

Foxlink 24W Flyback Magnetic Simulation

2025.04.25



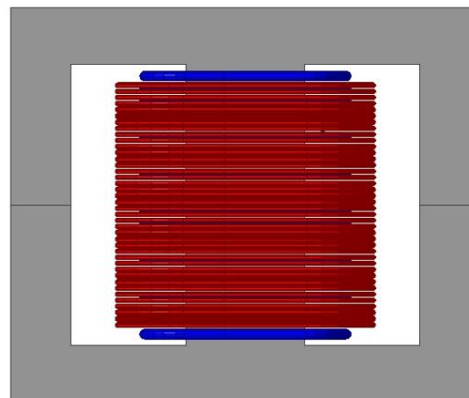
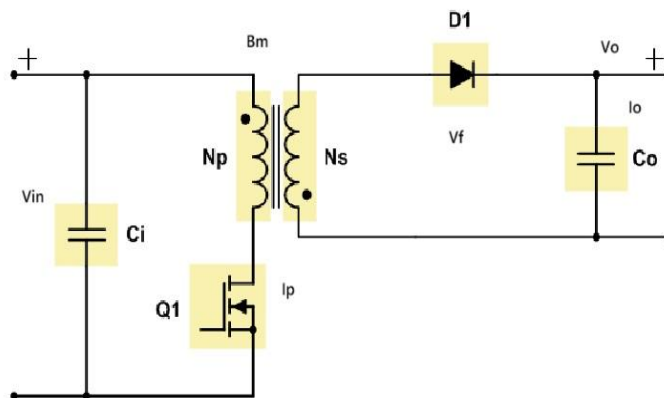
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24W Flyback Magnetic Design Spec

Data Collection before Magnetic Simulation

Input Voltage V_{in}	V_{acmax}	264	Vac
	V_{acmin}	85	Vac
	V_{dcmax}	373.4	V
	V_{dcmin}	120.2	V
Output Voltage	V_o	12	V
Forward Voltage	V_f (D1)	0.6	V
Output Current	I_o	2	A
Output Power	P_{out}	24	W
Efficiency = P_{out} / P_{in}		0.8	
Input Power	P_{in}	30	W
Switching Frequency	Freq.	100	KHz
Duty Cycle	Proied	10	μ S
	Ton Max	4.8	μ S
	Toff Min	5.2	μ S



B_m (Target)	0.41	T
I_{p_max}	1.0399	A
I_{p_rms}	0.2496	A
I_{s_max}	2.5	A
I_{s_rms}	2	A
L_p (Max.)	660	μ H
N_p/N_s (Selection)		
l_e	39.2	mm
A_e	23.3	mm ²
V_e	913	mm ³
N_p	81.1	Ts
N_s	9.21	Ts
N_p Selection	80	Ts
N_s Selection	11	Ts
$B_{sat.}$	0.41	T
$B_{max.}$	0.334	T

24W Flyback Magnetic Core Spec

1.變壓器繞線規格

绕组	绕组规格		套管		绕线规格		胶带 π	备注
	S	F	S	F	线材	圈数		
N1	4	5	\	\	2UEW-B $\phi 0.2 \times 1P$	80	2	
N2	10	7	\	\	TEX-E $\phi 0.4 \times 2P$	11	2	
N3	1	2	\	\	2UEW-B $\phi 0.4 \times 1P$	12	2	同层并绕
N4	2	3	\	\	2UEW-B $\phi 0.4 \times 1P$	8		
N5	4	5	\	\	2UEW-B $\phi 0.2 \times 1P$	80	2	

2.PC95 core規格

規格 (Type)	尺寸 (Dimensions) (Unit : mm)						圖形 Fig	參數 (Parameters)				重量 (g/set)			A-value (mH) $\pm 25\%$		
	A	B	C	D	E	F		C1	Le	Ae	Ve				1kHz, 0.25V		
								(mm)	(mm)	(mm ²)	(mm ³)				JPP-44A	JPP-95	JPP-96F
EE19/16	19.10 ± 0.30	16.05 ± 0.30	4.85 ± 0.25	14.20 min	4.85 ± 0.25	11.45 ± 0.25	Fig.1	1.68	39.2	23.3	913	4.50	1300	1780	1780		

