

CWS COILS Inc

Power Loss calculator

Based on the core details the calculator can provide Core Loss for DC and AC.

The calculator link is [Power Loss Calculator](#).

Here is the guide for Calculator

Input details

Part # - this carryover from the website

METHOD 1

ENTER REQUIRED INDUCTANCE OR

METHOD 2

ENTER WAVEFORM DETAILS

METHOD 1

ENTER REQUIRED INDUCTANCE

1. RMS CURRENT (I_{rms}) A
2. Iripple
3. Freq
4. Required Inductance

METHOD 2

ENTER WAVEFORM DETAILS

1. RMS CURRENT (I_{rms}) A
2. Freq (kHz)
3. Voltage input (V_{in}),
4. Voltage output (V_o),
5. Ripple voltage (V_{ripple}),
6. Voltage drop at switch (V_{sw}) (default 1.5V)
7. Voltage drop Diode (forward voltage drop) V_d (default 0.5V)

Assumption:

- Approximate Calculation for Buck converter.
- For the loop stability reason – output capacitor should have resistance of > 100 mOhms.
- No LC post filter
- Ripple current is assumed as $I_{peak} = I_{rms} + (Ripple\ A)/2$ Amps

Backend table for the calculator has all the details – core part #, cc, L_e , cross section, core power loss formula.

Output Results

Winding Loss (W) =

Core loss Dc (W) =

Core Loss AC (W) =

Required Inductance (μH) =

I_{peak} current (A) =

References:

Core loss calculation referred from core manufacturer catalog.

Waveform calculation is based on the Texas Instrument Inductor design guide.

Disclaimer:

- Power Loss Calculator is an effective tool for evaluating product performance; however, it does not calculate product performance in all test environments and is not intended to be a replacement for actual device testing by means of a test board or otherwise.
- Calculation results are for reference purposes only; CUSTOMER shall perform thorough testing using the actual device.

Example

Part # ES55246-341M-27AH

L = 340 uH; I rated: 27A ; DCR 13.50 mOhms. Core: Sen dust

Step: 1

Click the Power Loss calculator from the product table

http://www.coilws.com/index.php?main_page=index&cPath=208_212_229_113

Part Number	Inductance	Current Rating (Amps)	Inductance @ 25 Amps DC Bias	DCR Max (milli-Ohms)	Dimension: Length x Width x Height mm	Core Material	L (uH) @ DC Bias (Amps)	SolidWorks Model	Thermal Model	Power Loss
ES55246-341M-27AH	340.00 uH	27 Amps	129.1 uH	13.50 milli Ohms	58.0 x 58.0 x 35.0	Sendust	120.0 uH @27A	SolidWorks Model	Thermal Model	Power Loss

Step: 2

Select the part # from the drop down menu and click "select"

The screenshot shows the 'Core Loss Calculator' interface. At the top, there is a blue header with the CWS logo and the text 'Core Loss Calculator'. A green button with 'coilws.com' is located in the top right corner. Below the header, a grey box contains the instruction 'Please Select the Part Number' and a dropdown menu with 'ES55246-341M-27AH' selected. A blue 'Submit' button is positioned below the dropdown. At the bottom of the interface, a white box contains a graph illustrating current waveforms. The graph shows two modes: 'CONTINUOUS MODE (I₀ = MAX LOAD)' and 'DISCONTINUOUS MODE (CRITICAL BOUNDARY)'. The continuous mode waveform is a triangular wave with a peak current I_{PEAK} and a trough current I_{TROUGH} , with a ripple of $\Delta I/2$. The discontinuous mode waveform is similar but includes a zero-current interval. The graph also indicates the maximum current I_{CLIM} and the DC current $I_{DC} = I_0$.

Step: 3

In the screen below select the one of the option

Method #1 : "ENTER REQUIRED INDUCTANCE" Or **Method # 2**: ENTER WAVEFORM DETAILS.

Core Loss Calculator

Part Number: **ES55246-341M-27AH**

Please Enter Inductor Data OR Wave Form Data

ENTER REQUIRED INDUCTANCE ENTER WAVEFORM DETAILS

Current RMS (I_{rms}) A Ripple Current (Δ) A Frequency (kHz)

Current (A) Ripple Current (Δ) Frequency (kHz)

Req Inductance (uH)

Inductance (uH)

Submit

Result

Winding Loss: (W)
Core Loss DC: (W)
Core Loss AC: (W)
Req Inductance: (uH)
Peak Current: (A)

Print

Step #4: Method 1:

Refer the datasheet for the Inductance, I rated e.g in this case part # ES55246-341M-27AH is 340uH, 27A.

Enter required inductor frequency from data sheet or from design, ripple current. Click Submit for the values.

Core Loss Calculator

Part Number: **ES55246-341M-27AH**

Please Enter Inductor Data OR Wave Form Data

ENTER REQUIRED INDUCTANCE ENTER WAVEFORM DETAILS

Current RMS (I_{rms}) A Ripple Current (Δ) A Frequency (kHz)

27 10 10

Req Inductance (uH)

340

Submit

Result

Winding Loss: **9.8415(W)**
Core Loss DC: **2.1631(W)**
Core Loss AC: **9.9876(W)**
Req Inductance: **340.00(uH)**
Peak Current: **32.00(A)**

Print

Backend table for the calculator has all the core parameters, core loss formula based on the data given by core manufacturer.

- END FOR METHOD 1--

Method 2: Waveform Details: Enter the input details as shown below. Refer the data sheet for the I RMS.

