RF PULSE CURRENT MONITORING PROBE

1 Introduction

The TBPCP4-1H30 is an RF pulse current monitoring probe, expanding the Tekbox product range of affordable test equipment.
The probe has a 3 dB bandwidth from 1 Hz to 30 MHz and is characterized over the frequency range from 0.1 Hz to 100 MHz. The TBPCP4-1H30 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: TBPCP4-1H30 current monitoring probe

The aperture of the RF current monitoring probe is 46 mm.
The transfer-impedance is -26 dBΩ / 0.05 V/A when terminated with 50 Ohm and 0.1 V/A with a high impedance load. The typical 3dB bandwidth is 10 Hz to 30 MHz.

RF PULSE CURRENT MONITORING PROBE

2 Specification

Characterized frequency range:	0.1 Hz to 100 MHz
3 dB bandwidth:	1 Hz to 30 MHz (measured in a 50 + 50 Ohm loop)
Transfer impedance into 50 Ω load:	-26 dBΩ; 0.05 V/A [1)]
Transfer impedance into high Z:	0.1 V/A
Probe port impedance:	50 Ω
Droop rate:	0.2 %/ms [2)]
Rise time:	< 10 ns [3)]
Max. RMS AC current:	150 A [4)]
Max. pulse current:	5000 A [5)]
Current time product:	0.7 Ampere seconds [6)]
I/F parameter:	2.8 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 20 A_{RMS} results in an output voltage of 20 A x 0.05 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 20 A and a length of 100 ms would result in a square voltage pulse with 1 V at the rising edge, linearly declining to 1 V – (0.2% / ms) x 100 ms = 0.8 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 0.7 As, the probe could measure a 10 A pulse with a maximum length of 70 ms or a 100 A pulse with a maximum length of 7 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 2.8 A/Hz x 50 Hz = 140 A_{peak} = 100 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.

