

# EightByEight Blinky Badge

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## Revision Notes/Changelog

### Revision A:

- Diode mod required to power over USB

### Revision B:

- Add diodes to enable power from USB
- Connect ESP reset and boot select pins to ARM for auto-programming
- Connect ESP TX1 pin to ARM for LED control
- Move I2C\_SDA to ESP pin 12
- Connect accelerometer interrupt pin to ESP pin 13
- Remove ground planes under ESP8266 antenna area
- Add jumper pad for entering boot mode on ARM processor
- Hook LED\_OE or similar to the row driver MUX
- Bring unused ESP pins to pads
- Add TS silkscreen

### Revision D:

- Replace ARM JTAG connector with test points for automated programming
- Change value of pullup resistors from 10k to 47k
- Update filter caps for 3.3V regulator
- Add test pads for production

### TODO:

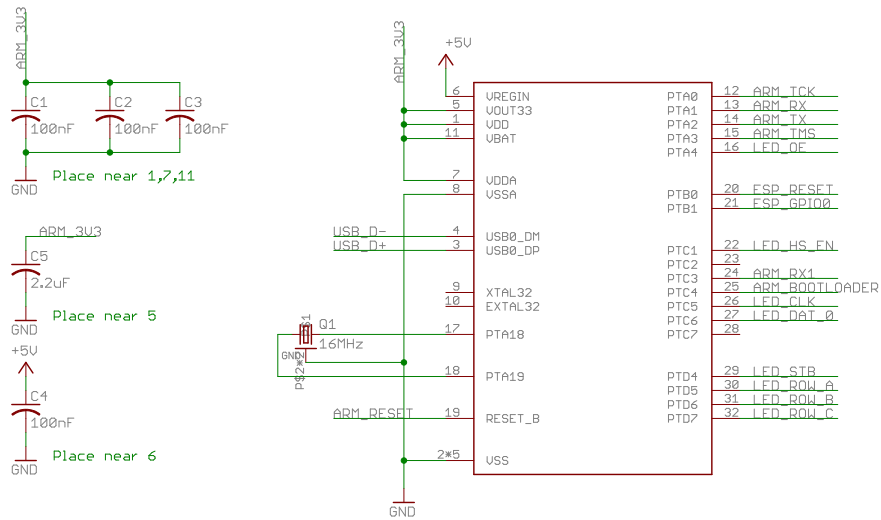
- Implement more user friendly expansion pads for the ESP
- Cosmetic: ESP8266 GPIO 18 mislabeled, should be 16
- Characterize the power situation
- test a flush-mount USB connector

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Provides LED drive signal, USB/Serial conversion



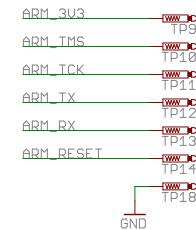
Pin assignments for USB/Serial conversion:  
ARM\_RX and ARM\_TX are UART0  
ESP\_RESET is virtually connected to RTS  
ESP\_GPI00 is virtually connected to DTR

Pin assignments for matrix output:  
LED\_DRT + LED\_CLK use ESPI hardware  
LED\_OE needs to be on a pin with FTM capability  
LED\_ROWx and LED\_STB are GPIO and need to be together on a unique port

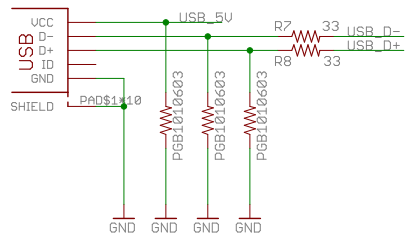
If shorted during boot, the ARM will go directly into DFU mode. Useful if the application firmware becomes unstable. Note that this is a software feature- it is implemented by the bootloader firmware.



Used for automated production testing

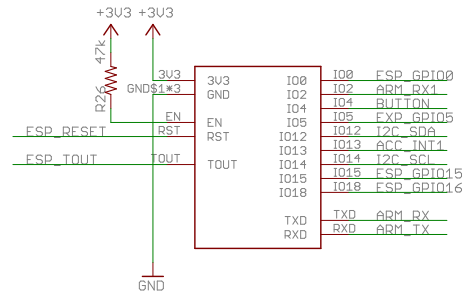


Battery charge, ARM programming using DFU, ESP programming using ACM



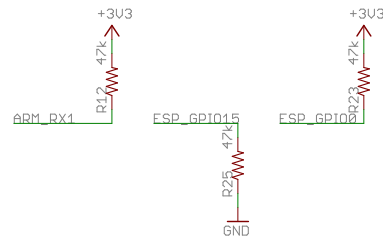
## ESP8266

Provides WiFi



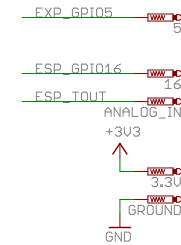
ESP826 Boot Select  
UART Download:  
GPIO15 Low, GPIO0 Low, GPIO2 High

