

RF PULSE CURRENT MONITORING PROBE

1 Introduction

The TBPCP4-50H50 is an RF pulse current monitoring probe, expanding the Tekbox product range of affordable test equipment.

The probe has a 3 dB bandwidth from 50 Hz to 50 MHz and is characterized over the frequency range from 0.1 Hz to 100 MHz. The TBPCP4-50H50 is typically used for surge or RF pulse current monitoring applications in the time domain, in contrary to RF current monitoring probes designed for EMC applications, which are typically used for measurements in the frequency domain.



Picture 1: TBPCP4-50H50 current monitoring probe

The aperture of the RF current monitoring probe is 46 mm.

The transfer-impedance is $-20 \text{ dB}\Omega$ / 0.1 V/A when terminated with 50 Ohm and 0.2 V/A with a high impedance load. The typical 3dB bandwidth is 50 Hz to 50 MHz.

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2 Specification

Characterized frequency range:	1 Hz to 100 MHz
3 dB bandwidth:	50 Hz to 50 MHz (measured in a 50 + 50 Ohm loop)
Transfer impedance into 50 Ω load:	-12 dB Ω ; 0.25 V/A ¹⁾
Transfer impedance into high Z:	0.5 V/A
Probe port impedance:	50 Ω
Droop rate:	7 %/ms ²⁾
Rise time:	< 10 ns ³⁾
Max. RMS AC current:	60 A ⁴⁾
Max. pulse current:	2500 A ⁵⁾
Current time product:	0.1 Ampere seconds ⁶⁾
I/F parameter:	0.5 Peak Ampere / Hz ⁷⁾
Max. core temperature:	80 °C
Aperture diameter:	46 mm
Outside diameter:	124 mm
Height:	37 mm
Weight:	1050 g
Connector type:	N female; comes supplied with a coaxial adapter to BNC-female

- 1) The transfer-impedance specifies the sensitivity of the probe. For instance, if the probe is terminated with 50 Ω , a current of 10 A_{RMS} results in an output voltage of 10 A x 0.25 V/A = 2.5 V_{RMS}.
- 2) The droop rate describes the downward slope of the output voltage trace, when measuring a flat topped current pulse. Example: a square current pulse with 10 A and a length of 1 ms would result in a square voltage pulse with 2.5 V at the rising edge, linearly declining to 2.5 V – (7% / ms) x 1 ms = 2.325 V at the falling edge. The lower the low -3dB frequency, the lower the droop rate.
- 3) The rise time is the fastest 10% to 90% transition that causes no more than 10% overshoot and ringing.
- 4) The maximum RMS AC current is limited by the maximum dissipation that can be handled by the probe's internal burden resistors.
- 5) The maximum peak current is limited by core saturation and the pulse current handling capability of the probes internal burden resistors.
- 6) The current time product specifies the maximum current of a rectangular pulse, depending on pulse width. E.g., with a current time product of 0.1 As, the probe could measure a 10 A pulse with a maximum length of 10 ms or a 100 A pulse with a maximum length of 1 ms.
- 7) The I/F (peak amperes per Herz) parameter describes the probes ability to handle high frequency signals without saturation. A sinusoidal signal of 50 Hz, for example, might have a maximum peak current of 0.5 A/Hz x 50 Hz = 25 A_{peak} = 18 A_{RMS} without saturating or distorting the signal at the probe output.

Pulse_Current_Probe_Parameters.doc, available on the Tekbox website, provides additional information.