3 Transfer impedance

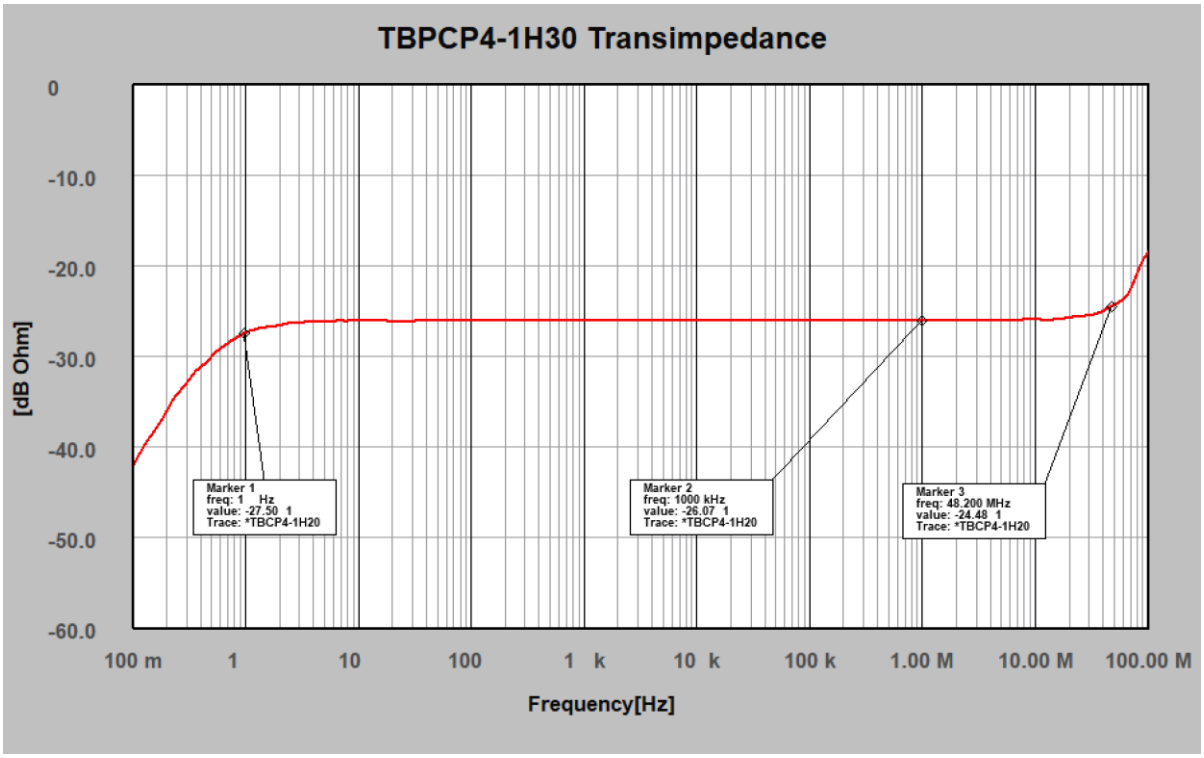


Figure1: typical transfer impedance, 1 Hz – 100 MHz

4 Phase

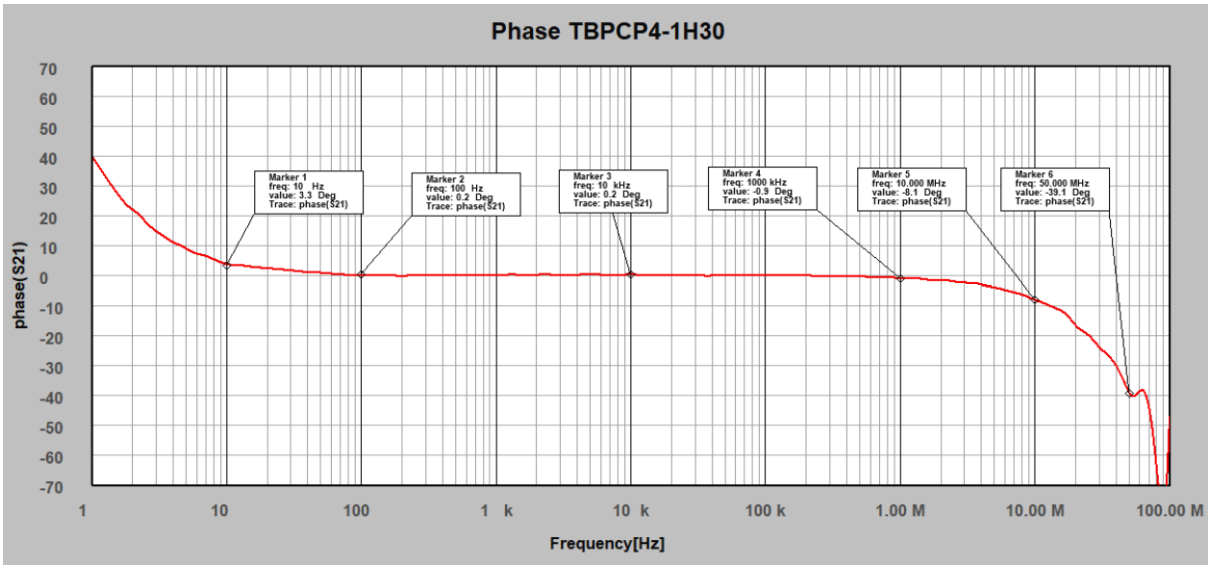


Figure2: S21, phase, 1 Hz – 100 MHz

5 Transfer impedance table

The table below shows typical transfer impedance data of a TBPCP4-1H30 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^(dBOhm/20) @ 50 Ohm
Transimpedance [V/A] = 2*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
0,1 Hz	-42,19	0,020	0,016
0,25 Hz	-34,14	0,031	0,039
0,5 Hz	-30,09	0,038	0,063
0,75 Hz	-28,34	0,042	0,077
1 Hz	-27,44	0,048	0,085
2,5 Hz	-26,36	0,05	0,10
5 Hz	-26,23	0,05	0,10
7,5 Hz	-26,14	0,05	0,10
10 Hz	-26,03	0,05	0,10
25 Hz	-26,18	0,05	0,10
50 Hz	-26,07	0,05	0,10
75 Hz	-26,01	0,05	0,10
100 Hz	-26,06	0,05	0,10
500 Hz	-26,07	0,05	0,10
1 kHz	-26,02	0,05	0,10
5 kHz	-26,02	0,05	0,10
10 kHz	-26,09	0,05	0,10
50 kHz	-26,07	0,05	0,10
100 kHz	-26,05	0,05	0,10
500 kHz	-26,06	0,05	0,10
1 MHz	-26,07	0,05	0,10
5 MHz	-26,07	0,05	0,10
10 MHz	-25,98	0,05	0,10
15 MHz	-25,98	0,05	0,10
20 MHz	-25,77	0,05	0,10
25 MHz	-25,59	0,05	0,11
30 MHz	-25,54	0,05	0,11
35 MHz	-25,35	0,06	0,11
40 MHz	-25,03	0,06	0,11
45 MHz	-24,68	0,06	0,12
50 MHz	-24,38	0,06	0,12
60 MHz	-23,80	0,07	0,13
70 MHz	-22,67	0,09	0,15
80 MHz	-20,90	0,11	0,18
90 MHz	-19,50	0,12	0,21
100 MHz	-18,48	1,00	0,24

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

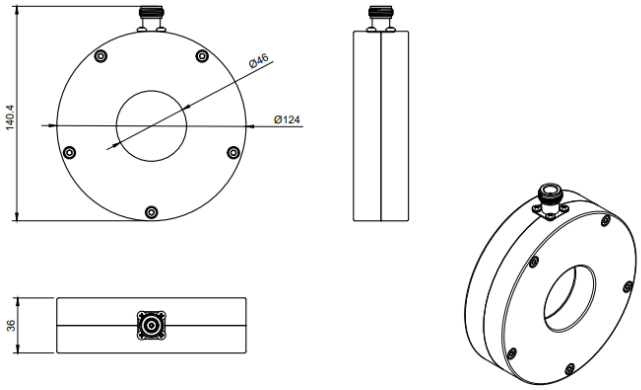
6 Calibration fixture

Tekbox supplies a calibrator suitable for the TBPCP4-1H30 current probe:



Picture 1: TBPCP4-CAL RF current probe calibration fixture

7 Dimensions



8 Ordering Information

Part Number	Description
TBPCP4-1H30	Pulse Current Probe 1Hz – 30 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	10.4.2026	Mayerhofer	Chapter 5 and chapter 7, typo
V1.2	22.6.2026	Mayerhofer	Chapter 2 updated; chapter 4 added

TekBox Digital Solutions Vietnam Pte. Ltd. www.tekbox.com
Factory 4, F4, Lot I-3B-1, Saigon Hi-Tech Park, Tan Phu Ward, Thu Duc, Ho Chi Minh City, Vietnam