3.線徑規格

AWG	直徑		面積		銅阻抗	
	(inch)	(mm)	(kcmil)	(mm ²)	(Ω /km)	(Ω /kFT)
16	0.0508	1.291	2.58	1.31	13.17	4.016
17	0.0453	1.15	2.05	1.04	16.61	5.064
18	0.0403	1.024	1.62	0.823	20.95	6.385
19	0.0359	0.912	1.29	0.653	26.42	8.051
20	0.032	0.812	1.02	0.518	33.31	10.15
21	0.0285	0.723	0.81	0.41	42	12.8
22	0.0253	0.644	0.642	0.326	52.96	16.14
23	0.0226	0.573	0.509	0.258	66.79	20.36
24	0.0201	0.511	0.404	0.205	84.22	25.67
25	0.0179	0.455	0.32	0.162	106.2	32.37
26	0.0159	0.405	0.254	0.129	133.9	40.81
27	0.0142	0.361	0.202	0.102	168.9	51.47
28	0.0126	0.321	0.16	0.081	212.9	64.9
29	0.0113	0.286	0.127	0.0642	268.5	81.84
30	0.01	0.255	0.101	0.0509	338.6	103.2
31	0.00893	0.227	0.0797	0.0404	426.9	130.1
32	0.00795	0.202	0.0632	0.032	538.3	164.1
33	0.00708	0.18	0.0501	0.0254	678.8	206.9

Core Material setting

Select Definition

Materials | Material Filters

Search Parameters
Search by Name

Search Criteria
☒ by Name ☐ by Property

Libraries ☒ Show Project definitions ☐ Select all libraries

[sys] Materials

Search

Relative Permittivity

Name	Location	Origin	Relative Permittivity	Relative Permeability	Bulk Conductivity
JPP-95	Project		12	3300	0.01
Krempel Akaflex KCL (tm)	SysLibrary	Materials	3.4	1	0
Krempel Akaflex PCL (tm)	SysLibrary	Materials	3.3	1	0
lead	SysLibrary	Materials	1	0.999983	5000000
magnesium	SysLibrary	Materials	1	1	22500000
marble	SysLibrary	Materials	8.3	1	0
Megtron2_R1577	SysLibrary	Materials	4.1	1	0
Megtron4_R5725	SysLibrary	Materials	4.1	1	0
Megtron4S_R5725S	SysLibrary	Materials	3.8	1	0
Megtron6_1035_Laminate	SysLibrary	Materials	3.46	1	0
Megtron6_1035_PP	SysLibrary	Materials	3.35	1	0
Megtron6_1078_PP	SysLibrary	Materials	3.41	1	0
Megtron6_3313_Laminate	SysLibrary	Materials	3.71	1	0
Megtron6_R5755	SysLibrary	Materials	3.7	1	0
Meatron6_R5755(N)	SvsLibrarv	Materials	3.4	1	0

View/Edit Materials... Add Material... Clone Material(s) Remove Material(s) Export to Library...

確定 取消 説明

View / Edit Material

Material Name: JPP-95

Material Coordinate System Type: Cartesian

Properties of the Material

Name	Type	Value	Units
Relative Permittivity	Simple	12	
Relative Permeability	Simple	3300	
Bulk Conductivity	Simple	0.01	siemens/m
Dielectric Loss Tangent	Simple	0	
Magnetic Loss Tangent	Simple	0	
Core Loss Model		Power Ferrite	w/m^3
- Cm	Simple	0.0356933502787556	
- X	Simple	1.77813621606488	
- Y	Simple	2.6999460071468	
Mass Density	Simple	4600	kg/m^3
Composition		Solid	


