0/RXD
2	2 PD1/TXD
3	3 PD2
4	4 PD3
5	5 PD4
6	6 PD5
7	7 PD6
8	8 PD7
9	9 VCC
10	10 GND
11	11 GND
12	12 VCC
13	13 PB1
14	14 PB2
15	15 PB3/MOSI
16	16 PB4/MISO
17	17 PB5/SCK
18	18 PC4/SDA
19	19 PC5/SCL
20	20 A_RESET



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REVISION HISTORY

Rev.	Descriptions	Editor	Release date
v0.9b	Initial design		Sep 14th, 2010
V1.0	Pictures changed	Lafier	Nov 19, 2010