

PQ3220 變壓器形式 PFC 電感計算

計算式	輸入條件	輸出結果																												
$D = (V_o - V_{in})/V_o$ 求出 Duty-Cycle 做為計算峰值電流的依據	以 90VAC 為計算點 $90 \times 1.414 = 127V_{in}$ 取 125 $V_{out} = 385$ 伏特	$D = (385 - 125)/385$ $D = 0.67$ 取 0.7																												
求出 90 伏特時 rms 電流 $W_{in} = 90 = I_{rms}$ $I_{rms} \times 1.414 = I_{peak}$ $I_{peak} / D = I_{Lav}$ $I_{Lav} / 0.75 = I_L =$ 流過 MOS 的峰值電流	輸出瓦數 = 效率 = 輸入瓦數 輸入瓦數 = $200/0.8 = 250$ 瓦 輸入瓦數 = $90 =$ 輸入電流 rms 輸入電流 rms = 2.8 安 輸入電流 $\times 1.414 =$ 峰值電流 峰值電流 = 4 安	$I_{rms} = 2.8A$ $I_{peak} = 4A$ $I_{peak} / D = I_{Lav} = 5.7A$ $I_{Lav} / 0.75 = I_L = 7.6A$ 選 15 安的 MOS 為 PFC 開關零件																												
決定 I 的大小 CCM 內定為 0.3 - 0.4 之間 DCM 或 PEAK 電流則為 1	$I_{peak} \times 0.4 =$ 漣波電流 基本上漣波電流設的越大電感量越低	$I = 2.3$ 安																												
$L = V_o / (4 \times f_{sw} \times I)$ 求出電感值	漣波電流 I $f_{sw} = 100KHz$	$L = 418\mu H$ 取 $500\mu H$																												
需查表得鐵心參數 A_L 利用 $L = A_L \times N^2$ 求得 N 圈數 可繞線面積 $A_w \times 0.6/2N =$	A_L 值 = $120nH$ GAP = 2mm 利用 N I 值確認鐵心是否合適 ($I = I_{peak}$)	圈數 $N = 65T$ $A_w \times 0.6/N =$ $80.8 \times 0.6 / (2 \times 65) = 0.37$ $= r^2$ 得 $r = 0.35mm$ 則線徑為 $2r$ 線徑 = $0.7mm$ $N = I = 65 \times 4 = 260$ 與曲線表 100 比較剛好邊界值 $N_{AUX} = 5T$																												
$H = 0.4 N I / l$ <table border="1" style="font-size: small; width: 100%; border-collapse: collapse;"> <tr><td>Core constant</td><td>C_r</td><td>mm^{-1}</td><td>0.33</td></tr> <tr><td>Effective cross-sectional area</td><td>A_e</td><td>mm^2</td><td>170</td></tr> <tr><td>Effective magnetic path length</td><td>l_e</td><td>mm</td><td>55.5</td></tr> <tr><td>Effective volume</td><td>V_e</td><td>mm^3</td><td>9420</td></tr> <tr><td>Cross-sectional center leg area</td><td>A_{cp}</td><td>mm^2</td><td>142</td></tr> <tr><td>Cross-sectional window area of core</td><td>A_{cw}</td><td>mm^2</td><td>80.8</td></tr> <tr><td>Approx. weight</td><td></td><td>gmsl</td><td>42</td></tr> </table>	Core constant	C_r	mm^{-1}	0.33	Effective cross-sectional area	A_e	mm^2	170	Effective magnetic path length	l_e	mm	55.5	Effective volume	V_e	mm^3	9420	Cross-sectional center leg area	A_{cp}	mm^2	142	Cross-sectional window area of core	A_{cw}	mm^2	80.8	Approx. weight		gmsl	42	計算磁場強度 H $l = 5.55cm$ $I = I_{peak}$ 如 $I = I_L$	$H = (0.4 \times 3.14 \times 65 \times 4) / 5.55$ $H_{peak} = 58.8oe$ $H = (0.4 \times 3.14 \times 65 \times 7.6) / 5.55$ $H_L = 111.8oe$
Core constant	C_r	mm^{-1}	0.33																											
Effective cross-sectional area	A_e	mm^2	170																											
Effective magnetic path length	l_e	mm	55.5																											
Effective volume	V_e	mm^3	9420																											
Cross-sectional center leg area	A_{cp}	mm^2	142																											
Cross-sectional window area of core	A_{cw}	mm^2	80.8																											
Approx. weight		gmsl	42																											
$B = V_{in} \times 10^8 / (D \times f_{sw} \times A_e \times N)$ $\mu = B / H$	計算磁通密度 B 計算磁通	$B = 4977$ 高斯 $= B A_e = 8461$ 條																												
	計算導磁係數 μ	$\mu = 84.6 - 44.5$ 之間																												

