PFC Specification

AC input : 90V ~ 265VAC

Switching Frequency Fsw : 56kHz (R110 = 82k)

Output voltage V_{out} : 385V

P_{out} ≈ 300 Watt

Power Factor : 95% @ Full load

A) I) Max. peak line current

Efficiency, $\eta = 0.8$

Input Power $P_{in} = \frac{300}{0.8} = 375W$

$$I_{max} = \frac{\sqrt{2}\, P_{in}}{V_{in(min)}} = \frac{1.41 \times 375}{90} = \underline{5.875A}\ \#$$

II) Roughly take 20% as a ripple current from I_{max}

$$\Delta I = 0.2 \times I_{max} = 0.2 \times 5.875 = \underline{1.175A}\ \#$$

(peak to peak)

So, Max peak current $I_{inpeak} = 5.875 + \frac{1}{2}(1.175)$

$$= \underline{6.4625A}\ \#$$

III) Duty cycle at Ipk where $V_{in(min)}$ is at low line :

$$D = \left[1 - \frac{V_{in(min)}}{V_{out}}\right]$$

$$= \left[1 - \frac{90}{385}\right]$$

$$= \underline{0.766}\ \#$$

⇒ So, PFC circuit (Mosfet)

⇒ $V_{out} = 385V$

→ 耐压需承受 400V 以上

⇒ $I_{inpk} = 6.4625A$, → 耐流需承受 6.4625A 以上

B) PFC Boost Inductor (L102) ②

I) Calculate inductance:

$$L = \frac{V_{in(peak)} * D}{F_{sw} * \Delta I}$$

$$= \frac{590 \times 0.766}{65kHz \times 1.175A} = 1.27mH \#$$

C) PFC Diode (D101)

→ $V_{out} = 385V$

→ 耐压需承受 385V 以上.

$$I_{out(max)} = \frac{300W}{385V} = 0.78A \#$$

→ 耐流需承受 0.78A 以上.

D) PFC Bulk Capacitor (C108)

取 V_{out} 允許 5% 的連波

$$C_o = \frac{I_o}{\Delta V_o * f} = \frac{0.78}{385 \times 0.05 \times 2 \times 60}$$

$$= 337\mu F \#$$

→ 可以選用 330μF, 耐压 450V 之 capacitor

E) Gate drive resistor R_{122} (3)

$$R_{122} = \frac{V_{GTmax}}{I_{GTmax}} = \frac{11.5\,V\ (\text{From Datasheet})}{1A}$$

$$= 11.5\,\Omega$$

$$\simeq \underline{12\ \text{ohm}}\ \#$$

I_{GTmax} = maximum gate drive capability of ICE1PCS01 of ±1A.

F) Shunt Resistor R_{103}

→ Current sense voltage limited to $V_{ISENSEM} = -0.7V$

$$\therefore R_{103} = \frac{V_{ISENSEM}}{I_{inpk}} = \frac{0.7V}{6.4625A}$$

$$= 0.1083\,\Omega$$

Shunt Resistor Power rating at least

$$P_{SH} = I^2_{inpk} \times R_{103}$$

$$= (6.4625)^2 \times 0.1083$$

$$= \underline{4.52\ \text{watt}}\ \#$$

R_{103} 選用需小于 0.1083 Ω (可以選 0.07 ohm), 5W 以上的电阻.

R_{101} 選用 220 ohm, limit the inrush current #

G) Voltage divider of Output Voltage

$R_A = (R106 + R107 + R108)$

$R_B = R112 = 10k\Omega$

$$R_A = \frac{V_{out} - V_{ref}}{V_{ref}} \times R_B$$

$$= \frac{385 - 5V}{5V} \times 10k\Omega$$

$$= 760k\Omega \ \#$$

$\therefore$ $R106 + R107 + R108 = 760k\Omega$

$270k + 270k + 220k$

選用 $R106 = 270k$, $R107 = 270k$, $R108 = 220k$ #

F) Current Control Loop Compensation.

$$C'114 \text{ (pin2 Icomp)} = \frac{g_{OTA2}}{2\pi \times f_p}$$

$$= \frac{1mS}{2\pi \times 56kHz}$$

$$= 2.84nF$$

為了电流环更補償,

$$C114 = C'114 + 0.5$$

$$= 3.34nF$$

選用 $C114 = 3.3nF$ #

G) Voltage Compensated loop

⇒ 见议 C115 = 0.47uF

C116 = 0.47uF

R111 = 10KΩ.

F) C132 见议电容 from 100pF ~ 470pF

不要太大，因为会影响回检的时间#