Core Loss Calculator
Reset
coilvs.com
Calc Guide
Home

Part Number: **ES55246-341M-27AH**

Please Enter Inductor Data OR Wave Form Data

ENTER REQUIRED INDUCTANCE
 ENTER WAVEFORM DETAILS

Inductor current RMS (I _{rms}) A <input type="text" value="current RMS (I<sub>rms</sub>)"/>	Frequency (kHz) <input type="text" value="Frequency (kHz)"/>	Voltage input (V _{in}) V <input type="text" value="Voltage input (V<sub>in</sub>)"/>
Voltage output (V _o) V <input type="text" value="Voltage output (V<sub>o</sub>)"/>	Output current Max (I _o) A <input type="text" value="current Max (I<sub>o</sub>)"/>	Ripple voltage (V _{ripple}) mV <input type="text" value="Ripple voltage (V<sub>ripple</sub>)"/>
Voltage drop at switch (V _{sw}) V <input type="text" value="1.5"/>	Voltage drop Diode (forward voltage drop) (V _d) V <input type="text" value="0.5"/>	

Submit

Assumption:

- Approximate Calculation for Buck converter.
- For the loop stability reason – output capacitor should have resistance of > 100 mOhms.
- No LC post filter

Result

Winding Loss: (W)

Core Loss DC: (W)

Core Loss AC: (W)

Req Inductance: (uH)

Peak Current: (A)

Print

I RMS: Inductor rated current (Refer Datasheet)

Freq : Switching Freq of Power Supply

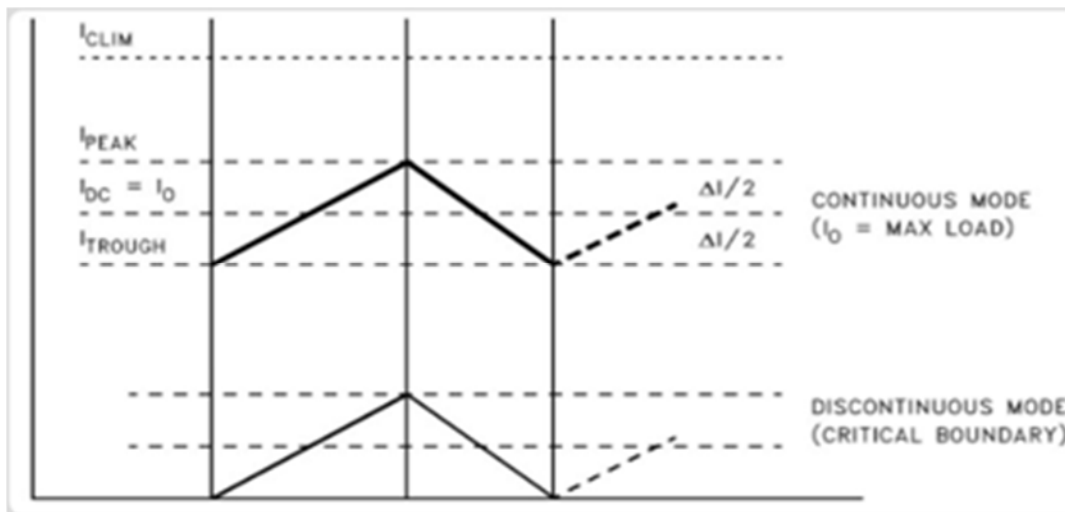
V_{in}: Input voltage DC

V_o: Output Voltage DC

V_{ripple}: Ripple voltage in mV

V_{sw}: Voltage drop at switch (default: 1.5V)

V_D: Voltage drop at Diode (default 0.5V)



Example from the Texas Instrument guide for buck convertor mode calculation.

Input DC voltage 24 V
Output Dc Voltage 12 V
Output Max Load 1A
Voltage ripple 30mV Peak-Peak
Vsw (assume) 1.5 V
V_D 0.5V
Freq 150 kHz

Calculation method
I Peak = I_{rms} + $\Delta I / 2$

The required inductance is:

$$L = \frac{(24 - 1.5 - 12) \times (12 + 0.5)}{(24 - 1.5 + 0.5) \times 0.3 \times 150000 \times 1.0} \times 10^6 \mu\text{H}$$

L = 127 μH

Enter the Value as below and click 'Submit' for result.

Core Loss Calculator [Reset](#) [coilws.com](#) [Calc Guide](#) [Home](#)

Part Number: **ES55246-341M-27AH**

Please Enter Inductor Data OR Wave Form Data

ENTER REQUIRED INDUCTANCE ENTER WAVEFORM DETAILS

Inductor current RMS (I _{rms}) A	Frequency (kHz)	Voltage input (V _{in}) V
<input type="text" value="27"/>	<input type="text" value="150"/>	<input type="text" value="24"/>
Voltage output (V _o) V	Output current Max (I _o) A	Ripple voltage (V _{ripple}) mV
<input type="text" value="12"/>	<input type="text" value="1"/>	<input type="text" value="30"/>
Voltage drop at switch (V _{sw}) V	Voltage drop Diode (forward voltage drop) (V _d) V	
<input type="text" value="1.5"/>	<input type="text" value="0.5"/>	

Assumption:

- Approximate Calculation for Buck converter.
- For the loop stability reason – output capacitor should have resistance of > 100 mOhms.
- No LC post filter

Result

Winding Loss: **9.8415(W)**
Core Loss DC: **0.0026(W)**
Core Loss AC: **0.0119(W)**
Req Inductance: **126.81(uH)**
Peak Current: **27.15(A)**

-END FOR METHOD 2-