FCC PLC HIGH PASS FILTER

1 Introduction

The TBHPF1-500kHz is a high pass filter customized for conducted emission measurements of powerline communication modems, which operate in the FCC PLC band from 10 kHz to 490 kHz. PLC signals can cause saturation of the measurement receiver and need to be suppressed at the LISN output. A 13th order Cauer filter achieves good suppression in the stop band and a very steep slope.
The filter has a passband from 500 kHz to 30 MHz. It is equipped with a 5dB attenuator on each side in order to provide a good 50 Ohm termination of the LISN.

2 Specification

Filter topology:	High Pass Filter, symmetric, 50 Ohm, 13th order Cauer
Attenuator:	Integrated; 2 x 5 dB
Nominal frequency range:	9 kHz – 30 MHz
3dB bandwidth:	540 kHz – 70 MHz
Stopband suppression:	9 kHz – 450 kHz < 60 dB (70 dB including attenuator), typ.
Input return loss, S11 (S22):	500 kHz – 30 MHz: < -20 dB, typ.
Impedance:	500kHz – 30 MHz: 50 Ω ± 10%, typ.
$IP3_{out}$:	f1 = 350 kHz, f2 = 400 kHz: +44 dBm, typ.
Filter capacitor voltage rating:	100V
Maximum input power:	10W
Connectors:	N-Female
Dimensions:	80 x 35 x 150 mm
Weight:	350g

RoHS

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3 Frequency response

Typical data, 50 Ohm system:

Frequency [kHz]	Attenuation [dB]	Frequency [kHz]	Attenuation [dB]	Frequency [MHz]	Attenuation [dB]
< 9	< -85	380	-83,69	1	-10,20
9	-93,81	390	-78,42	2	-9,96
10	-93,60	400	-72,06	4	-9,90
20	-98,32	410	-70,09	6	-9,89
30	-100,32	420	-71,28	8	-9,89
40	-98,82	430	-73,05	10	-9,90
50	-96,71	440	-72,29	12	-9,90
60	-94,28	450	-67,51	14	-9,91
70	-91,07	460	-59,72	16	-9,92
80	-88,25	470	-49,96	18	-9,93
90	-85,91	480	-38,92	20	-9,94
100	-83,85	490	-27,75	22	-9,95
110	-82,00	500	-19,01	24	-9,96
120	-80,43	510	-14,83	26	-9,98
130	-79,23	520	-13,89	28	-9,99
140	-78,10	530	-13,67	30	-10,01
150	-77,24	540	-13,11	32	-10,03
160	-76,53	550	-12,53	34	-10,05
180	-75,87	560	-12,20	36	-10,07
190	-75,86	570	-12,05	38	-10,10
200	-76,20	580	-11,93	40	-10,13
210	-76,92	590	-11,77	42	-10,17
220	-78,05	600	-11,60	44	-10,20
230	-79,87	610	-11,45	46	-10,24
240	-82,89	620	-11,32	48	-10,28
250	-88,59	630	-11,21	50	-10,33
260	-92,26	640	-11,11	52	-10,40
270	-86,95	650	-11,01	54	-10,49
280	-80,02	660	-10,93	56	-10,58
290	-77,38	680	-10,79	58	-10,69
300	-75,16	690	-10,73	60	-10,84
320	-72,92	700	-10,68	65	-11,40
330	-72,69	750	-10,49	70	-12,68
340	-73,08	800	-10,38	75	-13,44
350	-74,61	850	-10,31	80	-13,08
360	-77,68	900	-10,26	90	-15,46
370	-82,08	950	-10,23	100	-12,49

