How to generate a PWM_controlled DC output with a switch mode controller

Example

regulated, PWM_controlled DC output

25..40V input

IC1
LM2576T-ADJ/LF03

V_out = 5..15V
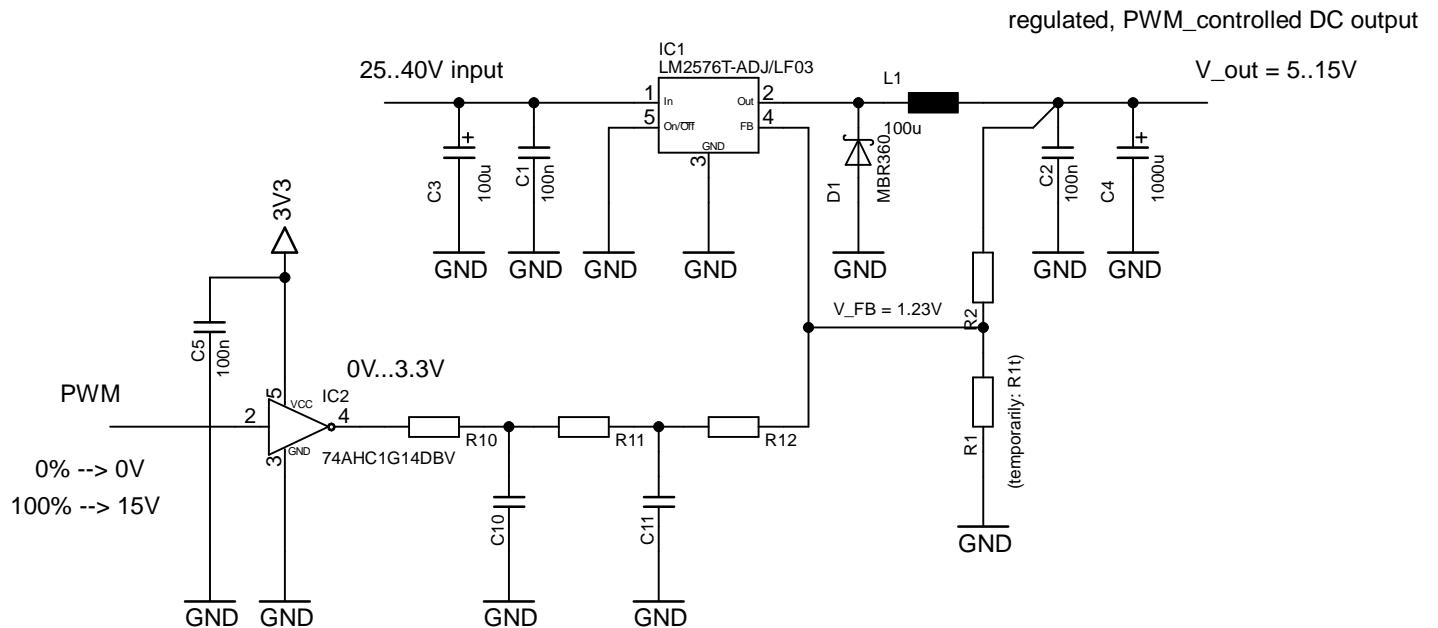
1) R1t = 4kOhms (temporary, will be modified later)   (Datasheet recommendation: 1k ... 5k)

2) Calculate R2 for V_out = 15V according datasheet formula   (44k8)

   IC2_output_voltage_range = 0...3.3V = 3.3V

   Regulator_output_voltage_range = 5V...15V = 10V

   "manipulation resistance" = R_M = R10 + R11 + R12

3) R_M = R2 x IC2_output_voltage_range / Regulator_output_voltage_range   (14k8)

4) To ease calculations: R10 = R11 = R12; ... = R_M / 3   (4k93)

   choose the next lower available value.

   Now the output voltage is: 15v plus the "manipulation voltage"

   --> V_out = 15V + R2 x (V_FB - 3.3V x (1- duty_cycle) / R_M

   (0% = 8.7V; 100% = 18.7V)

   We need to calculate correct value for R1 because: R1t = R1 parallel R_M

5) R1 = 1 / (1 / R1t - 1 / R_M)   (5k48)

PWM ripple suppression with C10 = C11:

To reduce the ripple to one LSB of a 10 bit PWM I recommend:

6) C10 = C11 = 11 / (R1 * f_PWM) ...at least.   (2.2uF @ 1kHz)