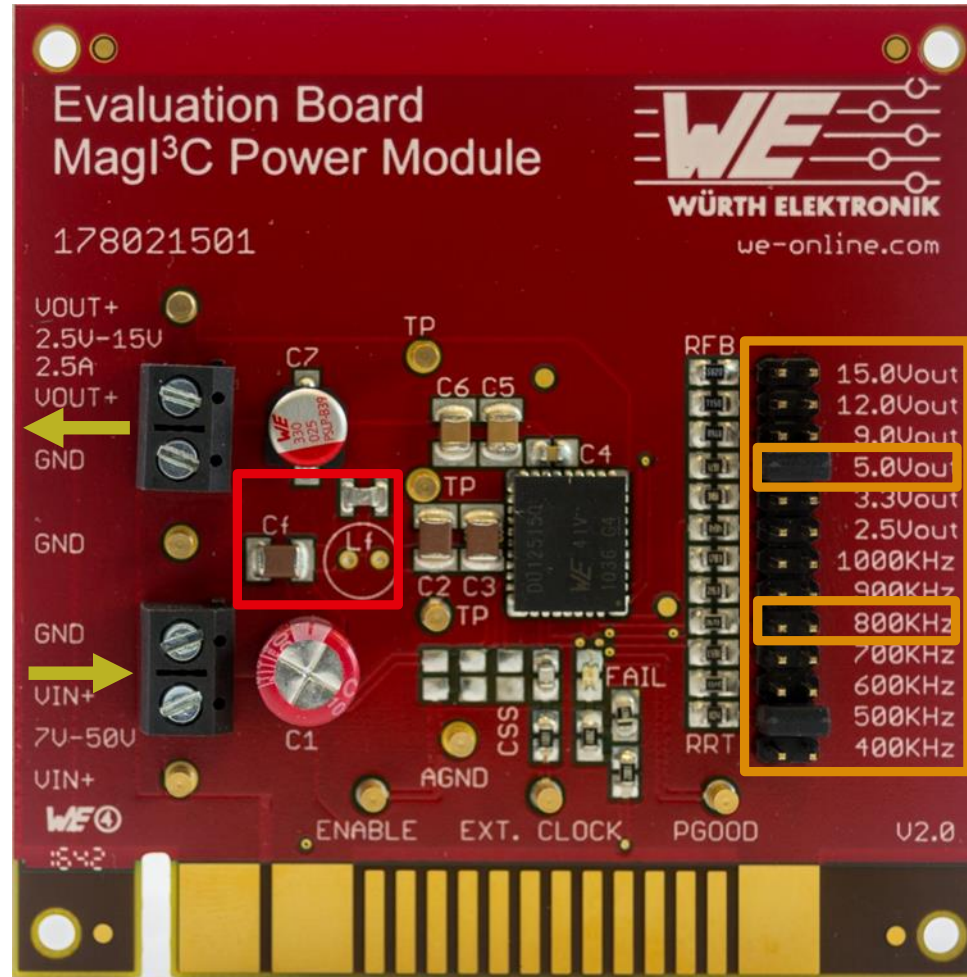


DEMO EVAL BOARD

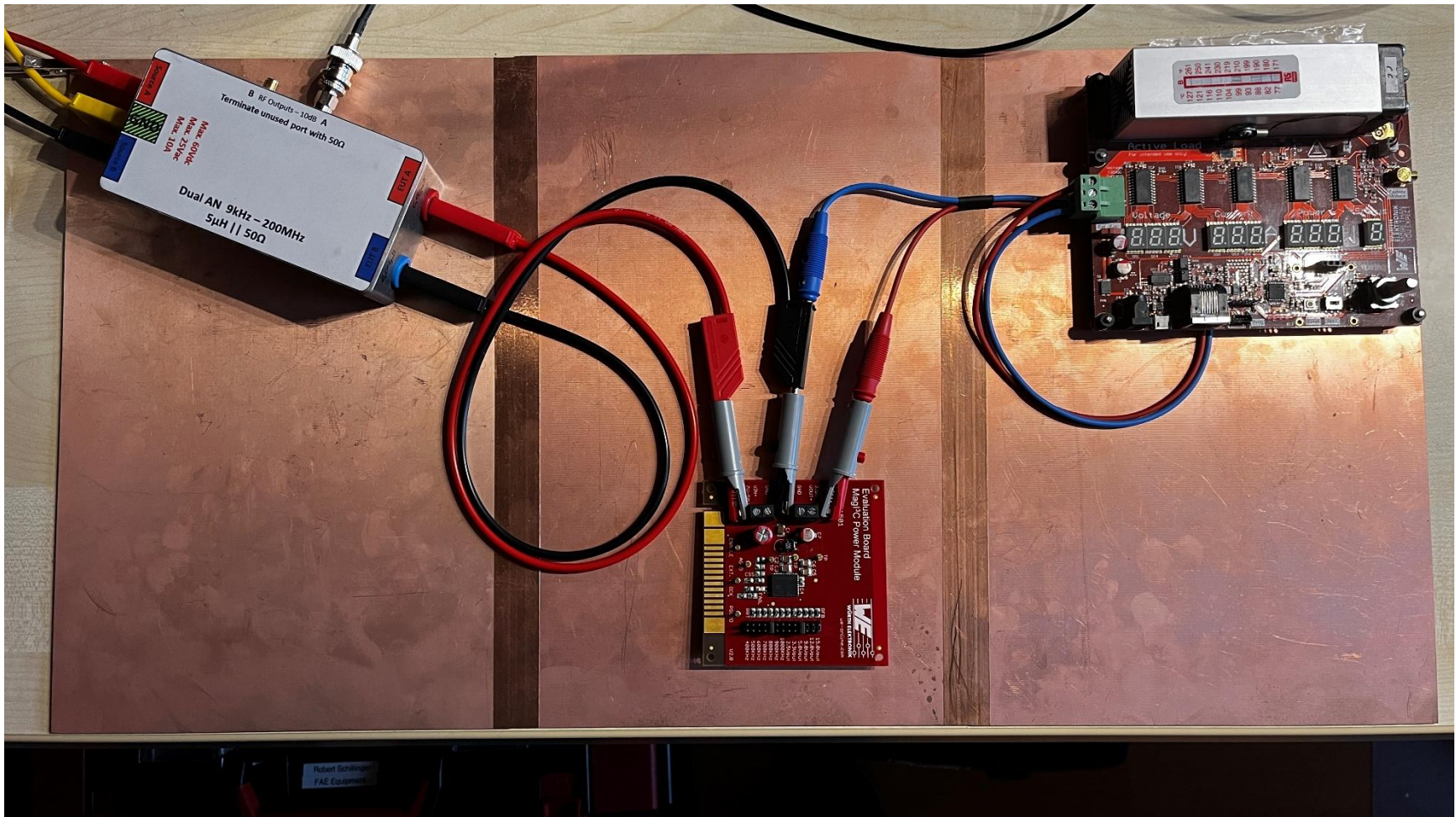
VDRM QFN-41

Output: 2.5V-15V@2.5A

Input: 7V-50V

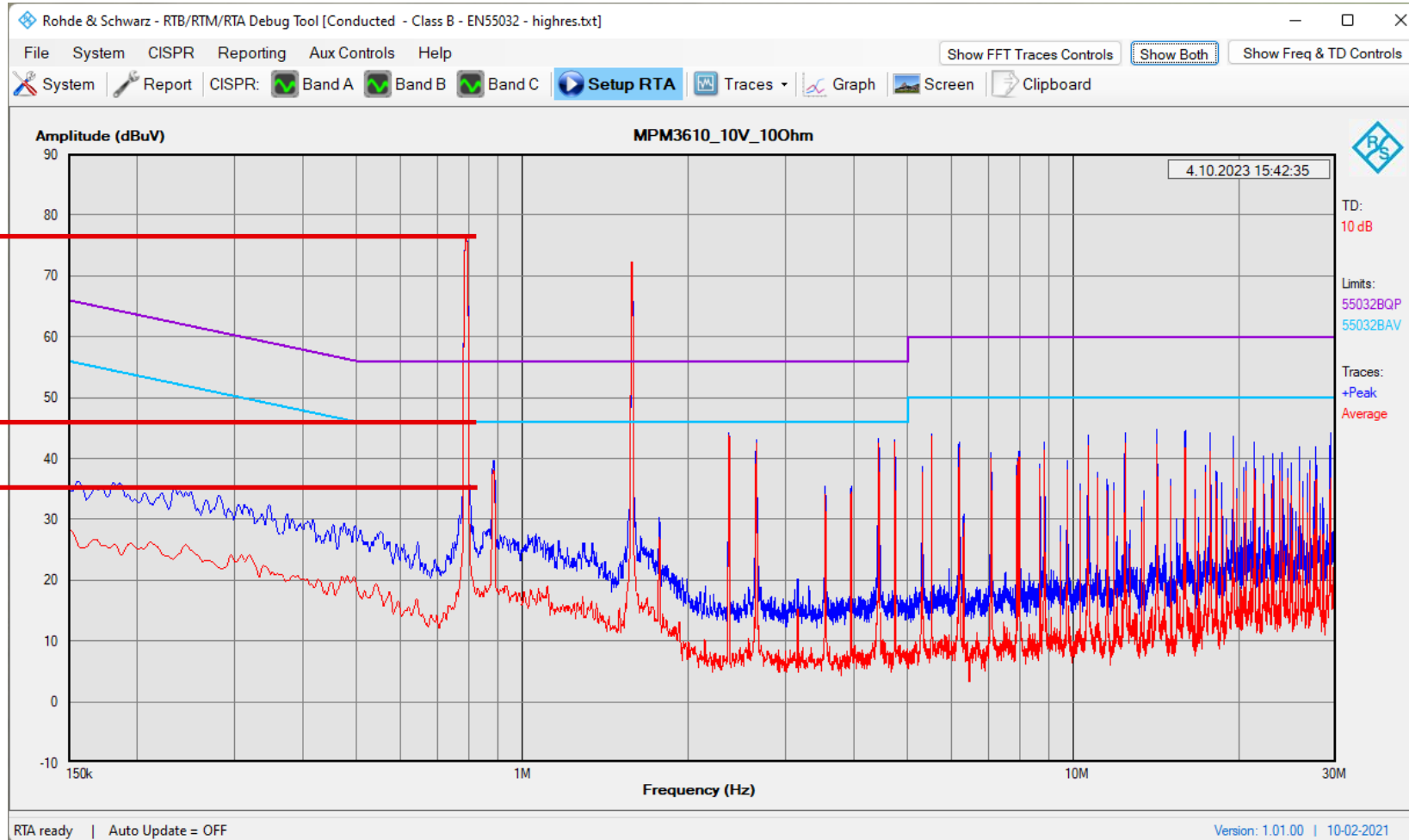


Configuration area for output voltage and switching frequency



DEMO EVAL BOARD

Conducted emissions without filters



76dBuV@800kHz

46dBuV avg. limit

36dBuV target

FILTER DESIGNER



From lab to desk
in seconds with
REDEXPERT

< Design Tools

- EMI Filter Designer
- Impedance Finder for PCB Ferrites
- Pulse Current for PCB-Ferrites

PARAMETERS

SELECTION AND SIMULATION

SUMMARY

NEXT >

EMI Filter Designer for differential mode:

Use this application to design a discrete electronic EMI filter for conducted differential noise, for example from your DC-DC converter, and evaluate the realistic response based on real components.

