MCU

Power

VBAT_SENSE_EN — VBAT_SENSE_EN
VBAT_SENSE — VBAT_SENSE
BLE_PWR_EN — BLE_PWR_EN

power.sch

Matrix

KEY_INT — KEY_INT
KEY_ROWS — KEY_ROWS
KEY_COLS — KEY_COL
CAPS_LED_EN — CAPS_LED_EN

matrix.sch

mcu.sch

+3V3

C? 100nF
C? 100nF
C? 100nF
C? 1uF
GND

U?

21 VCC
52 VCC
64 AVCC
7 UCAP

AREF 62   C? 1uF ▷ GND

ADC0/PF0 61 ◁ VBAT_SENSE
ADC1/PF1 60
ADC2/PF2 59   100nF C? ▷ GND
ADC3/PF3 58
TCK/ADC4/PF4 57
TMS/ADC5/PF5 56
TDO/ADC6/PF6 55
TDI/ADC7/PF7 54

3 UVCC
8 VBUS   +5V ◁

USB_OTG
VCC 1   +5V
D− 2   90 Ohm Diff Matched   R? +/−5%
D+ 3   22   4 D−
ID 4   22   5 D+
GND 5   R?   9 PE3/UID
shield 6
P?
GND

GND

VBAT_SENSE_EN ▷   1 PE6/INT6/AIN0
2 PE7/INT7/AIN1/UVCON

AD0/PA0 51   COL8
AD1/PA1 50   COL9
AD2/PA2 49   COL10
AD3/PA3 48   COL11
AD4/PA4 47   COL12
AD5/PA5 46   COL13
AD6/PA6 45   COL14
AD7/PA7 44

‾RESET   20 ‾RESET

43 HWB/ALE/PE2 ‾HWB‾   R? 10k ▷ GND
34 ‾RD/PE1
33 ‾WR/PE0   ▷ BLE_PWR_EN

Y?   23 XTAL2
24 XTAL1

CLK0/IC3/A15/PC7 42   COL7
OC3A/A14/PC6 41   COL6
OC3B/A13/PC5 40   COL5
OC3C/A12/PC4 39   COL4
T3/A11/PC3 38   COL3
A10/PC2 37   COL2
A9/PC1 36   COL1
A8/PC0 35   COL0

C? 8MHz C?
12pF 12pF
GND

18 PE4/INT4/TOSC1
19 PE5/INT5/TOSC2

KEY_INT ▷   25 PD0/INT0/SCL/OC0B
BLE_IRQ_RTS   26 PD1/INT1/SDA/OC2B
BLE_MISO_TXO   27 PD2/INT2/RXD
BLE_MOSI_RXI   28 PD3/INT3/TXD
BLE_CS_CTS R? 22   29 PD4/ICP1
BLE_SCK   30 PD5/XCK1
BLE_DFU R? 22   31 PD6/T1
BLE_RESET   32 PD7/T0

SS/PCINT0/PB0 10   ROW0
SCLK/PCINT1/PB1 11   SCLK   SCLK   ROW1
PDI/MOSI/PCINT2/PB2 12   MOSI   MOSI   ROW2
PDO/MISO/PCINT3/PB3 13   MISO   MISO   ROW3
OC2A/PCINT4/PB4 14   ROW4
OC1A/PCINT5/PB5 15
OC1B/PCINT5/PB6 16
OC1C/OC0A/PCINT7/PB7 17

6 UGND
22 GND
53 GND
63 GND
GND

AT90USB1286-AU

− Might need to use AT90USB646
for 64K limitations of avrdude?
− MIght need to use QFN package
just for size reasons

Serial Programming Header
TODO: Correct the connector

+3V3
2 P? 1   MISO
MOSI   4   3   SCK
6   5   RESET
GND   CONN_02X03

Reset Button
TODO: Correct the
pushbutton

+3V3
10K R?
SW?   RESET
GND

COL[14:0] ▷ KEY_COLS

ROW[4:0] ▷ KEY_ROWS

▷ CAPS_LED_EN

Bluetooth Low Engery (BLE) Headers
− Adafruit Bluefruit SPI Friend
− Can double as expansion header

BLE_SCK   1
BLE_MISO_TXO   2
BLE_MOSI_RXI   3
BLE_CS_CTS   4
BLE_IRQ_RTS   5
BLE_DFU   6
BLE_RESET   7
GND   8
VCC   9
P?
CONN_01X09

