

RF PULSE CURRENT MONITORING PROBE

1 Introduction

The TBPCP2-3070 is a RF pulse current monitoring probe, expanding the Tekbox product range of affordable test equipment.

The probe has a very flat response from 30 Hz to 70 MHz and is characterized over the frequency range from 1 Hz to 200 MHz. The TBPCP2-3070 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 used for measurements in the frequency domain.



Picture 1: TBPCP2-3070RF current monitoring probe

The aperture of the RF current monitoring probe is 25 mm. Its transfer impedance measured in a $50\Omega + 50\Omega$ loop test fixture is -26 dB Ohm with a 3dB bandwidth from 30Hz to 70 MHz.

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2 Specification

Characterized frequency range:	1 Hz to 200 MHz
3 dB bandwidth:	30 Hz to 70 MHz (measured in a 50 + 50 Ohm loop)
Transfer impedance into 50 Ohm load:	-26 dB Ohm; 0.05 V/A ¹⁾
Transfer impedance into high Z:	0.1 V/A
Probe port impedance:	50 Ohm
Droop rate:	20 % / ms ²⁾
Rise time:	< 5 ns ³⁾
Max. RMS AC current:	15 A ⁴⁾
Max. pulse current:	600 A ⁵⁾
Max. current time product:	0.02 Ampere seconds ⁶⁾
I/F parameter:	0.07 Peak Ampere / Hz ⁷⁾
Max. core temperature:	80 °C
Aperture diameter:	5.5 mm
Outside diameter:	27 mm
Length including SMA connector:	40mm
Height:	19 mm
Weight:	60 g
Connector type:	SMA female

- 1) The transfer-impedance specifies the sensitivity of the probe. For instance, if the probe is terminated with 50 Ω , a current of 5 A_{RMS} results in an output voltage of 5 A x 0.5 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 5 A and a length of 100 μ s would result in a square voltage pulse with 2.5 V at the rising edge, linearly declining to 2.5 V – (0.06% / μ s) x 100 μ s = 2.35 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 0.02 As, the probe could measure a 10 A pulse with a maximum length of 2 ms or a 100 A pulse with a maximum length of 200 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 0.2 A/Hz x 50 Hz = 10 A_{peak} = 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.

