

# Backlighting And RGB

Bling bling.

## QMK-Compatible LED backlighting

This is one LED per switch.

The structure is:

```
.  |- LED --- Resistor -|
    |                   |   N-Channel
5V ---|- LED --- Resistor -|----- MOSFET ----- GND
    |                   |   |
    |- LED --- Resistor -|   PWM PIN
```

- Use a N-channel MOSFET.
- A PWM pin can only deliver around 20mA absolute maximum. Drawing tons of LEDs from a single PWM pin will easily fry your microchip. Place a resistor between the PWM pin and MOSFET gate.
- All LED-Resistor pairs are placed in parallel.
- All LEDs can be run under a few or single resistor, but this leads to brightness inconsistencies among the LEDs.
- The current from the LED-Resistor pairs feed into the drain of the MOSFET.
- PWM feeds into the gate of the MOSFET with a 100~1k or so resistor, usually.
- Source of the MOSFET goes to ground.
- Each LED resistor should be planned to let around 1-5mA through the LEDs each. 20mA will hurt your eyes.

## Choosing the correct MOSFET

### Power Dissipation

- Make sure the current flowing through times the voltage drop doesn't lead to a power dissipation that doesn't fry the MOSFET.

### Maximum voltage and current

- Check for Drain-Source voltage/current max ratings.

### Size

- Do not pick a MOSFET which will not fit on your PCB.

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# RGB Underglow

WS2812B is the standard used for underglow.

- Draws 45-50mA per package maximum.
  - However, AliExpress GH60 PCBs have 16 WS2812B.
  - Current can be limited via QMK.
- Can be daisy-chained together. One LED passes data onto the next, and so on.
- Can be purchased in individual WS2812B or by strips. Use individual for assembled PCBs.
- Wired in the following way:
  - VDD to 5V
  - VSS to GND
  - DIN to previous LED DOUT, or AVR pin if first LED
  - DOUT to next LED DIN, or unconnected if last LED
  - Placing a 500 ohm resistor between AVR pin and first LED is highly recommended

## Various other RGB choices

WS2812 (without B) - Unsimplified version of WS2812B with 6 pins

WS2811 - The controller within WS2812B. Can be used as standalone controller with other RGBs.

Controller-less RGBs - Use with separate PWM LED controllers.

WS2812C - Low current variant

SK6812 - An alternative that also works with QMK

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# Indicator LEDs

Simplest.

MCU PIN --- LED --- Resistor --- GND    (Source setup - Toggle pin high to turn on)

or

5V --- LED --- Resistor --- MCU PIN    (Sink setup - Toggle pin high to turn off)

LED and resistor can be swapped.

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