View/Edit Material for

☒ Active Design
☐ Active Project
☐ All Properties

Physics:
☒ Electromagnetic
☒ Thermal
☒ Structural

View/Edit Modifier for

☐ Thermal Modifier
☐ Spatial Modifier

Material Appearance
☒ Use Material Appearance
Color: 
Transparency: 0

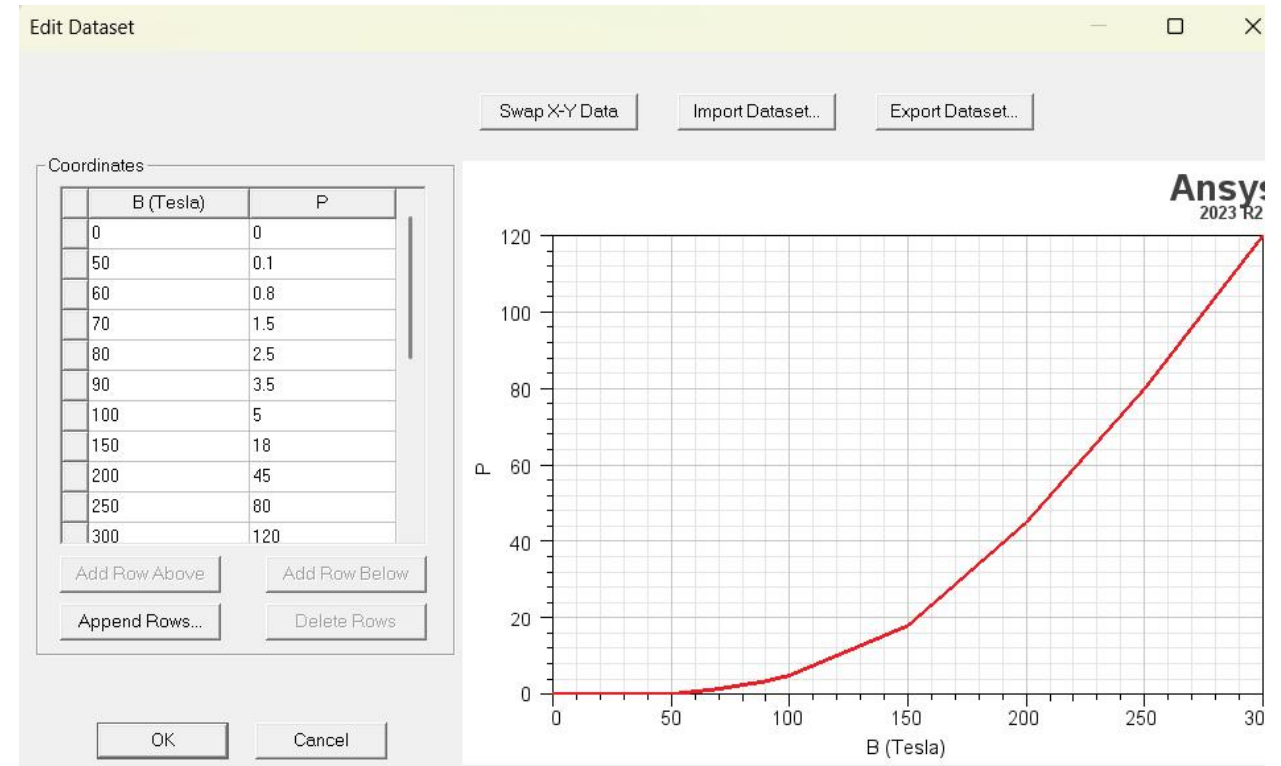
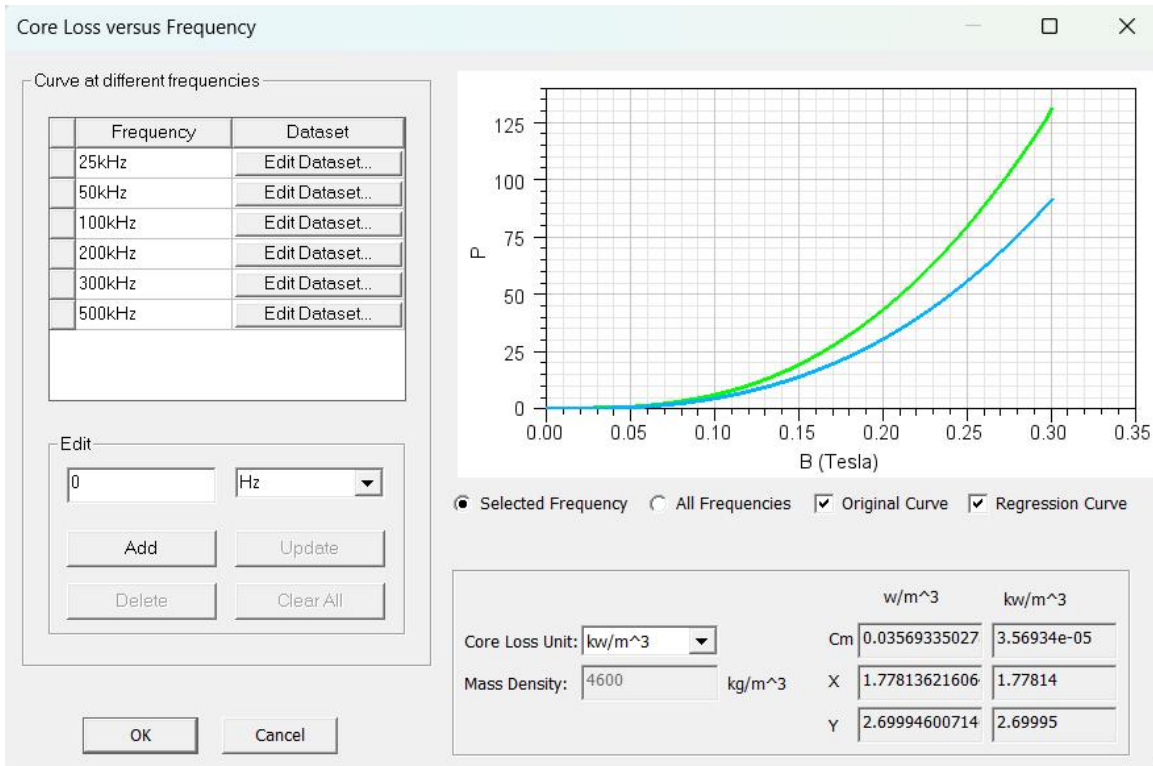
Notes

