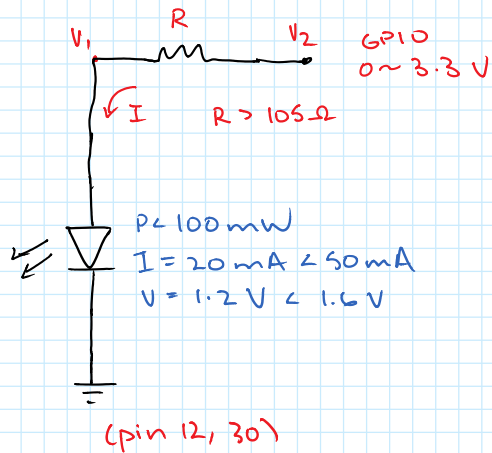


Infrared Emitter Circuit

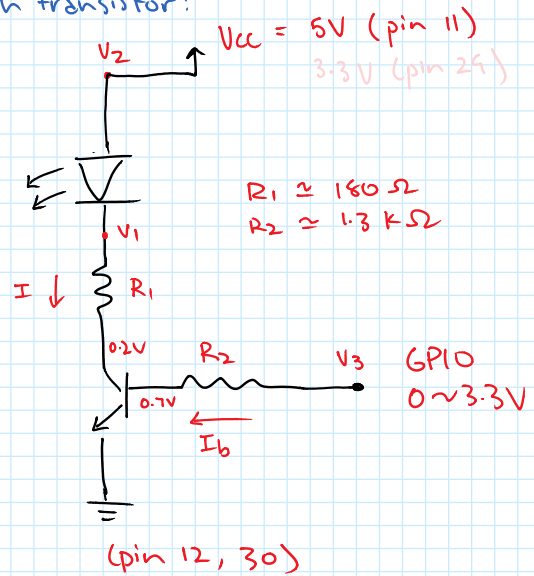
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direct to GPIO:



$$\begin{aligned} V_1 &= 1.2 \text{ V} \\ V_2 &= 3.3 \text{ V} \\ I &= 20 \text{ mA} \\ R &> \frac{V_2 - V_1}{I} \\ &> \frac{3.3 - 1.2}{20 \text{ m}} \\ &> 105 \Omega \end{aligned}$$

through transistor:



$$\begin{aligned} V_2 &= 5 \text{ V} \\ V_1 &= V_2 - V = 5 - 1.2 = 3.8 \text{ V} \\ I &= 20 \text{ mA} \\ R_1 &= \frac{V_1 - V_c}{I} = \frac{3.8 - 0.2}{20 \text{ m}} = 180 \Omega \end{aligned}$$

$$\begin{aligned} I_b &= 0.1 I \text{ for transistor in saturation} \\ &= 2 \text{ mA} \end{aligned}$$

$$R_2 = \frac{V_3 - V_b}{I_b} = \frac{3.3 - 0.7}{2 \text{ m}} = 1.3 \text{ k}\Omega$$

Infrared Receiver Circuit

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