

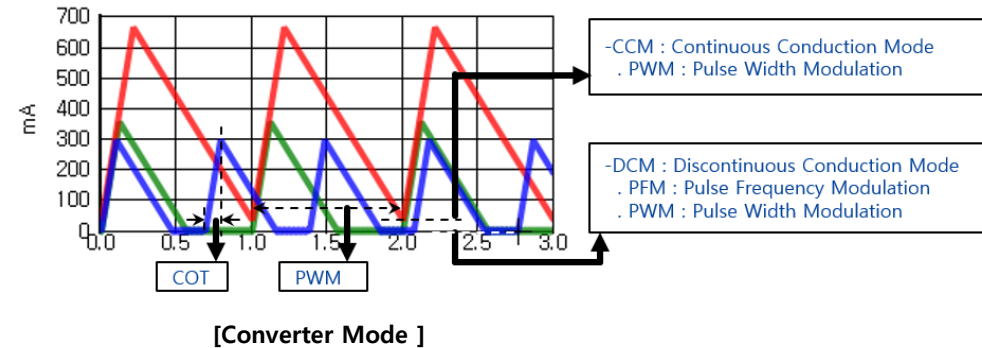


# User Guide for Inductor Calculation Tool

Aug. 2025

### ■ Simulate customer environments

- DCM ( PFM / PWM ) , CCM ( PWM )
- Buck( +Coupled ) / Boost / BuckBoost
- Variable COT ( Constant On Time )
- Custom waveform (with raw data file)



### ■ Visualization of voltage/current applied to Power Inductor.

- Voltage level plot
- Current level plot

### ■ Display current FFT , calculates DCR/ACR losses

- FFT level plot of current
- Loss graph separated by DCR and ACR

- Windows OS / Mac OS

- Download link : [https://weplib.samsungsem.com/pi/inductor\\_calculation\\_tool.do](https://weplib.samsungsem.com/pi/inductor_calculation_tool.do)
- Click on the link that corresponds to your OS and Download the executable file.



- The first screen may take 1-2min to load, depending on your PC's specifications.

## ■ Select converter topology

- 1phase buck / 2phase Buck(PWM) / Boost / BuckBoost

1 Phase Buck	2 Phase Buck (PWM)	Boost	BuckBoost
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## ■ Enter converter parameters

- Vin / Vout / Iout / Constant on Time or Fsw

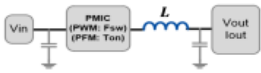
## ■ Enter inductor parameters

- L, Rdc, Steinmetz coefficient(k, a, b)

## ■ Click 'apply' button

Apply

### [ Converter parameter ]



Vin [V]

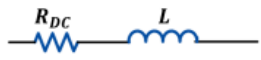
Vout [V]

Iout [mA]

Constant on time(PFM) [ns]

Fsw(PWM) [MHz]

### [ Inductor parameter ]



Core-loss :  $k * (f)^a * (I_{AC})^b$

L [uH]

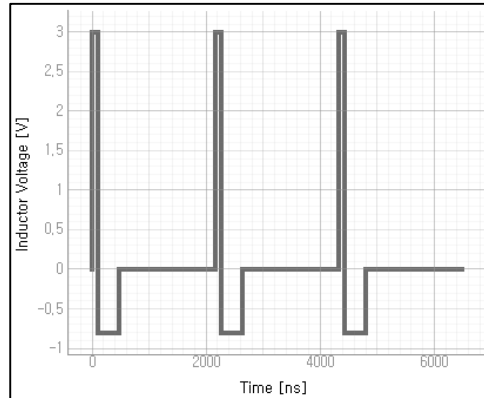
Rdc [mΩ]

Steinmetz 'k' [ $10^{-13}$ ]

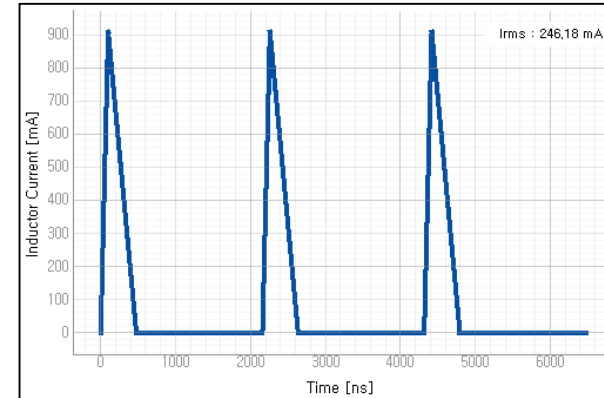
Steinmetz 'a'

Steinmetz 'b'