Project's Title:

Title
My EMI Filter project

Input parameters:

Operating voltage 12 V Operating current 0.5 A

Load / LISN impedance 50 Ω Noise source impedance 0.1 Ω

Cut-off frequency
 100 kHz

Attenuation 35 dB at Frequency 350 kHz

Topology:

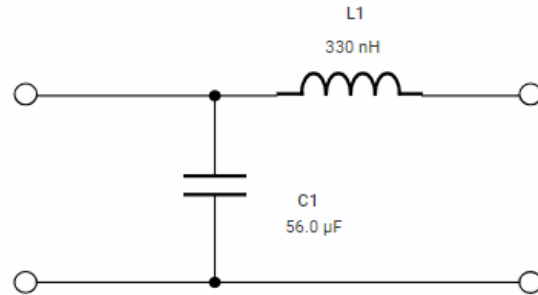
Topology selection grid:

- LC:
 LC
- RECOMMENDED CL:
 CL
- Pi:
 Pi
- T-Filter:
 T-Filter
- 4th-Order LC-LC:
 4th-Order LC-LC
- 4th-Order CL-CL:
 4th-Order CL-CL

System impedance is important for power transfer

Input parameters determine recommended topology

My EMI Filter project



Selected real components

C1		56.0 µF	63.0 V	3.90 mΩ	
L1		330 nH	800 mA	0.160 Ω	

Details

Calculated C1 Capacitance

48.3 µF

Calculated L1 Inductance

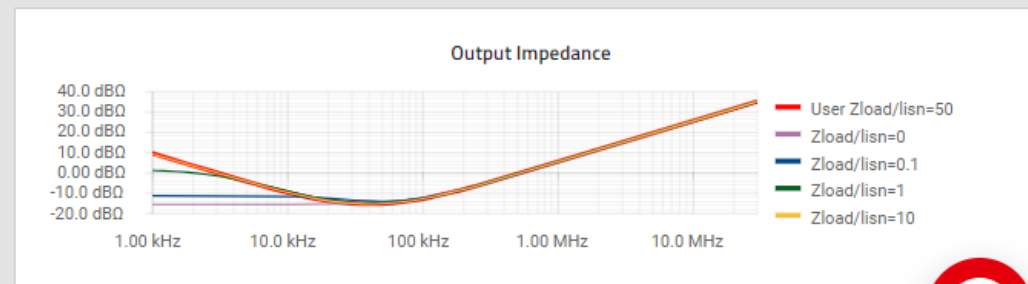
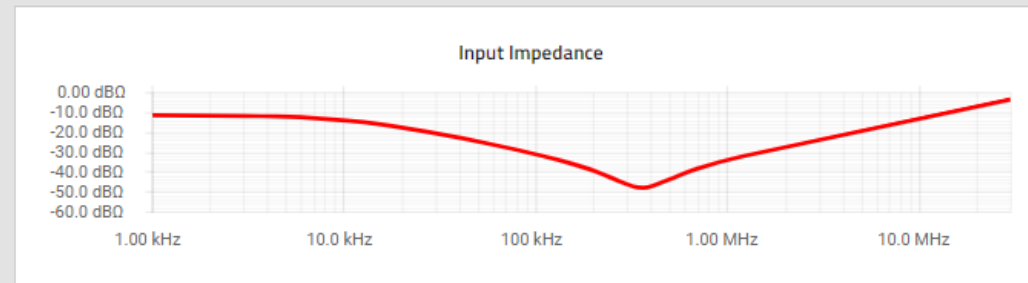
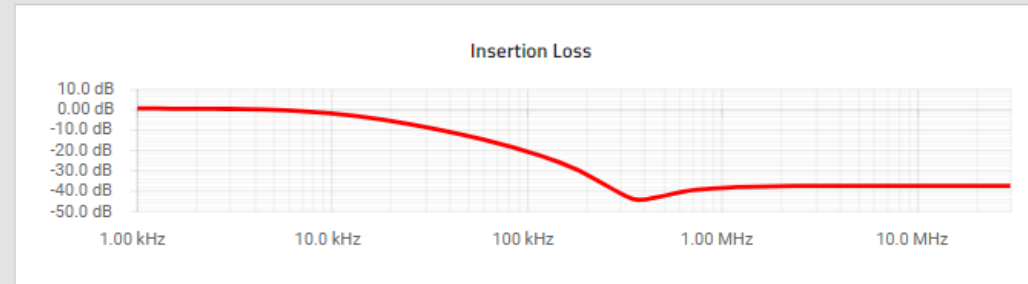
241 nH