Calculate Properties for:

Reset OK Cancel

Validate Material

Core Material setting

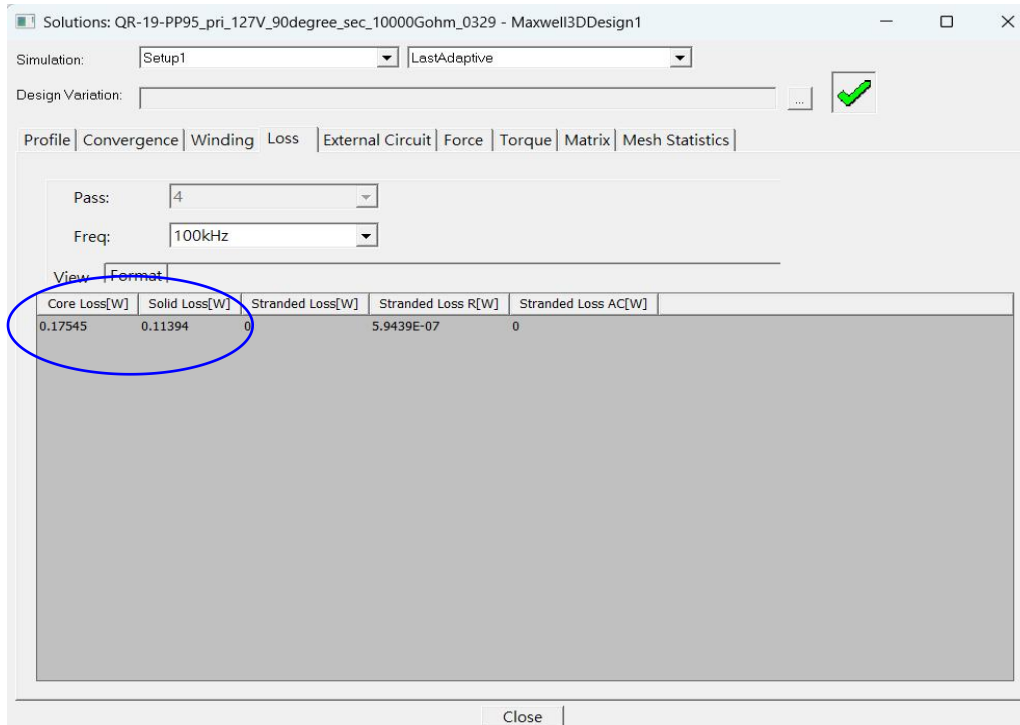


24W Flyback Magnetic Simulation - Coil & Core loss

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Coil loss: 0.11394W/ Core loss:0.1745W

Magnetic Power Loss SPEC :



Coil Loss

$$R_{dc_pri} = 1.653\text{ohm}$$

$$P_{trans_loss_wire_pri} = I_{p_max}^2 * R_{dc_p} = 1.786\text{W}$$

$$R_{dc_sec} = 0.0282\text{ohm}$$

$$P_{trans_loss_wire_pri} = I_{s_max}^2 * R_{dc_psec} = 0.17625\text{W}$$

$$\text{Total coil loss} = 1.786 + 0.17625 = 1.96225\text{W}$$

Core Loss

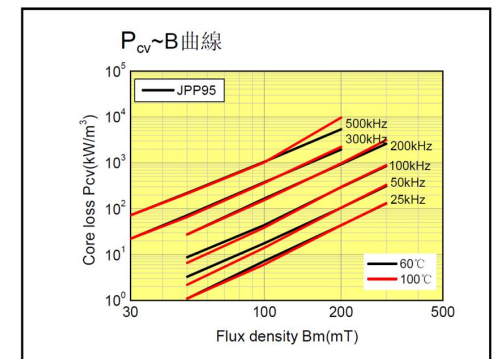
$$P_{cv} = 290 \text{ kW/m}^3$$

$$P_{loss_core} = P_{cv} * V_e$$

$$= 290 * 913$$

$$= 0.2648\text{W}$$

$$\text{Total loss} = 1.96225 + 0.2648 = 2.227\text{W}$$



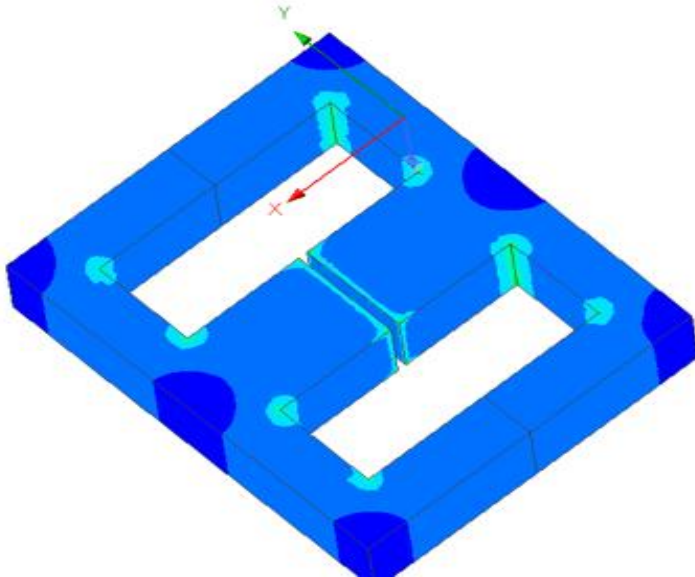
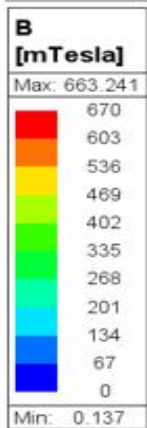
Core loss 和Coil loss模擬結果,小於計算結果

24W Flyback Magnetic Simulation - Magnetic Flux Density Distribution

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模擬值平均大約67~134mT,小於計算結果

Bmax計算結果



Magnetic flux density calculation:

