

Powerline Ripple Detector

1 Introduction

MIL-STD-461 CS101 and RTCA/DO-160 section 18, conducted susceptibility, power leads, suggest using a powerline ripple detector to measure the amplitude of the disturbance signal injected on AC or DC power buses.

The powerline ripple detector separates injected ripple from the power waveform and provides galvanic isolation to measure the ripple amplitude with a spectrum analyzer or measurement receiver.

The TBPRD-CS101-240V powerline ripple detector is suitable for supply voltages of up to 240V AC and 270V DC. It can be connected simultaneously to both sides of the coupling transformer. Measurement on the EUT side or on the power source side can be selected with a toggle switch. Another toggle switch can pick a flat frequency response or a frequency response that compensates for the CS101's power vs. frequency profile.

The powerline ripple detector has a nominal coupling loss of 80 dB, translating to 56 dB μ V at the measurement receiver, when injecting 80 W into the setup.



Picture 1: TBPRD-CS101-240V power ripple detector

Powerline Ripple Detector

2 Specification

Characterized frequency range:	10 Hz to 300 kHz
Insertion loss above 50 Hz:	80 dB $\pm$ 1 dB with toggle in "Flat response" position see frequency response plot for toggle switch in "CS101" position
Input voltage range:	100 V AC to 240 V AC; 100 V DC to 270 V DC
Maximum input voltage:	240 V AC, 270 V DC
Input connectors:	4 mm safety sockets
Output connector:	BNC female
Fuse:	50 mA, fast; Littlefuse 0217.050MXP
Dimensions:	W 75 mm x H 70 mm x L 160 mm
Weight:	300 g

3 Safety



Warning: High Temperature

- In use, it is normal for the temperature of the TBPRD-CS101-240V to rise to about 55°C (131°F). Do not block the ventilation holes on the side and bottom of the housing