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3 Transfer impedance

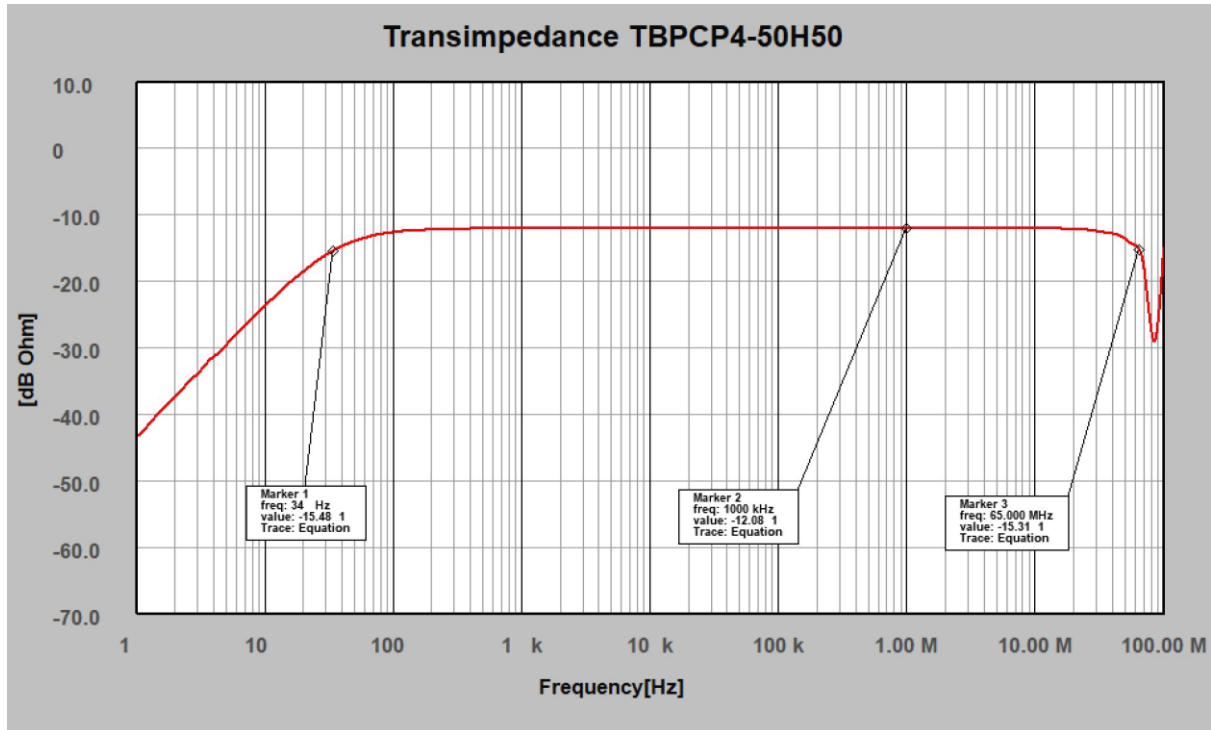


Figure1: typical transfer impedance, 1 Hz – 100 MHz

4 Phase

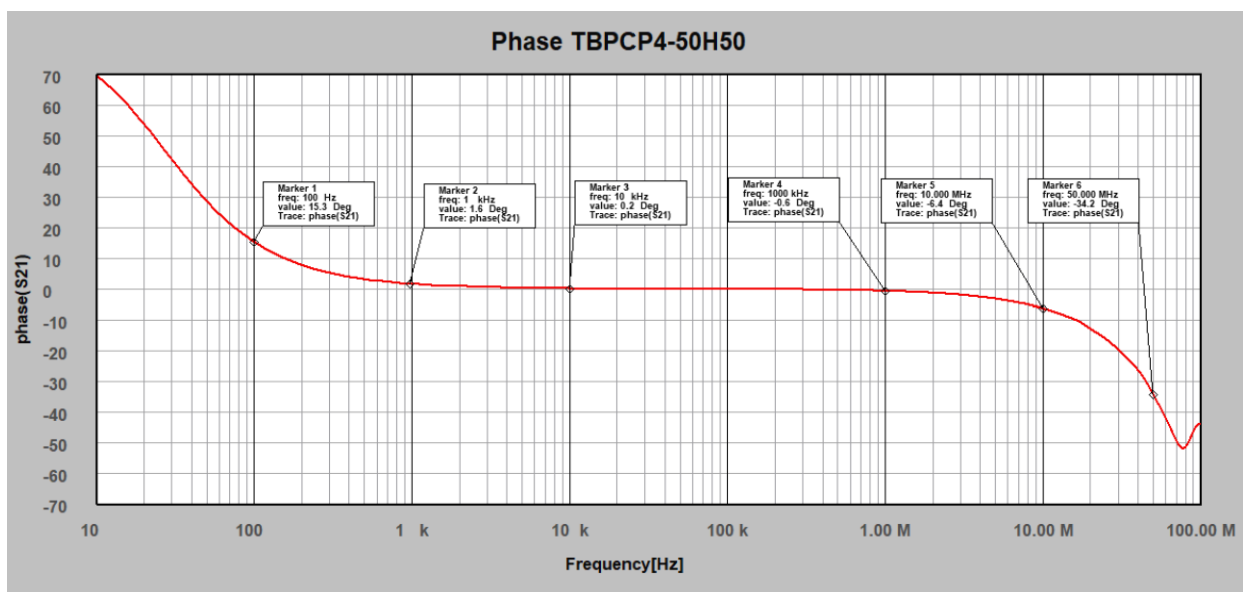


Figure2: S21, phase, 10 Hz – 100 MHz

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5 Transfer impedance table

The table below shows typical transfer impedance data of a TBPCP4-50H50 pulse current probe. Each current probe is delivered with its corresponding measurement protocol. The transimpedance in dBΩ is measured with a 50 Ohm load.

