



## 1 Introduction

The TBCMC-1 is a general purpose RF common mode choke. It is designed primarily to attenuate ground loop currents in impedance measurement setups based on the shunt method. The TBCMC-1 is a symmetric design.





## 2 Specification

Compliance:	RoHS
Differential mode impedance:	50 Ohm, typ.
Characterized frequency range:	1 Hz – 1 GHz
Recommended frequency range:	10 Hz – 500 MHz
Differential mode power rating:	max. 130 W up to 1 GHz
Differential mode voltage rating:	max. 225V <sub>pp</sub> up to 1 GHz
Insertion loss (S21, S12):	< 0.1 dB up to 10 MHz, typ.
	< 0.2 dB up to 100 MHz, typ.
	< 0.6 dB up to 1 GHz, typ.
Common mode rejection:	> 60 dB up to 1 MHz, typ.
	> 30 dB up to 100 MHz, typ.
	> 10 dB up to 1 GHz, typ.
Input return loss (S11, S22):	> 20 dB up to 1 GHz, typ.
Common mode saturation current:	500 mA, typ.
RF connectors:	50 $\Omega$ N - female,
Operating temp. range:	0°C – 60°C
Enclosure dimensions:	70 mm x 60 mm x 140 mm
Weight:	350 g

V1.0 TBCMC-1



# RF Common Mode Choke

## 3 Measurement plots

#### 3.1 Common mode rejection



Figure 3-1, Common Mode Rejection



#### 3.2 Insertion loss

Figure 3-2, typical insertion loss







#### 3.3 Input return loss

Figure 3-3, typical input return loss

## 4 Application

# Application example: measure a 0.47 Ohm resistor using the shunt method and TBVNA-6000

The shunt method is preferred for accurate measurement of low impedance values. To achieve the highest level of precision, the shunt method requires a common mode choke in the signal path.

Set start frequency to 10 Hz, set stop-frequency to 100 MHz, set the port power to -5 dBm and logarithmic sweep. Set the measurement bandwidth to 100 Hz. Connect a suitable common mode choke to Port 2 and perform a full 2-port calibration. Use a PCB with a short 50 Ohm microstrip line as Through-standard. This PCB will later carry the DUT resistor.







Solder the 0.47 Ohm resistor from the microstrip line to the GND of the PCB and set up the measurement.



Figure 4-2, Measurement setup

Create a rectangular diagram and add a trace. In the Trace Dialog, Scroll down the Trace Function list and select <IMP Shunt>

ource S-Param	Trace Function <tdr_s12_bp_rw> S12 - Time domain reflectometry, ban <tdr_s12_bp_hw> S12 - Time domain reflectometry, ban</tdr_s12_bp_hw></tdr_s12_bp_rw>	O Magnitude O Phase	<ul> <li>None</li> </ul>	<ul> <li>Left</li> <li>Right</li> </ul>
Memory 1 Memory 2 Memory 3 Memory 4	<tdr_s22_lp_rw> S22 - Time domain reflectometry, low; <tdr_s22_lp_hw> S22 - Time domain reflectometry, low <tdr_s22_bp_rw> S22 - Time domain reflectometry, ban <tdr_s22_bp_hw> S22 - Time domain reflectometry, ban <gtp> Transducer power gain, use Z0 = source imp., optio <q> Quality Factor <imp series=""> Impedance measurement by Series Method <imp shunt=""> Impedance measurement by Shunt Method</imp></imp></q></gtp></tdr_s22_bp_hw></tdr_s22_bp_rw></tdr_s22_lp_hw></tdr_s22_lp_rw>	Magnitude in dB     Real     Imaginary     Complex     Delay ( data (data)	S-Param Menory 1 Memory 2 Memory 3 Memory 4	50 Zo Optional Value 50 Use Correction Setup Corr.
0.00125		O Delay (-dphi/dw)     O loaded Q	Edit Limits	Create Corr.
Equation	Create Copy before overwrite			Add/Modify Car

Figure 4-3, Trace dialog

Close the Trace dialog, configure the Y-axis to 10 divisions, top level 1 Ohm, bottom level 0 Ohm and set a marker. Hit the Single Measurement button.





Figure 4-4, measurement result

We measure 0,476 Ohm between 1 kHz and 10 MHz. At higher frequencies, the parasitic inductance of the resistor starts to contribute to the impedance.

## **5** Ordering Information

Part Number	Description
TBCMC-1	RF common mode choke
TBTB-1	Test PCB for shunt impedance method; through, N-F/N-F; 40 x 60 mm
TBTB-2	Test PCB for series impedance method; N-F/N-F; 40 x 60 mm

### 6 History

V1.0

**TBCMC-1** 

Version	Date	Author	Changes
V 1.0	6.2.2025	Mayerhofer	Creation

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