

RF PULSE CURRENT MONITORING PROBE

1 Introduction

The TBPCP1-20100 is a RF pulse current monitoring probe, expanding the Tekbox product range of affordable test equipment.

The probe has a very flat response from 20 Hz to 100 MHz and is characterized over the frequency range from 1 Hz to 200 MHz. The TBPCP1-20100 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: TBPCP1-20100RF current monitoring probe

The aperture of the RF current monitoring probe is 25 mm. Its transfer impedance is -20 dB Ohm with a typical 3dB bandwidth from 20 Hz to 100 MHz.

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2 Specification

Characterized frequency range:	1 Hz to 200 MHz
3 dB bandwidth:	20 Hz to 100 MHz (measured in a 50 + 50 Ohm loop)
Transfer impedance into 50 Ohm load:	-20 dB Ohm; 0.1 V/A ¹⁾
Transfer impedance into high Z:	0.2 V/A
Probe port impedance:	50 Ohm
Droop rate:	10 %/ms ²⁾
Rise time:	< 5 ns ³⁾
Max. RMS AC current:	120 A ⁴⁾
Max. pulse current:	3000 A ⁵⁾
Current time product:	0.08 Ampere seconds ⁶⁾
I/F parameter:	0.3 Peak Ampere / Hz ⁷⁾
Max. core temperature:	80 °C
Aperture diameter:	25 mm
Outside diameter:	76 mm
Height:	31 mm
Weight:	320 g
Connector type:	N 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 0.1 V/A = 1 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 V at the rising edge, linearly declining to 2 V – (10 % / ms) x 1 ms = 0.9 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 0.08 As, the probe could measure a 10 A pulse with a maximum length of 8 ms or a 100 A pulse with a maximum length of 800 μ s.
- 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 0.3 A/Hz x 50 Hz = 15 A_{peak} = 10.7 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.