Insertion Loss

-44.3 dB@350 kHz

Calculated ideal components

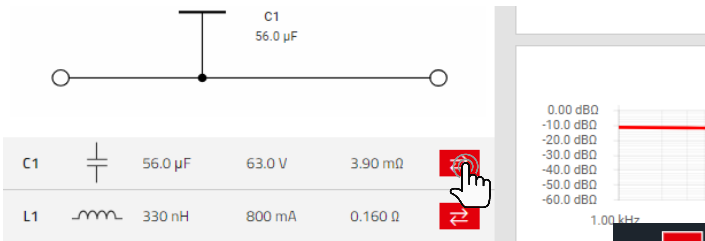
Achieved attenuation at frequency with real components



The component selection is based on the ideal component model. The filter details and response charts show the parasitics of the real component equivalent model. Tip: If the required attenuation is not achieved, reduce the cutoff frequency, select the next bigger component value or manually select a component.

Simulation with real components

Output impedance is important for stability with SMPS



Details

Calculated C1 Capacitance

Insertion Loss

Choose another recommended component

Inspect DC-bias capacitance and other parameters

WÜRTH ELEKTRONIK **REDEXPERT** Filter Designer 🛒 👤 ☰ MENU

PARAMETERS SELECTION AND SIMULATION SUMMARY [GET SUMMARY >](#)

HIGHLIGHTED ITEM REPLACES C1 [ADD MORE](#)

	C	C@5.00 V	Assy	ESR	V _R	Footprint	H	T _{MAX}	Att@200 kHz
<input checked="" type="checkbox"/>	47.0 µF	33.3 µF	SMT	2.31 mΩ	6.30 V	8.00 mm ²	2.50 mm	85.0 °C	-22.9 dB
<input type="checkbox"/>	47.0 µF	33.8 µF	SMT	2.10 mΩ	10.0 V	8.00 mm ²	2.50 mm	85.0 °C	-23.1 dB
<input type="checkbox"/>	47.0 µF	37.3 µF	SMT	2.26 mΩ	16.0 V	8.00 mm ²	2.50 mm	85.0 °C	-24.0 dB
<input type="checkbox"/>	33.0 µF	33.0 µF	THT	4.90 mΩ	63.0 V	78.5 mm ²	10.0 mm	105 °C	-24.1 dB
<input type="checkbox"/>	33.0 µF	33.0 µF	THT	5.20 mΩ	63.0 V	78.5 mm ²	10.0 mm	125 °C	-24.4 dB

Compare achieved attenuation



i The component selection is based on the ideal component model. The filter details and response include parasitics of the real component equivalent model. Tip: If the required attenuation is not achieved, reduce the cutoff frequency, select the next bigger component value or manually select a component.

SELECTION AND SIMULATION

ADD MORE

T_{MAX} Att @ 350 kHz

125 °C -41.1 dB

10.0 dB
0.00 dB
-10.0 dB
-20.0 dB

Add a part from complete portfolio

Search part with custom filters

WÜRTH ELEKTRONIK REDEXPERT Components

Rated Voltage = [5.00 V, 3.00 kV] Capacitance = [47.0 µF, 220 µF] Assembling Technology = SMT

