

Step-down Configuration In the step-down configuration, the output voltage is always less than the input voltage. When V_{out} tries to decrease, the ON-time of Q, is increased, causing an additional charge on to offset the attempted decrease. When V tries to increase, the ON-time of Q, is decreased, causing C to discharge enough to offset the attempted increase the output voltage. Therefore, the switching regulator is useful primarily in higher power applications or in applications where is of at most concern. The ON and OFF interval of Q, are shown in the below. The capacitor charges during the ON-time (t_{on}) and discharge during the off-time (t_{off}). When the ON-time is increased relative to the OFF-time, the capacitor charges more, thus increasing the output voltage, as indicated in part (b). When the ON-time is decreasing relative to the OFF-time, the capacitor discharges more, thus decreasing the output voltage, as in part (c). The inductor further smooths the fluctuating of the output voltage caused by the charging and discharges action. Transistor Q, is used to switch the input voltage at a duty cycle that is based on the regulators load requirement. Therefore, by adjusting the duty cycle of Q1 The output voltage can be varied. A basic step- down switching regulator is shown in the below and its simplified equivalent in part (b). The LC filter is then used to average the switch voltage. Since Q) is either on (saturated) or cut off, the power lost in the control element is relatively small.