Flash Boot:  
GPIO15 Low, GPIO0 High, GPIO2 High



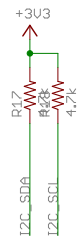
## Extra IO

Unused pins from the ESP8266



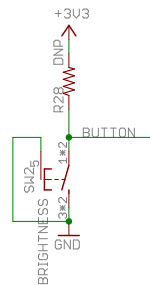
## I2C pullups

Note: The I2C bus runs at 100KHz



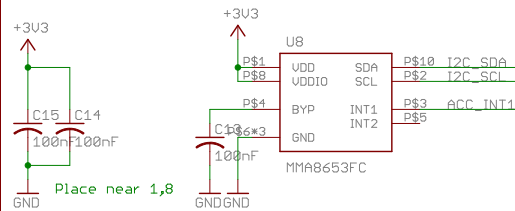
## Button input

Momentary, active low  
Connected to ESP



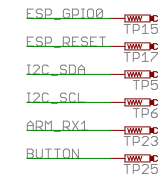
## 3 axis accelerometer

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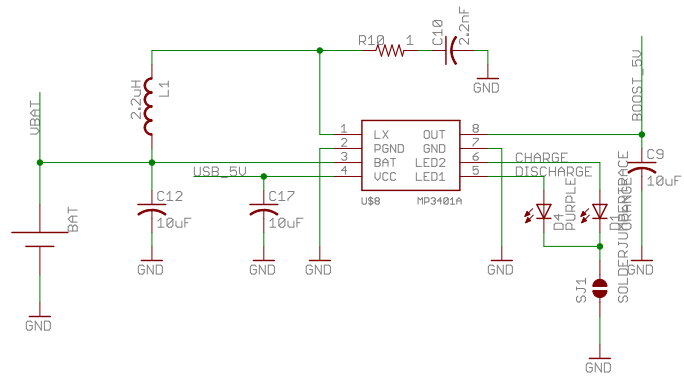
## ESP test pins

Used during automated production testing  
Note: RX and TX are available on  
the ARM JTAG pins



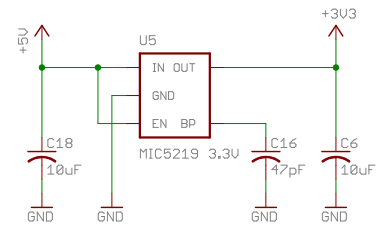
## Battery Charger / 5v boost

Integrated charge circuit and 5v boost regulator.



## 3.3V Regulator

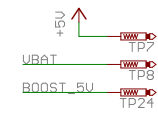
Powers the ESP8266 and other ICs



Note: LED constant current drivers are powered by a regulator built into the ARM part.

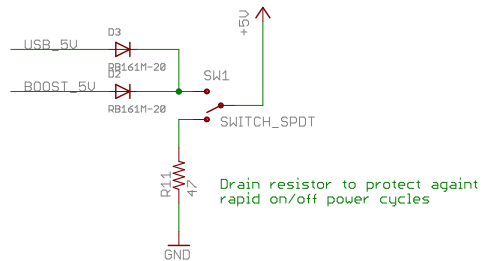
## Power supply Test points

Used for automated production testing



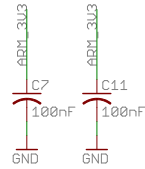
## Power switch

Powers device from USB or battery

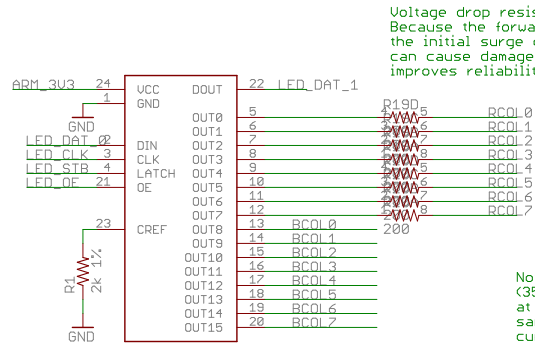
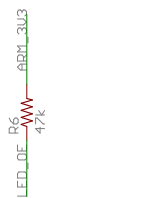


## Low side (column) drivers

Constant current shift registers, PWM signal is generated by the processor

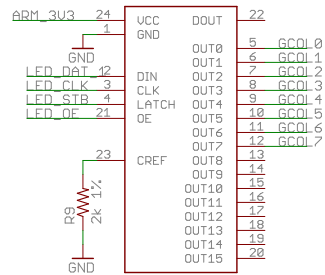


Place near U2, U4



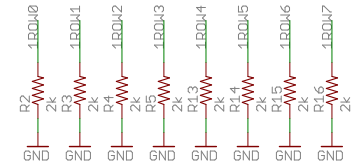
Note: Based on the datasheet for the LED we are using (3528RGB4C-CA), R and B have similar luminous intensity at the same forward current so they can be driven from the same driver. Ideally each color would have an independent current setpoint, however that would require an extra drive IC

Note: Tune CREF resistors for each color



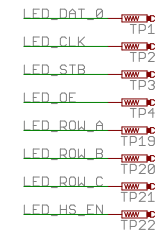
## Ghostbusting resistors

Reduces ghosting by draining row capacitance



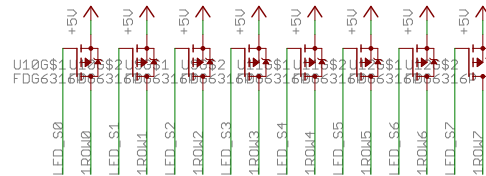
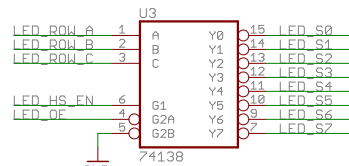
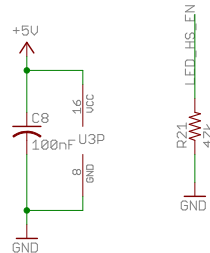
## LED Test points

Used for automated production testing



## High side (row) drivers

P channel MOSFETs with gate drive capability



Note: The primary purpose for the MUX is to boost the 10 signals to 5V. A secondary benefit is to reduce the number of I/O lines needed on the ARM processor.  
Note: LED\_HS\_EN prevents the first row of LEDs from flashing briefly during poweron.

