

DC Biased Inductor Measurements with Tektronix 5/6 Series MSO

Accurate DC-Biased Inductor Measurements are Important in Power Electronics

An important component in a switching power supply is its power inductor. A power inductor has a high permeability core around which wire is wound. Saturation is a material property of the magnetic core and occurs when the winding current creates excessive flux in the core. Inductor DC bias current affects the inductance versus frequency plot, so it is important to measure the inductance-over-frequency with an inductor current representing the maximum DC current of the power supply in operation.

Ultra-low impedances are accurately measured using a Tektronix 5/6 Series MSO in a 2-port shunt-through configuration. Visit <https://www.picotest.com/measurements/2-port.html> for information about the 2-port shunt-through measurement. Picotest introduces a measurement solution to measure inductance in 2-port shunt-through method with DC current using J2121A line injector.

J2121A Line Injector for Inductor DC Bias Measurements

The J2121A line injector is used to combine the oscillator signal from the VNA with the DC current bias. It can be used to inject up to 20A of current at 400 VDC and has a bandwidth of 100Hz - 1MHz. The J2121A can also be used for PSRR and DC-DC converter input impedance testing.



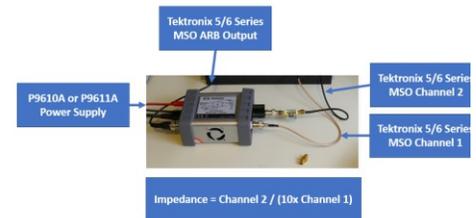
P9610A/ P9611A Power Supplies

P9610A or P9611A power supplies can be used to provide the DC bias constant current for the inductor under test. More than one supply can be paralleled to source higher current if the measurement needs more current.



Visit https://www.picotest.com/products_P9610A_11A.html for more information on the Picotest power supplies.

- The Picotest J2121A High Power Line Injector facilitates DC-biased inductor measurements using the 2-port shunt-through impedance test configuration. With a bandwidth of 100Hz - 1MHz, it measures up to 20A DC of bias current and supports voltages up to 400VDC, which includes 270V military and satellite busses.
- Picotest P9610A or P9611A power supplies inject a DC bias current into an inductor. The P9610A sources up to 7A with a programming resolution of 0.21mA. The P9611A can source up to 6A with a programming resolution of up to 1mA. For higher current requirements, more than one power supply can be paralleled.

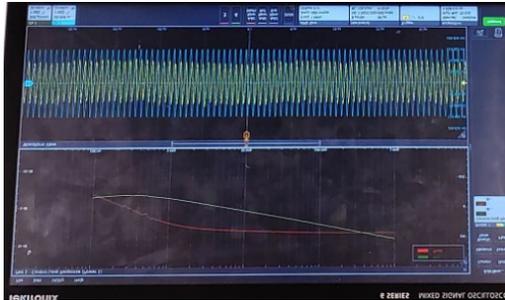


A DC-biased 3.3μH 6.5A inductor measured using a Tek 5/6 Series MSO and the J2121A. The current source is the Picotest P9610A and/or P9611A. They are paralleled for higher currents.

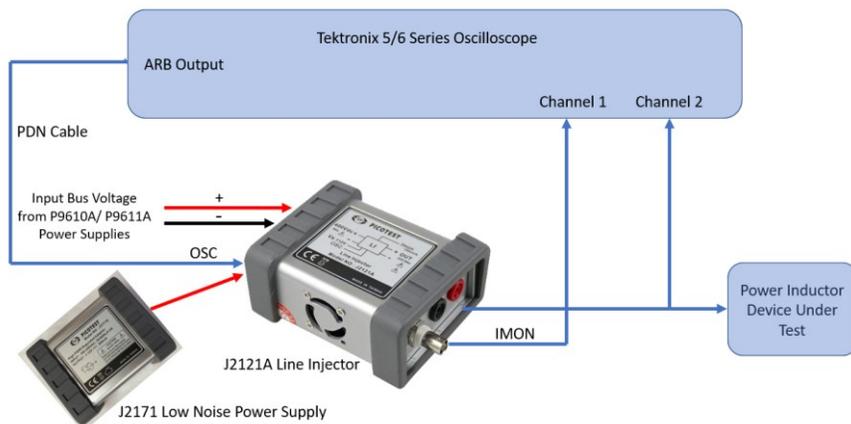
The entire solution case study is available from Picotest.



DC Biased Inductor Measurement



Practically speaking, inductance is the ability of a magnetic device to oppose a change in the current flowing through its winding. As inductor current increases, the core's magnetic flux should increase, but there are limits to this mechanism. As current increases, flux density approaches core saturation. Saturation occurs when current increases without a corresponding increasing core flux. Essentially, in saturation, the inductance is nearly zero and the inductor does not constrain current flow. It is important for the circuit designer to know how inductance changes with in-circuit current flow.



DC biased inductor measurement setup using a Tek MSO and J2121A line injector. The $\pm 12V$ supply to the line injector is fed from (included) J2171A power supply. The DUT inductor is connected in 2-port shunt-through configuration. The J2121A current monitor (± 10) output is connected to CH1 of the oscilloscope. The oscilloscope ARB (arbitrary waveform generator) oscillator is connected to modulation input of the J2121A.

DC Biased Inductor Measurement Testing Products

J2121A Line Injector	J2121A + J2171A - 200mA Low Noise Power Supply 1-ohm Calibration Fixture
Tektronix 5/6 Series MSO	Mixed Signal Oscilloscope with Arbitrary Waveform Generator
P9610A	Mixed mode power supply Output voltage = 0 to 36V Maximum current output = 7A Current programming resolution = 0.21mA
P9611A	Mixed mode power supply Output voltage = 0 to 60V Maximum current output = 6A Current programming resolution = 1mA

To learn how this solution can address your specific needs please contact Picotest:

877-914-7426

info@picotest.com

www.picotest.com



Products used in this test:



J2171A High PSRR Regulated Adaptor (included with the J2121A)



Tektronix 5/6 Series MSO



P9610A/P9611A Mixed Mode Power Supply

Picotest provides products that are designed to simplify measurements while providing the ultimate resolution and fidelity.