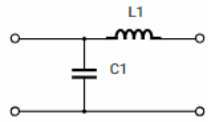
ADD 2 SELECTED TO FILTER DESIGNER

Adding Filters	P/N ↑	C	Assy	DF	V _R	Series	H	T _{MAX}	T _{MIN}	Size	ESR	Footprint	RMS	L	W
Part Number	86506014200347.0 µF	47 µF	SMT	22.0%	6.30 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	5.30 mm	0.610 Ω	28.1 mm ²		5.30 mm	5.30 mm
Capacitance	865060143004100 µF	100 µF	SMT	22.0%	6.30 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	6.60 mm	0.520 Ω	43.6 mm ²		6.60 mm	6.60 mm
Assembling Technology	865060143005150 µF	150 µF	SMT	22.0%	6.30 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	6.60 mm	0.430 Ω	43.6 mm ²		6.60 mm	6.60 mm
SMT	865060145006220 µF	220 µF	SMT	22.0%	6.30 V	WCAP-ASLL	7.70 mm	105 °C	-55.0 °C	6.60 mm	0.251 Ω	43.6 mm ²		6.60 mm	6.60 mm
Screw Type	86506024300347.0 µF	47 µF	SMT	19.0%	10.0 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	6.60 mm	0.330 Ω	43.6 mm ²		6.60 mm	6.60 mm
Snap-In	865060243004100 µF	100 µF	SMT	19.0%	10.0 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	6.60 mm	0.480 Ω	43.6 mm ²		6.60 mm	6.60 mm
THT	865060243005150 µF	150 µF	SMT	19.0%	10.0 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	6.60 mm	0.490 Ω	43.6 mm ²		6.60 mm	6.60 mm
Rated Voltage	865060245006220 µF	220 µF	SMT	19.0%	10.0 V	WCAP-ASLL	7.70 mm	105 °C	-55.0 °C	6.60 mm	0.377 Ω	43.6 mm ²		6.60 mm	6.60 mm
Product Series	86506034300447.0 µF	47 µF	SMT	16.0%	16.0 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	6.60 mm	0.358 Ω	43.6 mm ²		6.60 mm	6.60 mm
	865060343005100 µF	100 µF	SMT	16.0%	16.0 V	WCAP-ASLL	5.50 mm	105 °C	-55.0 °C	6.60 mm	0.290 Ω	43.6 mm ²		6.60 mm	6.60 mm
	865060345006150 µF	150 µF	SMT	16.0%	16.0 V	WCAP-ASLL	7.70 mm	105 °C	-55.0 °C	6.60 mm	0.233 Ω	43.6 mm ²		6.60 mm	6.60 mm

Add selected parts to simulation

Print result to paper or PDF

Circuit Schematic



Specifications [Edit](#)

"My EMI Filter project"

TYPE: CL
 V_{op}: 5.00 V
 I_{op}: 200 mA
 LOAD / LISN IMPEDANCE: 50.0 Ω
 NOISE SOURCE IMPEDANCE: 100 mΩ
 ILOSS -22.9 dB@200 kHz