BF BLE SPI Friend
@ <= 4 MHz
1 − SCK
2 − MISO
3 − ‾MOSI‾
4 − ‾CS‾
5 − ‾IRQ‾
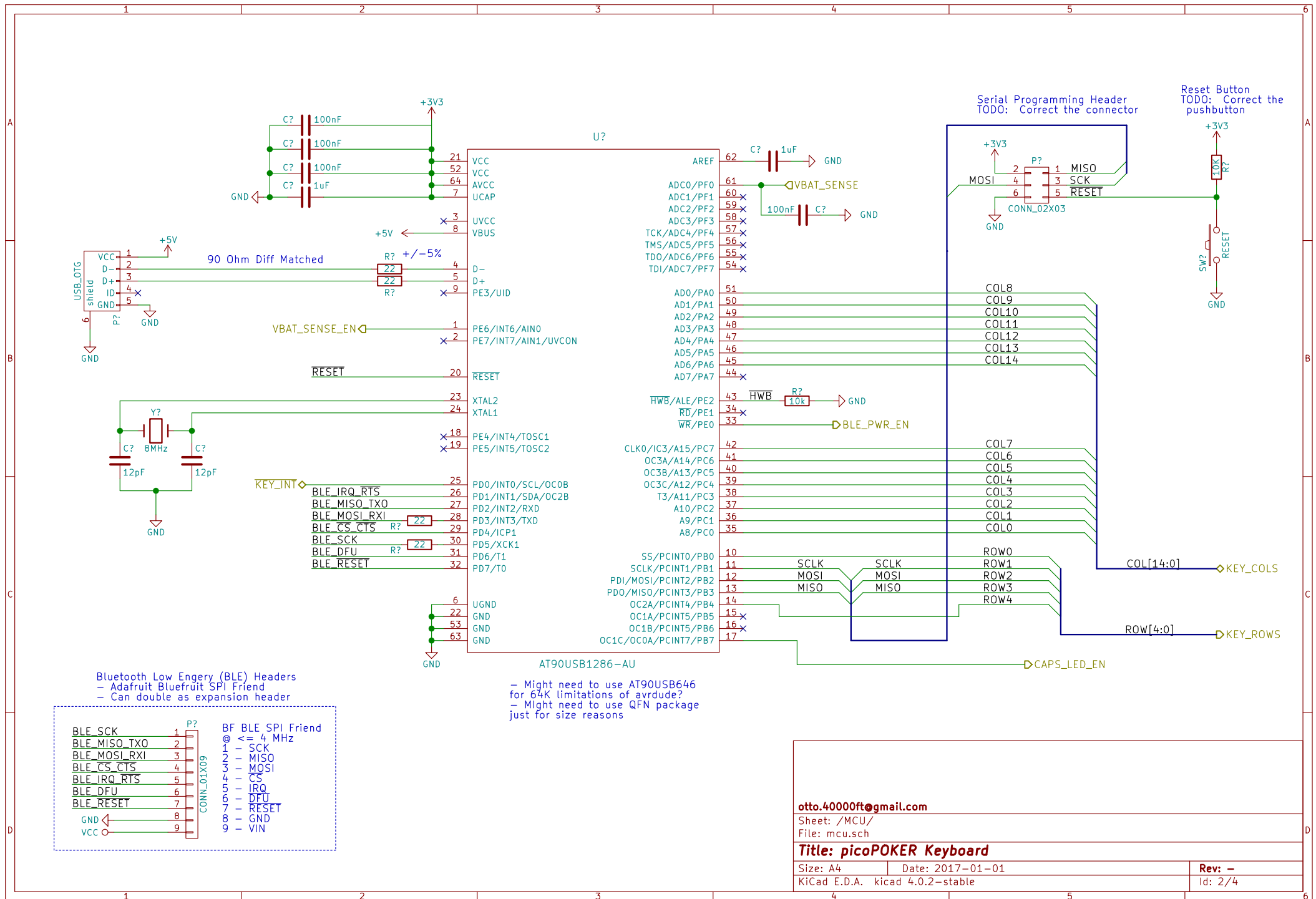6 − ‾DFU‾
7 − ‾RESET‾
8 − GND
9 − VIN