4 Frequency response

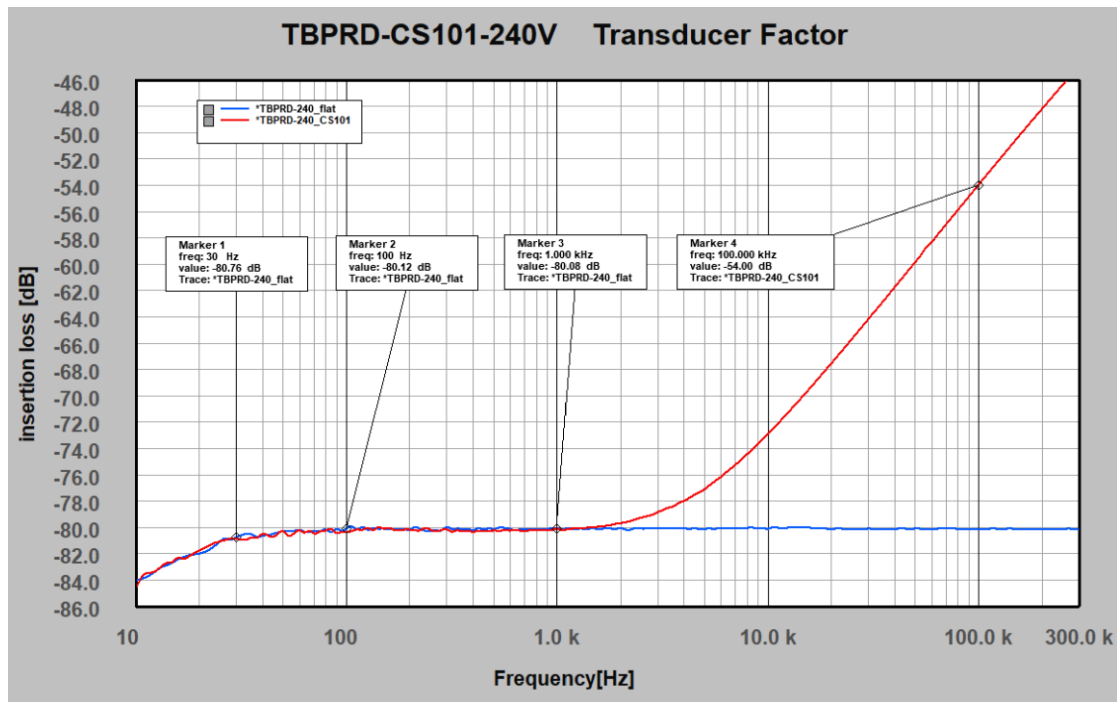


Figure1: typical frequency response, 10 Hz – 300 kHz; red: CS101; blue: flat

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5 Transducer factor table

Frequency	Flat response, insertion loss [dB]	CS101 response, insertion loss [dB]
10 Hz	-84.08	-84.62
12.5 Hz	-83.27	-83.31
15 Hz	-82.68	-82.65
17.5 Hz	-82.21	-82.34
20 Hz	-82.02	-81.81
25 Hz	-81.11	-81.11
30 Hz	-80.76	-80.91
50 Hz	-80.31	-80.32
75 Hz	-80.33	-80.34
100 Hz	-80.12	-80.37
250 Hz	-80.29	-80.22
500 Hz	-80.16	-80.27
750 Hz	-80.16	-80.25
1 kHz	-80.08	-80.12
1.5 kHz	-80.13	-80.06
2 kHz	-80.09	-79.71
2.5 kHz	-80.12	-79.29
3 kHz	-80.13	-78.86
4 kHz	-80.11	-78.02
5 kHz	-80.15	-77.12
6 kHz	-80.07	-76.17
7 kHz	-80.09	-75.27
8 kHz	-80.07	-74.43
9 kHz	-80.12	-73.65
10 kHz	-80.14	-72.94
25 kHz	-80.18	-65.72
50 kHz	-80.11	-59.88
75 kHz	-80.11	-56.43
100 kHz	-80.15	-54.01
125 kHz	-80.16	-52.12
150 kHz	-80.18	-50.6
175 kHz	-80.19	-49.33
200 kHz	-80.19	-48.24
225 kHz	-80.18	-47.28
250 kHz	-80.19	-46.43
275 kHz	-80.15	-45.67
300 kHz	-80.13	-44.99