Transimpedance [V/A] = $10^{(\text{dB}\Omega/20)}$ @ 50 Ohm

Transimpedance [V/A] = $2 \cdot 10^{(\text{dB}\Omega/20)}$ @ High Z

Frequency	transfer impedance [dBΩ] 50 Ohm load	transfer impedance [V/A] 50 Ohm load	transfer impedance [V/A] high Z load
1 Hz	-43,48	0,007	0,013
2,5 Hz	-35,36	0,017	0,034
5 Hz	-29,68	0,033	0,066
7,5 Hz	-26,15	0,049	0,098
10 Hz	-23,74	0,065	0,130
25 Hz	-17,13	0,139	0,278
50 Hz	-14,02	0,199	0,398
75 Hz	-13,05	0,222	0,445
100 Hz	-12,67	0,233	0,465
250 Hz	-12,25	0,24	0,49
500 Hz	-12,04	0,25	0,50
750 Hz	-12,05	0,25	0,50
1 kHz	-12,02	0,25	0,50
5 kHz	-12,01	0,25	0,50
10 kHz	-12,01	0,25	0,50
50 kHz	-12,04	0,25	0,50
100 kHz	-12,04	0,25	0,50
500 kHz	-12,05	0,25	0,50
1 MHz	-12,08	0,25	0,50
5 MHz	-12,06	0,25	0,50
10 MHz	-12,04	0,25	0,50
15 MHz	-12,09	0,25	0,50
20 MHz	-12,27	0,24	0,49
25 MHz	-12,30	0,24	0,49
30 MHz	-12,49	0,24	0,47
40 MHz	-12,89	0,23	0,45
50 MHz	-13,67	0,21	0,41
60 MHz	-14,67	0,18	0,37
65 MHz	-15,31	0,172	0,343
70 MHz	-17,80	0,129	0,258
75 MHz	-22,61	0,074	0,148
80 MHz	-27,31	0,043	0,086
85 MHz	-29,08	0,035	0,070
90 MHz	-26,75	0,046	0,092
95 MHz	-21,58	0,083	0,167
100 MHz	-14,98	0,178	0,356

Table1: Transfer impedance: 1 Hz to 100 MHz, typical data

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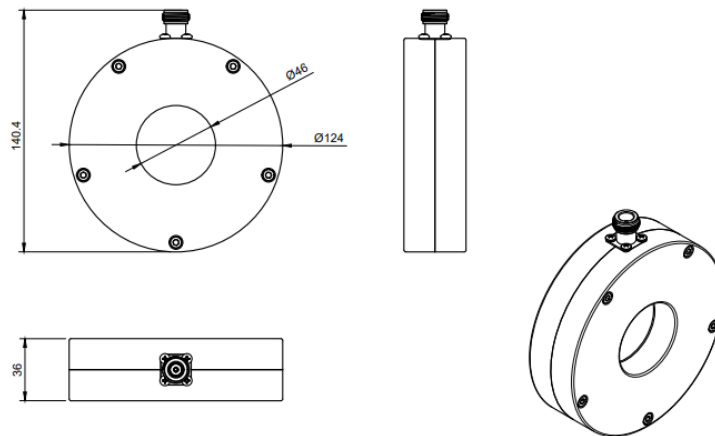
6 Calibration fixture

Tekbox supplies a calibrator suitable for the TBPCP4-50H50 current probe:



Picture 1: TBPCP4-CAL RF current probe calibration fixture

7 Dimensions



8 Ordering Information

Part Number	Description
TBPCP4-50H50	Pulse Current Probe 50Hz – 50 MHz, N-male to BNC-Female adapter
TBPCP4-CAL	Calibration fixture for TBPCP4 series pulse current probes

9 History

Version	Date	Author	Changes
V 1.0	7.7.2025	Mayerhofer	Creation
V 1.1	26.9.2025	Mayerhofer	Correction, chapter 1
V 1.2	10.4.2026	Mayerhofer	Correction, chapter 5 & 7
V 1.3	22.6.2026	Mayerhofer	Chapter 2 updated, chapter 4 added

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