Calculation:

**Feedback voltage control: Rf**

Pin 1 and pin 2 are the error amplifier input for voltage control, voltage different across pin 1 and 2 indicated that the voltage of output is different to the desired value. The voltage of pin 2 is 2.5 volt, which pre-set by resistors R1 and R3. Voltage for pin 1 must be 2.5 volt as well. That can be set by matching Rf with R4. The output voltage is 9V in our design. The value of Rf can be calculated by following:

Rf is 12.2k ohm.

**Current limiting control: RCL**

Pin 4 and 5 are the control for current limiting. When the voltage different between two pins are greater than 200mV, the duty cycle of output drop about 25%, increasing the sensing voltage about 5% resulting a 0% output duty cycle. Pin 5 is connected to the power in ground and pin 4 is connected to the power out ground across R9. Since R9 is only a overcurrent protection for the chip, normally no current pass through R9, the voltage different between pin 4 and 5 is the voltage across RCL. We need a RCL value would have a voltage drop about 200mV when 3.7A current pass through. The RCL value can be calculated by:

RCL is 0.054054 ohms.

RCL is a tiny value, so we use 4 resistors in parallel to achieve that value. RCL1 to RCL4 can by calculated by: which is approximate 0.22 ohms.

**Operating frequency control: CT and RT**

The operating frequency for switching can be controlled by selecting different CT and RT value. CT control the dead time between switching and RT control the oscillator period. Notice that the outputs switch on every 2 oscillator cycle, one operating period is formed by 2 oscillator period. In our design, the operating frequency is 50kHz, that means the oscillator frequency we should select is 100kHz. In our design, we decided to have a 0.5us dead time to give us a little bit of margin for input voltage. By the figure on the data sheet, we choose CT to be 0.001uF. Then we choose RT to be 8.2k ohm to give us around 100kHz of oscillator frequency.

Compensation: R\_COMP and C\_COPM

For compensation pin 9. The voltage on pin 9 will increase when the duty cycle of output increase. We are not using that output; we choose R\_COMP and C\_COMP value to be 30k ohm and 0.01 uF as it is recommend in the data sheet for step-Down switching regulator.