Table1: insertion loss, 10 Hz to 300 kHz, typical data

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6 Informative schematic

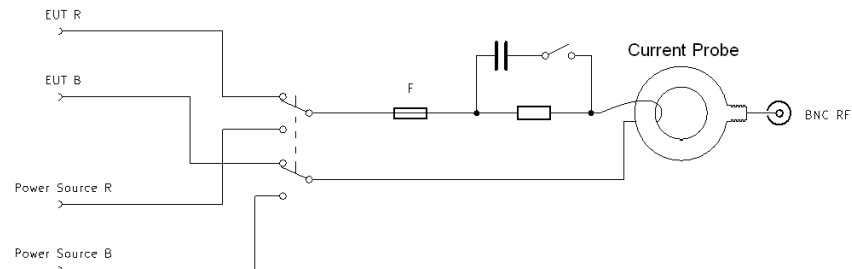


Figure 2: informative schematic

7 Application

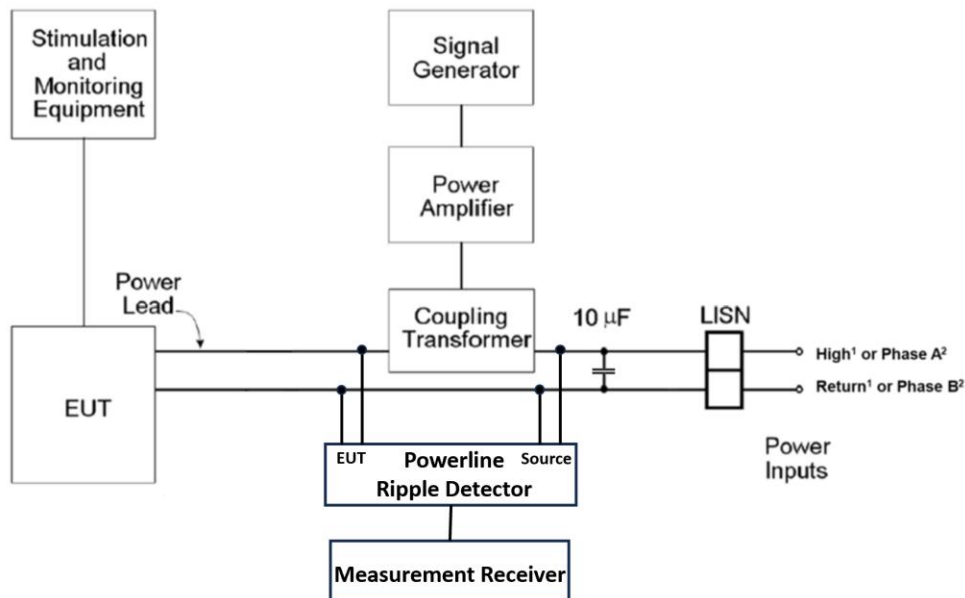


Figure 3: CS101 test setup

To measure ripple amplitude, CS101 gives the option of connecting a measurement receiver via a powerline ripple detector instead of an oscilloscope powered by an isolation transformer. The signal generator and measurement receiver may now be controlled via software, allowing for automated testing. Another difference from the CS101 setup specified in MIL-STD-461 is that the powerline ripple detector connects across the EUT, and also across the power source. This additional feature is used when the required ripple amplitude across the EUT cannot be achieved at low frequencies. It enables measurement of the ripple amplitude across the 10µF capacitor to determine if the power source impedance is low enough to force the injected disturbance signal across the EUT at low frequencies.



Powerline Ripple Detector

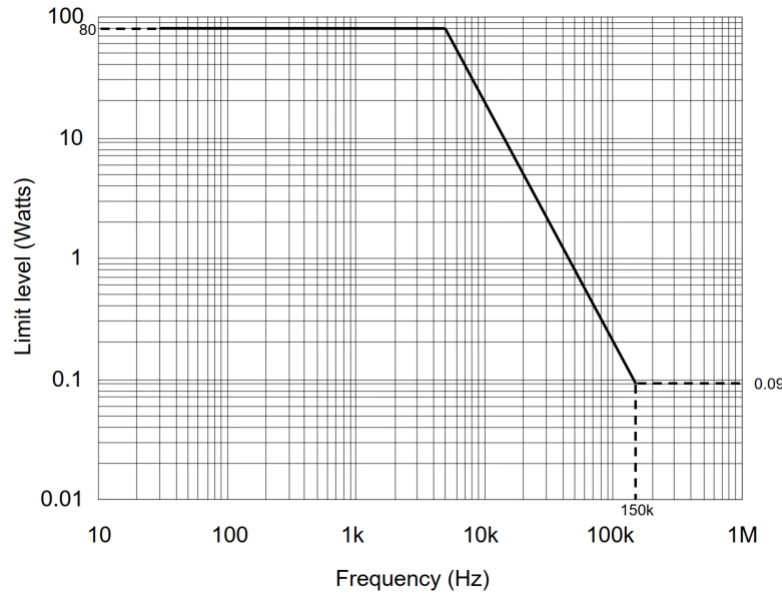


Figure 4: CS101 power limit for all applications

With the frequency response switch of the PRD-CS101-240V in CS101 position, it will compensate the frequency characteristic of the CS101 power limit and deliver a constant reading of 56 dB μ V across the entire frequency range. However, the actual compensation cannot implement the sharp edge at 5 kHz, resulting in a deviation between 1 kHz and 10 kHz. If susceptibility is encountered between 1 kHz and 10 kHz, determine the actual level using the transducer table, instead of relying on the 56 dB μ V reading.

8 Ordering Information

Part Number	Description
TBPRD-CS101-240V	240V Power Ripple Detector, individual factory calibration documentation

9 History

Version	Date	Author	Changes
V 1.0	28.8.2026	Mayerhofer	Creation

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