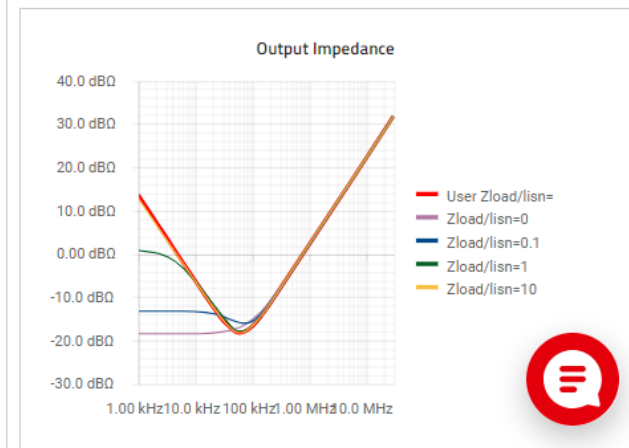
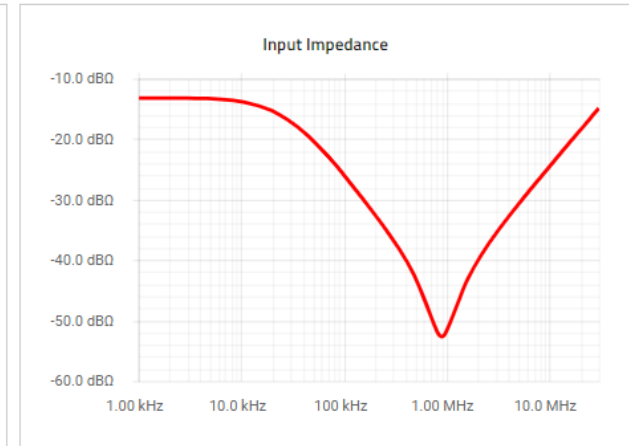
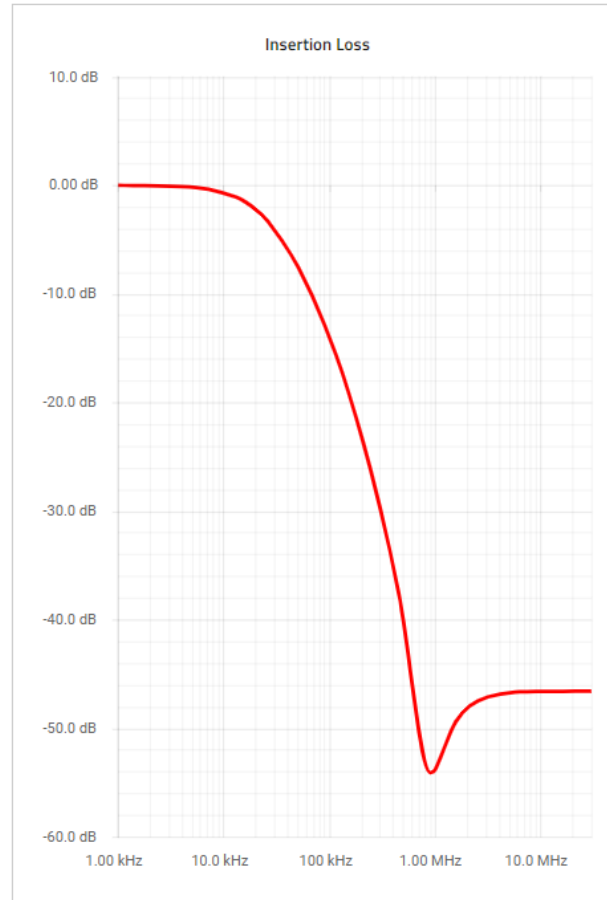
Bill of Materials

 ADD

#	Mat...	Order Code	Value	Properties	Qty
1.	C1	885012109003	47.0 μF	Assembling Technology = SMT Capacitance = 47.0 μF Rated Voltage = 6.30 V Height = 2.50 mm	1
	L1	74479762122	220 nH	Inductance = 220 nH Rated Current = 900 mA	1

Add part to basket for free samples or sending via clipboard

Simulation Responses



EMI FILTER DESIGNER

Demo eval board

REDEXPERT Filter Designer

PARAMETERS SELECTION AND SIMULATION **SUMMARY**

Circuit Schematic

Specifications [Edit](#)

"178021501_800kHz"

TYPE: CL
V_{opt}: 24.0 V
I_{opt}: 2.00 A
LOAD / LISN IMPEDANCE: 100 Ω
NOISE SOURCE IMPEDANCE: 100 mΩ
ILOSS: -19.3 dB@80.0 kHz

Bill Of Materials [ADD](#)

#	N...	Order Code	Value	Properties	Qty
1.	C1	885012209071	2.20 μF	Assembling Technology = SMT Capacitance = 2.20 μF Rated Voltage = 100 V Height = 2.50 mm	1
2.	L1	744776122	22.0 μH	Inductance = 22.0 μH Rated Current = 2.04 A	1