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Sheet: /MCU/
File: mcu.sch

Title: picoPOKER Keyboard
Size: A4   Date: 2017-01-01   Rev: −
KiCad E.D.A. kicad 4.0.2-stable   Id: 2/4

KEY_COL — COL[14:0]

COL0   COL1   ...   COL14

KEY_INT

KEY_ROWS — ROW[4:0]

ROW0

ROW1

ROW4
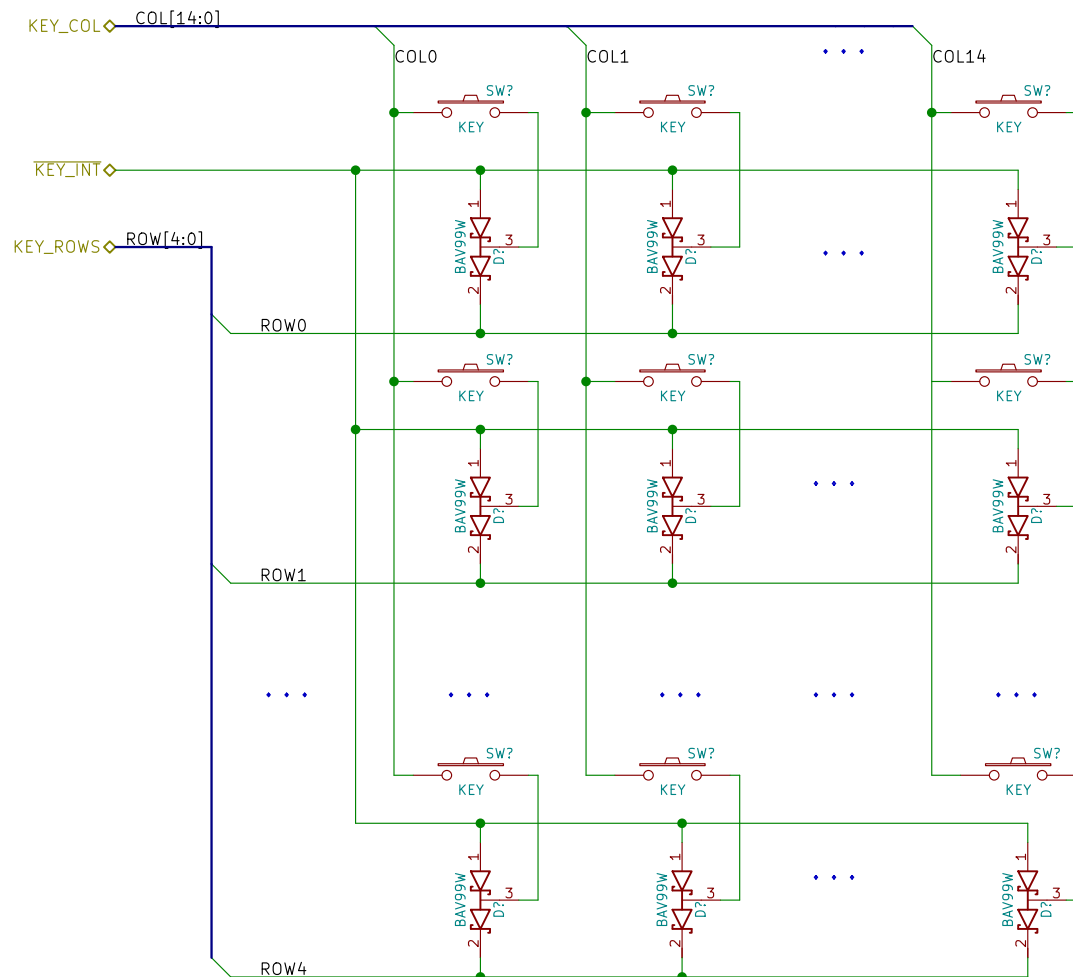
CAPS LED

Use higher unregulated voltage
to ensure the LED is driven.