## Time domain Inductor Voltage / Current waveform



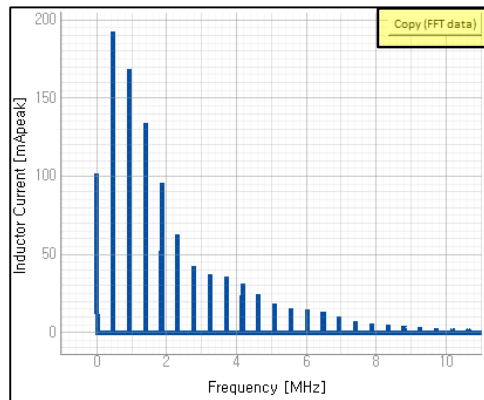
[Voltage]



[Current]

\* FT : Fourier Transform

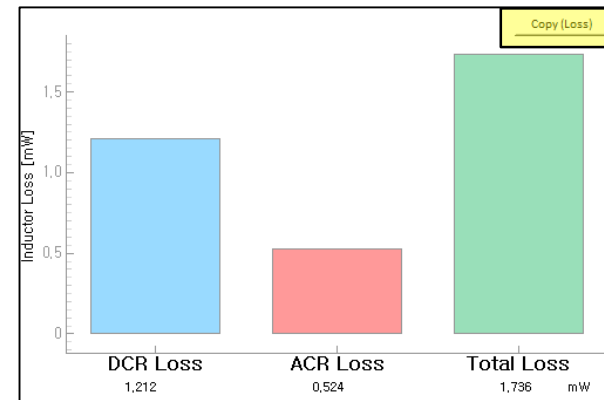
## Frequency domain Inductor Current graph (FT) and DCR/ACR Loss



[Current- FFT]

Copy (FFT data)

Current @ Freq.	
Freq[MHz]	Value[mApeak]
0	99.9999
0.4632	191.3044
0.9263	167.0272
1.3895	132.2026
1.8526	94.0876
2.3158	61.0634
2.7789	41.323
3.2421	36.0386
3.7053	34.632
4.1684	30.1282
4.6316	23.0254
5.0947	16.7724
5.5579	14.0362
6.0211	13.2598
6.4842	11.6426
6.9474	9.7344



[Loss]

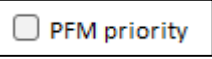
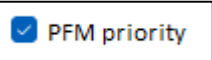
Copy (Loss)

Loss @ Freq.	
Freq[MHz]	Loss[mW]
0	0
0.4632	0.048813379
0.9263	0.10055278
1.3895	0.10934401
1.8526	0.079153757
2.3158	0.042558851
2.7789	0.023618237
3.2421	0.021947355
3.7053	0.024481176
4.1684	0.021444469
4.6316	0.013878572
5.0947	0.007964612
5.5579	0.006123588
6.0211	0.006080608
6.4842	0.005097064
6.9474	0.003002004

# Appendix. Mode selection & Importing CSV data

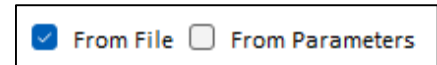
## ■ Selecting the priority mode : PFM or PWM

- PFM priority : frequency drift at different light loads and Fixed frequency in CCM
- PWM : operation at a constant frequency regardless of load



## ■ How to import raw data(CSV)

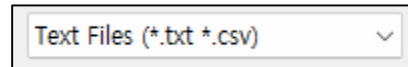
- From File : operation based on raw data



- Method : click the "File" – "Open" menu.

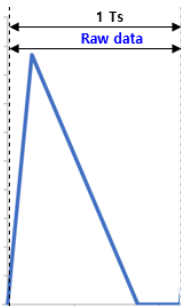


- Format : ".csv" or ".txt"

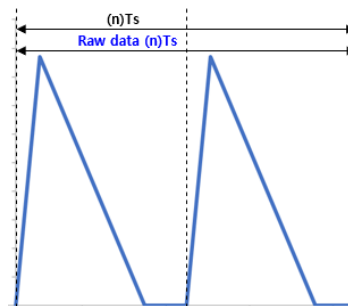


- **CAUTION** : The imported data must be matched to (n)Ts cycle.

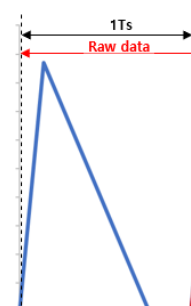
If not, it may produce incorrect results during FFT conversion and loss calculation.