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3 Transfer impedance

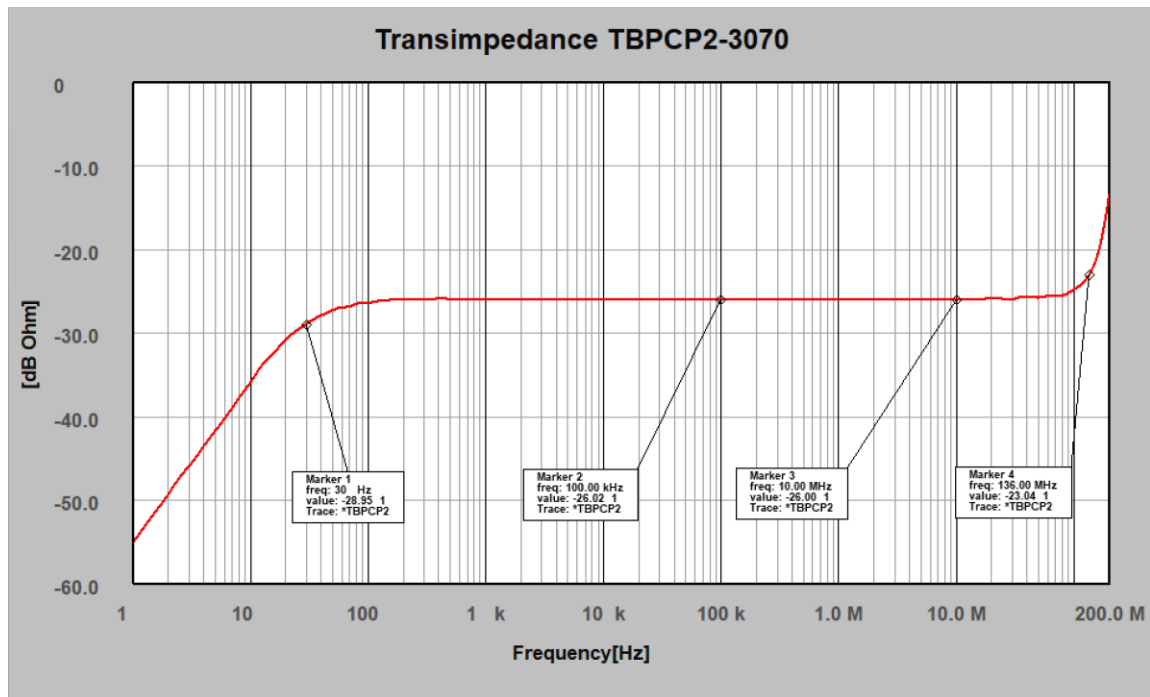


Figure1: typical transfer impedance, 1 Hz – 200 MHz

4 Phase

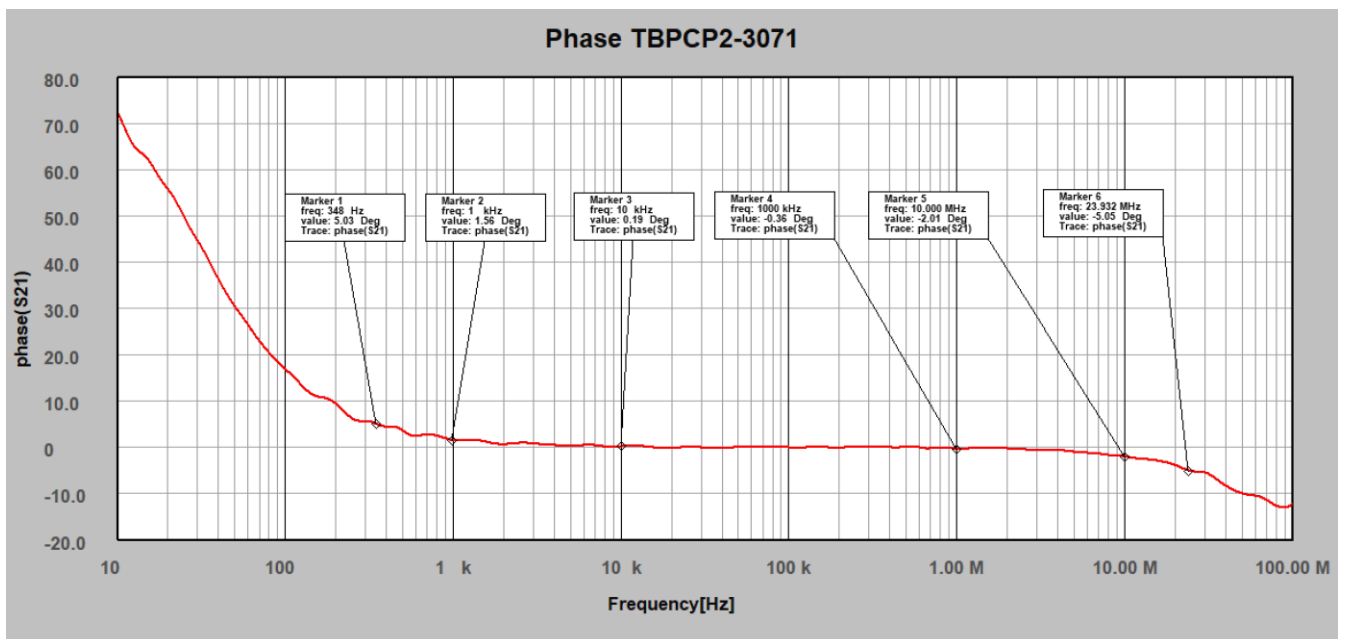


Figure2: S21, phase, 10 Hz – 100 MHz

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5 Typical transfer impedance table

The table below shows typical transfer impedance data of a TBPCP2-3070 pulse current probe. Each current probe is delivered with its corresponding measurement protocol. The transimpedance is given for a 50 Ohm load.