Simulation Responses

Insertion Loss

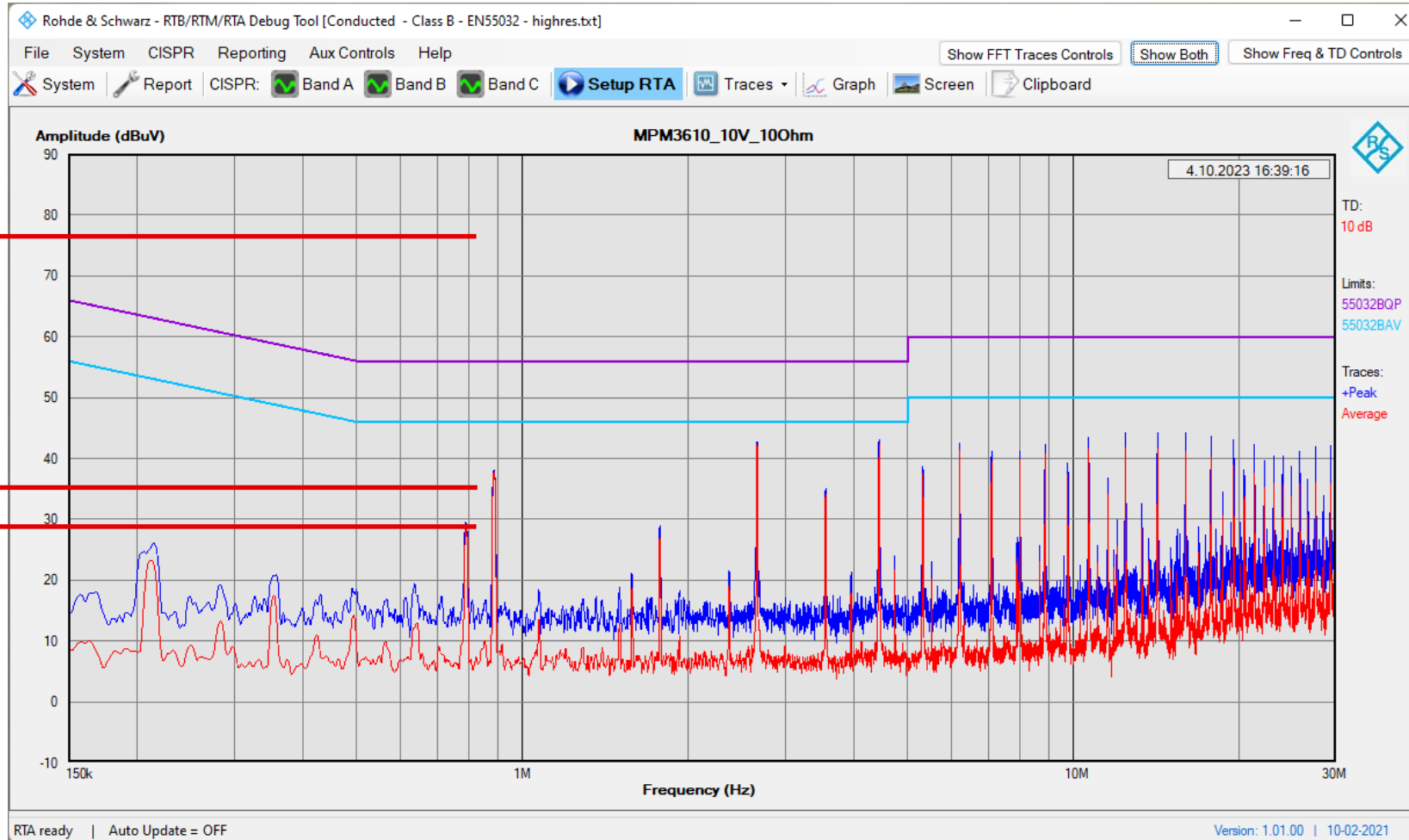
Input Impedance

Output Impedance

- User Zload/lisn=
- Zload/lisn=0
- Zload/lisn=0.1
- Zload/lisn=1
- Zload/lisn=10

DEMO EVAL BOARD

Conducted emissions with filters



76dBuV@800kHz

36dBuV target
28dBuV with filters