TBHPF1-500kHz-B: Insertion loss, 9 kHz to 30 MHz, typical data

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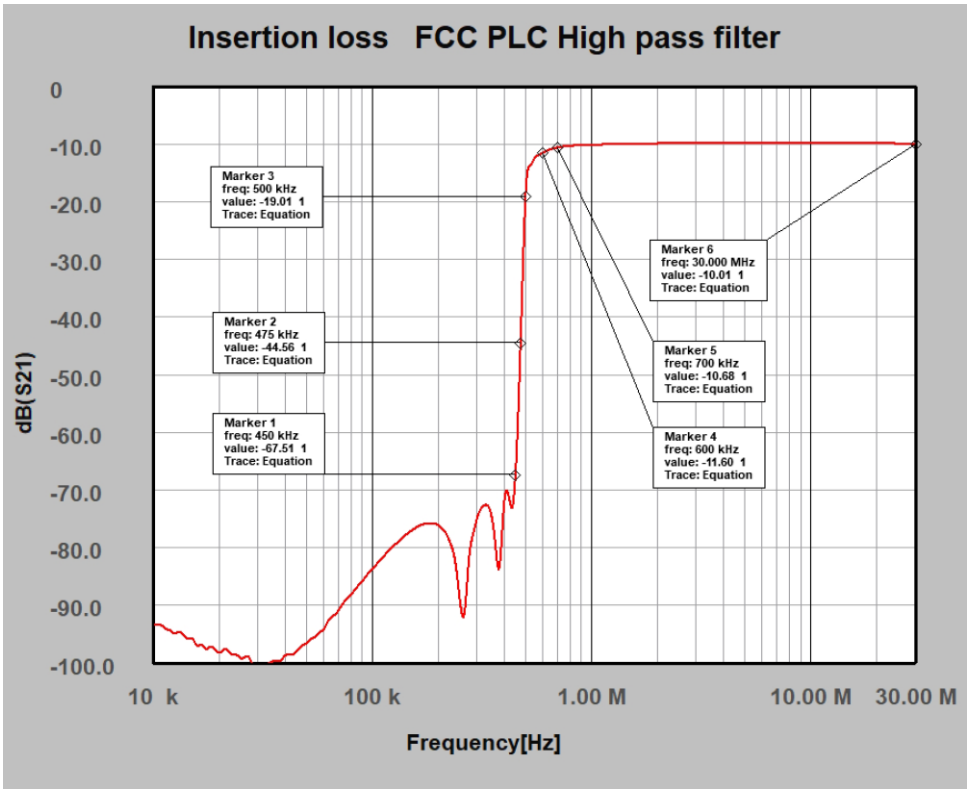
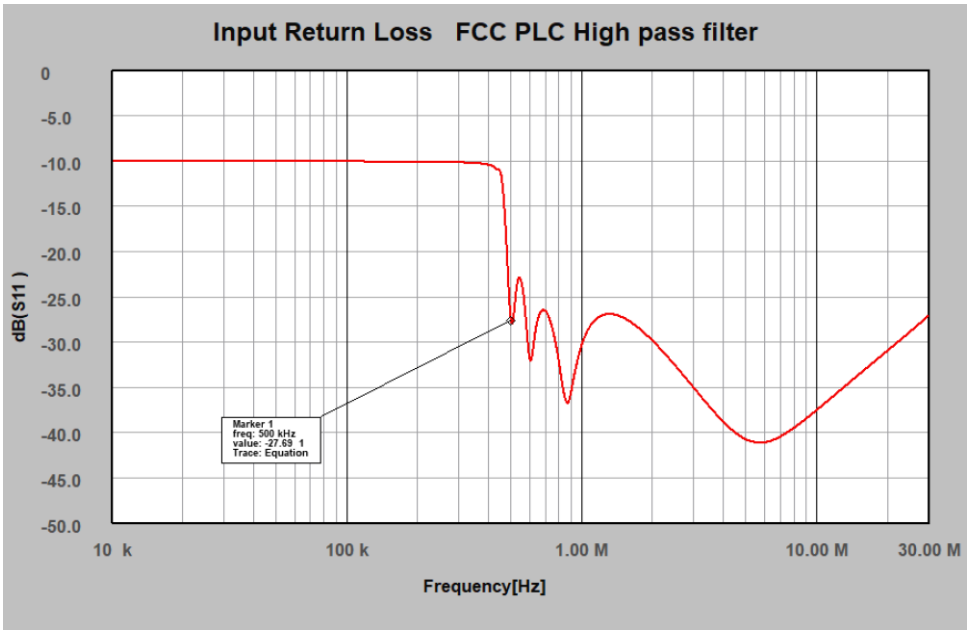


TBHPF1-500kHz: Insertion loss, 10 kHz to 30 MHz, typical data

4 S11, Impedance



TBHPF1-500kHz: S11 (=S22), 10 kHz to 30 MHz, typical data

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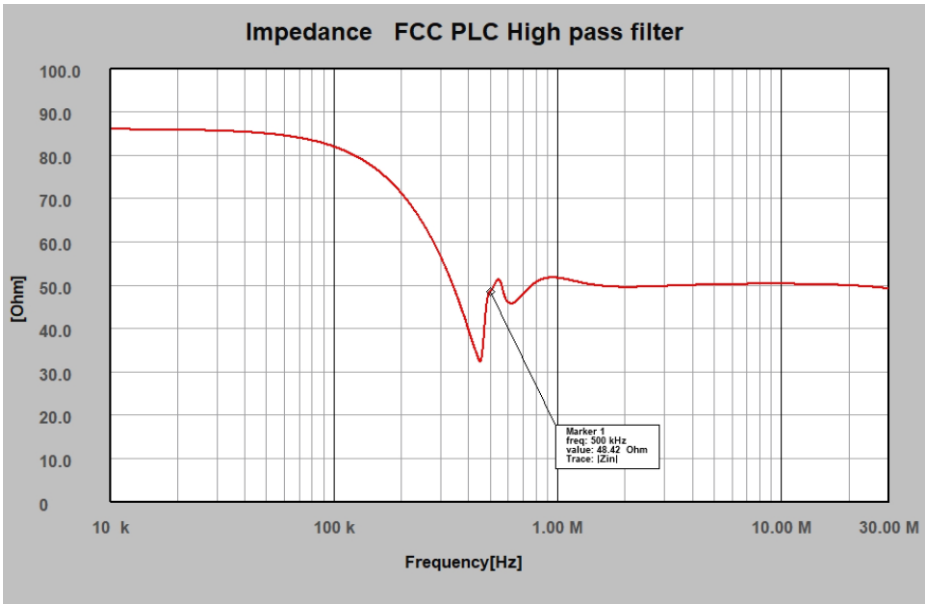

TBHPF1-500kHz: Impedance, 10 kHz to 30 MHz, typical data

5 Nonlinear distortions

The TBHPF1-500kHz contains inductors with ferrite cores. They are susceptible to magnetic saturation, resulting in nonlinear distortions that can fold from the stop band into the pass band. Refer to the third-order interceptpoint in Chapter 1. In case of signals with high amplitude, use an additional input attenuator to validate the measurement result.

6 Applications

- Conducted emission measurement with FCC PLC band suppression
- Spectrum analyzer / measurement receiver RF input protection

7 Ordering Information

Part Number	Description
TBHPF1-500kHz	High Pass Filter, N-female, N-female

8 History

Version	Date	Author	Changes
V1.0	7.12.2025	Mayerhofer	Creation of the document

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