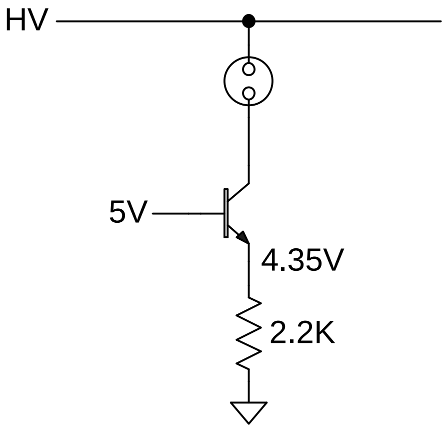
Single Transistor Current Sink



I = 4.35V / 2.2K = ~2mA

This circuit has a current drift over temperature because of the -2.2mV/Deg-C of the Vbe of the transistor. This can be minimized (As a percentage) by making the voltage across the setting resistor as large as possible. As shown, the typical swing would be:

25C -25/+60
=
4.35V +55/-132mV
=
1.98mA -0.03/+0.05mA

The power dissipation across the setting resistor would be ~9mW and proortional to the duty cycle applied when dimming. There is no current overshoot since the transistor is self regulating (No reference start up) and the turn on time is the same as the transistor itself.

Since the Vce-sat of even a bad NPN will be no more than a few hundred milli-volts at these currents, this sets the minimum collector voltage to about 5V, where the maximum for SOA would simply be the rated device power divided by the current: A typical SOT23 NPN is rated for 300mW so the maximum allowable Vce would be 150V at 2mA!

Ripple on the power supply is automattically smoothed out by the transistor up to it's corner frequency so power supply ripply such as seen by constant off time boost converts does not show up as flicker in the disply.

Current from the control logic is simply the Emmiter current divided by the h_{fe} (beta) of the transistor and results in a decrease in the sink current but since typical beta is >100, it can usually be ignored.