$A_e = 23.3\text{mm}$ (EE19 Core)

$L_p = 554.88\mu\text{H}$

Set $B_{\text{max}} = 0.33$

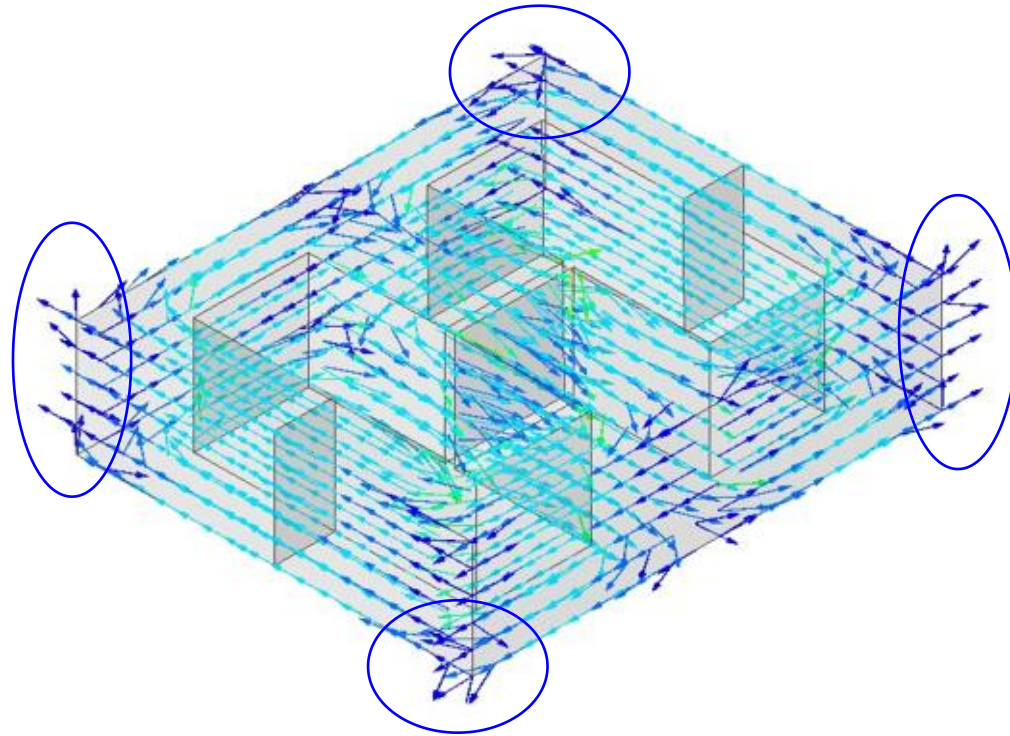
$$\begin{aligned} N_p &= L_p \cdot I_{p_max} / A_e \cdot B_{\text{max}} \\ &= 554.88 \cdot 1.0399 / 23.3 \cdot 0.33 \\ &= 81.1442 \end{aligned}$$

Select $N_p = 80$ turns

$$\begin{aligned} B_{\text{max}} &= L_p \cdot I_{p_max} \cdot 1000 / A_e \cdot N_p \\ &= 554.88 \cdot 1.0399 \cdot 1000 / 23.3 \cdot 80 \\ &= 334.7198 \text{ mT} \end{aligned}$$

24W Flyback Magnetic Simulation - Flux Flow Direction

磁性材料的間斷處,磁力線外露嚴重



24W Flyback Magnetic Simulation - QA

1. 鐵損和銅損模擬結果小於計算值有差異
2. 磁通分佈模擬結果小於計算值
3. 如何分析磁向量磁力線外露

A low-angle photograph of a modern glass skyscraper against a clear blue sky. The building's facade is composed of a grid of dark-framed windows. In the foreground, a stone-clad base of the building features a logo and Chinese text. The image is overlaid with a dark blue geometric shape and a pattern of small, light blue squares. The words "Thank You" are written in a large, blue, italicized font across the center of the image.

Thank You

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