RF PULSE CURRENT MONITORING PROBE

3 Transfer impedance

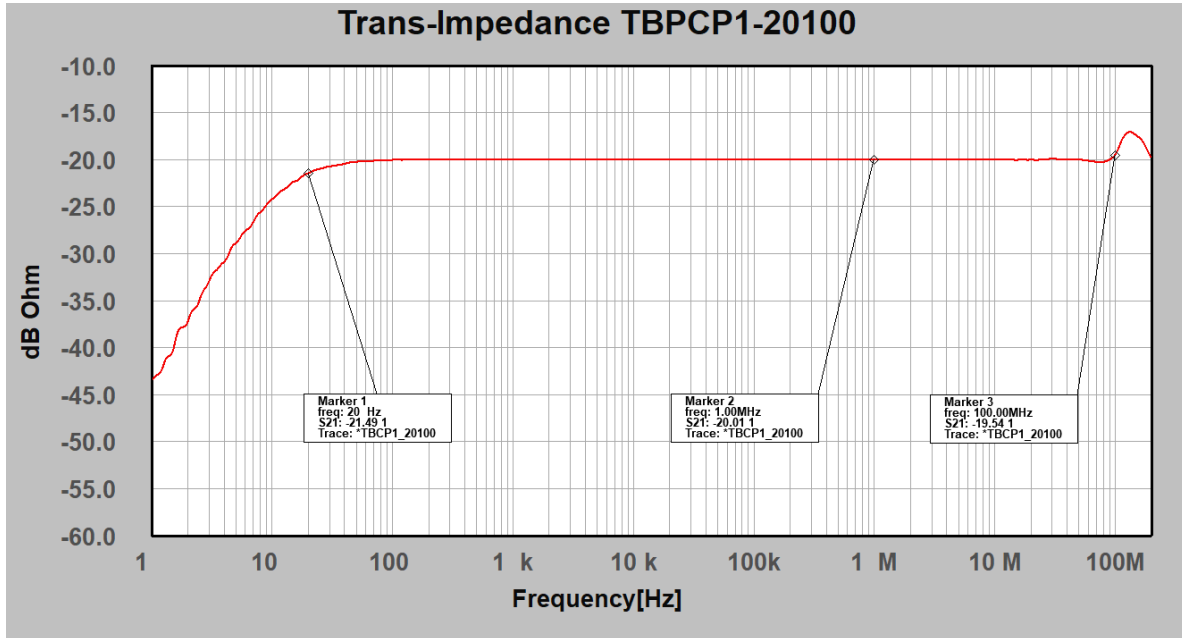


Figure 1: typical transfer impedance, 1 Hz – 200 MHz

4 Phase

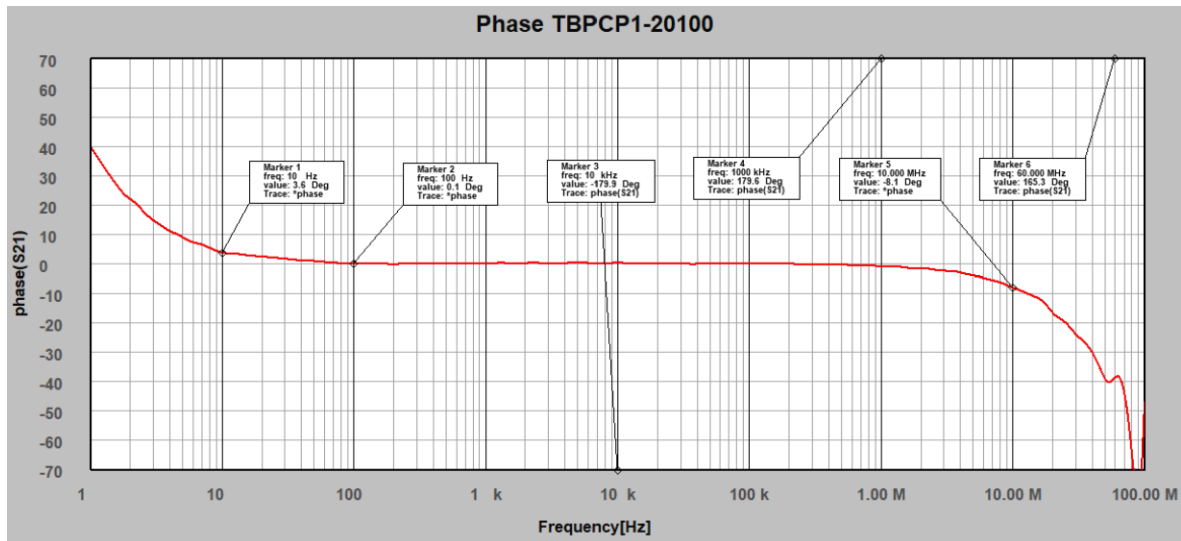


Figure 2: S21, phase, 1 Hz – 100 MHz

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5 Typical transfer impedance table

The table below shows typical transfer impedance data of a TBPCP1-20100 pulse current probe. Each current probe is delivered with its corresponding measurement protocol. The transimpedance is measured with a 50 Ohm load.

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

Transimpedance [V/A] = $2 \cdot 10^{(dB\Omega/20)}$ @ 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	-43,49	0,007	0,013
2,5 Hz	-35,00	0,018	0,036
5 Hz	-28,96	0,036	0,071
7.5 Hz	-25,98	0,050	0,101
10 Hz	-24,27	0,061	0,122
12.5 Hz	-23,23	0,069	0,138
15 Hz	-22,41	0,076	0,151
17.5 Hz	-21,89	0,080	0,161
20 Hz	-21,49	0,084	0,168
25 Hz	-21,03	0,089	0,178
50 Hz	-20,29	0,097	0,194
75 Hz	-20,11	0,099	0,198
100 Hz	-20,08	0,099	0,198
1 kHz	-20,06	0,099	0,199
10 kHz	-20,02	0,100	0,200
100 kHz	-20,01	0,100	0,200
1 MHz	-20,01	0,100	0,200
10 MHz	-19,99	0,100	0,200
25 MHz	-19,99	0,100	0,200
50 MHz	-20,01	0,100	0,200
60 MHz	-20,16	0,098	0,196
70 MHz	-20,29	0,097	0,194
80 MHz	-20,30	0,097	0,193
90 MHz	-20,06	0,099	0,199
100 MHz	-19,54	0,105	0,211
110 MHz	-18,39	0,120	0,241
120 MHz	-17,46	0,134	0,268
130 MHz	-17,13	0,139	0,278
140 MHz	-17,21	0,138	0,276
150 MHz	-17,49	0,133	0,267
160 MHz	-17,75	0,130	0,259
170 MHz	-18,17	0,123	0,247
180 MHz	-18,80	0,115	0,230
190 MHz	-19,37	0,108	0,215
200 MHz	-19,87	0,101	0,203

Table1: Transfer impedance: 1 Hz to 200 MHz, typical data

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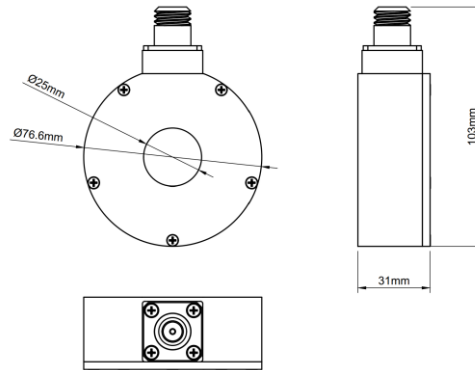
6 Accessory

Tekbox supplies a calibrator suitable for the TBPCP1-20100 current probe:



Picture 1: TBPCP1-CAL RF current probe calibration fixture

7 Dimensions



8 Ordering Information

Part Number	Description
TBPCP1-20100	Pulse Current Probe 20Hz – 100 MHz
TBCP1-CAL	Calibration fixture for TBPCP1-20100 current probe

9 History

Version	Date	Author	Changes
V 1.0	4.2.2023	Mayerhofer	Creation
V 1.1	12.2.2025	Mayerhofer	Chapter 2 updated
V 1.2	9.7.2025	Mayerhofer	Chapter 2 updated
V 1.3	24.6.2026	Mayerhofer	Chapter 2 updated, chapter 4 added

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