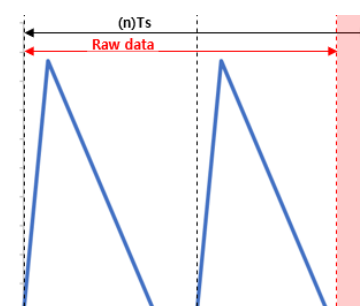
[OK Example]



[OK Example]



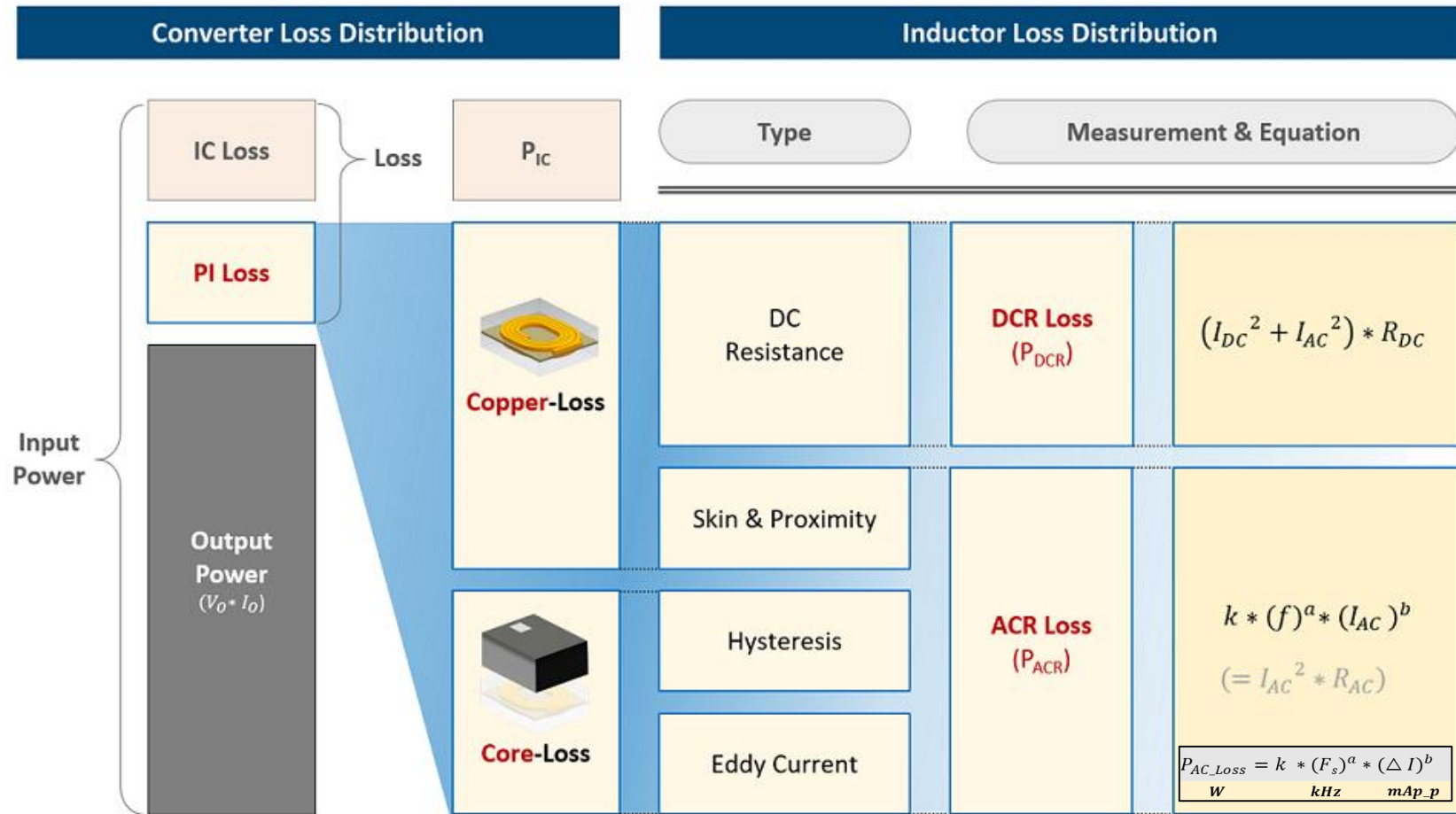
[N.G. Example]



[N.G. Example]

# Appendix. Inductor loss

## Detailed Inductor Loss Analysis under Converter Conditions



# Appendix. Troubleshooting

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## ▪ Mac OS Troubleshooting

- **Issue : Downloaded executable program file is not running on MacOS**
- **Cause Analysis : The program may not have execute permissions or may be quarantined by the system.**
- **Solution :**

( The following commands can be entered in the terminal.)



- Run below command to grant execute permission to the program.

```
% chmod +x ./<File name>
```

- Run the command to remove the quarantine attribute from the program.

```
% xattr -d com.apple.quarantine ./<File name>
```