VCOM

D? LED

150 R?

CAPS_LED_EN

Q?
Q_NMOS_DGS

GND

SW? KEY
BAV99W D?
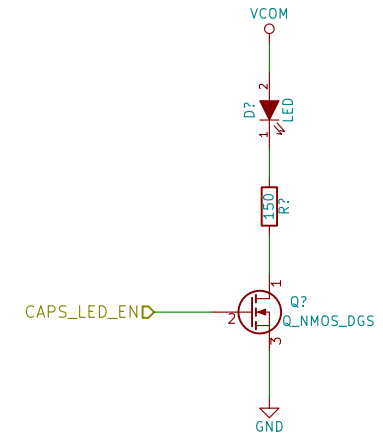
TODO: Wire up a proper matrix

Matrix Mode	Pin	Pin Mode / Direction	Comment
Scanning	KEY_INT	Out	Drive '0' to not interfere with scan.
	ROWn	Out	Drive '0' to select a row to read, drive '1' to others
	COLn	In / P.U.	Read the column ports to discover key states for the selected row. '0'=Key Pressed.
Power Down	KEY_INT	In / P.U.	Used as interrupt to wake MCU in this mode. Enable P.U. on pin. '0'=Key Pressed.
	ROWn	Out	Drive '1' to deselect all rows.
	COLn	Out	Drive '0' to select all collumns.

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Sheet: /Matrix/
File: matrix.sch

Title: picoPOKER Keyboard

Size: A4	Date: 2017-01-01	Rev: —
KiCad E.D.A. kicad 4.0.2-stable		Id: 3/4

LiPo Battery Charger
MCP73831-2ACI/OT

TODO: JST LiPo
Battery Connector

MCU and BLE Power Generation & Control

MCP73831/2

+5V

C?
10uF

GND

D?
LED

2k
R?

4 VDD   VBAT 2
              PROG 5
1 STAT   VSS   3
        U?

10k = 0.1A
5k = 0.2A
2k = 0.5A
1k = 1A

2k
R?

GND

+BATT

C?
10uF

GND

+BATT

P?
1
2
3
4
CONN_01X04

GND

Power Rail Descriptions

LiPo   USB   MCU   Diode ORd   BLE
                          LDO   BATT/USB   VIN
+BATT   +5V   +3V3   VCOM   VCC   PWR_FLAG

PWR_FLAG   PWR_FLAG   PWR_FLAG   PWR_FLAG   PWR_FLAG   GND

Battery Voltage Monitor (ADC input)

+BATT   OR.... could just use another MIC9406x

Q?   Q_PMOS_DGS
1   3
     2

R?
1M

100K
R?

VBAT_SENSE_END

Q?
Q_NMOS_DGS

VBAT_SENSE

154K
R?

GND

Use 1% resistors

Battery Voltage Divider

Using 2.56V internal band gap reference:
R1 = 100K, R2 = 154K
VBAT 4.2 (max) --> Sense 2.54
VBAT 3.0 (min) --> Sense 1.82

NOTE: using internal reference may
 introduce as much as 7.8% error. Due to
 this and the narrower sense range,
 AVCC reference would normally be preferred
 for the monitor. However, due to the crude
 nature of the monitor to start with, and the
 complexity of monitoring a voltage not derived
 from VCC/AVCC, the internal band gap reference
 is selected. If necessary to improve measurements,
 calibration offsets can be calculated and stored.

+BATT   +5V   picoPOKER   VCOM   MCU LDO   +3V3
                    Main
                    ON / OFF   MIC5225-3.3YM5
D?   D?   Switch   MIC5225
MBR120   MBR120   SW?   1 VIN   VOUT 5
                    ON/OFF   2   3 EN
                              1   2 GND   ADJ   4
                                                                  U?

Can use either Battery or USB   C?   C?
 for primary power.   10uF   10uF
Automatically switch to USB
 power when available.   GND   GND   GND
Prevent battery voltage from
 passing to ext. 5V pin or
 to the charger input.

BLE High-side Power Switch
BLE Load Shed for Deep Sleep

MIC94060BC6   VCC
MIC9406X

BLE_PWR_END   4 VIN   VOUT 1   MIC9406X has internal pull-down
               3 EN   NC   6   on EN input consuming 2-4uA.
               5 GND   GND   2   BF LE Friend has on-board MIC5225
                  U?   3.3V LDO and bulk 10uF input cap.
               GND   GND   BF LE Friend VIN range: 16-3.3V

NOTE: This power topology
 may not work with BF LE UART Friend
 due to diode ORing on VIN. The double
 diode drop from the battery to the BF
 UART Friend's LDO in this ciruit may be
 too low as the battery drains. Either:
 - use the BF LE SPI Friend, which
    doesn't have the VIN diode
 - Modify your BF LE UART Friend to
    remove and jumper the VIN diode