Logarithmic to linear conversion:

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

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

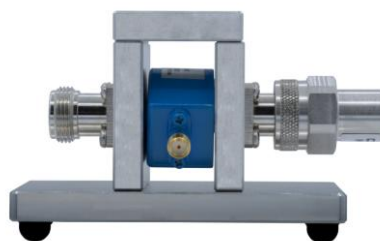
Frequency	Transfer impedance [dBΩ] 50 Ohm load	Transfer impedance [V/A] 50 Ohm load	Transfer impedance [V/A] high Z load
1 Hz	-55.07	0.002	0.004
2.5 Hz	-47.32	0.004	0.009
5 Hz	-41.35	0.009	0.017
7.5 Hz	-38.14	0.012	0.025
10 Hz	-35.69	0.016	0.033
12.5 Hz	-33.95	0.020	0.040
15 Hz	-32.81	0.023	0.046
17.5 Hz	-31.74	0.026	0.052
20 Hz	-30.84	0.029	0.057
25 Hz	-29.78	0.032	0.065
50 Hz	-27.39	0.043	0.085
75 Hz	-26.80	0.046	0.091
100 Hz	-26.46	0.048	0.095
1 kHz	-26.17	0.049	0.098
10 kHz	-26.11	0.049	0.099
100 kHz	-26.02	0.049	0.099
1 MHz	-26.03	0.049	0.099
10 MHz	-26.00	0.049	0.099
25 MHz	-26.08	0.050	0.099
50 MHz	-26.07	0.050	0.099
60 MHz	-25.75	0.052	0.103
70 MHz	-25.79	0.051	0.103
80 MHz	-25.52	0.053	0.106
90 MHz	-25.44	0.053	0.107
100 MHz	-25.12	0.055	0.111
110 MHz	-24.81	0.057	0.115
120 MHz	-24.22	0.061	0.123
130 MHz	-23.43	0.067	0.135
140 MHz	-22.34	0.076	0.153
150 MHz	-20.81	0.091	0.182
160 MHz	-18.92	0.113	0.226
170 MHz	-16.42	0.151	0.302
180 MHz	-13.40	0.214	0.427
190 MHz	-10.39	0.302	0.605
200 MHz	-7.47	0.423	0.846

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

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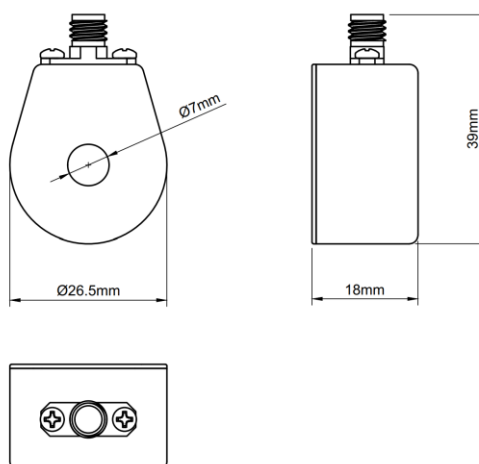
6 Accessory

Tekbox supplies a calibrator suitable for the TBPCP2-3070 current probe:



Picture 2: TBPCP2-CAL

7 Dimensions



8 Ordering Information

Part Number	Description
TBPCP2-3070	Pulse Current Probe 30Hz – 70 MHz
TBPCP2-CAL	Calibration fixture for TBPCP2-3070 current probe

9 History

Version	Date	Author	Changes
V 1.0	9.11.2022	Mayerhofer	Creation of the preliminary document
V 1.1	19.3.2023	Mayerhofer	Chapter 5 updated
V 1.2	9.7.2025	Mayerhofer	Chapter 2 updated
V 1.3	23.6.2026	Mayerhofer	Chapter 2 updated

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